DETAILED FLORA AND VEGETATION SURVEY, PARDOO/RIDLEY

ATLAS IRON PTY LTD

OCTOBER 2022

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EXECUTIVE SUMMARY

Atlas Iron Pty Ltd (Atlas) is investigating opportunities associated with the mining and processing of additional resources at Pardoo, Western Australia. Atlas previously operated the Pardoo DSO Project between 2008 and 2014, and is currently undertaking investigations in support of the Ridley Magnetite Project.

Focused Vision Consulting Pty Ltd (FVC) was commissioned to conduct a detailed flora and vegetation assessment with targeted survey for significant flora and ecological communities, comprising a desktop assessment and field assessment, plus data processing and reporting, in accordance with the relevant Environmental Protection Authority (EPA) guidelines, within the relevant survey area.

The field assessment was conducted by Botanists/Ecologists, Daniel Roberts, Megan Gray and Olga Nazarova, and Graduate Ecologist, Kelly Hopkinson over two separate field trips between 24-29 May and between 27 June and 1 July 2022, totalling 23 person-days of survey effort.

The key results and conclusions from the detailed flora and vegetation survey of the Pardoo/Ridley survey area are as follows:

- The following Priority flora species were recorded during the field assessment:
    - *Rothia indica* subsp. *australis* (Priority (P)3)
    - *Goodenia nuda* (P4).
- The following 12 flora species were found to be exhibiting an extension beyond their currently documented range, based on records of the WAH (1998-).
    - *Acacia colei* ?var. *ileocarpa*
    - *Cucumis argenteus*
    - *Cyperus ?concinnus*
    - *Ehretia saligna*
    - *Ehretia saligna* var. *saligna*
    - *Eragrostis setifolia*
    - *Goodenia cusackiana*
    - *Grevillea pyramidalis* subsp. *pyramidalis*
    - *Portulaca pilosa*
    - *Pterocaulon serrulatum* var. *velutinum*
    - *Ptilotus aervoides*
    - *Schoenoplectus subulatus.*
- The following three undescribed flora were recorded:
    - *Sida* sp. articulation below (A.A. Mitchell PRP 1605)
    - *Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
    - Tephrosia sp. D Kimberley Flora (R.D. Royce 1848*)*
- Sixteen introduced (weed) species were recorded within the survey area, contributing to 6.35% of the species diversity, with the majority occurring in drainage lines.
- One recorded weed species, **Parkinsonia aculeata* is listed as a Weed of National Significance (WoNS) (Weeds Australia 2022).
- Two recorded weed species **Parkinsonia aculeata* and **Calotropis procerus* are listed as Declared Pest (DP) plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

- The vegetation condition of the survey area was found to range from 'Completely Degraded' to 'Excellent' condition, with 66% of the survey area in 'Very Good' condition or better.
- The survey area was found to support three broad landforms; drainage (including rivers, creek lines and floodplains), hills (undulating areas supporting mostly spinifex) and plains (supporting woodlands, shrublands and grasslands), that support eight vegetation units that have been defined and mapped.
- No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) were found to occur within the survey area. The observed vegetation types do not align with any defined TEC or PEC vegetation, nor were they considered likely to occur. Furthermore, none of the land systems known to support the PEC resulting from the desktop assessment occur within the survey area.
- One of the recorded vegetation units, EcAhEf, is considered to represent groundwater dependent vegetation (GDV) due to the presence of phreatophytic species, *Eucalyptus camaldulensis* subsp. *refulgens* as the dominant tree species. The total area of this vegetation unit mapped in the survey area is 247.066 ha (2.23%).
- Several of the recorded vegetation units within the survey area have been determined to potentially be of significance, as follows:
    - The following vegetation units are considered to be of regional significance:
        - AsTe, CfIoCf and TcAiTe due to supporting Priority flora
        - EcAhEf, due to playing a role in an important ecological process (as GDV)
        - AsTe, CfAcTe, CfIoCf, EcAhEf, FaTeCc, SgEeTs and TcAiTe, due to supporting range-extending flora
        - AsTe, CfAcTe, CfIoCf, EcAhEf and TcAiTe due to supporting undescribed flora.
    - The following vegetation unit is considered to be of local significance:
        - FaTeCc, due to occurring as small, isolated communities
        - FaTeCc, due to having a limited local extent and distribution.

1. INTRODUCTION

1.1 BACKGROUND

Atlas Iron Pty Ltd (Atlas) is investigating opportunities associated with the mining and processing of additional resources at Pardoo, Western Australia, which was an Atlas direct shipping iron ore mining operation between 2008 and 2014. Atlas also has 100% ownership of the Ridley Magnetite Project (Ridley), which is located within the Atlas Pardoo project area. Focused Vision Consulting Pty Ltd (FVC) was requested to undertake a detailed flora and vegetation assessment with targeted survey for significant flora and ecological communities, within the defined bounds of the Pardoo and Ridley project areas (collectively referred to as the 'survey area') (**Figure 1**). The purpose of the assessment was to identify and map vegetation units within the survey area and locate any occurrences of conservation significant ecological communities and flora species in accordance with the Environmental Protection Authority (EPA) guidelines.

1.2 LOCATION

The survey area is located within the Town of Port Hedland, Western Australia approximately 46 kilometres (km) east of the township of Port Hedland and approximately 1,336 km north of Perth (**Figure 1**). The survey area occupies an area of 11,060 ha and is accessible via Atlas roads and De Grey Pastoral Station access tracks.

1.3 SCOPE OF WORK

The flora and vegetation assessment followed the guidelines for Flora and Vegetation assessments in Western Australia, as described in:

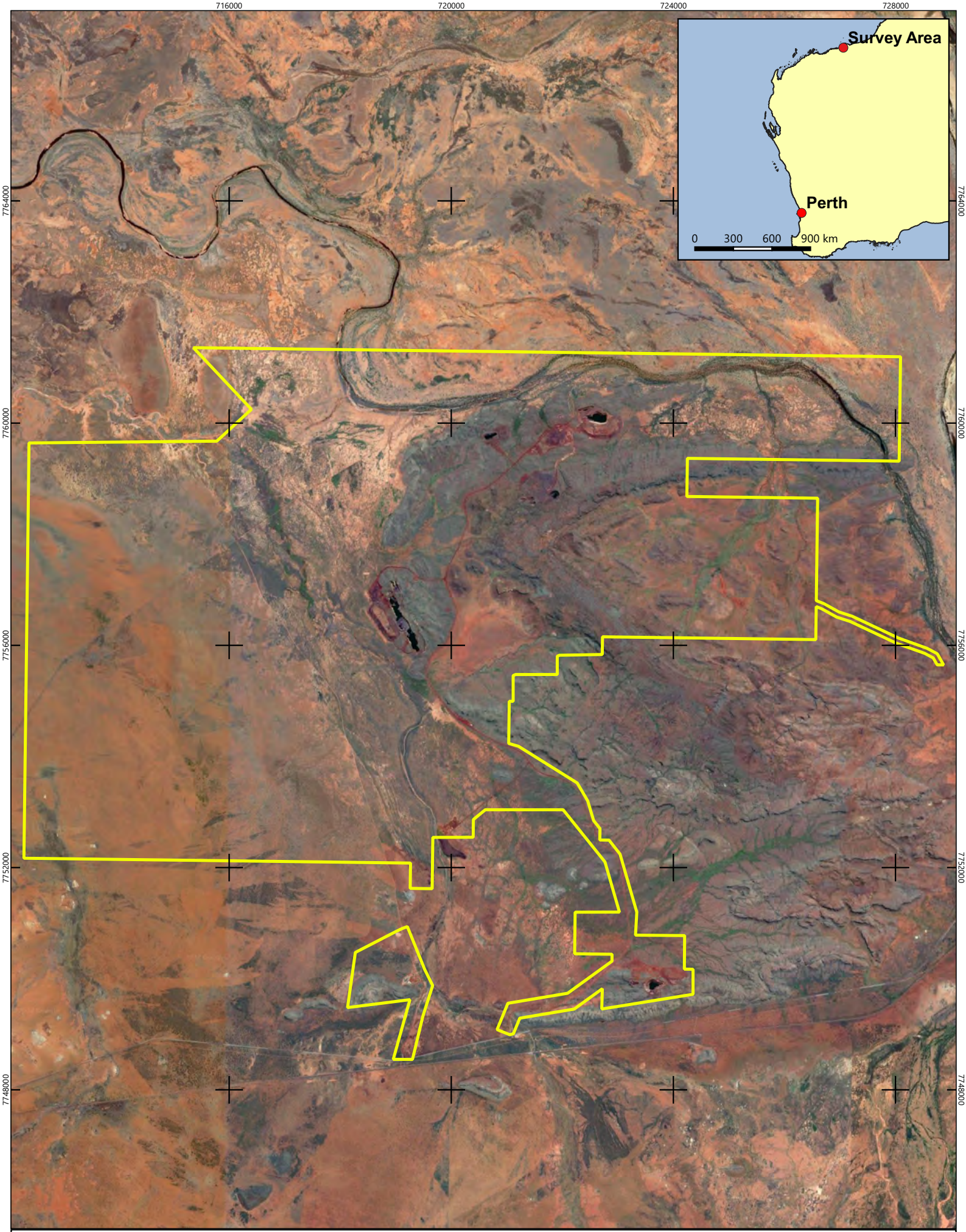
- **Technical Guidance -** *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a)
- **Environmental Factor Guideline -** Flora and Vegetation (Environmental Protection Authority (EPA 2016b).

The assessment required the following:

- **Desktop Assessment**. As described in section 3 of EPA's Technical Guidance - *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a) and including all available literature.
- **Detailed Field Assessment**. As described in section 4.3 of EPA's Technical Guidance - *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a), including:
    - sampling of quadrats
    - description and mapping of vegetation communities and a description of their regional significance and condition, particularly where they may represent Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs)
    - description and mapping of vegetation condition
    - identification and recording/mapping of the abundance of weed species and the impact they are having on native vegetation health
    - collection of data to assist in the regional statistical assessment of floristic data to demonstrate wider occurrence of vegetation types found to be of limited spatial distribution within the survey area (where possible, based on the availability of data).
- **Targeted Field Assessment**. As described in section 4.2 of Technical Guidance - *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a), with specific focus on:
    - Targeted searches for conservation significant flora either based on previous records or where suitable habitat occurs. Any populations identified were required to be quantified

- Targeted searches for conservation significant vegetation communities, and where vegetation considered potentially representative of significant vegetation is identified, best attempts will be made to delineate extents.

- Preparation of a comprehensive flora and vegetation assessment report and associated spatial data.



0 1 2 3 4 km

GDA 94 / MGA Zone 50

Legend

Survey Area

Figure 1 - Survey Area

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2. LEGISLATIVE CONTEXT

Flora and vegetation assessments are required to be conducted in accordance with the following legislation:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Western Australian *Environmental Protection Act 1986* (EP Act)
- Western Australian *Biodiversity Conservation Act 2016* (BC Act).

The assessments complied with requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2008) *Guidance Statement No. 33: Environmental Guidance for Planning and Development*
- EPA (2016a) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*
- EPA (2016b) *Environmental Factor Guideline – Flora and Vegetation*.

2.1 THREATENED AND PRIORITY FLORA

The Department of Biodiversity, Conservation and Attractions (DBCA) assigns conservation status to endemic plant species that are geographically restricted to few known populations or threatened by local processes. Allocating conservation status to plant species assists in protecting populations and conserving species from potential threats (DBCA 2019).

The BC Act provides a statutory basis for the listing of threatened species, specially protected species, TECs, critical habitat and key threatening processes. Whilst not awarded any statutory protection, DBCA also maintains the Priority flora list, for species of conservation concern. Priority flora are given consideration in environmental impact assessments (EIAs) and in the assessment of clearing permit applications, in accordance with the ten clearing principles (DER 2019). Therefore, both Threatened and Priority flora are important focuses of surveys conducted to inform the EIA process, and their definitions are presented in **Table 1**.

Table 1 – Definitions of Threatened and Priority Flora Species

Conservation Code	Category
T	**Threatened Species** Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the BC Act. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
P1	**Priority 1 – Poorly Known Species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2 – Poorly Known Species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3 – Poorly Known Species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4 – Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Federal Minister for the Environment (Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022a).

Species at risk of extinction are recognised as Threatened at a Commonwealth level and are categorised according to the EPBC Act as summarised in **Table 2**.

Table 2 – Categories of EPBC Act Threatened Flora Species

Conservation Code	Category
EX	**Extinct** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
EW	**Extinct in the Wild** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
CR	**Critically Endangered** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
EN	**Endangered** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Any species listed in State and Commonwealth legislation as being of conservation significance is broadly considered to be a significant species. This incorporates species that are endangered, vulnerable and rare or covered by international conventions. Significance is not limited to species covered by State and Commonwealth legislation, and it also includes species of local significance and species showing significant range extensions or species at the edge of their known range.

2.2 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Threatened Ecological Communities (TECs) are naturally occurring biological assemblages that occur in a particular type of habitat, which are subject to processes that threaten to destroy or significantly modify the assemblage across its range (DEC 2007).

The Minister may list an ecological community as a TEC in one of the following categories; Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). The categories and the criteria for defining TECs have been described by English and Blyth (1999). A publicly available database, listing TECs within Western Australia (WA) is maintained by DBCA.

TECs in WA are protected under the State BC Act and some are also protected under the Commonwealth EPBC Act. The TECs on the Commonwealth register are also listed on the DCCEEW website, and in the Protected Matters Database (DCCEEW 2022b, DCCEEW 2022c).

Additional to TECs, ecological communities that are considered potentially of conservation significance (and potentially TECs) that do not currently meet survey criteria or that are not adequately defined, are rare but not threatened, have been recently removed from the TEC list or require regular monitoring, are considered to be Priority Ecological Communities (PECs) (DEC 2013) and are required to be taken into consideration during environmental impact assessments (EPA 2016b).

2.3 VEGETATION OF SIGNIFICANCE

Alongside and in addition to significance according to statutory listings, vegetation may be considered significant at a National, State, regional or local level. Whilst not applicable to statutory protection, vegetation significance is an important consideration in the environmental impact assessment process.

2.3.1 Nationally Significant Vegetation

Vegetation communities may be considered to be of National significance where they support the following Commonwealth listed Matters of National Environmental Significance (MNES):

- populations of Threatened (EPBC listed) species
- TECs listed as nationally (EPBC) significant
- RAMSAR Wetlands of International Importance (DCCEEW 2022d).

2.3.2 State Significant Vegetation

Vegetation communities may be considered to be of State significance where they:

- support State listed Threatened flora, fauna and TECs afforded protection under the BC Act (EPA 2008)
- occur within the State-managed conservation estate (areas protected under the *Conservation and Land Management Act 1984*) or areas that have been formally recommended by DBCA for inclusion in the State conservation estate (EPA 2008).

2.3.3 Regionally Significant Vegetation

Vegetation communities may be considered to be of regional significance where they:

- support populations of Priority Flora or ecological communities (EPA 2016b, Government of Western Australia 2000a)
- are formally protected or recognised as Environmentally Sensitive Areas (ESAs), or under planning schemes for conservation, such as Bush Forever (EPA 2008, WALGA 2004)
- support conservation category wetlands including associated vegetation (Government of Western Australia 2000a and 2000b)
- maintain important ecological processes (EPA 2016b)
- support high diversity of flora, fauna, communities, or community structure (Government of Western Australia 2000a)
- contain flora species exhibiting range extensions and undescribed species (EPA 2016b)
- have a restricted regional distribution (EPA 2016b)
- are represented by less than 30% of their pre-European extent (Commonwealth of Australia 2001).

2.3.4 Locally Significant Vegetation

Vegetation communities may be considered to be locally significant where they:

- occur as small, isolated communities (Government of Western Australia 2000a, WALGA 2004)
- have a restricted local extent (proportion) (EPA 2016b) and/or are locally restricted to only one or a few locations (WALGA 2004).

2.4 VEGETATION CLEARING, EXTENT AND STATUS

Clearing of native vegetation is regulated in WA under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Any clearing of native vegetation is an offence, unless carried out under a Part IV (EP Act) approval (Ministerial Statement), native vegetation clearing permit (NVCP) or if the clearing is for an exempt purpose (Department of Water and Environmental Regulation (DWER) 2022).

The objective of the EPA in relation to flora and vegetation is 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained' (EPA 2016a). This objective is documented in the *EPA Factor Guideline - Flora and Vegetation* (EPA 2016a). The EPA considers it is important that ecological communities are maintained above the threshold level of 30% of the original pre-clearing extent of the community in unconstrained areas and 10% within 'constrained' areas (EPA 2008).

2.5 ENVIRONMENTALLY SENSITIVE AREAS

Environmentally Sensitive Areas (ESAs) are areas that require special protection due to aspects such as landscape, fauna or historical value and are generally considered to be areas of high conservation value. ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (Minister for the Environment 2005).

There are several types of ESAs relating to flora and vegetation, declared under Part V of the EP Act, which include:

- a defined wetland and the area within 50 m of that wetland
- the area covered by vegetation within 50 m of rare (Threatened) flora, to the extent where the vegetation is continuous with the vegetation in which the rare (Threatened) flora is located
- the area covered by a TEC
- Bush Forever sites.

2.6 INTRODUCED FLORA

Over 1,200 introduced (weed) species have been recognised to occur within Western Australia (EPA 2007). Weeds are plants that are not indigenous to an area and have been introduced either directly or indirectly through human activity. They establish in natural ecosystems and adversely modify natural processes, have the potential to dominate and simplify the ecosystems and thus decrease habitat value provided for native fauna. Weeds pose a threat to many native flora species due to their ability to rapidly grow and out-compete for available water, space, sunlight, and nutrients (EPA 2007).

2.6.1 Weeds of National Significance

Under the National Weed Strategy, there are currently 32 weed species listed as Weeds of National Significance (WoNS) (Weeds Australia 2022). Each weed listed was considered for inclusion based on the following criteria:

- invasive tendencies
- impacts
- potential for spread
- socioeconomic and environmental values.

2.6.2 Declared Pest Plants

The Western Australian Organism List (WAOL) details organisms listed as Declared Pests (DPs), including pest plants, under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) (DPIRD 2022). Under the BAM Act, DP plants are listed under one of the following categories:

- **C1 (exclusion)**, that applies to pests not established in Western Australia; control measures are to be taken to prevent their entry and establishment
- **C2 (eradication)**, that applies to pests that are present in Western Australia but in low numbers or in limited areas where eradication is still a possibility
- **C3 (management)**, that applies to established pests where it is not feasible or desirable to manage them in order to limit their damage.

2.6.3 Environmental Weeds

Introduced species have also been ranked by a number of attributes including invasiveness, distribution and environmental impacts in the various regions in the *Environmental Weed Strategy* (CALM 1999). To advance the above categorisation, the Invasive Plant Prioritisation Process for DBCA was developed in 2008 (DPAW 2013).

3. EXISTING ENVIRONMENT

3.1 CLIMATE

The survey area occurs in the Pilbara bioregion, which experiences a semi-desert to tropical climate (McKenzie *et al.* 2002). The closest weather station to the survey area is Port Hedland (Site 004032) which is operated by the Bureau of Meteorology (BoM). A long-term average of 317.3 millimetres (mm) of rain was recorded at the station, with most rain typically falling in January, February, and March. Annual mean temperatures range from 12.5°C in winter to 36.8°C in summer (BoM 2022). Summer rainfall data, for the four months preceding the 2022 field assessment, indicated that February and April recorded above average monthly rainfall, whilst January and March recorded below average monthly rainfall (**Figure 2**).

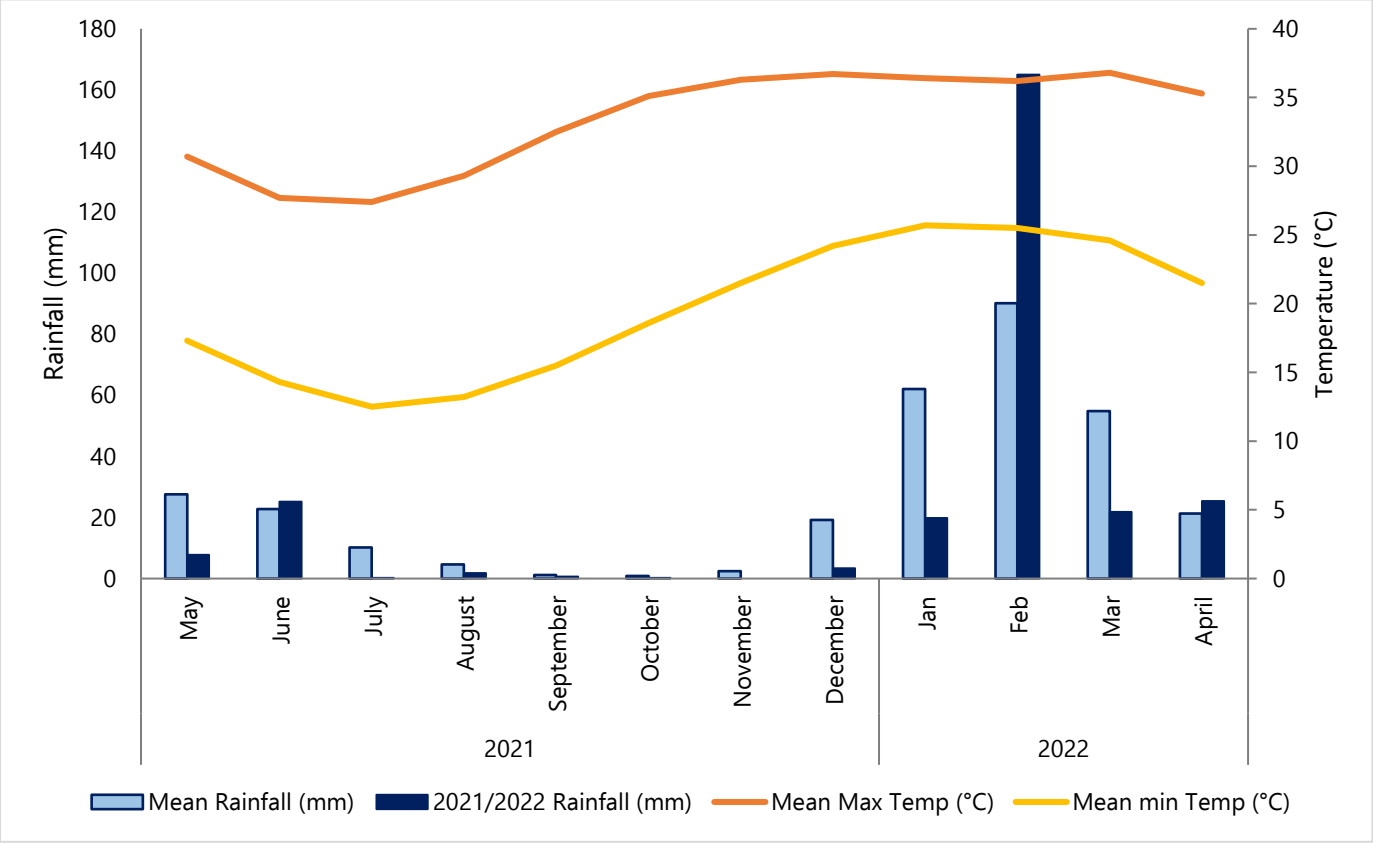

Figure 2 – Port Hedland Climate Data (BoM 2022)

3.2 IBRA REGION

There are 89 recognised Interim Biogeographic Regionalisation for Australia (IBRA) regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (DCCEEW 2022e). The survey area is situated in the Pilbara IBRA region which is characterised as extensive coastal plains, mountain ranges, and active drainage in the Ashburton, Fortescue, and De Grey River systems. Vegetation is predominantly mulga low woodlands or snappy gum over tussock and hummock grasses (Bastin and the ACRIS Management Committee 2008; McKenzie *et al.* 2002).

The survey area occurs within the Roebourne sub-region (PIL04) which is located on the northern section of the Pilbara Craton (**Figure 3**). This sub-region is described as 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 of this sub-region are dominated by *Triodia* hummock grasslands; ephemeral drainage lines inhabited by *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands; and marine alluvial flats and river deltas populated by Samphire, Sporobolus and mangal (Kendrick 2002b).

The study area also occurs within the Chichester sub-region (PIL1) which is also located on the northern section of the Pilbara Craton (**Figure 3**). The sub-region is described as undulating Archaean granite and basalt plains include significant areas of basaltic ranges. The vegetation consists of shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, with *Eucalyptus leucophloia* tree steppes occur on ranges. The main land uses are grazing, native pasture, conservation land, urban and mining (Kendrick 2002a).

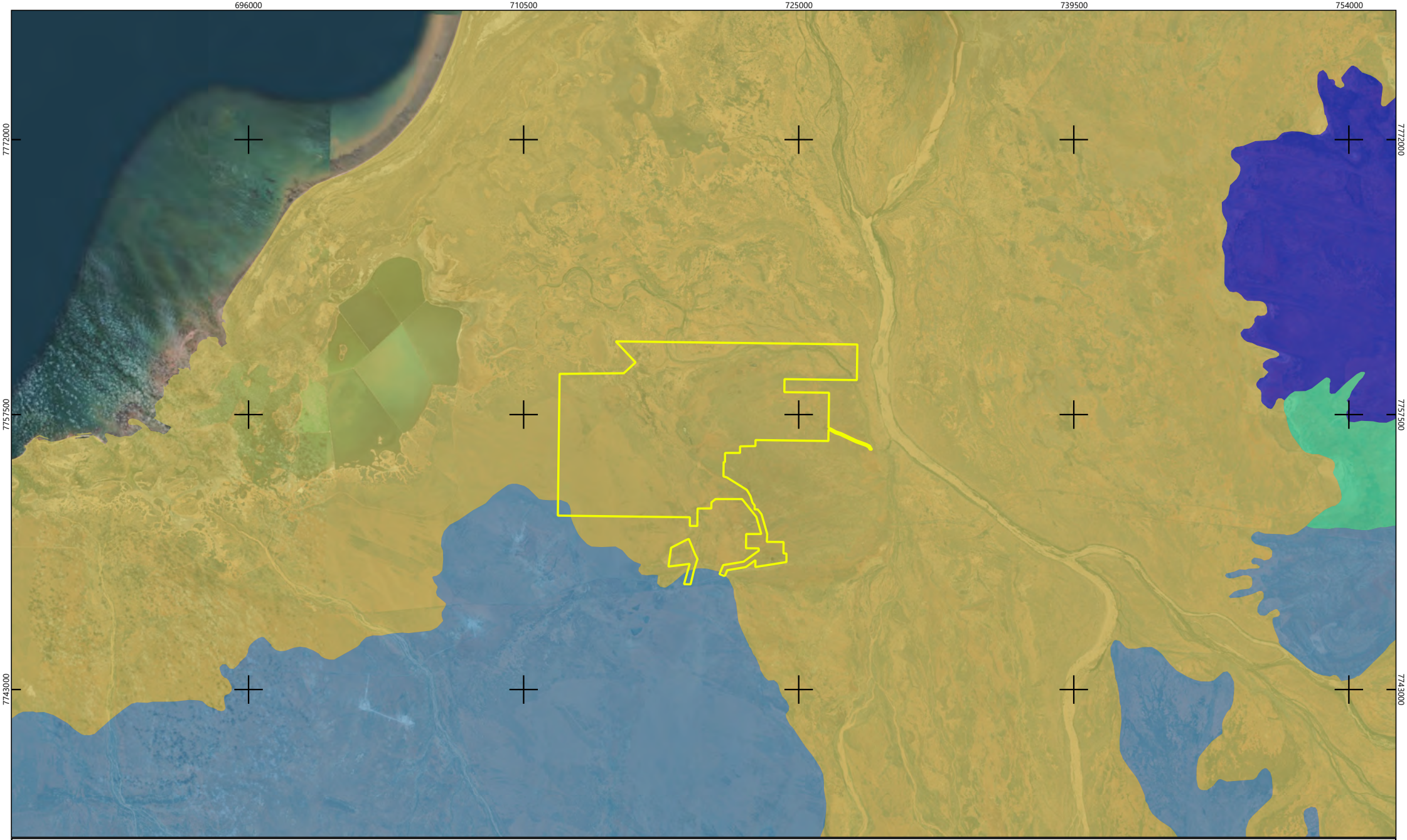

Figure 3 - IBRA Subregions

3.3 GEOLOGY AND SOILS

The Pilbara region is formed of a basement of Archaean granite and volcanics, overlain by massive deposits of Proterozoic sediments and volcanics (Beard 1990).

The geology of the survey area occurs within the northern part of the Fortescue Province that lies over the Pilbara Craton. In the north are the Archaean rocks of Pilbara Granite-Greenstone Terranes. Included in these terranes are granitoid rocks, basic and ultrabasic volcanic rocks, and acidic volcanic rocks. The north of the province also comprises of Archaean shale, siltstone and wacke and granitic intrusions of the Mallina Basin; the Archaean greywacke of the Mosquito Creek Basin; and the late Archaean Palaeoproterozoic basalt and sandstone of the Marble Bar Sub-basin (Tille 2006).

The survey area is located within both the Nullagine Hills (280) and the De Grey - Roebourne Lowlands (281) zones (Tille 2006). The Nullagine Hills zone (280) is defined by hills and ranges on volcanic and sedimentary rocks and stony soils with red shallow loams and sands. The De Grey – Roebourne Lowlands zone (281) is characterised by alluvial sandplains and deep sandy duplexes with Red loamy earths and some Red/brown noncracking clays, Cracking clays, Red sandy earths, and Red deep loamy duplexes (Tille 2006).

At a finer scale, the seven geological units of the survey area are described in **Table 3** and presented in **Figure 4** (DMIRS 2020).

Table 3 – Geological Units of the Survey Area

Geological Unit	Code	Description
Gorge Creek Group	Acg	Chert, ferruginous chert, banded iron formation, jaspilite; minor siltstone, shale, sandstone, pebbly sandstone, quartzite, polymictic conglomerate, felsic volcaniclastic rock, basalt, ultramafic schist, mafic schist
Sisters Supersuite	Agi	Undifferentiated granitoid intrusions of the Sisters Supersuite; leucogranite (locally schlieric or pegmatitic), monzogranite, granodiorite, tonalite, diorite, tonalitic orthogneiss, rhyolite dykes, pegmatite; interleaved in places
Chillerina Granodiorite	Agic	Hornblende-biotite granodiorite, K-feldspar-phyric monzogranite
Callawa Formation	JKsc	Fluviatile cross-bedded very fine to coarse-grained sandstone, granule conglomerate and minor siltstone; plant and trace fossils
Alluvium 38485	Qa	Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted
Coastal Dunes 38488	Qdc	Beach sand, sand dunes, coastal dunes, beaches, and beach ridges; calcareous and siliceous, locally shelly and/or cemented (beach rock); locally reworked
Colluvium 38491	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

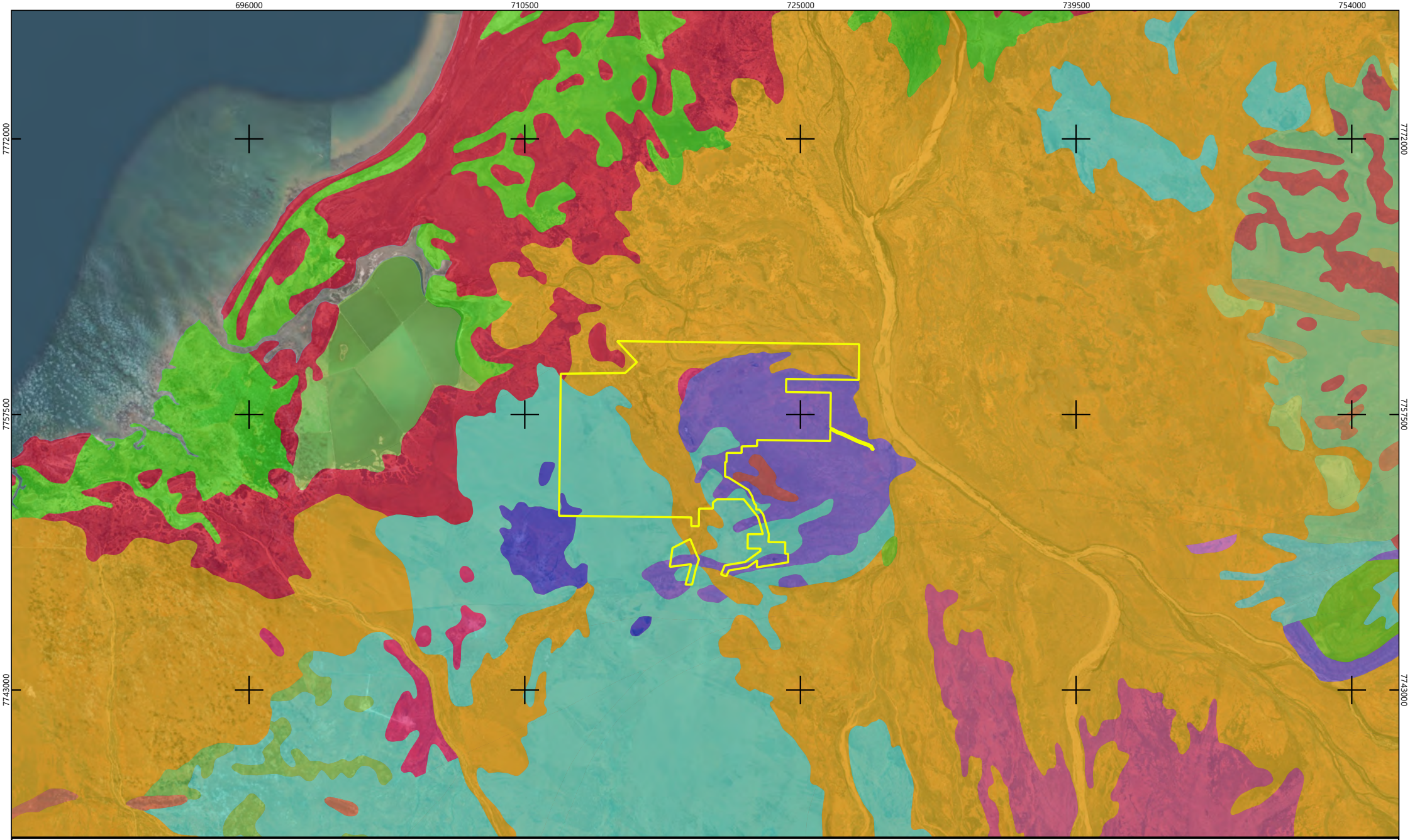

Figure 4 - Geology

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3.4 LAND SYSTEMS

Land systems are composed of repeating forms of topography, soils and vegetation, which are described as a series of land units (Christian and Stewart 1953). The Department of Agriculture described land systems within the Pilbara IBRA region based on general ecological information, vegetation physiognomy and composition, patterns of variation, conservation status, gradational association and land system representation (Payne *et al.* 1988; Van Vreeswyk *et al.* 2004). The distribution of land systems in the locality of the survey area is shown in **Figure 5**. The survey area intersects seven land systems within the Chichester and Roebourne IBRA subregions, which are summarised in **Table 4**.

Table 4 – Land Systems in the Survey area

Land System	Description
Boolgeeda Land System	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.
Capricorn Land System	Hills and ridges of sandstone and dolomite supporting low shrublands or shrubby spinifex grasslands.
Mallina Land System	Sandy surfaced alluvial plains supporting soft spinifex (and occasionally hard spinifex) grasslands.
Paradise Land System	Alluvial plains supporting soft spinifex grasslands and tussock grasslands.
River Land System	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.
Uaroo Land System	Broad sandy plains supporting shrubby hard and soft spinifex grasslands.
Yamerina Land System	Flood plains and deltaic deposits supporting tussock grasslands, grassy woodlands and minor halophytic low shrublands.

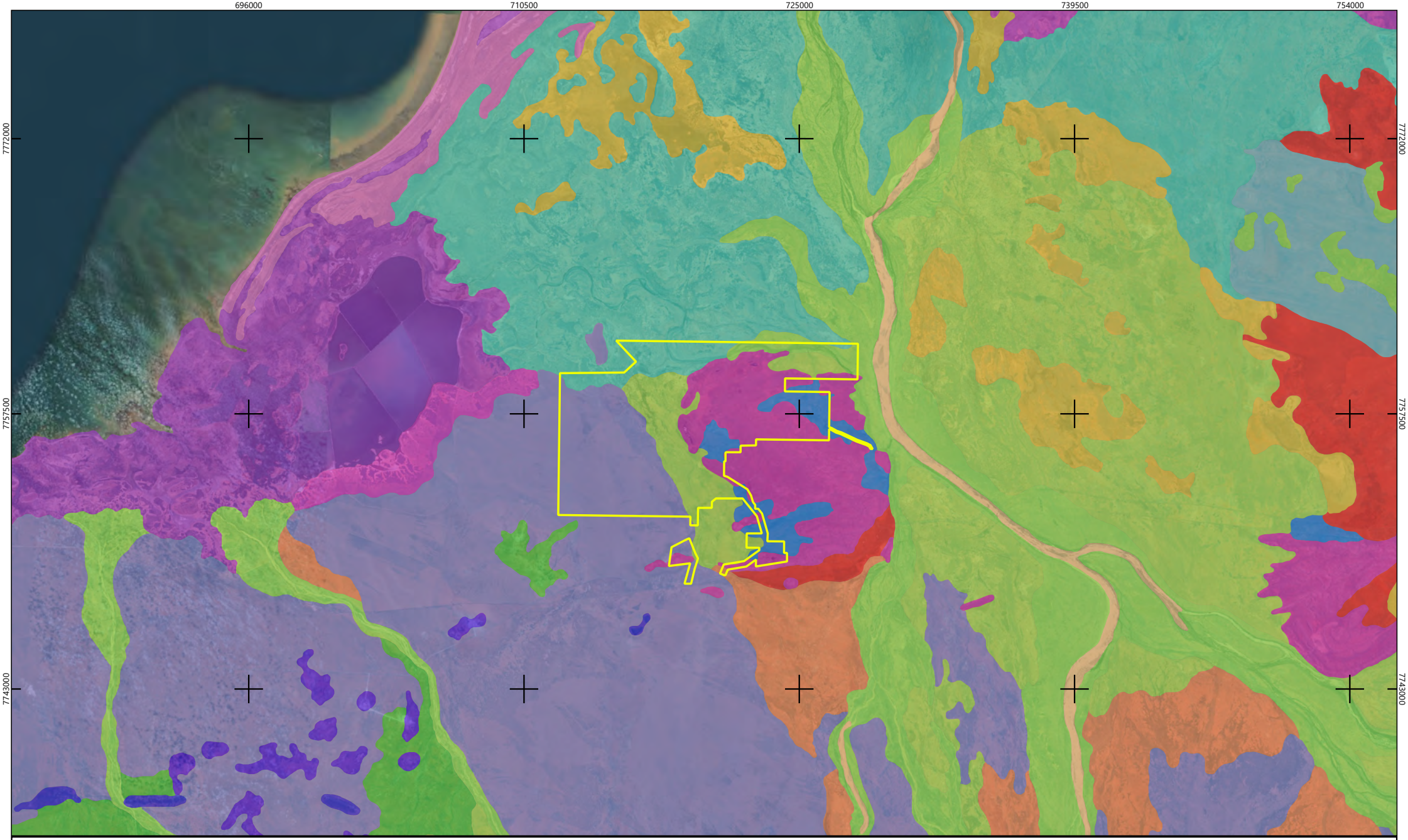

Figure 5 - Land Systems

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3.5 VEGETATION

3.5.1 Pre-European Vegetation

Pre-European vegetation in Western Australia has been broadly characterised by Beard (1990, 1975a, 1975b) which described and mapped the vegetation of the Pilbara at a scale of 1:1,000,000 and has since been converted into a digital form (Shepherd *et al.* 2002). The vegetation is described in three categories (from broad to finer scale) as systems, associations (can occur in multiple systems), or system – association (combined system and vegetation association). Four Beard (1975a, 1975b) vegetation associations are situated in the survey area and their remaining extent across a range of contexts are presented in **Table 5** and spatially in **Figure 6**.

Table 5 - Pre-European Vegetation in the Survey Area

Extent Context	Vegetation Association	Broad Vegetation Description	Pre–European Extent (ha)	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent in DBCA Managed Lands (%)
Western Australia	93	Hummock grasslands, shrub steppe; kanji over soft spinifex	3,044,309.52	3,040,640.98	99.88	1.96
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	807,698.58	802,713.40	99.38	1.89
	619	Medium woodland; river gum (*Eucalyptus* camaldulensis)	119,373.78	118,205.01	99.02	0.20
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	195,860.89	191,711.41	97.88	0
Pilbara IBRA Region	93	Hummock grasslands, shrub steppe; kanji over soft spinifex	3,042,114.27	3,038,471.67	99.88	1.96
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	728,768.20	724,695.82	99.44	2.10
	619	Medium woodland; river gum (*Eucalyptus* camaldulensis)	118,920.31	118,116.78	99.32	0.20
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	195,859.95	191,710.92	97.88	0
Chichester IBRA Sub-Region	93	Hummock grasslands, shrub steppe; kanji over soft spinifex	2,940,348.04	2,936,731.54	99.88	2.02
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	53,376.40	53,368.34	99.98	1.78
	619	Medium woodland; river gum (*Eucalyptus* camaldulensis)	85,543.15	85,520.95	99.97	0.28
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	6,958.63	6,936.22	99.68	0
Roebourne IBRA Sub-Region	93	Hummock grasslands, shrub steppe; kanji over soft spinifex	46,360.53	46,334.43	99.94	0
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	675,391.80	671,327.48	99.40	2.13
	619	Medium woodland; river gum (*Eucalyptus* camaldulensis)	33,377.16	32,595.83	97.66	0
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	6,958.63	6,936.22	99.68	0

Extent Context	Vegetation Association	Broad Vegetation Description	Pre–European Extent (ha)	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent in DBCA Managed Lands (%)
Town of Port Hedland	93	Hummock grasslands, shrub steppe; kanji over soft spinifex	1,015,339.22	1,014,599.99	99.93	0
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	338,269.05	335,921.21	99.31	0
	619	Medium woodland; river gum (*Eucalyptus* camaldulensis)	63,650.59	62,598.14	98.35	0
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	180,908.49	176,759.02	97.71	0

The objective of the EPA in relation to flora and vegetation is; to protect flora and vegetation so that biological diversity and ecological integrity are maintained (EPA 2016b). The EPA considers it is important that ecological communities are maintained above a threshold level of 30% of the original pre-clearing extent of each community (EPA 2008). Additionally, the National Objectives and Targets for Biodiversity Conservation 2001-2005 (Commonwealth of Australia 2001) recognise that the retention of at least 30% of the pre-clearing extent of each vegetation association is necessary for Australia's biological diversity to be protected (DER 2019). A level of 30% of pre-clearing extent is considered to be the level below which species loss appears to accelerate exponentially at the ecosystem level (EPA 2008). From purely a biodiversity perspective, a level of 10% of the original extent of a vegetation association is regarded as being a level representing Endangered (EPA 2008) and any clearing which would increase the threat level to a vegetation association should be avoided.

All vegetation associations within the survey area exceed the 30% retention threshold in a State, regional and local context; and therefore, the remaining extents meet the EPA objective of retention for the purpose of biodiversity conservation.

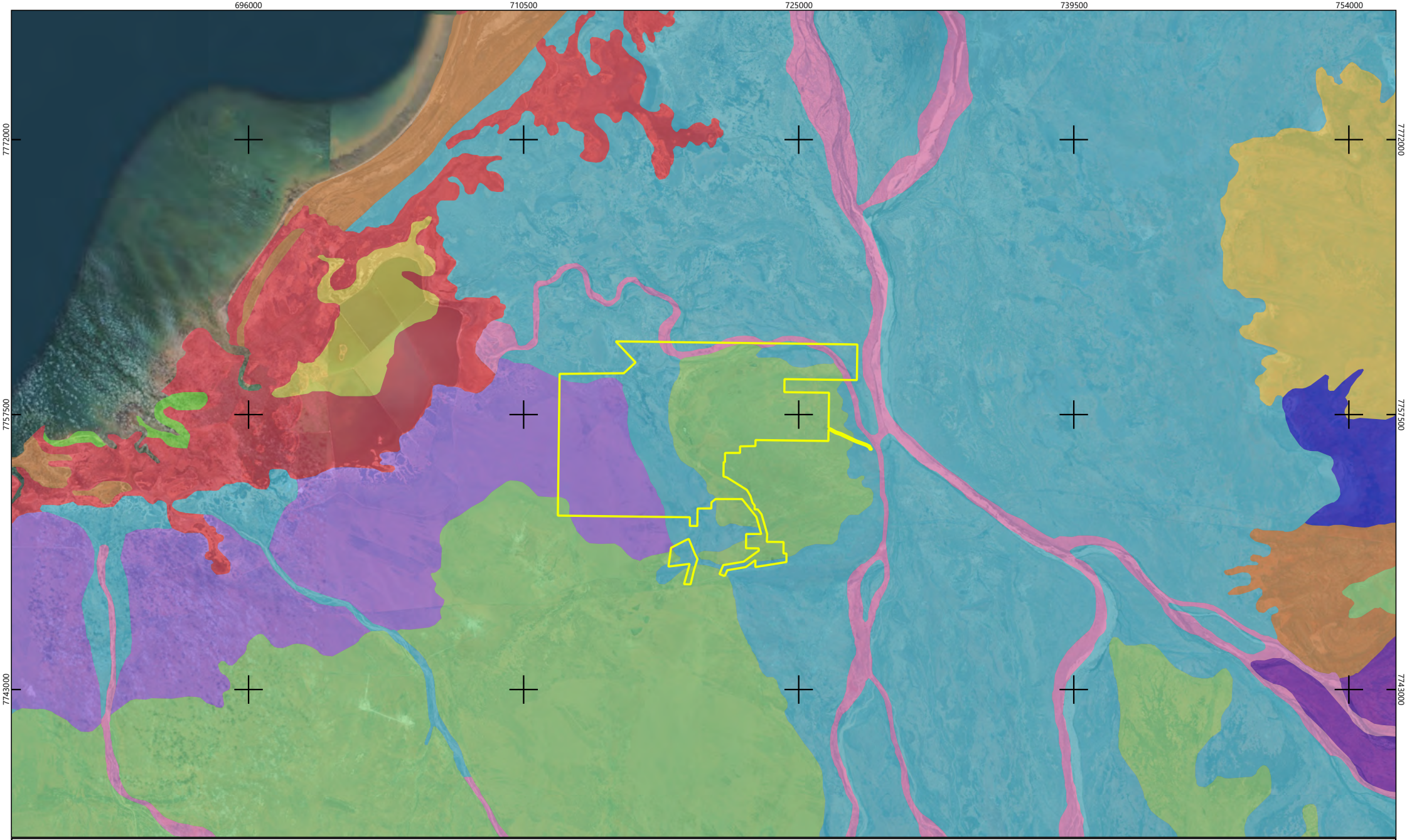

Figure 6 - Pre-European Vegetation

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3.5.2 Groundwater Dependent Vegetation

Groundwater dependent ecosystems (GDEs) are ecosystems that are dependent on groundwater. The functioning and composition of these ecosystems are often highly responsive to changes in groundwater availability (Murray *et al.* 2003). Therefore, the groundwater regime is a key factor influencing the composition of flora and fauna, ecological processes and ecosystem services (Sinclair Knight-Merz 2001; Hatton and Evans 1998).

Key elements of the groundwater regime that influences the health of GDEs (and the groundwater dependent vegetation (GDV) occurring within them) in relation to vegetation are:

- Groundwater level: groundwater dependent plants require groundwater or the associated capillary fringe to be at least episodically or periodically within the root zone
- Groundwater flux: the rate of groundwater flow needs to be sufficient to maintain plant water status
- Groundwater quality: tolerance to changes in groundwater quality, such as pH and salinity, varies between plant species and is also dependent upon other environmental factors (Sinclair Knight-Merz 2001).

Phreatophytes, or groundwater dependent plants, can be categorised as either:

- Obligate phreatophytes: plants that are completely or highly dependent on groundwater. This reliance can be continual, seasonal or episodic. Obligate phreatophytes are highly sensitive to changes in groundwater regime and will respond negatively to significant or rapid groundwater drawdown.
- Facultative phreatophytes: plants that utilise groundwater opportunistically, most notably during times of drought (Lamontagne *et al.* 2005).

Common phreatophytic tree species of the Pilbara, which are indicators of GDV, include:

- *Eucalyptus camaldulensis* subsp. *refulgens* – a tall tree (up to 30 m) primarily located along watercourses throughout much of Australia and considered a facultative phreatophyte
- *Eucalyptus victrix* – a moderately tall tree (up to 15 m) with a spreading form and considered a facultative phreatophyte
- *Melaleuca argentea* – a moderate to tall tree (up to 25 m) often restricted to the banks of watercourses and swamps and is considered an obligate phreatophyte (Maunsell 2006; Loomes 2010).

3.5.3 Sheet Flow Dependent Mulga

Sheet flow is an overland flow or downslope movement of water taking the form of a thin film over relatively smooth soil or rock surfaces where it is not concentrated into channels larger than rills (Miller *et al.* 2002). It typically occurs in gently sloping landscapes (< 2º) in arid and semi-arid areas of Australia (Mabbutt *et al.* 1987; Ludwig *et al.* 1997). Other factors influencing the generation of sheet flow besides rainfall duration, intensity, variability and temporal occurrence (Reaney *et al.* 2007), are soil properties including texture, hydraulic conductivity, soil crust and sodicity. Sheet flow and surface runoff are major components of the important hydrologic cycle in the arid zone, including the Pilbara (Biota 2018). Some vegetation units dominated by mulga are known to be dependent on the sheet flow movement of surface water. Mulga typically occurs as groves (with bare intergrove areas between these) or as distinct patches (woodland or low open forest formations) and can produce a distinct banding pattern across the landscape. The groves or patches act as an ecologically important sink for water and nutrients, and intercept sheet flow during periods of seasonal rainfall. Mulga vegetation occurring as groves and intergroves and as patches of woodland or open forest are often identifiable on aerial photography as characteristic darker patches (due to the density of individuals present) on the flatter landforms (broad alluvial drainage flats) (Mabbutt *et. al.* 1987). Interruptions to local hydrology and therefore sheet flow can negatively impact on mulga occurrences, if they are sheet flow dependent.

4. METHODOLOGY

The detailed flora and vegetation assessment with targeted survey for significant flora and ecological communities, comprising a desktop assessment and field assessment, plus data processing and reporting, was conducted in accordance with the following:

- EPA (2016a) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*
- EPA (2016b) *Environmental Factor Guideline – Flora and Vegetation*.

4.1 DESKTOP ASSESSMENT

4.1.1 Literature Review

As part of the desktop assessment, a review of previous botanical surveys that have been undertaken near the project site was conducted. These surveys are listed below and have also been summarised in **Section 5.1.1** (**Table 8**):

- ENV Australia (2011) *Port Hedland Regional Flora and Vegetation Assessment*. Unpublished report prepared for BHP Billiton
- Mattiske Consulting (2000) *Flora, Vegetation and Vertebrate Fauna of the Proposed Expansion at Wodgina*. Unpublished report prepared for Venturex Resources Ltd
- Onshore Environmental (2013) *Flora and Vegetation Survey and Fauna Assessment: Cundaline Northern Ridge*. Unpublished report prepared for BHP Billiton Iron Ore
- Woodman Environmental Consulting (2017) *Corunna Downs Intersection Works: Flora and Vegetation Assessment*. Unpublished report prepared for Atlas Iron
- Woodman Environmental Consulting (2009) *Flora and Vegetation Assessment, Ridley Magnetite Project*. Unpublished report prepared for Atlas Iron Limited
- Woodman Environmental Consulting (2008) *Additional Survey for Significant Flora, Pardoo Direct Shipping Ore Project*. Unpublished report prepared for Atlas Iron Limited
- Woodman Environmental Consulting (2007) *Flora and Vegetation Studies and Project Minesite Impact Assessment, Pardoo Direct Shipping Ore Project*. Unpublished report prepared for Atlas Iron Limited
- Woodman Environmental Consulting (2005) *Farrell Well Survey Flora and Vegetation Study*. Unpublished report prepared for Atlas Iron Limited
- Woodman Environmental Consulting (2001) *Proposed Wodgina Lateral Natural Gas Pipeline Flora, Vegetation and Fauna Survey.* Unpublished report prepared for Atlas Iron Limited.

4.1.2 Database Searches

A desktop assessment for Threatened and Priority flora potentially occurring within the survey area was undertaken prior to the field assessment. The desktop assessment made reference to NatureMap (DBCA 2022a) (**Appendix A**), DBCA Threatened and Priority flora (DBCA 2022b) and ecological communities (DBCA 2022c) databases and the Commonwealth Protected Matters Search Tool (PMST) for MNES (DCCEEW 2022c) (**Appendix B**).

NatureMap, PMST, DBCA TEC, PEC and Priority flora database searches were based on a central point within the survey area, with a 50 km radial buffer.

Each species of Threatened and Priority flora resulting from the desktop assessment was evaluated for its likelihood of occurring within the survey area or surrounds. Prior to the field assessment, the possible habitats provided were assessed in reference to regional vegetation data, aerial imagery and results from the Threatened and Priority Flora Database (TPFL) and the WA Herbarium database (WAHerb) provided by the Species and Communities Branch within DBCA.

The likelihood of occurrence of flora and vegetation of conservation significance was based on four criteria: the presence of suitable habitat within the survey area, age of previous records, proximity of previous records to the survey area and current condition of the survey area. These criteria are discussed in detail in **Table 6**.

Table 6 – Likelihood of Occurrence Criteria

Criteria	Explanation
Suitable habitat	The likelihood of suitable habitat being present within the survey area was based on known habitat information gathered from DBCA database information, FloraBase (Western Australian Herbarium (WAH 1998-) and literature sourced from the Species Profile and Threats Database (SPRAT) (DCCEEW 2022c) (e.g., recovery plans, conservation advice).
Age of previous records	The age of previous records for significant species resulting from the desktop assessment was evaluated to determine how likely the species was to still occur in the area (i.e., habitat of species recorded decades ago may no longer occur or a species may be locally extinct).
Proximity of previous records	The proximity of previous significant flora and vegetation results in relation to the survey area contributed to the likelihood of occurrence conclusions, with those previously recorded close by considered more likely to occur within the survey area. It is noted that species identified from the PMST have not necessarily been recorded within close proximity to the survey area and may have resulted due to habitat possibly occurring within the area.
Current condition of survey area	The survey area is largely unmodified although is degraded in some areas from pastoral activities, particularly in the riparian sections where degradation has likely been exacerbated by cattle grazing and trampling and long-term low rainfall and dry conditions. Highly modified and degraded environments usually represent a lower likelihood of the occurrence of significant flora, whilst intact remnants are known to harbour significant species and communities that may have otherwise been cleared or impacted throughout their range.

4.2 FIELD ASSESSMENT

4.2.1 Flora and Vegetation Assessment

The field assessment was conducted over two separate field trips. The first part of the assessment was carried out by Botanists/Ecologists, Daniel Roberts , Megan Gray and Olga Nazarova between 24-29 May 2022, consisting of a survey effort of 15 person-days (not including travel time).

The second part of the assessment was carried out by Daniel Roberts (Botanist/Ecologist) and Kelly Hopkinson (Graduate Ecologist) between 27 June and 1 July 2022, consisting of a survey effort of eight person-days (not including travel time).

Field data were collected using electronic tablet devices with customised data forms and mobile spatial mapping capability, within the software program, Mappt™. The methodologies utilised for the field assessment tasks carried out are described in the following sections.

4.2.2 Quadrats

Field data were collected from flora and vegetation assessment quadrats, where vegetation was in 'Good' or better condition, representative of the diversity of floristic values of the site. To meet the EPA requirements, at least three quadrats per vegetation unit were aimed to be established, with more than three for dominant and widespread units. Relevés were also used for sampling, which are a low intensity survey technique for gathering information for flora and vegetation reconnaissance surveys, or as part of detailed surveys, in areas of vegetation that are not in 'Good' or better condition.

Consistent with EPA guidance for the Pilbara bioregion, quadrats sampled were 50 m x 50 m, or an area equal to 2,500 m^2 where the vegetation dictated that a quadrat of differing proportionate dimensions was appropriate (such as in narrow flowlines). Each quadrat was photographed from the north-west corner and surveyed in accordance with the EPA Technical Guidance (EPA 2016a). The locations of quadrats and one relevé sampled are presented in **Figure 7**.

The following information was collected at each quadrat:

- recorder
- date
- site code
- GPS location (MGA94)
- representative photograph
- landform and soil description
- topography/slope
- time since fire
- comprehensive list of flora species observed, including average height and estimated projected foliage cover of dominant species within each stratum
- vegetation degradation/disturbances (e.g. grazing, weed invasion, fire)
- vegetation condition, assessed against the currently accepted scale; an adaptation of the Keighery (1994) and Trudgen (1991) condition scales.

The two field assessment trips (with a total of 23 person-days) were conducted via vehicle and foot traverses to sample a total of 59 quadrats and one relevé within the survey area (**Figure 7**). Quadrat sites were initially selected at a desktop level during the planning stage of the assessment, using information including aerial imagery, available track files and land system mapping. Sites were adjusted in the field where appropriate, such as where occurrences of different vegetation unit or condition were identified, and in relation to available access. Sites were selected to provide representative and replicate samples of each vegetation unit.

Flora and vegetation that were not recorded through other sampling methods were opportunistically sampled as encountered either from vehicle or on foot. Opportunistic sampling also included significant species and where there was the likelihood of new species as well as introduced (weed) species. The flora and vegetation data collected from the combination of quadrats, relevés, traverses and continuous opportunistic observations contributed to the flora inventory for the assessment, including weeds (**Appendix C**).

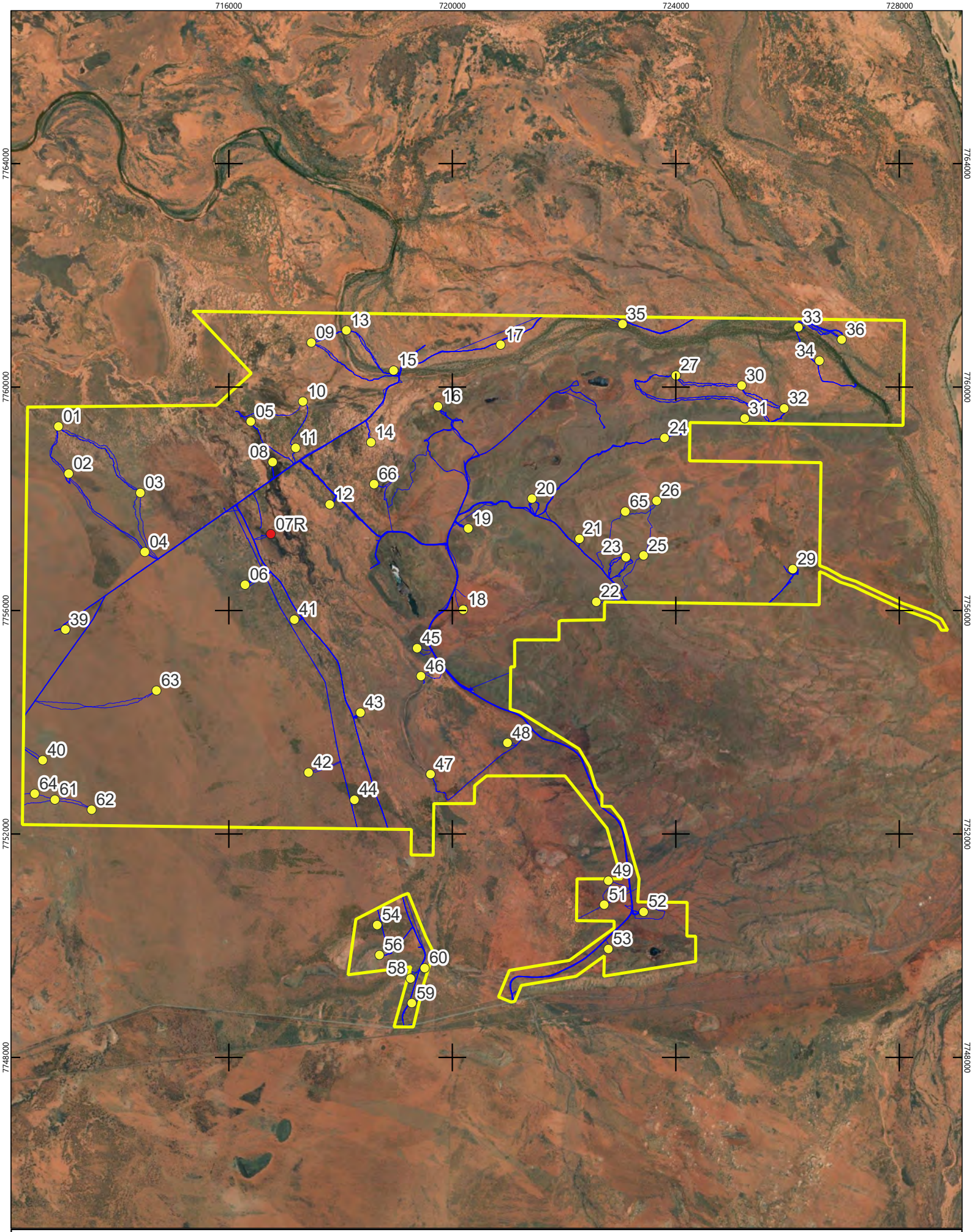

Figure 7 - Survey Effort

4.2.3 Traverses

The flora and vegetation values of the survey area were also recorded along walked and driven traverses. A traverse is an unmarked route along which data is collected. Traverses gather information for the general characterisation of flora and vegetation, such as identifying the boundaries of vegetation units, selecting sites for detailed surveys, and targeting significant flora or vegetation. The information recorded along a traverse was dependant on observations made, which was usually recorded as opportunistic data recorded spatially in point or polygon format, to assist in mapping and other results. The traverses made during the field assessment are presented in **Figure 7**.

4.2.4 Targeted Significant Flora Survey

Prior to the field survey, the locations of all Threatened and Priority flora retrieved from the various database searches and literature reviews (desktop assessment) was collated. Optimal flowering times varied for the species identified in the desktop assessment and therefore, the field assessment was conducted during a period when the greatest number of potential significant flora species would likely be in flower.

A proportion of the field assessment time was dedicated to conducting selected targeted searches (traverses and opportunistic sampling) for significant flora, in suitable habitats, particularly for those recorded within or in close proximity to the survey area. The preferred habitat of significant species was determined during the desktop assessment in order to determine the presence of suitable habitat within the survey area. Where suitable habitat was observed, intensive searching for target species was conducted in the field assessment. The targeted flora assessment was conducted within areas likely to support Threatened or Priority flora, as well as a selection of the other habitats considered less likely to support significant flora in the survey area (**Figure 7**).

Where suspected Threatened or Priority flora were observed, the following data were recorded:

- GPS location of each individual plant allowing an inventory of the plants/population size
- vegetation type and condition at the recorded location
- condition of plants
- reproductive status
- photograph.

4.2.5 Weeds

Targeted searches were carried out for introduced flora, particularly DP plants and WoNS (Weeds Australia 2022). The locations of significant weed species or significant infestations of any weeds observed was recorded.

4.2.6 Flora Inventory

The flora and vegetation data collected from the combination of quadrats, relevés, traverses and continuous opportunistic observations contributed to the flora inventory for the survey, including weeds (**Appendix C**).

4.2.7 Vegetation Unit and Condition Mapping

The field assessment focused on recording information at a series of locations (quadrats, relevés, traverses and continuous opportunistic observations) throughout the survey area, which enabled some initial mapping of vegetation units and condition in the survey area. The initial mapping was prepared in the field, using spatial software on mobile/tablet devices. Upon returning from the field, the initial mapping was refined using GIS mapping software to digitise mapping boundaries for the range of vegetation units present in the survey area.

Diagnosis of potential TEC and PEC vegetation within the survey area was carried out using the qualitative vegetation unit descriptions and species composition from the desktop assessment, as well as directly referring to the relevant conservation advice and other available information (DCCEEW 2022b, DCCEEW 2022c).

Consolidation of vegetation units was based on the information gathered about species composition, structure and broad landforms and land systems. The conclusions of the analysis also took into consideration the vastness of the survey area and variation of vegetation as visible in aerial imagery.

Vegetation condition was recorded at quadrats and relevés and where other areas of varying condition not recorded from quadrats (e.g. areas of degradation or of better condition than the general surrounds) were observed. The vegetation condition was mapped across the survey area at the same scale as the vegetation mapping. Vegetation condition ratings are in accordance with the scale of EPA (2016a), an adaptation of the Keighery (1994) and Trudgen (1991) condition scales which specifically relates to the Eremaean and Northern Botanical Provinces.

4.3 DATA PROCESSING AND REPORTING

Flora identifications were undertaken by botanical taxonomists, Dr Margaret Collins and Shibi Chandran.

Data analysis was conducted for all flora quadrat data, in order to group the vegetation units defined across the survey area utilising PATN™ software, Version 3.12 (Belbin and Collins 2009). The species list was checked for up-to-date nomenclature, taxa with informally assigned names were removed, unconfirmed names, sub-species and varieties were amalgamated and annuals and weeds were included.

An association matrix of the Bray-Curtis coefficient using classification parameter (beta = -0.1) to determine similarity was used to generate flexible unweighted pair group mean average (UPGMA) fusion from analysis of the presence and absence site by species matrix. The resultant dendrogram identified clusters of floristic similarity for the quadrats, which were then grouped into vegetation units and described as NVIS association vegetation descriptions.

Once the quadrats were grouped in clusters of floristic similarity, some further groupings and separations were determined based on similarities between the groups. The suite of vegetation units represented in the survey area could then be determined and descriptions for each of the vegetation types were prepared in accordance with NVIS (association) (NVIS Technical Working Group 2017).

This technical report has been prepared by suitably qualified and experienced personnel (**Table 20**), in accordance with EPA (2016a).

4.4 STUDY LIMITATIONS

The limitations of the flora and vegetation field assessment have been considered in accordance with the Technical Guidance (EPA 2016a) and are summarised in **Table 7**.

Table 7 – Study Limitations

Aspect	Constraint?	Explanation
Availability of local/ regional contextual information	No	The survey area occurs within the Pilbara IBRA region and, at a finer scale, within the Chichester and Roebourne sub-regions, which have been extensively surveyed and are well-understood areas in terms of ecological values. Several previous flora and vegetation survey reports and information or regional data are available for comparison. A significant number of Pilbara mining developments in the region have proceeded through their life cycle, which have included biological studies to obtain approvals, apparent in the number of reports available for the literature review and in database search results, which provided numerous records in the region.
Competency of field personnel	No	The field assessments were conducted by personnel working in pairs or a group of three, with the project team lead having at least nine years of Pilbara biological survey experience. At all stages of the project, personnel with relevant qualifications and experience contributed to the various study tasks, such as flora identifications, floristic analysis, technical reporting and technical review.
Selected scope, survey methods and level of survey detail/ intensity	No	The selected scope to the point of completion of this report was a single-phase, detailed flora and vegetation assessment. The detailed assessment was coupled with opportunistic targeted surveys for Threatened and Priority flora and relevant Threatened and Priority ecological communities. Due to good access, the survey intensity and detail was relatively high, in the context of the size of the survey area.
Seasonal timing and climatic conditions	No	The field assessment was conducted in late autumn/early winter, which is the recommended and optimal survey timing for vegetation surveys for the Eremaean botanical province. Rainfall in two of the months (February and April) preceding the survey were above average for the survey area region and the specimen material collected was optimal for taxonomic identifications.
Accessibility	No	The majority of the survey area was accessed via vehicle due to accessible public and private roads and tracks. A small portion of the survey area to the central east was not accessible due to degraded tracks and required some walking of significant distances to complete surveys in the area.
Mapping reliability/ proportion of values identified/ recorded based on extent of survey	No	The mapping has been prepared at a scale based on ground-truthed areas, with limited extrapolation given the good accessibility for most of the survey area. Mapping reliability, as well as the proportion of values identified and recorded is considered high throughout the survey area.
Disturbances that may have affected survey results	Yes	The survey area is mostly in excellent condition in areas of elevation, and areas with high levels of pastoral or weed impacts are evident in areas of lower elevation. Major drainage lines and their tributaries support slightly degraded vegetation due to the impacts of livestock and weeds. The degradation in areas affected by impacts from pastoral activity and weeds is considered to have affected the vegetation structure, and the native flora species diversity and abundance.
Survey completeness	Somewhat	The survey was conducted in late autumn/early winter, which is optimal for undertaking biological surveys in the region. Quadrat and relevé placement showed adequate spatial spread across the survey area and the species accumulation curve (**Figure 15**) indicates that the survey area has been adequately sampled. Based on the logarithmic trendline equation ($y = 70.606\ln(x) - 85.782$) it is estimated that there would be a total species count of 240 species at 100 quadrats in the survey area. Based on this estimate, the 252 species that were identified from 59 sampled quadrats and one relevé is considered adequate. However, given the large scale of the survey area, it may be appropriate to consider further targeted survey for significant flora within proposed impact areas, once these are defined.

5. RESULTS

5.1 DESKTOP ASSESSMENT

5.1.1 Literature Review

A literature review was undertaken as part of the desktop assessment to identify previous botanical surveys undertaken within or within the vicinity of the survey area. The botanical surveys were reviewed to provide a broader local context and to identify key findings including; the presence of conservation significant flora, presence of TECs and PECs, and other vegetation of conservation significance. The previous botanical surveys that were reviewed for local and regional context of the survey area are summarised in **Table 8**.

Table 8 – Previous Surveys Within and Surrounding the Survey area

Reference	Survey Methodology	Key Results
Port Hedland Regional Flora and Vegetation Assessment (ENV Australia 2011)	Level 2 (now detailed) (two-phase) flora and vegetation assessment	• Survey area 8,087 ha • 158 quadrats and three relevés sampled • Total of 338 vascular flora species (55 families, 152 genera) • Four Priority flora species recorded (a total of 12 recorded from current and previous survey) o *Abutilon pritzelianum* MS (Priority 1) o *Heliotropium muticum* (Priority 1) o *Tephrosia rosea* var. *venulosa* MS (Priority 1), now known as *Tephrosia rosea var.* Port Headland o *Gomphrena pusilla* (Priority 2). • Ten species of interest found: o *Mimulus uvedaliae* var. *uvedaliae* (more recently know as, *Uvedalia linearis* var. *linearis*) usually found in Kimberley region with one record in the Murchison represents a significant range extension o *Murdannia graminea* only found in the Kimberley region, represents a large south-westerly range extension of the species and a disjunct population o *Bergia ?pusilla* usually found in Northern Territory, difficult to confirm identification as there is only one other reference collection o *Vigna lanceolata* var. *filiformis* usually found in the Kimberley region, this collection represents a significant south-westerly range extension o *Drosera burmanni* found in the Kimberley, Little Sandy Desert and Great Sandy Desert, this collection represents a significant south-westerly range extension o *Tephrosia simplicifolia* usually found in Kimberley region, with one previous record in the Pilbara o *Eriachne sulcata* misidentified as *Eriachne glauca.* o *Goodenia* sp. possibly represents *Goodenia nuda* (P3) o *Mitrasacme exsert* range extension as previously only recorded in Kimberley region o *Tecticornia* species could potentially be *Tecticornia halocnemoides* but is unresolved. • Twelve introduced species recorded (28 from current and previous survey), none of which were classified as WoNS or DP plants • 40 vegetation associations mapped • Three veg associations of interest recorded: o Samphire shrublands (*Tecticorni*a spp.) o Grasslands dominated by *Triodia secunda* o High Shrubland of *Acacia tumida* var. *pilbarensis* and *A. colei* var. *colei*, with Low open Shrubland of *Hybanthus aurantiacus* with Very Open Hummock Grassland of *Triodia epactia* on Flood Plains and at the base of Granite Domes and Tors • No TECs or PECs present in survey area.
Flora, Vegetation and Vertebrate Fauna of the Proposed Expansion at Wodgina (Mattiske 2000)	Detailed flora and vegetation assessment and desktop fauna and invertebrate review	• Total of 214 taxa were recorded across 46 families and 112 genera • Most well represented families were Poaceae, Fabaceae • No Declared Rare Flora were recorded • One Priority one species was recorded, *Acacia aphanoclada* • One Priority three species was recorded, *Euphorbia inappendiculata.*

Reference	Survey Methodology	Key Results
Flora and Vegetation Survey and Fauna Assessment, Cundaline Northern Ridge (Onshore Environmental 2013)	Level 2 (now detailed) (two-phase) flora and vegetation assessment and Level 1 fauna assessment	• 165 flora taxa recorded (38 families, 85 genera) • Most well represented being Fabaceae (34), Poaceae (26), Malvaceae (20) • No conservation significant flora was recorded • One undescribed taxon was recorded *Stemodia* sp. with potential to be a Priority taxon • One species of interest, *Sida macropoda* for its range extension, approx. 700 km south-west of main populations • Eight introduced species recorded: **Aerva javanica*, **Cenchrus ciliaris*, **Cenchrus setiger*, **Cenchrus setaceus*, **Chloris barbata*, **Citrullus colocynthis*, **Jatropha gossypiifolia* and **Portulaca oleracea* • Including one listed as a DP plant, **Jatropha gossypiifolia*. • No TECs or PECs recorded.
Corunna Downs Intersection Works Flora and Vegetation Assessment (Woodman 2017)	Level 1 (now reconnaissance survey) flora and vegetation survey	Area 1 • 6 relevés • 69 flora taxa recorded (21 families, 51 genera) • Most represented being Fabaceae (16 taxa) • Five introduced species Area 2 • 4 relevés • 60 flora taxa recorded (21 families, 43 genera) • Most represented being Fabaceae (14 taxa) • Three introduced species Area 3 • 2 relevés • 45 flora taxa recorded (16 families, 32 genera) • Most represented being Fabaceae (14 taxa) • Two introduced species No conservation significant flora was recorded • No TECs or PECs recorded.

Reference	Survey Methodology	Key Results
Flora and Vegetation Assessment, Ridley Magnetite Project (Woodman 2009)	Detailed, (two-phase) flora and vegetation assessment and targeted survey for conservation-significant flora	• 89 quadrats sampled • Total of 328 vascular flora taxa (51 families, 146 genera) • Four Priority flora species recorded: o *Rothia indica* subsp. *australis* (P1), 'High' local and regional significance o *Gomphrena pusilla* (P2), 'High' local and regional significance o *Eragrostis crateriformis* (P3), 'Low' local and regional significance o *Tephrosia* sp. Cathedral Gorge (F.H. Mollemans 2420) (P3), 'High' local and regional significance • One species of potential interest; *Polymeria* sp. (unidentifiable, requires further collection for determination) • Significant range extensions discovered for 12 species o *Cyperus conicus*. First from Pilbara region o *Fimbristylis caespitosa*. First from Pilbara region o *Gyrocarpus americanus* subsp. ?*pachyphyllus* o *Hybanthus enneaspermus* subsp. *enneaspermus*. First from Pilbara region o *Melaleuca leucadendra* o *Murdannia graminea*. First from Pilbara region o *Sauropus trachyspermus*. First from Pilbara region o *Stemodia lathraia*. First from Pilbara region o *Tephrosia leptoclada* o *Tephrosia* sp. Cathedral Gorge (F.H. Mollemans 2420) (P3) o *Triodia bitextura* o *Vigna* sp. Central (M.E. Trudgen 1626) • One DP plant, *Parkinsonia aculeata* (P1 and P2 for Port Hedland/East Pilbara region) • 11 introduced species (weeds) recorded • Total of nine vegetation units (FCTs) described and mapped, of which seven were identified as locally significant: o Three due to supporting Priority flora o Three due to being mapped to occupy less than 10% of the total project area o One due to both supporting Priority flora and being mapped to occupy less than 10% of the total project area • No TECs or PECs were considered to be represented.
Additional Survey for Significant Flora, Pardoo Direct Shipping Ore Project (Woodman 2008)	Supplementary targeted flora survey for significant flora	• Previously recorded *Sauropus* sp. was determined as *Sauropus trachyspermus,* representing a significant range extension (500 km), nearest known record from the Kimberley • Previously suspected undescribed taxa, *Lotus* sp. Pardoo (D. Coultas & F. Obbens s.n. 16/06/2008) was determined as *Rothia indica* subsp. a*ustralis* (P1) • *Gomphrena pusilla* (P2) could not be relocated, potentially due cattle movement degrading area and recent dry "wet" season • *Eragrostis crateriformis* (P3) was relocated in one location and three additional populations were recorded • *Rothia indica* subsp. *australis* (P1) was relocated at the three previous locations and two new locations were recorded • *Tephrosia* sp. Cathedral Gorge (F.H. Mollemans 2420) (P3) was relocated at eight of the 12 previously recorded locations, plus 31 new locations were discovered. Estimates are that 755,370 individuals are present within the project area.
Flora and Vegetation Studies and Project Mine Site Impact	Level 2 (now detailed) (two-phase) flora and vegetation assessment)	• 30 permanent quadrats sampled (50 m x 50 m) • Total of 238 vascular flora species (47 families, 126 genera) • Three Priority flora species recorded: o *Gomphrena pusilla* (P2) o *Eragrostis crateriformis* (P3)

Reference	Survey Methodology	Key Results
Assessment, Pardoo Direct Shipping Ore Project (Woodman 2007)		o *Tephrosia* sp. Cathedral Gorge (F.H. Mollemans 2420) (P3) • Two taxa were recorded that were of interest due to being unidentifiable; *Lotus* affin. *cruentus* and *Sauropus* sp. • Total of six vegetation units (FCTs) described and mapped • All six defined FCTs support Priority flora species and are therefore considered to be of local significance and some are of further significance due to other factors such as limited representation (less than 10% of the total project survey area mapped) • Of particular significance was FCT 4, associated with wet flats adjacent to the Ridley River and is not represented elsewhere in the Ord Range • No TECs present in survey area.
Farrell Well Survey Flora and Vegetation Study (Woodman 2005)	Detailed flora and vegetation assessment	• 104 flora taxa recorded across 26 families • Most well represented families were Poaceae and Fabaceae • One Priority three species was recorded, *Euphorbia inappendiculata* • No Declared Rare (Threatened) Flora were recorded.
Proposed Wodgina Lateral Natural Gas Pipeline Flora, Vegetation and Fauna Survey (Woodman 2001)	Detailed flora and vegetation survey	• Total of 166 flora taxa were recorded across 116 genera and 36 families • Most well represented families were Poaceae, Fabaceae, Amaranthaceae and Malvaceae • No Declared Rare Flora were recorded • One Priority two species was recorded, *Euphorbia clementii* • One Priority three species was recorded, *Phyllanthus aridus.*

NB: Species listed in key results were current at the completion of each report, species names and conservation status may have changed.

5.1.2 Threatened and Priority Flora

The desktop assessment considered information from the literature review (**Table 8**), NatureMap (DBCA 2022a), Protected Matters Search Tool (PMST) (DCCEEW 2022a), DBCA Threatened and Priority flora database (DBCA 2022b) and the TEC and PEC database (DBCA 2022c).

It was identified that 14 conservation significant flora species have the potential to be supported by the survey area. An assessment of suitable habitat, age of previous records, proximity of previous records and current condition of survey area indicated that ten of these taxa have the potential to be supported by the survey area, comprising of seven that are considered 'likely to occur' and seven that 'may occur'. None of these ten taxa are listed as Endangered under the EPBC Act and BC Act, but two is listed as P1, one is P2, ten are P3 and one is P4 taxa (**Table 9**, **Figure 8**).

Within the 50 km buffer of the survey area, there are DBCA records of a Threatened flora taxa (**Figure 8**). There is a single population record for one Threatened flora species, *Seringia exastia*, near Port Hedland, 47 km west of the survey area. However, this species has recently undergone taxonomic revision and it has been determined to be synonymous with the common species, *Seringia elliptica* and therefore, no Threatened classification applies (Mike Hislop, WA Herbarium, pers. comm.).

Table 9 – Threatened and Priority Flora Likelihood of Occurrence

Species	EPBC Act Conservation Status	BC Act/ DBCA Conservation Status	Description*	Habitat Preference	Likelihood of Occurrence	Source
Atriplex eremitis		P1	Perennial, erect and open shrub, growing up to 0.40 m high and 0.5 m wide. Produces green flowers in August.	Plain, rangeland or semi saline plain. Brown dry sand or clay.	Unlikely to occur - one occurrence 13.9 km south-west on geology which does not occur within the survey area.	DBCA, NatureMap
Euploca parviantrum		P1	Erect annual, herb, growing to 0.15 m high. Produces flowers in February to June.	Sandy soils. Flats, plains, rocky slopes.	Likely to occur – one occurrence within the survey area.	NatureMap
Tephrosia rosea var. Port Hedland (A.S. George 1114) (Synonym, *Tephrosia rosea* var. *venulosa)*		P1	A sprawling, spindly low shrub, up to 75cm high and 1m across. Fruit silvery/grey. Produces pink flowers in July, August, and September	Red sandy soils. Undulating sand dunes. Red - brown loam. Common in disturbed habitats e.g. road verge.	May occur - found 40 km from survey area on similar geology that is present within the survey area.	DBCA, ENV Australia (2011)
Gomphrena pusilla		P2	Slender branching annual, herb, to 0.2 m high. Produces white flowers in March to April or June.	On fine beach sand or on limestone behind foredune.	May occur - found 45 km from survey area on geology that may occur in the survey area.	DBCA, ENV (2011), Woodman (2007, 2008, 2009)
Abutilon sp. Pritzelianum (Synonym, *Abutilon pritzelianum*)		P3	Tall grey spreading shrub with yellow flowers, growing up to 2 m tall.	Sandplain of orange, brown sands. Stony undulating shallow soiled granitic plains. Common on roadside	May occur - one occurrences 57 km SW of survey area on geology system that may occur within the area.	ENV Australia (2011)
Bonamia oblongifolia		P3	Perennial, herb or shrub. Produces blue flowers in February.	Sandy or gravelly soils.	Unlikely to occur - one occurrence 139 km east on geology which does not occur within the area.	NatureMap
Eragrostis crateriformis		P3	Annual, grass-like or herb, growing from 0.17 to 0.42 m high. Produces flowers in January to May or July.	Clayey loam or clay. Creek banks, depressions.	Likely to occur - two occurrences one within the survey area and one 2.6 km south of the survey area on similar geology that is present within the area.	DBCA, NatureMap, Woodman (2009)

Species	EPBC Act Conservation Status	BC Act/ DBCA Conservation Status	Description*	Habitat Preference	Likelihood of Occurrence	Source
Euphorbia clementii		P3	Erect herb, to 0.6 m high. Produces whitish flowers in May to June.	Gravelly hillsides, stony grounds.	Likely to occur - one occurrences 5.2 km south of the survey area on similar geology that is present within the survey area.	DBCA, NatureMap, Woodman (2001)
Gymnanthera cunninghamii		P3	Erect shrub growing 1 to 2 m high. Produces green-cream-yellow flowers from January to December.	Sandy soils.	May occur - found 24 km from survey area on geology that may occur within the survey area.	DBCA
Euploca muticum		P3	A grey-green scabrous herb or spreading shrub, growing 30 m tall. Leaves are small and ovate. Produces white flowers from May to August.	Plain with brown loam over calcrete or red sand over ironstone.	Likely to occur - one population occur 17.7 km south of the survey area on similar geology that is present within the survey area.	DBCA, NatureMap, ENV (2011)
Gymnanthera cunninghamii		P3	Erect shrub growing to 1-2 m high. Produces cream-yellow-green flowers in January to December.	Sandy soils.	May occur - found 45 km from survey area on geology that may occur within the survey area.	NatureMap
Heliotropium murinum		P3	Short-lived perennial, herb growing up to 0.4 m high. Produces flowers in May or September.	Red sand plains	May occur - found 50 km from survey area on geology that may occur within the survey area.	NatureMap
Euploca mutica		P3	Ascending to spreading perennial, herb growing to 0.3 m high.	On plain with red-orange sand.	May occur - found 16 km from survey area on geology that may occur within the survey area.	NatureMap
Hibiscus krichauffianus		P3	Low or ascending shrub growing up to 0.7 m high. Produces purple-pink flowers in March or October.	Red sandy soils.	Unlikely to occur - the closest occurrence approximately 680 km south on the survey area on geology that does not occur within the survey area.	NatureMap
Rothia indica subsp. *australis*		P3	Prostrate annual herb densely covered in spreading hairs growing to 0.3 m high. Produces yellow flowers April to August.	Sandy soils. Sandhills and sandy flats.	Likely to occur - six occurrences; two within the survey area and one 200 km west and three 5.6 km south of survey area on similar geology that is present within the survey area.	DBCA, NatureMap, Woodman (2008,2009)

Species	EPBC Act Conservation Status	BC Act/ DBCA Conservation Status	Description*	Habitat Preference	Likelihood of Occurrence	Source
Triodia chichesterensis		P3	Hummock grass growing 20 cm high with short blue-green leaves, pubescent lemma midlobe and colourless sparkly droplets on glumes and leaf sheaths. Produces flowers in May.	Rocky surface with scattered quartzite. Gravelly loam.	Likely to occur - found 21 km south of survey area on similar geology that occurs in the survey area.	DBCA
Bulbostylis burbidgeae		P4	Tufted, erect to spreading annual, grass-like or herb (sedge) growing to 0.25 m high. Spikelets in a simple umbel or rarely solitary. Produces brown flowers in March or from June to August.	Granitic soils. Granite outcrops, cliff bases.	Unlikely to occur - found 42 km south of survey area on geology that is unlikely to occur in the survey area.	DBCA
Goodenia nuda		P4	Erect to ascending herb growing to 0.5 m high. Produces yellow flowers from April to August.	Drainage area / floodplain. On brown silty clay	Likely to occur - found 47 km SW of survey area on geology system that occurs within the survey area.	DBCA, ENV (2011)

*Information sourced from WAH (1998-)

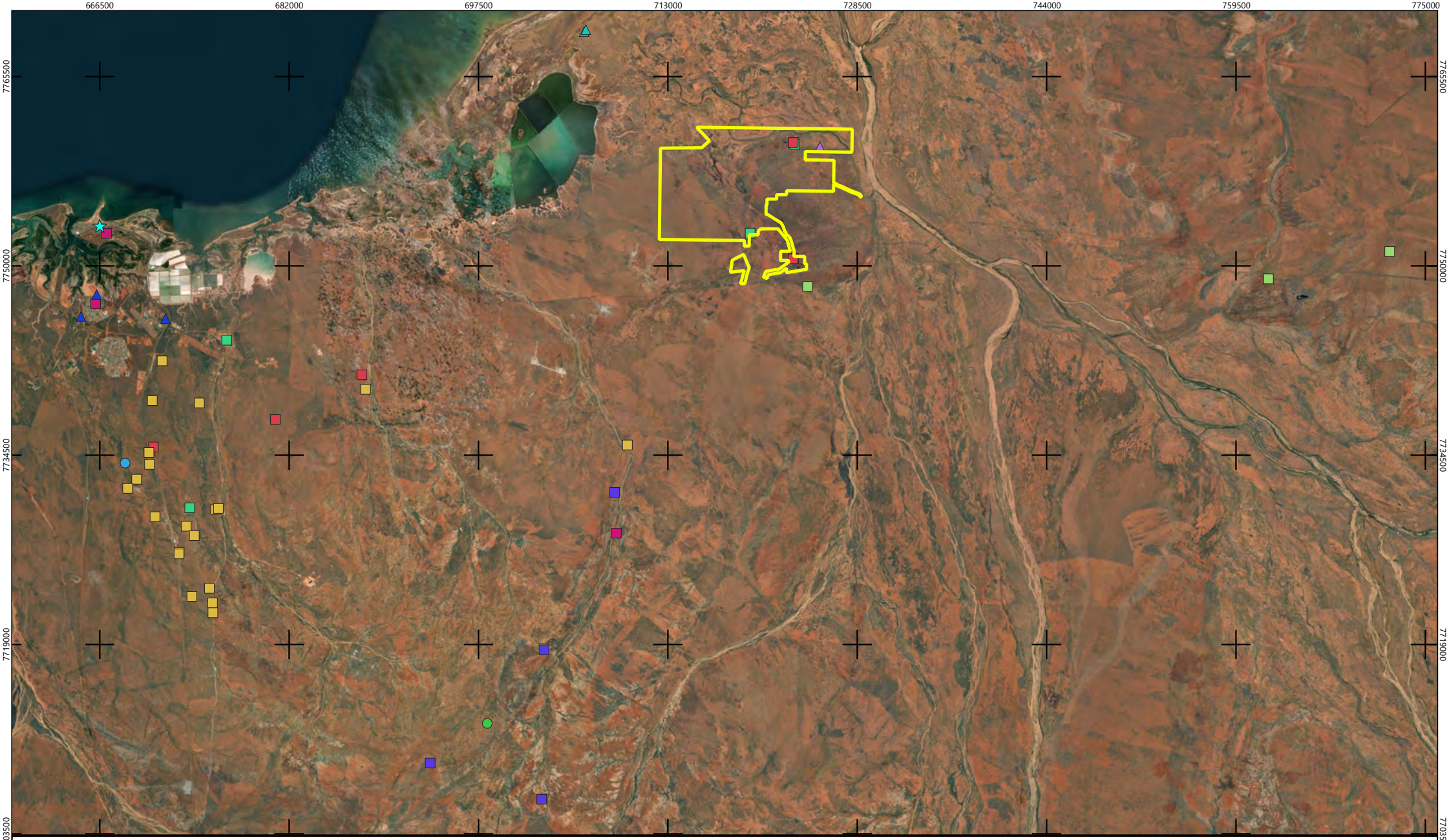

Figure 8 - Threatened and Priority Flora

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5.1.3 Threatened and Priority Ecological Communities

A review of the DBCA Threatened and Priority Ecological Communities (TEC and PEC) database confirmed that no TECs are known to occur within 50 km of survey area and one PEC is known to occur within 50 km (DBCA 2022b, DBCA 2022c).

The Eighty Mile Land System PEC occurs to the north of the survey area with the closet point approximately 11 km from the survey area boundary. The PEC are summarised in **Table 10** and the known extent of those occurring within 50 km of the survey area are presented in **Figure 9**).

Table 10 - Priority Ecological Communities within 50 km of the Survey Area

Common ID	Common Name	State Conservation Category	Distance and Direction from the Survey area
Eighty Mile Land System	Eighty Mile Land System	Priority 3	11 km north

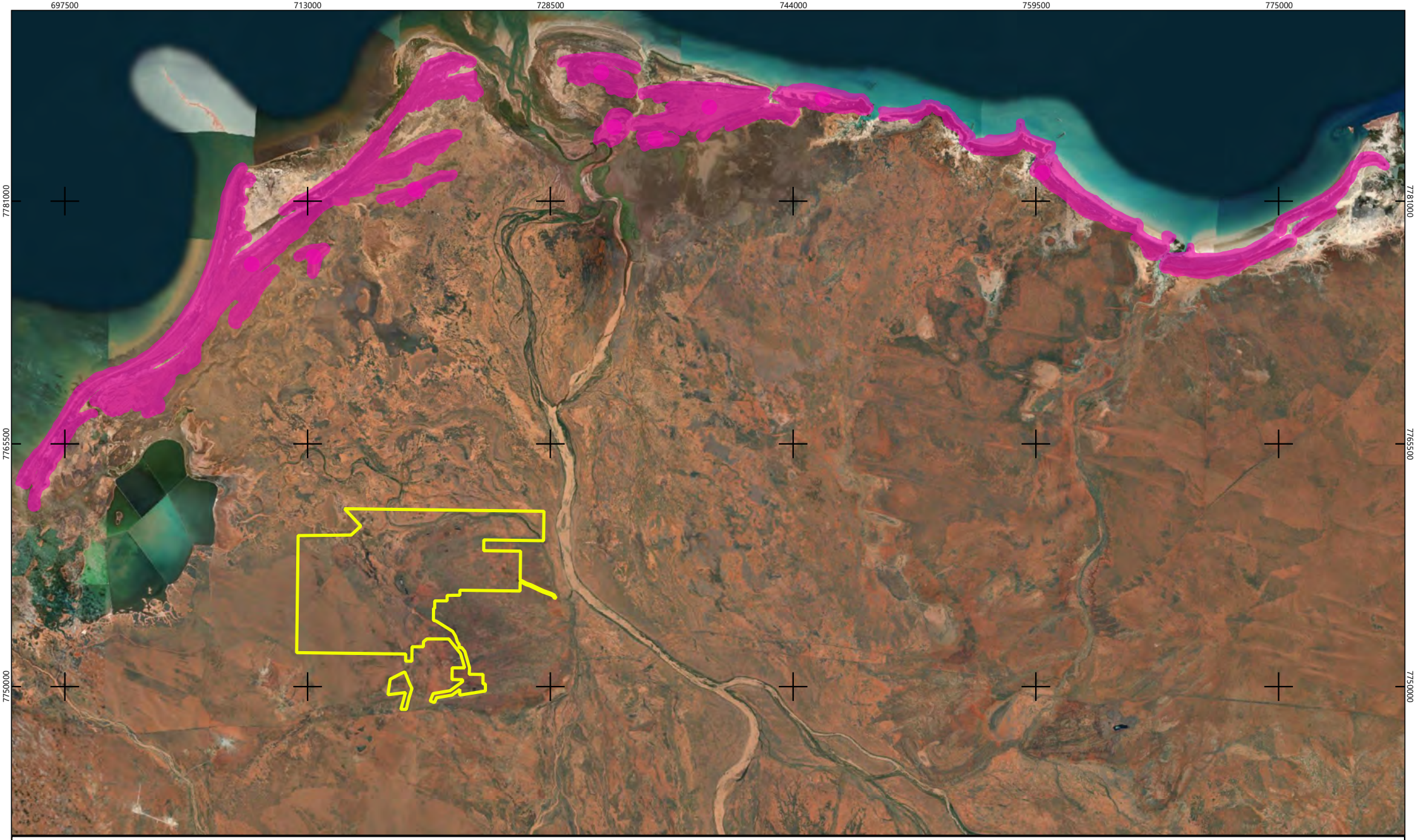

Figure 9 - Priority Ecological Communities

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5.2 FIELD ASSESSMENT

5.2.1 Flora

A total of 252 flora species, from 131 genera and 42 families were recorded during the field assessment. The dominant families were found to be Fabaceae (54 taxa), Poaceae (42 taxa), Malvaceae (24 taxa) and Amaranthaceae (16 taxa). The flora recorded within the survey area is summarised in **Table 11**. The full list of vascular flora recorded is presented in **Appendix C**. The species recorded within each vegetation unit are presented in **Appendix C** and individual quadrat and relevé data is presented in **Appendix D**. Recorded flora species includes those recorded from sampled quadrats and relevés, opportunistically whilst moving around the survey area and those recorded during targeted searches and opportunistic sampling for Threatened and Priority flora. Eleven of the collected flora specimens were unable to be identified with certainty to species level and three were unable to identified with certainty to genus level, due to inadequate or sterile material.

Table 11 - Summary of Flora Taxa Recorded in the Survey Area

Overview	Total Number
Families	42
Genera	131
Taxa (species, sub species, varieties)	252
Native Flora	236
Introduced Flora	16 (6.35%)
WoNS	1
DP Plants	2
Threatened Flora	0
Priority Flora	2
Range Extensions	12
Undescribed Flora	3
Dominant Families	**Number of Taxa**
Fabaceae	54
Poaceae	42
Malvaceae	24
Amaranthaceae	16
Dominant Genera	**Number of Taxa**
Acacia	16
Corchorus	8
Eriachne	8
Ptilotus	8

5.2.1.1 Threatened and Priority Flora

Two Priority flora species were recorded opportunistically during the field assessment, comprising of one P3 species, *Rothia indica* subsp. *Australis,* and one P4 species, *Goodenia nuda,* as summarised in **Table 12**, with their recorded locations presented in **Figure 10**.

Table 12 – Significant Flora Recorded within the Survey Area

Species	EPBC Act Conservation Status	WA Conservation Status	Recorded Quadrat (or from Targeted Searches)	Abundance	Coordinates (GDA2020, MGA Zone 50)	
					Easting (mE)	Northing (mN)
Rothia indica subsp. *australis*		Priority 3	opportunistic	30	723341	7750630
Rothia indica subsp. *australis*		Priority 3	opportunistic	30	723341	7750632
Rothia indica subsp. *australis*		Priority 3	opportunistic	16	723364	7750645
Rothia indica subsp. australis		Priority 3	opportunistic	11	723377	7750652
Rothia indica subsp. *australis*		Priority 3	opportunistic	6	723396	7750664
Rothia indica subsp. *australis*		Priority 3	opportunistic	6	723423	7750653
Rothia indica subsp. *australis*		Priority 3	opportunistic	5	723354	7750636
Rothia indica subsp. *australis*		Priority 3	opportunistic	5	723299	7750620
Rothia indica subsp. *australis*		Priority 3	opportunistic	5	723443	7750679
Rothia indica subsp. *australis*		Priority 3	opportunistic	5	723396	7750577
Rothia indica subsp. *australis*		Priority 3	opportunistic	4	723466	7750680
Rothia indica subsp. australis		Priority 3	opportunistic	3	723247	7750565
Rothia indica subsp. *australis*		Priority 3	opportunistic	2	723591	7750685
Rothia indica subsp. *australis*		Priority 3	opportunistic	2	723260	7750549
Rothia indica subsp. *australis*		Priority 3	opportunistic	2	723393	7750642
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	720346	7757596
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	720137	7757528
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	723384	7750628
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	723352	7750634
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	723268	7750525
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	723657	7750649

Species	EPBC Act Conservation Status	WA Conservation Status	Recorded Quadrat (or from Targeted Searches)	Abundance	Coordinates (GDA2020, MGA Zone 50)	
					Easting (mE)	Northing (mN)
Rothia indica subsp. *australis*		Priority 3	opportunistic	1	723681	7750641
Goodenia nuda		Priority 4	opportunistic	6	716621	7757341
Goodenia nuda		Priority 4	opportunistic	6	716695	7757348
Goodenia nuda		Priority 4	opportunistic	1	720062	7757602
Goodenia nuda		Priority 4	opportunistic	1	720073	7757589

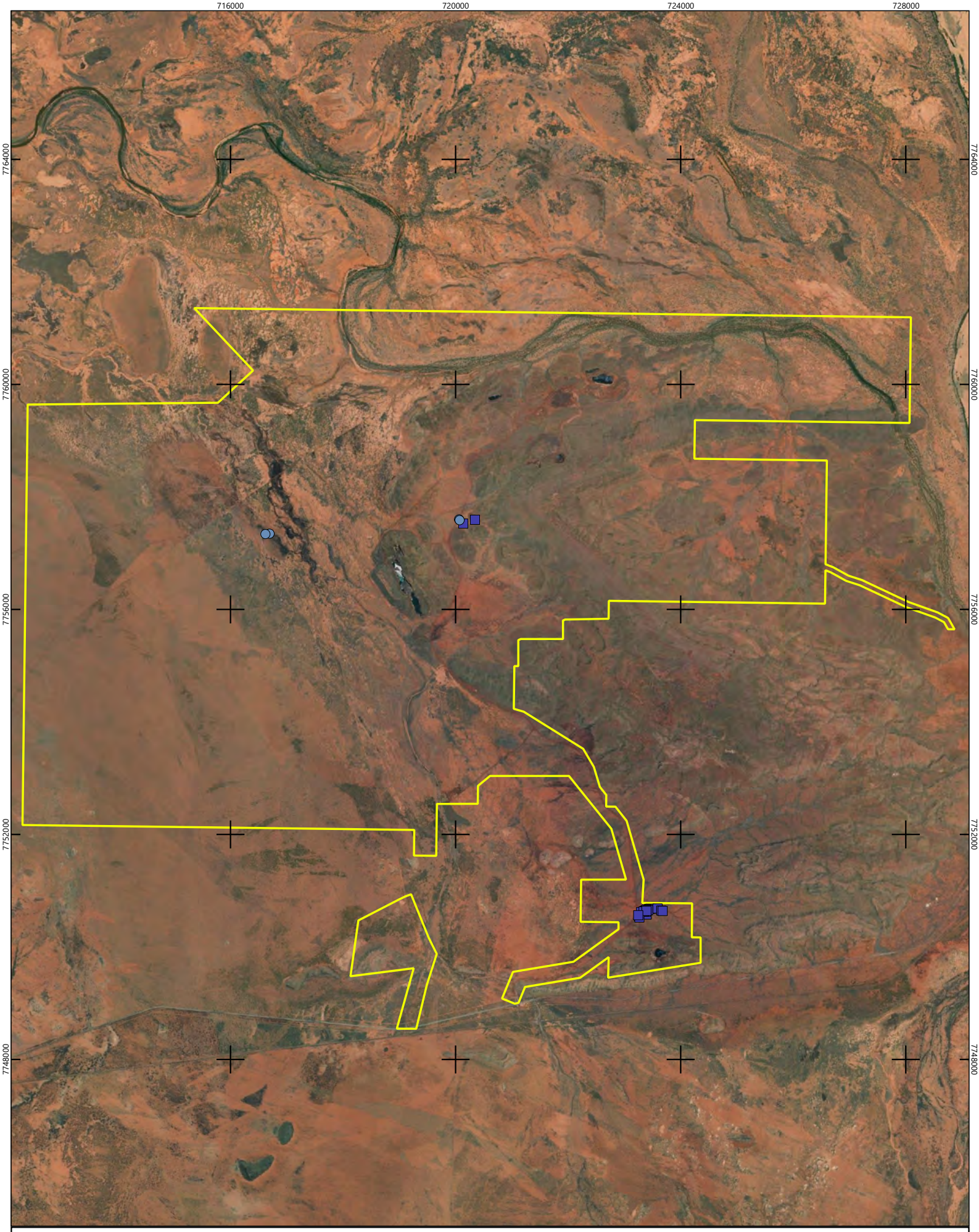

Figure 10 - Recorded Significant Flora

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5.2.1.2 Range Extending Flora

Twelve species are considered to be exhibiting an extension beyond their currently documented range of occurrence, in accordance with records of the Western Australian Herbarium (WAH) (WAH 1998-). The range-extending distance is calculated from the survey area centroid (719139 mE, 7756739 mN) to the closest known location listed by the West Australian Herbarium (WAH 1998-). A summary of the recorded range-extending taxa is summarised in **Table 13**.

Table 13 – Recorded Range-Extending Flora (WAH 1998-) in the Survey area

Species	Distance between Survey area Centroid and Closest Known Record (WAH 1998-)	Recorded Quadrat	Coordinates (GDA2020, MGA Zone50)	
			Easting (mE)	Northing (mN)
Acacia colei ?var. *ileocarpa*	238 km	45	719370	7755327
Cucumis argenteus	184 km	62	713543	7752435
Cyperus ?concinnus	277 km	46	719439	7754827
Ehretia saligna	210 km	45	719370	7755327
		53	722793	7749943
Ehretia saligna var. *saligna*	149 km	Opp	725393	7759192
		35	723048	7761130
Eragrostis setifolia	193	66	718599	7758264
Goodenia cusackiana	213	25	723423	7756987
Grevillea pyramidalis subsp. *pyramidalis*	149	40	712668	7753322
		53	722793	7749943
		56	718696	7749834
Portulaca pilosa	275	11	717196	7758914
		12	717806	7757901
		3	714415	7758108
		40	712668	7753322
		6	716290	7756462
		62	713543	7752435
Pterocaulon serrulatum var. *velutinum*	161	1	712949	7759298
		Opp	721380	7757916
Ptilotus aervoides	178	Opp	720053	7756290
Schoenoplectus subulatus	108	15	718948	7760299

5.2.1.3 Undescribed Flora Species

Three of the recorded flora were found to be undescribed (phrase name) taxa in accordance with records of the Western Australian Herbarium (WAH) (WAH 1998-) and these are summarised in **Table 14**.

Table 14 – Recorded Undescribed Species in the Survey Area

Species	Recorded Quadrat	Coordinates (GDA2020, MGA Zone50)	
		Easting (mE)	Northing (mN)
Sida sp. articulation below (A.A. Mitchell PRP 1605)	23	723107	7756957
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	24	723800	7759091
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	31	725234	7759441
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	33	726193	7761073
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	52	723424	7750607
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	43	718356	7754174
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	48	720987	7753633

5.2.1.4 Introduced Flora

Sixteen introduced (weed) species were recorded within the survey area. DP plants and WoNS were targeted during the field assessment. In Western Australia many WoNS are also DP plants under the BAM Act. One of the recorded weeds, **Parkinsonia aculeata*, is listed as a WoNS for the Pilbara region (Weeds Australia 2022). Two of the recorded weeds, **Parkinsonia aculeata and *Calotropis procerus* are listed as DP plants for the Pilbara region under the BAM Act (DPIRD 2022). The records of WoNS and DP plants made during the field survey are summarised in **Appendix E** and spatially presented in **Figure 11**.

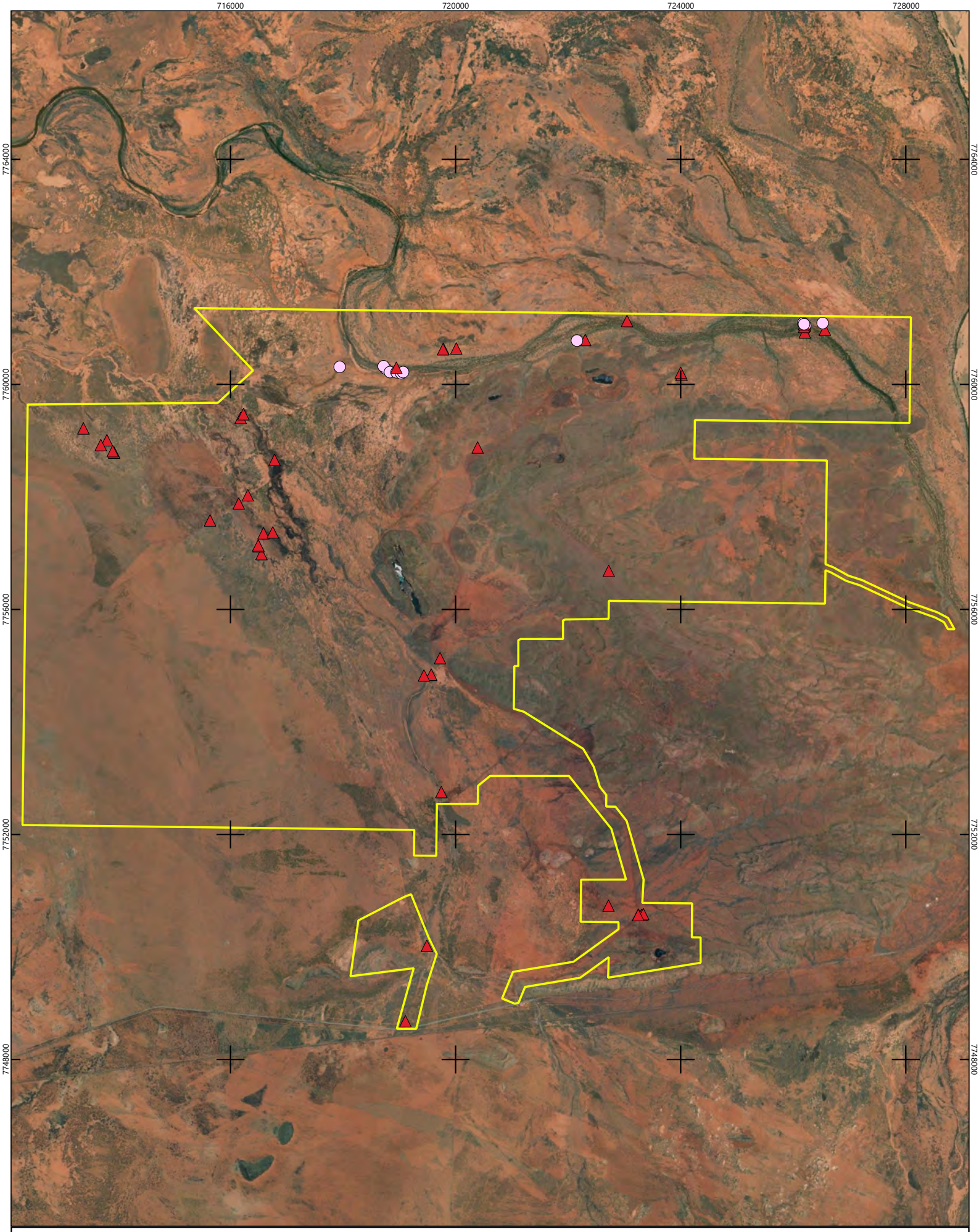

Figure 11 - Weeds of National Significance and Declared Plants

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5.2.2 Vegetation

5.2.2.1 Vegetation Units

Floristic analysis of quadrat data through multivariate cluster analysis was carried out in order to group quadrats of similar species composition (**Figure 12**). Eight vegetation units were defined and mapped within the survey area (**Table 15**, **Figure 13**). The majority of these vegetation units are considered typical of the vegetation of the Roebourne and Chichester sub-regions, as summarised in **Table 15** and discussed in more detail in **Section 6.2**.

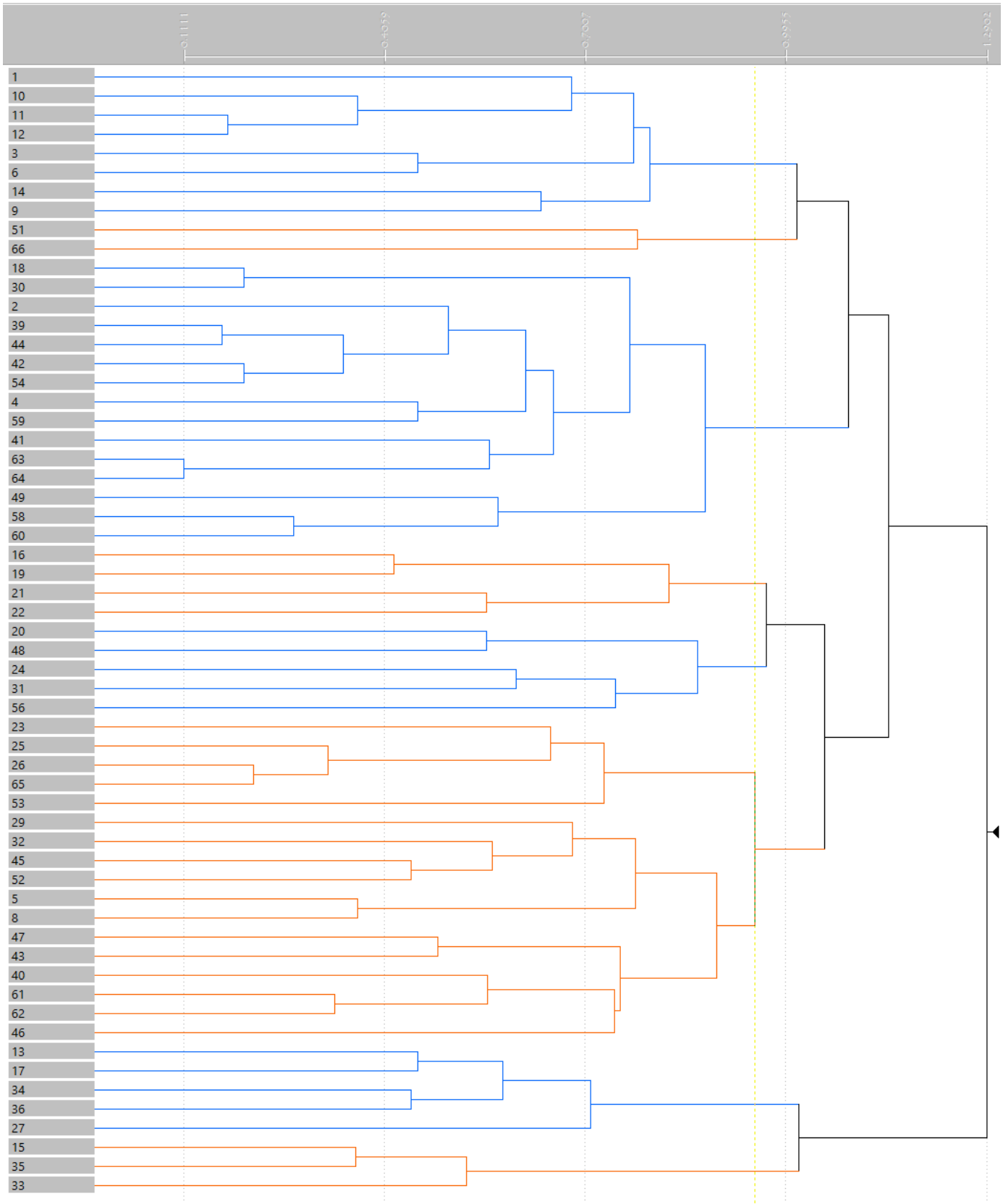
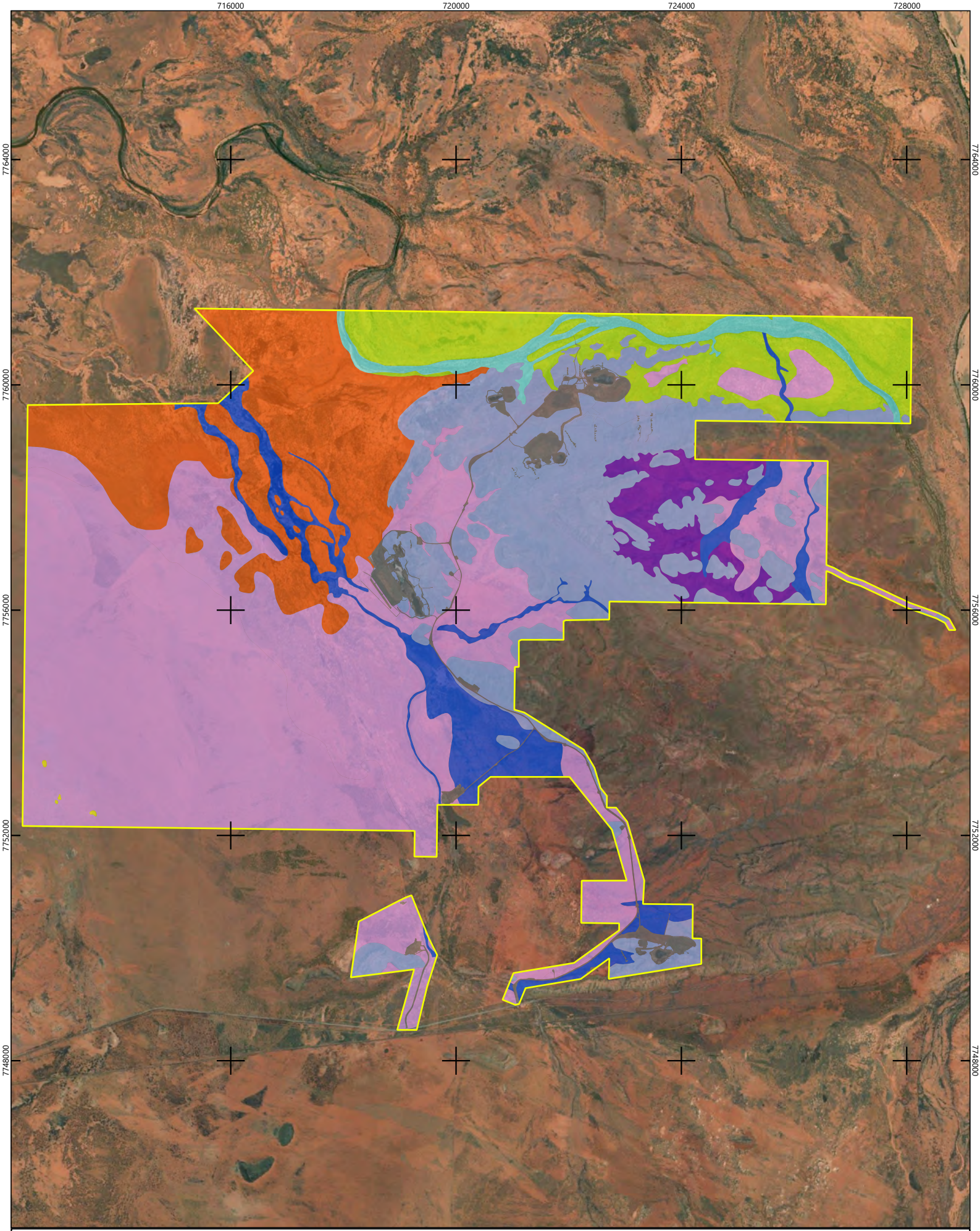


Figure 12 – Cluster Analysis Dendrogram

Table 15 - Summary of Recorded Vegetation Units in the Survey area

Landform	Broad Description	Vegetation Unit Code	Vegetation Description	Representative Photo	Representative Quadrats and Relevé	Area (ha)	% of Survey Area
Drainage Medium drainage or floodplain	*Corymbia* and *Eucalyptus* woodland with mixed shrubs and tussock and hummock grasses.	**CfIoCf**	*Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.		5, 8, 29, 32, 45, 46, 47, 52, 53, 7R	708.678	6.407
Drainage Major drainage	*Eucalyptus* and *Melaleuca* Woodland with tall shrubs over tussock grasses.	**EcAhEf**	*Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* Mid Woodland over *Atalaya hemiglauca* and *Indigofera oblongifolia* Tall Sparse Shrubland over *Eriachne flaccida and Cynodon dactylon* Low Open Tussock Grassland.		15, 33, 35	247.066	2.234
Drainage Riverbanks, adjacent to major drainage	Eucalyptus and *Lysiphyllum* woodland with mixed shrubs and tussock grasses.	**EvIoCc**	*Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland.		13, 17, 27, 34, 36	928.020	8.390
Plain Sandy loam plains	Low *Acacia* shrubs with hummock grasses.	**AsTe**	*Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.		2, 4, 18, 30, 39, 41, 42, 43, 44, 49, 51, 54, 58, 59, 60, 63, 64	4,836.947	43.732

Landform	Broad Description	Vegetation Unit Code	Vegetation Description	Representative Photo	Representative Quadrats and Relevé	Area (ha)	% of Survey Area
Plain Sandy or clay loam plains	*Corymbia* woodland with mixed *Acacia* shrubs, and tussock and hummock grasses.	**CfAcTe**	*Corymbia flavescens* Mid Open Woodland over *Acacia colei and Acacia acradenia* Tall Open Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Sparse Tussock Grassland.		23, 25, 26, 65	342.609	3.098
Plain Clay loam soils flats with seasonal inundation	Chenopods with tussock and hummock grasses.	**SgEeTs**	*Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.		1, 3, 6, 9, 10, 11, 12, 14, 66	1,686.820	15.251
Hill Granite outcropping	*Ficus* and *Acacia* shrubland with hummock and tussock grasses and herbs.	**FaTeCc**	*Ficus aculeata* var. *indecora*, *Acacia colei* and *Ficus brachypoda* Tall Sparse Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Low Sparse Tussock Grassland over *Stemodia grossa* Low Isolated Herbs.		40, 61, 62	2.563	0.023
Hill Ironstone hills	Scattered *Terminalia* with mixed shrubs and hummock grasses.	**TcAiTe**	Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera, Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.		16, 19, 20, 21, 22, 24, 31, 48, 56	2,012.385	18.194
		Cleared	Areas that have been cleared for roads, infrastructure and mining.	NA	NA	295.3580	2.670
					TOTAL	**11,060.446**	**100**



0 1 2 3 4 km

GDA 94 / MGA Zone 50

Figure 13 - Vegetation Units

Legend

- Survey Area
- AsTe
- CfAcTe
- CfIoCf
- Cleared
- EcAhEf
- EvIoCc
- FaTeCc
- SgEeTs
- TcAiTe

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5.2.2.2 Vegetation Condition

The vegetation condition throughout the survey area was found to range from 'Completely Degraded' to 'Excellent', with 48.487% in 'Excellent' condition. Areas in 'Good' or poorer condition comprise a small proportion (12.108%) of the total survey area, observed in drainage areas and the plain of the northern and central areas. Vegetation in 'Excellent' condition occurs mostly on the hills, in gorges and areas of higher elevation.

The spatial extent of the varying vegetation condition across the survey area is presented in **Figure 14** and the areas and percentages of each condition category are presented in **Table 16**.

Table 16 - Vegetation Condition in the Survey Area

Vegetation Condition Rating	Total Area (ha)	% of Survey area
Excellent	5,362.869	48.487
Very Good to Excellent	1,102.884	9.971
Very Good	869.808	7.864
Good to Very Good	2,090.329	18.899
Good	1,295.409	11.712
Degraded	43.789	0.396
Completely Degraded	295.358	2.670
TOTAL	11,060.446	100

5.2.2.3 Threatened and Priority Ecological Communities

A review of the DBCA Threatened and Priority Ecological Communities (TEC and PEC) database confirmed that no TECs or PECs are known to occur within the survey area and one PEC (Eighty Mile Land System) is known to occur within 11 km of the survey area (DBCA 2022a).

The vegetation recorded during the survey is not considered to be representative of the Eighty Mile Land System PEC, as per the following rationale:

- The PEC is restricted to vegetation on the Eighty Mile Land System which does not occur within the survey area.
- The PEC is restricted to coastal sand dunes, and these landforms do not occur in the region of the survey area.
- The vegetation of the survey area does not align with that of the PEC.

Figure 14 - Vegetation Condition

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6. DISCUSSION

6.1 FLORA

6.1.1 Floristic Composition

A total of 252 flora species, from 131 genera and 43 families that were recorded during the survey. The dominant families were found to be Fabaceae (54 taxa), Poaceae (42 taxa), Malvaceae (24 taxa) and Amaranthaceae (16 taxa). Recorded flora species included those documented from sampled quadrats and relevés, opportunistically whilst moving around the survey area and those recorded during targeted searches for Threatened and Priority flora.

Sixteen introduced (weed) species were recorded within the survey area, contributing to 6.35% of the species diversity. One of the recorded weeds, **Parkinsonia aculeata* was recorded in 12 locations and is listed as a WoNS for the Pilbara region (Weeds Australia 2022). Two of the recorded weeds, **Parkinsonia aculeata* and **Calotropis procerus* (which was recorded at 42 locations) are listed as DP plants for the Pilbara region under the BAM Act (DPIRD 2022) (**Figure 11**, **Appendix E**).

**Parkinsonia aculeata* is a native of tropical America and was introduced into northern Australia as an ornamental plant, because of its attractive foliage and its drought tolerance. It is a large shrub or small tree growing up to eight metres, has light green, narrow, leaves up to 30 cm long and flowers yellow in May and June, but individual plants may flower throughout the year. Currently it is a serious weed in pastoral areas of the Kimberley and Pilbara and grows best in moist conditions along riverbanks and flats where it forms dense thickets, and once established it withstands heat and drought (DCCEEW 2022a, DPIRD 2022).

The legal status of **Parkinsonia aculeata* is 's22(2)', meaning it must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. The control category is 'C3 Management' - these, organisms 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. This species was recorded at a number of locations along the Ridley River within the survey area and is predominately associated with vegetation unit EcAhEf, which is a typical observation in arid regions and where livestock grazing is a major land use (DCCEEW 2022a, DPIRD 2022).

**Calotropis procera* is a shrub or small tree growing up to 4 m tall and originates from Asia and sub-tropical parts of south-east Asia. The stems are smooth pale green-grey and have white milky sap. The species legal status is 's22(2)', meaning it must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms (DPIRD 2022). The control category is 'Unassigned' meaning, relative to other species, it has a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals. Species under this category may also be subject to control and keeping requirements once within Western Australia. In the survey area, **Calotropis procera* was observed on the plains and areas where there are impacts from grazing stock and run-off from seasonal rainfall. In particular, the species was found to occur in abundance in the major drainage lines associated with vegetation units EcAhEf and CfIoCf., which is a typical observation in arid regions and where livestock grazing is a major land use (DCCEEW 2022a, DPIRD 2022).

Eleven of the collected flora specimens were unable to be identified with certainty to species level and three were unable to identified with certainty to genus level, due to inadequate or sterile material.

Despite some specimens not being able to be identified fully to genus or species level, it is considered unlikely that any of these are Threatened or Priority flora since none resemble any of the targeted significant flora. Therefore, this minor limitation is not considered to influence the key observations and conclusions of this report regarding significant flora.

A species accumulation curve (**Figure 15**) has been produced to demonstrate the adequacy of the quadrat sampling. The species accumulation curve indicates that a large proportion of flora species present in the survey area have been recorded where the curve begins to reach an asymptote, around 46 quadrats, however there is a steady increase.

Based on the logarithmic trendline equation (y = 70.606In(x) - 85.782) it is estimated that there would be a total species count of approximately 240 at 100 quadrats and 267 at 150 quadrats in the survey area. Using this estimate, compared with 252 species that were identified from 59 sampled quadrats and one relevés, it is considered that the representative vegetation and landforms in the survey area have been adequately sampled.

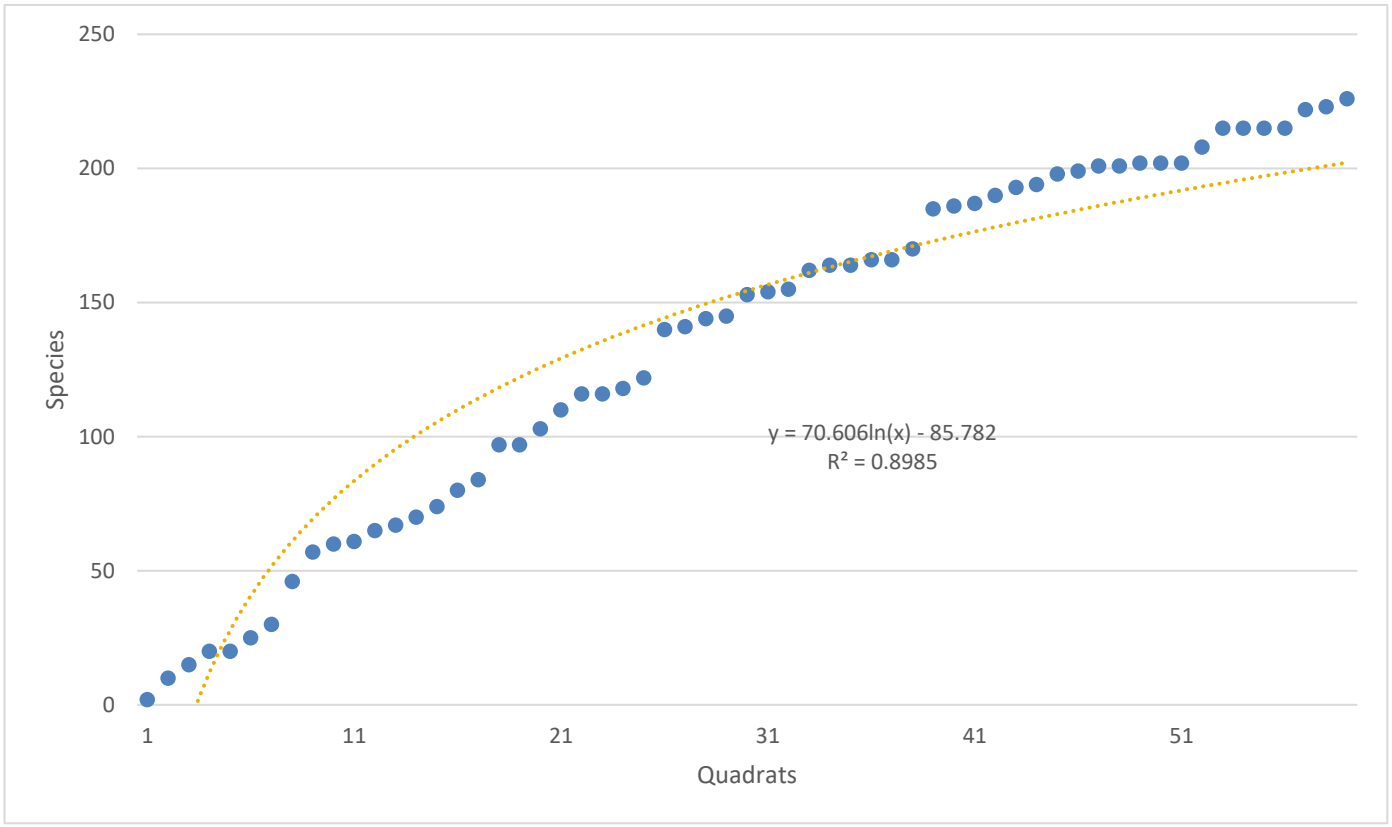

Figure 15 - Species Accumulation Curve

6.1.2 Threatened and Priority Flora

The desktop assessment identified 14 Priority flora species previously recorded inside or within 50 km of the survey area. All records were sourced from the DBCA database, NatureMap and Protected Matters Search Tool (PMST) and previous flora and vegetation report within the vicinity of the survey area, in particular the Woodman (2009) report. Of the 14 species identified through the database searches, taxa that are 'likely' to or 'may' occur; no species are listed as Endangered under the EPBC Act and BC Act, two is listed as P1, one is P2, ten are P3 and one is a P4 taxa.

The following two Priority flora were recorded during the field assessment:

- *Rothia indica* subsp. *australis* (P3)
- *Goodenia nuda* (P4).

Rothia indica subsp. *australis* (P3) is a prostrate annual herb densely covered in reddish or white spreading hairs growing up to 30 cm high and produces yellow flowers between April and August (WAH 1998-, Holland 1997). This species is found in sandy soils on sandhills or sandy flats occurring in the drier parts of northern Australia including the Dampierland, Great Sandy Desert, Pilbara and Victoria Bonaparte IBRA (Interim Biogeographic Regionalisation for Australia) Regions (Holland 1997, WAH 1998-).

Rothia indica subsp. *australis* was recorded during the Pardoo DSO Project in 2007, the Ridley Magnetite Project area in 2008, and also during significant species searching for the Pardoo DSO Project area in 2008. It was recorded at five locations within the Ridley Magnetite Project area either on drainage lines or drainage flats. It was found to be uncommon at all locations, with the exception of a single location where 246 plants were found along the edge of a recently graded track (Woodman 2009).

According to the Western Australian Herbarium (WAH 1998-) there are 18 known records of *Rothia indica* subsp. *australis*, the most northern being in the Northern Territory on Bradshaw Station (15° 16′ 33.0″ S 130° 7′ 55.0″ E). While the most eastern and western specimens are located at Lake Mackay (22° 39′ 42.8″ S 128° 25′ 25.1″ E) and 43 km south of Port Hedland (20° 41′ 53.9″ S 118° 35′ 10.5″ E), respectively (WAH 1998–). The Atlas of Living Australia however, lists 83 occurrences across northern Australia (ALA 2022). *Rothia indica* subsp. *australis* was opportunistically recorded 22 times during targeted searches from the current survey, and it was found to be associated with drainage lines and flood plains within vegetation units AsTe, CfIoCf and TcAiTe.

Goodenia nuda (P4) is a small, glabrous, erect to ascending herb growing up to 0.5 m high with elliptic to lanceolate leaves at the base of the plant and produces yellow flowers from April to August (WAH 1998 , ALA 2022). This species is found in alluvial floodplains, drainage lines and on brown silt or clay. It is endemic to the Pilbara region of Western Australia, with the most eastern and western locations recorded approximately 200 km south-east of Newman along the Canning Stock Route (24° 51′ 4.2″ S 121° 39′ 21.0″ E) and approximately 40 km east of Onslow (21° 51′ 40.4″ S 115° 34′ 55.8″ E), respectively (WAH 1998-). *Goodenia nuda* was recorded four times during targeted searches and is associated vegetation units AsTe and CfLoCf.

Solanum sp. (aff. *cleistogamum*) was recorded at quadrat 62, which was sampled on an isolated granite outcrop in the west of the survey area, within vegetation unit FaTeCc. The vegetation is broadly described as *Ficus* and *Acacia* shrubland with hummock and tussock grasses and herbs. The collected specimen is of interest, as it doesn't fit well with any of the currently recognised taxa. The very long glandular indumentum (covering of hairs) is distinctive. Two other specimens at WA Herbarium probably represent the same entity, with one currently referred to as *Solanum* aff. *cleistogamum* and the other, *Solanum* aff. *Gabrielae*; although in both cases, their indumentum is shorter. It is considered that the collected specimen represents a currently unrecognised taxon and is therefore of taxonomic interest. It is suggested that further collections from the area would help assess the consistency of the indumentum characters (Mike Hislop, WA Herbarium, pers. comm.).

6.2 VEGETATION

6.2.1 Vegetation Units

Floristic analysis was conducted for all 59 sampled quadrats (the one recorded relevé was not included in the analysis), to determine floristic communities across the survey area, utilising PATN software and analysis of presence/absence of species. Interrogation of the resulting dendrogram clusters identified 11 initial groups of vegetation. Each cluster was reviewed, considering tangible site and community characteristics such as dominant flora species, total species composition, vegetation structure (community type; e.g. woodland, shrubland), landform, land systems and the scale of the survey area. In some cases, field botanist analysis of site and community characteristics overruled the results of the PATN analysis and allocated these quadrats and sampled vegetation to other clusters. Based on the further analysis, some clusters identified in the dendrogram were consolidated and others were separated, resulting in eight vegetation units (**Figure 13**).

The eight vegetation units were defined from 59 quadrats sampled within the survey area. Vegetation mapping was extrapolated based on a combination of the floristics, observations made from ground-truthing, landforms and vegetation boundaries distinctly visible in aerial imagery, and land system mapping. The survey area was found to support three broad landforms: drainage (including rivers, creek lines floodplains), hills (undulating areas supporting mostly spinifex), and plains (supporting woodlands, shrublands and grasslands), supporting eight vegetation units that have been defined and mapped.

6.2.2 Vegetation Condition

The vegetation condition throughout the survey area was found to range from 'Completely Degraded' to 'Excellent'. Almost 50% of the vegetation was observed to be in 'Excellent' condition, which occurs mostly on the hills or areas of elevation and sandy plains in the western part of the survey area.

Areas in 'Good' or poorer condition comprise 14.78 % of the total survey area, occurring mostly where historical mine sites and roads have been established. More degradation was observed in drainage associated with Ridley River that intersects the northern portion of the survey area and low-lying areas, due to the presence of livestock and weeds, likely introduced by grazing activity. Portions of the survey area have been burnt within the past several years, and this was observed to have altered vegetation structure in these areas. However, the nature of the fire impacts (patchy, cool burns) that were observed suggests that vegetation would rapidly return to its former condition. Condition mapping was extrapolated based on a combination of the vegetation condition, recorded as part of field assessment, from targeted searches and opportunistic observations

6.2.3 Threatened and Priority Ecological Communities

The Eighty Mile Land System PEC consists of depositional surfaces, beaches, dunes and broader sandy plains and swales. The dunes are stable when heavily vegetated but highly susceptible to wind erosion if threatened by overgrazing, fire or other disturbances (Payne and Schoknecht 2011). The regional representations of the Eighty Mile Land System are associated with the coastline, from approximately 28 km north-east of Port Hedland and 11 km west north-west of the survey area, extending east to Cape Keraudren. The survey area supports the Boolgeeda, Capricorn, Mallina, Paradise, River, Uaroo and Yamerina Lands Systems and the Eighty Mile Land System and the associated PEC are not supported therein. This is due to the land systems that are needed to support the Eighty Mile Land System PEC do not occur within the survey area. Furthermore, the observed vegetation types in the survey area do not align with any of the defined PEC vegetation. It can be concluded that the survey area does not support any TECs or PECs as they are currently defined.

6.2.4 Groundwater Dependent Vegetation

Groundwater dependent ecosystems depend on groundwater to exist. Due to the potential for groundwater reserves to be drawn down below the water table through mining activities, the presence of groundwater dependent vegetation (GDV) is typically required to be identified for consideration as part of the environmental impact assessment process.

The currently accepted identifying features for GDV are the presence of obligate phreatophytic tree species along riparian systems, specifically River Red Gums (*Eucalyptus camaldulensis*) and Silver Cadjeput (*Melaleuca argentea*). In addition, potential GDV is considered to be comprised of vegetation that supports the vadophytic (soil-moisture dependent) and facultative phreatophytic Coolibah trees (*Eucalyptus victrix*) (Maunsell 2006, Loomes 2010).

The vegetation unit EcAhEf is considered to represent GDV due to the presence of phreatophytic *Eucalyptus camaldulensis* subsp. *refulgens* as the dominant tree species. This vegetation units occupies 2.23% (247.07 ha) of the survey area. Phreatophytic *Eucalyptus victrix* is also more regularly present in medium to minor drainage lines, and seasonally flooded areas (drainage flats/floodplains) adjacent to major drainage lines (vegetation unit EcIoCc). In conclusion, one of the defined and mapped vegetation units of the survey area, EcAhEf, is considered to represent GDV.

6.2.5 Sheet Flow Dependent Mulga

Some mulga vegetation is known to be dependent on the sheet flow surface water and these habitats typically exhibit a high level of species diversity, particular after significant seasonal rainfall. Interruptions to local surface hydrology (e.g. from clearing or installation of infrastructure, particularly liner infrastructure) upstream from occurrences of sheet flow dependent mulga have the potential to negatively impact on such vegetation.

Sheet flow occurs in very gently sloping landscapes (<2°) over relatively smooth soil or rock surfaces, in arid and semi-arid areas of Australia (Mabbutt *et al.* 1987, Miller *et al.* 2002, Ludwig *et al.* 1997). The probability of sheet flow is considered very high where the slope angle is <2°, high where the slope angle is 3-4°, moderate where the slope angle is 5-6°, and low or very low on steeper slopes (Astron 2014).

Mulga vegetation that is dependent on sheet flow are more likely to grown in groves, with bare intergroves where the nutrients carried by sheet flow are collected. These groves produce a distinct banding pattern which is visible in aerial imagery (Mabbutt *et al.* 1987).

No *Acacia* species that fall within the mulga 'umbrella' was recorded within the survey area and therefore not a dominant nor characteristic species of any vegetation unit supported by the survey area. Therefore, it is concluded that none of the sampled vegetation of the survey area supports sheet flow-dependent mulga or banded mulga.

6.3 VEGETATION OF SIGNIFICANCE

6.3.1 Nationally Significant Vegetation

The National significance of the vegetation units was assessed based on presence of:

- populations of Threatened (EPBC listed) species
- TECs listed as nationally (EPBC) significant
- Ramsar Wetlands of International Importance (DCCEEW 2022d).

6.3.1.1 Threatened Flora

No EPBC-listed, Endangered and Threatened flora was recorded in the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.1.2 Threatened Ecological Communities

No EPBC-listed TECs occur nor are any likely to occur in the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.1.3 Ramsar Wetlands

No Ramsar wetlands occur within the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.2 State Significant Vegetation

The State significance of the vegetation units was assessed based on presence of:

- State-listed Threatened flora or TECs
- land within (or areas recommended by DBCA for inclusion) the State-managed conservation estate.

6.3.2.1 Threatened Flora

No State-listed Endangered or Threatened flora species was recorded in the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.2.2 TECs

None of the vegetation units recorded in the survey area are representative of any TEC. There is only one listed (terrestrial) TEC for the Pilbara bioregion; '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)', which is not supported within the survey area. Therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.2.3 Conservation Estate

There are no areas (or areas recommended by DBCA for inclusion) within the State-managed conservation estate and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.3 Regionally Significant Vegetation

The regional significance of the vegetation units was assessed based on:

- the presence of populations of Priority flora or ecological communities
- the presence of ESAs or areas relevant to a conservation scheme
- the presence of conservation category wetlands
- their role in maintaining important ecological processes
- the presence of a high diversity of flora, communities, or community structure
- the presence of flora species exhibiting range extensions or undescribed species
- having a restricted regional distribution
- being represented by less than 30% of the pre-European extent.

6.3.3.1 Priority Flora

Two Priority flora were recorded from three vegetation units (AsTe, CfIoCf and TcAiTe) during the field assessment. The vegetation units in which these species occur are considered to be regionally significant due to this factor. Collectively, these vegetation units account for 7,558.01 ha (68.334%) of the survey area.

6.3.3.2 Priority Ecological Communities

There are no PECs supported by the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.3.3 ESAs or Conservation Areas

There are no ESAs or conservation areas within the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.3.4 Conservation Category Wetlands

There are no conservation category wetlands within the survey area and therefore, none of the recorded vegetation units are of significance due to this factor.

6.3.3.5 Maintaining Important Ecological Processes

One of the recorded vegetation units, EcAhEf is considered to represent GDV due to the presence of the phreatophytic tree species, *Eucalyptus camaldulensis* subsp. *obtusa, Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix*. This groundwater dependence and use of the groundwater by the phreatophytic species is an important ecological process and GDVs play an important role in maintaining this process. This vegetation unit occupies 2.23% (247.066 ha) of the survey area. Therefore, vegetation unit EcAhEf is considered to be of regional significance due to this factor.

6.3.3.6 High Diversity

The species accumulation curve for the field assessment (**Figure 15**, **Section 6.1.1**) demonstrates that at 200 species, the curve is beginning to approach an asymptote and the trendline suggests approximately 240 species would be recorded from 100 quadrats and 267 species from 150 quadrats. Therefore, the 252 species that were recorded from 59 sampled quadrats and one relevé, is considered to represent adequate sampling. These records represent a species richness of 2.287 species per hectare within the survey area, which is not considered significant.

All of the vegetation units mapped as part of the current study were represented by a minimum of three quadrats. The quadrat and relevé data suggested that one of the dominant landforms, hills (98 species) typically support a lower floral diversity, whereas the drainage areas (142 species) and plain (124 species) support a higher level of species diversity.

Nine vegetation units were previously recorded within or adjacent to the survey area (Woodman 2009), which aligns with the eight vegetation units that were described and mapped for the current survey. The diversity of vegetation units across the survey area (11,060.446 ha) is considered appropriate for the region. The floral composition and vegetation structure of the vegetation units are considered typical of the vegetation of the Chichester and Roebourne sub-regions. None of the recorded vegetation units are considered to exhibit a complex or diverse structure.

None of the vegetation units are considered to support high floral species, community or structural diversity for the region and are therefore, none are considered to be regionally significant due to this factor.

In conclusion, none of the recorded vegetation units were found to support a high diversity of flora, communities, or community structure, and therefore, none are considered to be of regional significance due to this factor.

6.3.3.7 Range Extending Taxa

Of the recorded flora, 14 are considered to be exhibiting an extension beyond their currently documented range of occurrence, in accordance with records of the West Australian Herbarium (WAH 1998-). A range extension is considered an expansion of the geographic area currently recognised to be occupied by a species. No particular distance is specified in published documentation by the WA Herbarium or EPA; in the absence of this, it is considered any record more than 100 km from the closest known record (on FloraBase) to be a range extension listed in **Table 13**. The distance is calculated from the centroid within the survey area to known locations as per FloraBase. The species discussed below, and as described by WAH (1998-), have met the criteria of exhibiting an extension beyond their currently documented range of occurrence.

Acacia colei ?var. *ileocarpa* is an erect, spreading shrub or tree that can growing up to 7 m high and produces yellow flowers between June and July. This species grows in stony soils and clay loam in floodplains and drainage lines (WAH 1998-). Its closest known location is 238 km from the survey area centroid and the species was recorded in quadrat 45, within vegetation unit CfAcTe.

Cucumis argenteus is a perennial herbaceous vine that grows up to 2 m tall and produces yellow flowers. This species grows in rocky floodplains and sandplains in red loamy sand (WAH 1998-). Its closest known location is 184 km away from the survey area centroid and was recorded in quadrat 62, within vegetation unit FaTeCc.

Cyperus concinnus is a rhizomatous, perennial, grass or sedge like herb that grows between 0.2 and 0.8 m high and produces brown flowers. This species grows in swamps, creeks and pools in clay, sand and mud (WAH 1998). Its closest known location is 277 km south of the survey area centroid and the species was recorded within quadrat 46, within vegetation unit CfAcTe.

Ehretia saligna is a weeping tree or shrub that grows between 1 to 6 m high and produces white to creamy green flowers between March and May or August and November. It grows in alluvium, sandy and clayey soils on coastal dunes, along drainage lines, rock outcrops and claypans (WAH 1998-). Its closest known location is near Roebourne, 210 km from the survey area centroid, and the species was recorded in quadrats 45 and 53, within vegetation units CfAcTe and CfIoCf.

Ehretia saligna var. *saligna*, much like *Ehretia saligna*, is a weeping tree or shrub that grows between 1 to 6 m high and produces white to creamy green flowers between March and May or August and November. It grows in alluvium, sandy and clayey soils on coastal dunes, along drainage lines, rock outcrops and claypans (WAH 1998-). Its closest known location is on Depuch Island, 149 km from the survey area centroid. It was recorded in quadrat 35, within vegetation unit EcAhEf and opportunistically within vegetation unit TcAiTe.

Eragrostis setifolia is a caespitose perennial, grass-like herb that grows between 0.12 and 0.6 m high and has a hairy, thickened base and produces flowers between January and December. It occurs on clay, loam, alluvium, grey sand and sometimes saline soils in seasonally flooded habitats (WAH 1998-). Its closest known location is 193 km from the survey area centroid on Pyramid Station and the species was recorded in quadrat 66, within vegetation unit SgEeTs.

Goodenia cusackiana is an erect to spreading, semi-woody perennial herb with hairy leaves that grows between 0.05 and 0.6 m high and forms colonies up to 1 m. It produces yellow flowers between July and September and grows in sandy, stony loam on rocky hillsides, gorges and undulating plains (WAH 1998-). Its closest known is 213 km from the survey area centroid near Nullagine and the species was recorded in quadrat 25, within vegetation unit CfAcTe.

Grevillea pyramidalis subsp. *pyramidalis* is a tree or shrub that grows up to 6 m high and produces white to cream to yellow flowers from May to July. It occurs in sand, gravelly loam, skeletal sandy soils on sandstone, laterite and granite (WAH 1998-). Its closest known location is 149 km from the survey area centroid, on Depuch Island. It was recorded in quadrat 40, 53, and 56 within vegetation units FaTeCc, CfAcTe and TcAiTe.

Portulaca pilosa is a succulent, stout erect or prostrate annual herb that grows up to 0.2 m high and produces yellow/pink flowers between January to July or November and grows in sandy loamy and clayey soils (WAH 1998-). Its closest known location is 275 km from the survey area centroid. It was recorded in quadrats 3, 6, 11, 12, 40 and 62 within vegetation units SgEeTs and FaTeCc.

Pterocaulon serrulatum var. *velutinum* is a spreading or erect perennial herb or shrub that grows up to 0.6 m tall and produces white to creamy pink coloured flowers between May and October. It occurs in a variety of gravelly soils including alluvial flats and rocky slopes (WAH 1998-). Its closest known record occurs 161 km from the survey area centroid near Marble Bar. It was recorded in quadrat 161, within vegetation unit SgEeTs and opportunistically within vegetation unit TcAiTe.

Ptilotus aervoides is a prostrate annual, herb that grows up to 1 m high and produces white to cream flowers between April and October. It has ovate to lanceolate leaves that can grow up to 70 mm long and has cylindrical green to white spikes. It is often found on stony, red sandy loam and is common in open plains (WAH 1998-). Its closest known record is 178 km from the survey area centroid and the species was recorded opportunistically within vegetation unit AsTe.

Schoenoplectus subulatus is a rhizomatous, aquatic perennial, grass-like herb or sedge that grows between 0.6 to 2.8 m high and produces brown flowers. It occurs in alluvium pools, swamps and streams (WAH 1998-). Its closest known record occurs 108 km from the survey area centroid and the species was recorded in quadrat 15, within vegetation unit EcAhEf.

Seven of the eight vegetation units, described and mapped within the survey area, being AsTe, CfAcTe, CfIoCf, EcAhEf, FaTeCc, SgEeTs and TcAiTe, are considered to be of regional significance, due to supporting range extending flora.

6.3.3.8 Undescribed Flora

The following three taxa are undescribed species which have not yet been formally described and published in a recognised journal (EPA 2016a, WAH 1998-).

Sida sp. articulation below (A.A. Mitchell PRP 1605) is an erect, open, perennial shrub growing up to 2.5 m high and 1 m wide, with oblong to lanceolate leaves. It produces small yellow flowers in June to September or October. It occurs in gorges or on rocky slopes, colluvial gravels, or red or brown sand. It was recorded in quadrat 23, within vegetation unit CfAcTe.

Sida sp. Pilbara (A.A. Mitchell PRP 1543) is an erect, open perennial shrub growing up to 1.3 m high, with grey stems grey with white corky fissures. It produces small, yellow flowers in March, May, June, July or August. It occurs on banded ironstone or other rocky Pilbara terrain, on red or brown sandy loam. It was recorded at quadrats 24, 31, 33 and 52 within vegetation units CfIoCf, EcAhEf and TcAiTe.

Tephrosia sp. D Kimberley Flora (R.D. Royce 1848) is a prostrate or sprawling shrub growing up to 0.5 m high. It produces yellow, orange-brown and red flowers in May to September. It occurs on red sandy soils in plains. It was recorded in quadrats 43 and 48, within vegetation units AsTe and TcAiTe.

Vegetation units AsTe, CfAcTe, CfIoCf, EcAhEf and TcAiTe are considered to be of regional significance, due to supporting undescribed flora.

6.3.3.9 Restricted Regional Representation and Distribution

The most important aspect in the consideration of regional significance of vegetation is the representation of that vegetation in the region. Within each IBRA region, some regionally defined vegetation associations (Shepherd *et al.* 2002) comprise a very small proportion of the vegetation associations within that region. Vegetation units are considered significant if they are poorly represented regionally. In order to gain a wider context for assessing the regional representation (and remaining extent of the vegetation units of the current study, as discussed further in the following section), each of the recorded vegetation units were aligned (where possible) with the regional vegetation associations relevant to the survey area, as described in Shepherd *et al.* (2002), based on dominant species and vegetation structure. These vegetation associations align with seven of the eight vegetation units recorded and mapped for the current survey. The results of the analysis are presented in **Table 17**, which demonstrates that none of the vegetation associations represented in the survey area are significantly limited across the range of contexts.

One vegetation unit (FaTeCc) does not align with any of the regional vegetation associations, and therefore, the regional representation of this vegetation unit requires further analysis. Vegetation unit FaTeCc is associated with isolated granite outcrops within the Uaroo Land System, generally described as 'broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs' (Payne *et al.* 1988; Van Vreeswyk *et al.* 2004). Vegetation unit FaTeCc is not typical in this land system, however a review of aerial imagery and known land systems that occur nearby (Macroy Land System) showed multiple granite outcrops outside the survey area within the Pilbara IBRA region. The species associated with this unit are common in the Pilbara and therefore, this vegetation unit and the species it supports, are not considered to be regionally limited and therefore, unlikely to be of regional significance due to this factor.

6.3.3.10 Extent Remaining

The EPA's current objective, to protect flora and vegetation so that biological diversity and ecological integrity are maintained (EPA 2016b), was identified in EPA Guidance Statement 33, as achievable by ensuring that ecological communities are maintained above certain threshold levels. These levels are considered to be 30% of the original extent in unconstrained areas and 10% in constrained areas, such as urban zones.

The survey area is an unconstrained area and as such, the minimum retention target of 30% of the original pre-European vegetation extent applies. All of the vegetation associations within the survey area far exceed the 30% retention threshold in State, regional and local contexts (**Table 17**). Therefore, the none of the vegetation units are considered to be regionally significant due to this factor.

Table 17 – Regional and Local Extent of Vegetation Associations within the Survey area

Context	Shepherd *et.al.* (2002) Veg. Association No.	Description	Corresponding Vegetation Unit/s	Pre-European Extent (ha)	Current Extent (ha)	Association's % of Context Area	% Pre-European Extent Remaining	Extent within the Survey Area (ha)	% of Survey Area
Western Australia	93	Hummock grassland of soft *Triodia* spp. With scattered *Acacia inaequilatera* (kanji), *Grevillea* spp. And mallee *Eucalyptus* spp.	TcAiTe	3,044,309.52	3,040,640.98	1.30	99.88	2012.385	18.194
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	CfAcTe, CfIoCf SgEeTs,	807,698.58	802,713.40	0.34	99.38	2738.107	24.756
	619	Medium woodland; *Eucalyptus camaldulensis* (river gum)	EcAhEf, EvIoCc	119,373.78	118,205.01	0.05	99.02	1175.086	10.624
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia* translucens over soft spinifex	AsTe	195,860.89	191,711.41	0.08	97.88	4836.947	43.732
Pilbara IBRA Region	93	Hummock grassland of soft *Triodia* spp. With scattered *Acacia inaequilatera* (kanji), *Grevillea* spp. And mallee *Eucalyptus* spp.	TcAiTe	3,042,114.27	3,038,471.67	17.14	99.88	2012.385	18.194
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	SgEeTs, CfAcTe, CfIoCf	728,768.20	724,695.82	4.09	99.44	2738.107	24.756
	619	Medium woodland; *Eucalyptus camaldulensis* (river gum)	EcAhEf, EvIoCc	118,920.31	118,116.78	0.67	99.32	1175.086	10.624
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia* translucens over soft spinifex	AsTe	195,859.95	191,710.92	1.08	97.88	4836.947	43.732
Chichester IBRA Sub-Region	93	Hummock grassland of soft *Triodia* spp. With scattered *Acacia inaequilatera* (kanji), *Grevillea* spp. And mallee *Eucalyptus* spp.	TcAiTe	2,940,348.04	2,936,731.54	35.17	99.88	2012.385	18.194
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	SgEeTs, CfAcTe, CfIoCf	53,376.40	53,368.34	0.64	99.98	2738.107	24.756
	619	Medium woodland; *Eucalyptus camaldulensis* (river gum)	EcAhEf, EvIoCc	85,543.15	85,520.95	1.02	99.97	1175.086	10.624
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia* translucens over soft spinifex	AsTe	6,958.63	6,936.22	0.08	99.68	4836.947	43.732

Context	Shepherd *et.al.* (2002) Veg. Association No.	Description	Corresponding Vegetation Unit/s	Pre-European Extent (ha)	Current Extent (ha)	Association's % of Context Area	% Pre-European Extent Remaining	Extent within the Survey Area (ha)	% of Survey Area
Roebourne IBRA Sub-Region	93	Hummock grassland of soft *Triodia* spp. With scattered *Acacia inaequilatera* (kanji), *Grevillea* spp. And mallee *Eucalyptus* spp.	TcAiTe	46,360.53	46,334.43	2.56	99.94	2012.385	18.194
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	SgEeTs, CfAcTe, CfIoCf	675,391.80	671,327.48	37.07	99.40	2738.107	24.756
	619	Medium woodland; *Eucalyptus camaldulensis* (river gum)	EcAhEf, EvIoCc	33,377.16	32,595.83	1.80	97.66	1175.086	10.624
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia* translucens over soft spinifex	AsTe	6,958.63	6,936.22	0.38	99.68	4836.947	43.732
Town of Port Hedland	93	Hummock grassland of soft *Triodia* spp. With scattered *Acacia inaequilatera* (kanji), *Grevillea* spp. And mallee *Eucalyptus* spp.	TcAiTe	1,015,339.22	1,014,599.99	55.79	99.93	2012.385	18.194
	589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	SgEeTs, CfAcTe, CfIoCf	338,269.05	335,921.21	18.47	99.31	2738.107	24.756
	619	Medium woodland; *Eucalyptus camaldulensis* (river gum)	EcAhEf, EvIoCc	63,650.59	62,598.14	3.44	98.35	1175.086	10.624
	647	Hummock grasslands, dwarf-shrub steppe; *Acacia* translucens over soft spinifex	AsTe	180,908.49	176,759.02	9.72	97.71	4836.947	43.732

6.3.4 Locally Significant Vegetation

The local significance of the vegetation units in the survey area was assessed based on:

- their presence as small, isolated communities
- their local extent (proportion) and distribution.

6.3.4.1 Small, Isolated Communities

Vegetation units may be of conservation significance if they occur in small, isolated occurrences. Vegetation unit FaTeCc is associated with granite outcropping occurring on the Uaroo land system in small, isolated pockets in the western portion of the survey area. It is generally characterised by *Ficus* and *Acacia* shrubland with hummock and tussock grasses and herbs, occupying 0.023% of the survey area, in the western section. Therefore, this vegetation unit is considered to be locally significant due to this factor.

6.3.4.2 Limited Extent and Distribution

Vegetation unit FaTeCc was mapped to occupy less than 1% of the survey area, and this local extent is considered to be limited. Vegetation unit FaTeCc is unique in the survey area, restricted to isolated outcropping of granite and therefore, is considered to be locally significant due to having both a limited local extent and distribution.

6.3.5 Summary of Vegetation Significance

The significant vegetation units of the survey area, along with the aspects determining their significance, are summarised in **Table 18**. The level of significance for each vegetation unit is broadly summarised in **Table 19**.

Table 18 - Summary of Vegetation Units with Potential Significance in the Survey Area

Scale	Significance Aspect	Vegetation Units
National Significance	Populations of Threatened (EPBC listed) species	-
	Presence of EPBC listed TECs	-
	Presence of Ramsar wetlands	-
State Significance	Presence of State-listed Threatened flora	-
	Presence of State-listed TECs	-
	Land within in the Conservation Estate	-
Regional Significance	Presence of Priority flora	AsTe, CfIoCf, TcAiTe
	Presence of PECs	-
	Presence of ESAs or areas relevant to a conservation scheme	-
	Presence of conservation category wetlands	-
	Role in maintaining an important ecological process	EcAhEf
	High diversity of flora, communities, or community structure	-
	Presence of flora species exhibiting a range extension	AsTe, CfAcTe, CfIoCf, EcAhEf, FaTeCc, SgEeTs, TcAiTe
	Presence of undescribed flora	AsTe, CfAcTe, CfIoCf, EcAhEf, TcAiTe
	Having a restricted regional representation and distribution	-
	Represented by less than 30% of the pre-European extent	-
Local Significance	Small, isolated communities	FaTeCc
	Having a limited local extent and distribution	FaTeCc

Table 19 - Summary of Level of Potential Significance of the Vegetation Units of the Survey area

Vegetation Unit	Overall Significance – Factor of Significance	Area (ha)	% of the Survey Area
AsTe	Regional significance – presence of Priority flora Regional significance – presence of range extending flora Regional significance – presence of undescribed flora	4,836.947	43.732
CfAcTe	Regional significance – presence of range extending flora Regional significance – presence of undescribed flora	342.609	3.098
CfIoCf	Regional significance – presence of Priority flora Regional significance – presence of range extending flora Regional significance – presence of undescribed flora	708.678	6.407
EcAhEf	Regional significance – a role in maintaining important ecological processes Regional significance – presence of range extending flora Regional significance – presence of undescribed flora	247.066	2.234
EvIoCc	-	928.020	8.390
FaTeCc	Regional significance – presence of range extending flora Local Significance – presence of small, isolated communities Local significance – limited local extent and distribution	2.563	0.023
SgEeTs	Regional significance – presence of range extending flora	1,686.820	15.251
TcAiTe	Regional significance – presence of Priority flora Regional significance – presence of range extending flora Regional significance – presence of undescribed flora	2,012.385	18.194
Cleared	NA	295.358	2.670
	TOTAL	**11,060.446**	**100**

7. CONCLUSIONS

The key results and conclusions from the detailed flora and vegetation survey of the Pardoo/Ridley survey area are as follows:

- The following Priority flora species were recorded during the field assessment:
    - *Rothia indica* subsp. *australis* (P3)
    - *Goodenia nuda* (P4).
- The following 12 flora species were found to be exhibiting an extension beyond their currently documented range, based on records of the WAH (1998-).
    - *Acacia colei* ?var*. ileocarpa*
    - *Cucumis argenteus*
    - *Cyperus ?concinnus*
    - *Ehretia saligna*
    - *Ehretia saligna* var. *saligna*
    - *Eragrostis setifolia*
    - *Goodenia cusackiana*
    - *Grevillea pyramidalis* subsp. *pyramidalis*
    - *Portulaca pilosa*
    - *Pterocaulon serrulatum* var. *velutinum*
    - *Ptilotus aervoides*
    - *Schoenoplectus subulatus.*
- The following three undescribed flora were recorded:
    - *Sida* sp. articulation below (A.A. Mitchell PRP 1605)
    - *Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
    - Tephrosia sp. D Kimberley Flora (R.D. Royce 1848*)*
- Sixteen introduced (weed) species were recorded within the survey area, contributing to 6.35% of the species diversity, with the majority occurring in drainage lines.
- One recorded weed species, **Parkinsonia aculeata* is listed as a WoNS (Weeds Australia 2022).
- Two recorded weed species **Parkinsonia aculeata* and **Calotropis procerus* are listed as DP plants under the BAM Act.
- The vegetation condition of the survey area was found to range from 'Completely Degraded' to 'Excellent' condition, with 66% of the survey area in 'Very Good' condition or better.
- The survey area was found to support three broad landforms; drainage (including rivers, creek lines and floodplains), hills (undulating areas supporting mostly spinifex) and plains (supporting woodlands, shrublands and grasslands), that support eight vegetation units that have been defined and mapped.
- No TECs or PECs were found to occur within the survey area. The observed vegetation types do not align with any defined TEC or PEC vegetation, nor were they considered likely to occur. Furthermore, none of the land systems known to support the PEC resulting from the desktop assessment occur within the survey area.
- One of the recorded vegetation units, EcAhEf, is considered to represent GDV due to the presence of phreatophytic species, *Eucalyptus camaldulensis* subsp. *refulgens* as the dominant tree species. The total area of this vegetation unit mapped in the survey area is 247.066 ha (2.23%).

- Several of the recorded vegetation units within the survey area have been determined to potentially be of significance, as follows:
    - The following vegetation units are considered to be of regional significance:
        - AsTe, CfIoCf and TcAiTe due to supporting Priority flora
        - EcAhEf, due to playing a role in an important ecological process (as GDV)
        - AsTe, CfAcTe, CfIoCf, EcAhEf, FaTeCc, SgEeTs and TcAiTe, due to supporting range-extending flora
        - AsTe, CfAcTe, CfIoCf, EcAhEf and TcAiTe due to supporting undescribed flora.
    - The following vegetation unit is considered to be of local significance:
        - FaTeCc, due to occurring as small, isolated communities
        - FaTeCc, due to having a limited local extent and distribution.

8. LIST OF PARTICIPANTS

The FVC personnel who contributed to the project are summarised in **Table 20**.

Table 20 - Project Team

Name	Qualification	Years of Relevant Experience	Project Role
Kellie Bauer–Simpson Principal Ecologist/ Environmental Manager	BSc. (Biological Science)	23	Project manager, study scoping, technical and authorisation review
Kristen Bleby Senior Ecologist	B.Sc. (Hons) Natural Resource Management PhD (Ecology)	10	Report technical review
Dan Roberts Botanist/Ecologist	B.Sc. (Environmental Science; Marine Science)	10	Field survey, vegetation mapping, field safety and logistics planning, GIS, data analysis, floristic analysis and reporting
Megan Gray Botanist/Ecologist	B.Sc. (Environmental Science)	3	Field survey, technical support
Olga Nazarova Botanist/Ecologist	B.Sc. (Botany and Genetics)	4	Field survey, flora identifications support, technical support, reporting
Kelly Hopkinson Graduate Botanist/Ecologist	B.Sc. (Biological Sciences, Conservation and Wildlife Biology)	0.5	Field survey, reporting support
Margaret Collins Botanist/Taxonomist	Ph.D. Botany M.Sc. Biotechnology and Molecular Biology B.Sc. (Hons.) Organic Chemistry and Microbiology	26	Flora identifications
Shibi Chandran Botanist/Taxonomist	BSc. (Zoology) MSc. (Fisheries and Aquaculture)	11	Flora identifications
Will Bauer–Simpson Technician	Cert IV (Health and Safety)	11	GIS and mapping
Flavia dos Santos Pereira Technician	B.Sc. (Geography)	3	GIS and mapping
Sarah Beckwith Graduate Botanist/Ecologist	B.Sc. (Conservation Biology) [Still in progress]	0.5	Reporting support
Megan Rabadan Administration		4	Data entry, report compilation

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APPENDIX A – DBCA NATUREMAP SEARCH REPORT

Taxon	Count	BC Act/ DBCA Conservation Status
Atriplex eremitis	2	P1
Heliotropium parviantrum	1	P1
Tephrosia rosea var. Port Hedland (A.S. George 1114)	20	P1
Gomphrena pusilla	5	P2
Bonamia oblongifolia	1	P3
Euphorbia clementii	3	P3
Gymnanthera cunninghamii	3	P3
Heliotropium murinum	1	P3
Heliotropium muticum	27	P3
Rothia indica subsp. *australis*	8	P3
Eragrostis crateriformis	8	P3
Triodia chichesterensis	1	P3
Goodenia nuda	2	P4
Bulbostylis burbidgeae	3	P4

APPENDIX B – EPBC PMST SEARCH REPORT

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 22-Aug-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	32
Listed Migratory Species:	66

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	73
Commonwealth Heritage Places:	None
Listed Marine Species:	109
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	1

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	3
EPBC Act Referrals:	35
Key Ecological Features (Marine):	None
Biologically Important Areas:	13
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
EEZ and Territorial Sea	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
FISH			
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In feature area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhinonicteris aurantia (Pilbara form)			
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
Aipysurus apraefrontalis			
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Aipysurus foliosquama			
Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Eretmochelys imbricata			
Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Liasis olivaceus barroni			
Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
SHARK			
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pristis clavata			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
Fregata ariel			
Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area	In buffer area only
Fregata minor			
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia			
Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Macronectes giganteus			
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In buffer area only
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area	In buffer area only
Migratory Marine Species			
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In buffer area only
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
[Limosa limosa](#) Black-tailed Godwit [845]		Species or species habitat known to occur within area	In buffer area only
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Numenius minutus](#) Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area	In buffer area only
[Numenius phaeopus](#) Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area	In feature area
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]		Species or species habitat known to occur within area	In buffer area only
[Tringa brevipes](#) Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
[Tringa glareola](#) Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [51684]	WA	In buffer area only
Commonwealth Land - [51689]	WA	In buffer area only
Commonwealth Land - [51688]	WA	In buffer area only
Commonwealth Land - [51403]	WA	In buffer area only
Commonwealth Land - [51054]	WA	In buffer area only
Commonwealth Land - [51049]	WA	In buffer area only
Commonwealth Land - [51678]	WA	In buffer area only
Commonwealth Land - [51048]	WA	In buffer area only
Commonwealth Land - [51676]	WA	In buffer area only
Commonwealth Land - [51679]	WA	In buffer area only
Commonwealth Land - [51718]	WA	In buffer area only
Commonwealth Land - [50323]	WA	In buffer area only
Commonwealth Land - [50324]	WA	In buffer area only
Commonwealth Land - [50325]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51690]	WA	In buffer area only
Commonwealth Land - [51711]	WA	In buffer area only
Commonwealth Land - [51719]	WA	In buffer area only
Commonwealth Land - [50326]	WA	In buffer area only
Commonwealth Land - [51683]	WA	In buffer area only
Commonwealth Land - [50327]	WA	In buffer area only
Commonwealth Land - [51682]	WA	In buffer area only
Commonwealth Land - [51712]	WA	In buffer area only
Commonwealth Land - [51404]	WA	In buffer area only
Commonwealth Land - [51713]	WA	In buffer area only
Commonwealth Land - [51666]	WA	In buffer area only
Commonwealth Land - [51686]	WA	In buffer area only
Commonwealth Land - [51687]	WA	In buffer area only
Commonwealth Land - [50359]	WA	In buffer area only
Commonwealth Land - [51681]	WA	In buffer area only
Commonwealth Land - [51685]	WA	In buffer area only
Commonwealth Land - [50349]	WA	In buffer area only
Commonwealth Land - [51716]	WA	In buffer area only
Commonwealth Land - [51710]	WA	In buffer area only
Commonwealth Land - [51715]	WA	In buffer area only
Commonwealth Land - [51717]	WA	In buffer area only
Commonwealth Land - [51055]	WA	In buffer area only
Commonwealth Land - [51702]	WA	In buffer area only
Commonwealth Land - [51703]	WA	In buffer area only
Commonwealth Land - [51700]	WA	In buffer area only
Commonwealth Land - [51050]	WA	In buffer area only
Commonwealth Land - [51709]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51708]	WA	In buffer area only
Commonwealth Land - [51707]	WA	In buffer area only
Commonwealth Land - [51706]	WA	In buffer area only
Commonwealth Land - [51705]	WA	In buffer area only
Commonwealth Land - [51429]	WA	In buffer area only
Commonwealth Land - [51053]	WA	In buffer area only
Commonwealth Land - [51704]	WA	In buffer area only
Commonwealth Land - [51680]	WA	In buffer area only
Commonwealth Land - [51714]	WA	In buffer area only
Commonwealth Land - [51668]	WA	In buffer area only
Commonwealth Land - [51720]	WA	In buffer area only
Commonwealth Land - [51947]	WA	In buffer area only
Commonwealth Land - [51667]	WA	In buffer area only
Commonwealth Land - [51051]	WA	In buffer area only
Commonwealth Land - [51669]	WA	In buffer area only
Commonwealth Land - [51671]	WA	In buffer area only
Commonwealth Land - [51670]	WA	In buffer area only
Commonwealth Land - [51673]	WA	In buffer area only
Commonwealth Land - [51672]	WA	In buffer area only
Commonwealth Land - [51675]	WA	In buffer area only
Commonwealth Land - [51674]	WA	In buffer area only
Commonwealth Land - [51677]	WA	In buffer area only
Commonwealth Land - [51695]	WA	In buffer area only
Commonwealth Land - [51696]	WA	In buffer area only
Commonwealth Land - [51693]	WA	In buffer area only
Commonwealth Land - [51694]	WA	In buffer area only
Commonwealth Land - [51699]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51052]	WA	In buffer area only
Commonwealth Land - [51697]	WA	In buffer area only
Commonwealth Land - [51698]	WA	In buffer area only
Commonwealth Land - [51692]	WA	In buffer area only
Commonwealth Land - [51691]	WA	In buffer area only

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
[Chalcites osculans as Chrysococcyx osculans](#) Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area overfly marine area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In buffer area only
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area	In feature area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area	In feature area
[Phaethon lepturus](#) White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In buffer area only
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Recurvirostra novaehollandiae](#) Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Rostratula australis as Rostratula benghalensis (sensu lato)](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
[Sterna dougallii](#) Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
[Sternula albifrons as Sterna albifrons](#) Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
[Stiltia isabella](#) Australian Pratincole [818]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Sula leucogaster](#) Brown Booby [1022]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area	In buffer area only
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area	In buffer area only
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area	In buffer area only
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area	In buffer area only
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In buffer area only
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area	In buffer area only
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In buffer area only
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In buffer area only
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In buffer area only
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In buffer area only
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In buffer area only
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In buffer area only
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In buffer area only
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In buffer area only
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In buffer area only
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area	In buffer area only
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Solegnathus lettiensis](#) Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In buffer area only
[Solenostomus cyanopterus](#) Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
[Syngnathoides biaculeatus](#) Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
[Trachyrhamphus longirostris](#) Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In buffer area only
Mammal			
[Dugong dugon](#) Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Reptile			
[Acalyptophis peronii](#) Horned Seasnake [1114]		Species or species habitat may occur within area	In buffer area only
[Aipysurus apraefrontalis](#) Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
[Aipysurus duboisii](#) Dubois' Seasnake [1116]		Species or species habitat may occur within area	In buffer area only
[Aipysurus eydouxii](#) Spine-tailed Seasnake [1117]		Species or species habitat may occur within area	In buffer area only
[Aipysurus foliosquama](#) Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area	In buffer area only
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area	In buffer area only
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area	In buffer area only
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area	In buffer area only
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area	In buffer area only
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area	In buffer area only
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area	In buffer area only
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area	In buffer area only
Leioselasma czeblukovi as Hydrophis czeblukovi Fine-spined Seasnake, Geometrical Seasnake [87374]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Australian Marine Parks		[Resource Information]
Park Name	Zone & IUCN Categories	Buffer Status
Eighty Mile Beach	Multiple Use Zone (IUCN VI)	In buffer area only

Habitat Critical to the Survival of Marine Turtles			
Scientific Name	Behaviour	Presence	Buffer Status
Aug - Sep			
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Eighty Mile Beach	Marine Park	WA	In buffer area only
North Turtle Island	Nature Reserve	WA	In buffer area only

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
De Grey River	WA	In buffer area only
Eighty Mile Beach System	WA	In buffer area only
Leslie (Port Hedland) Saltfields System	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Project Highclere Cable Lay and Operation	2022/09203		Completed	In buffer area only
Controlled action				
Additional Rail Infrastructure between Herb Elliott Port Facility and Cloudbreak Mine Site	2010/5513	Controlled Action	Post-Approval	In buffer area only
Development of a Quarry Operation to extract gravel, sand and pindan material	2012/6636	Controlled Action	Post-Approval	In buffer area only
Great Northern Pipeline - 630 km buried gas pipeline	2009/5257	Controlled Action	Completed	In buffer area only
Miralga Creek Project, Pilbara region, WA	2019/8601	Controlled Action	Post-Approval	In buffer area only
North Star Magnetite Project	2012/6689	Controlled Action	Post-Approval	In buffer area only
Panoram Copper-Zinc mine	2007/3310	Controlled Action	Completed	In buffer area only
Poondano Iron Ore Project	2010/5759	Controlled Action	Post-Approval	In buffer area only
Port Hedland Outer Harbour Development and associated marine and terrestrial in	2008/4159	Controlled Action	Post-Approval	In buffer area only
Port Hedland Spoilbank Marina, WA	2019/8520	Controlled Action	Post-Approval	In buffer area only
Not controlled action				

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Bulgarene Borefield	2006/2507	Not Controlled Action	Completed	In feature area
Construction of a Commodities Berth, Wharf and Associated Infrastructure	2008/4129	Not Controlled Action	Completed	In buffer area only
Development of iron ore resources in eastern Pilbara region, including port at P	2004/1562	Not Controlled Action	Completed	In buffer area only
Horizon Power South Hedland Transmission Line, WA	2012/6551	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Iron Bridge Port Facility, Port Hedland, WA	2015/7565	Not Controlled Action	Completed	In buffer area only
Pardoo Direct Shipping Ore (DSO) Project	2007/3539	Not Controlled Action	Completed	In feature area
Pilbara Transmission Project, Pilbara, WA	2018/8349	Not Controlled Action	Completed	In buffer area only
Pippingarra Quarry Expansion Works	2012/6461	Not Controlled Action	Completed	In buffer area only
Port Hedland Channel Risk and Optimisation Project, WA	2017/7915	Not Controlled Action	Completed	In buffer area only
Rail and Port Facilities	2001/474	Not Controlled Action	Completed	In buffer area only
Telfer Gold Mine Project - Mine and Borefield Extensions and Upgrade of Storage	2002/787	Not Controlled Action	Completed	In feature area
Telfer Gold Mine Project - Power Supply and Infrastructure Corridor	2002/786	Not Controlled Action	Completed	In feature area
Walkway Lighting Upgrade	2009/4965	Not Controlled Action	Completed	In buffer area only
Wilga Quarry Expansion	2020/8726	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Additional Rail Infrastructure	2012/6314	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Dredging of marine sediment to enable construction of eight berths and a turnin	2010/5678	Not Controlled Action (Particular	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
Marine Geotechnical Drilling Program	2008/4012	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Nelson Point Dredging	2009/4920	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT	2014/7223	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Port Headland Outer Harbour Pre-construction Pilling program	2012/6341	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Port of Port Hedland channel marker replacement project, WA	2017/8010	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Realignment of the Great Northern Highway	2010/5793	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
upgrade of 3 community recreation sites	2005/2349	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Outer Harbour Development and associated marine and terrestial infrastructure	2008/4148	Referral Decision	Completed	In buffer area only

Biologically Important Areas			
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Caretta caretta Loggerhead Turtle [1763]	Foraging	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur	In feature area
Fregata ariel Lesser Frigatebird [1012]	Breeding	Known to occur	In feature area
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur	In buffer area only
Sula leucogaster Brown Booby [1022]	Breeding	Known to occur	In buffer area only
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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APPENDIX C – FLORA SPECIES BY VEGETATION UNIT

* = introduced (weed) species, DP = Declared Pest plant, WoNS = Weed of National Significance

Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Acanthaceae	*Rostellularia adscendens* var. *clementii*				+	+			
Aizoaceae	*Trianthema oxycalyptrum* var. *oxycalyptrum*							+	
Aizoaceae	*Trianthema pilosum*	+		+			+		
Aizoaceae	**Trianthema portulacastrum*				+				
Aizoaceae	*Trianthema triquetrum*	+						+	
Aizoaceae	*Trianthema turgidifolium*							+	
Amaranthaceae	*Achyranthes aspera*			+		+	+		
Amaranthaceae	**Aerva javanica*					+			
Amaranthaceae	*Alternanthera nana*	+							
Amaranthaceae	*Alternanthera nodiflora*			+	+				
Amaranthaceae	*Amaranthus undulatus*			+			+		
Amaranthaceae	*Gomphrena canescens*	+						+	
Amaranthaceae	*Gomphrena canescens* subsp. *canescens*							+	+
Amaranthaceae	*Gomphrena cunninghamii*						+		+
Amaranthaceae	*Ptilotus aervoides*	+							
Amaranthaceae	*Ptilotus arthrolasius*	+							
Amaranthaceae	*Ptilotus auriculifolius*	+							
Amaranthaceae	*Ptilotus calostachyus*								+
Amaranthaceae	*Ptilotus exaltatus*								+
Amaranthaceae	*Ptilotus fusiformis*								+
Amaranthaceae	*Ptilotus gomphrenoides*	+		+				+	
Amaranthaceae	*Ptilotus murrayi*	+			+			+	
Apocynaceae	**Calotropis procera* **(DP)**	+		+	+	+		+	+
Apocynaceae	*Carissa lanceolata*			+	+	+			+
Apocynaceae	*Vincetoxicum lineare*				+				
Asteraceae	*Blumea tenella*				+				
Asteraceae	*Pluchea ferdinandi-muelleri*	+							
Asteraceae	*Pluchea tetranthera*	+	+	+			+	+	+
Asteraceae	*Pterocaulon serrulatum* var. *velutinum*							+	+
Asteraceae	*Pterocaulon sphaeranthoides*							+	
Asteraceae	*Sonchus hydrophilus*				+				
Bignoniaceae	*Dolichandrone occidentalis*	+							
Bignoniaceae	*Ehretia saligna*			+					
Boraginaceae	*Ehretia saligna* var. *saligna*				+				
Boraginaceae	*Euploca cunninghamii*			+					
Boraginaceae	*Euploca tenuifolia*			+					
Boraginaceae	*Heliotropium crispatum*	+			+				
Capparaceae	*Capparis spinosa* subsp. *nummularia*						+		+
Chenopodiaceae	*Atriplex bunburyana*							+	
Chenopodiaceae	*Salsola australis*					+		+	
Chenopodiaceae	*Sclerolaena glabra*	+						+	
Chenopodiaceae	*Suaeda arbusculoides*							+	
Cleomaceae	*Arivela viscosa*			+			+		+
Combretaceae	*Terminalia circumalata*								+
Commelinaceae	*Commelina ensifolia*							+	+

Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Commelinaceae	*Murdannia graminea*			+					
Convolvulaceae	*?Bonamia* sp.		+	+					
Convolvulaceae	*?Polymeria mollis*		+						
Convolvulaceae	*Bonamia ?pannosa*			+					
Convolvulaceae	*Bonamia linearis*	+		+			+		
Convolvulaceae	*Bonamia media*		+	+		+		+	+
Convolvulaceae	*Bonamia pannosa*	+							
Convolvulaceae	*Bonamia pilbarensis*								+
Convolvulaceae	*Bonamia rosea*	+	+						
Convolvulaceae	*Duperreya commixta*							+	
Convolvulaceae	*Evolvulus alsinoides*						+		
Convolvulaceae	*Evolvulus alsinoides* var. *decumbens*	+					+		
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*	+						+	
Convolvulaceae	*Ipomoea muelleri*			+	+		+	+	
Convolvulaceae	*Operculina aequisepala*			+	+				
Convolvulaceae	*Polymeria ambigua*	+							
Cucurbitaceae	*Citrullus amarus*			+				+	
Cucurbitaceae	*Cucumis argenteus*						+		
Cucurbitaceae	*Cucumis variabilis*		+				+		+
Cyperaceae	*Bulbostylis barbata*				+		+		
Cyperaceae	Cyperaceae sp.			+	+				
Cyperaceae	*Cyperus ?concinnus*			+					
Cyperaceae	*Cyperus* sp.						+		
Cyperaceae	*Fimbristylis ?dichotoma*			+					
Cyperaceae	*Fimbristylis dichotoma*	+		+				+	
Cyperaceae	*Schoenoplectus subulatus*				+				
Elatinaceae	*Bergia perennis* subsp. *perennis*	+					+		
Euphorbiaceae	*Euphorbia australis*								+
Euphorbiaceae	*Euphorbia careyi*			+					
Euphorbiaceae	*Euphorbia coghlanii*			+					
Euphorbiaceae	**Ricinus communis*				+				
Fabaceae	*Acacia ?ampliceps*					+			
Fabaceae	*Acacia acradenia*		+	+					+
Fabaceae	*Acacia ampliceps*			+					
Fabaceae	*Acacia bivenosa*								+
Fabaceae	*Acacia colei*		+				+		
Fabaceae	*Acacia colei* ?var. *ileocarpa*			+					
Fabaceae	*Acacia colei* var. *colei*	+	+	+			+		
Fabaceae	*Acacia dictyophleba*			+					
Fabaceae	*Acacia glaucocaesia*	+				+			
Fabaceae	*Acacia inaequilatera*			+		+			+
Fabaceae	*Acacia orthocarpa*								+
Fabaceae	*Acacia pyrifolia* var. *pyrifolia*	+				+			
Fabaceae	*Acacia stellaticeps*	+	+	+			+		
Fabaceae	*Acacia trachycarpa*			+					+
Fabaceae	*Acacia tumida*			+					+
Fabaceae	*Acacia synchronicia*					+			
Fabaceae	*Aeschynomene indica*			+				+	
Fabaceae	*Alysicarpus muelleri*	+		+				+	

Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Fabaceae	*Crotalaria cunninghamii*				+	+	+		
Fabaceae	*Crotalaria medicaginea* var. *neglecta*						+		
Fabaceae	*Crotalaria ramosissima*	+		+				+	
Fabaceae	*Cullen stipulaceum*	+						+	
Fabaceae	*Grona filiformis*							+	+
Fabaceae	*Indigastrum parviflorum*								+
Fabaceae	*Indigofera colutea*						+		
Fabaceae	*Indigofera hirsuta*			+					
Fabaceae	*Indigofera linifolia*	+		+	+		+		+
Fabaceae	*Indigofera linnaei*	+							
Fabaceae	**Indigofera oblongifolia*	+		+	+	+		+	
Fabaceae	*Indigofera trita*							+	
Fabaceae	*Indigofera trita* subsp. *trita*		+						
Fabaceae	*Isotropis atropurpurea*		+						
Fabaceae	*Lysiphyllum cunninghamii*			+	+	+			
Fabaceae	*Neptunia dimorphantha*	+		+				+	+
Fabaceae	**Parkinsonia aculeata* (**DP/WoNS**)				+	+		+	
Fabaceae	*Petalostylis labicheoides*								+
Fabaceae	*Rhynchosia minima*		+					+	+
Fabaceae	*Rhynchosia* sp.			+					+
Fabaceae	*Rothia indica* subsp. *australis* (**P3**)	+		+					+
Fabaceae	*Senna artemisioides* subsp. *oligophylla*					+			
Fabaceae	*Senna glutinosa* subsp. *pruinosa*								+
Fabaceae	*Senna notabilis*				+				
Fabaceae	*Senna pleurocarpa* var. *pleurocarpa*				+				
Fabaceae	*Senna symonii*								+
Fabaceae	*Senna venusta*			+			+		+
Fabaceae	*Sesbania cannabina*			+					
Fabaceae	**Stylosanthes hamata*	+		+			+	+	
Fabaceae	*Tephrosia leptoclada*						+		
Fabaceae	*Tephrosia* sp. D Kimberley Flora (R.D. Royce 1848)	+							+
Fabaceae	*Tephrosia supina*	+	+	+					+
Fabaceae	*Tephrosia virens*			+					
Fabaceae	*Vachellia farnesiana*				+	+			
Fabaceae	*Vigna lanceolata*			+					
Fabaceae	*Vigna lanceolata* var. *lanceolata*	+		+	+				
Goodeniaceae	*Dampiera candicans*			+					
Goodeniaceae	*Goodenia cusackiana*		+						
Goodeniaceae	*Goodenia forrestii*							+	
Goodeniaceae	*Goodenia lamprosperma*	+		+				+	
Goodeniaceae	*Goodenia nuda* (**P4**)	+		+					
Goodeniaceae	*Goodenia* sp.			+					
Lamiaceae	*Basilicum polystachyon*			+	+				
Lamiaceae	*Clerodendrum floribundum*								+
Lauraceae	*Cassytha capillaris*	+	+				+		
Lauraceae	*Cassytha* sp.	+							
Lythraceae	*Ammannia auriculata*				+				
Malvaceae	*?Waltheria indica*			+					

Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Malvaceae	*Abutilon lepidum*								+
Malvaceae	*Abutilon oxycarpum*					+			
Malvaceae	*Corchorus elachocarpus*	+	+						
Malvaceae	*Corchorus incanus* subsp. *incanus*	+		+			+		
Malvaceae	*Corchorus laniflorus*	+		+				+	
Malvaceae	*Corchorus lasiocarpus*				+				
Malvaceae	*Corchorus sidoides* subsp. *vermicularis*		+						
Malvaceae	*Corchorus tectus*			+					+
Malvaceae	*Corchorus tridens*			+					
Malvaceae	*Corchorus walcottii*							+	
Malvaceae	*Hibiscus burtonii*		+						
Malvaceae	*Hibiscus leptocladus*								+
Malvaceae	*Hibiscus* sp.					+			
Malvaceae	*Hibiscus sturtii*			+					+
Malvaceae	**Malvastrum americanum*			+					
Malvaceae	**Melochia pyramidata*				+				
Malvaceae	*Sida arenicola*								+
Malvaceae	*Sida fibulifera*			+		+		+	
Malvaceae	*Sida rohlenae* subsp. *rohlenae*		+	+			+		
Malvaceae	*Sida* sp. articulation below (A.A. Mitchell PRP 1605)		+						
Malvaceae	*Sida* sp. Pilbara (A.A. Mitchell PRP 1543)			+	+				+
Malvaceae	*Triumfetta clementii*	+	+			+			+
Malvaceae	*Waltheria indica*			+			+		
Marsileaceae	*Marsilea ?hirsuta*							+	
Marsileaceae	*Marsilea* sp.							+	
Menispermaceae	*Tinospora smilacina*						+		
Molluginaceae	*Trigastrotheca molluginea*	+	+						
Moraceae	*Ficus aculeata* var. *indecora*			+	+		+		
Moraceae	*Ficus brachypoda*						+		
Myrtaceae	*Corymbia ?hamersleyana*		+						+
Myrtaceae	*Corymbia flavescens*		+	+					
Myrtaceae	*Corymbia hamersleyana*								+
Myrtaceae	*Eucalyptus camaldulensis* subsp. *refulgens*			+	+	+			
Myrtaceae	*Eucalyptus odontocarpa*			+					
Myrtaceae	*Eucalyptus* sp.			+					
Myrtaceae	*Eucalyptus victrix*			+		+			
Myrtaceae	*Melaleuca argentea*				+				
Nyctaginaceae	*Boerhavia ?coccinea*				+		+		
Nyctaginaceae	*Boerhavia burbidgeana*			+					
Nyctaginaceae	*Boerhavia coccinea*	+						+	+
Nyctaginaceae	*Boerhavia gardneri*								+
Oleaceae	*Jasminum didymum* subsp. *lineare*			+					
Passifloraceae	**Passiflora foetida* var. *hispida*				+	+			
Phyllanthaceae	*Nellica maderaspatensis*				+			+	
Phyllanthaceae	*Notoleptopus decaisnei*								+
Phyrymaceae	*Uvedalia linearis* var. *linearis*				+				
Plantaginaceae	*Stemodia grossa*	+		+			+	+	
Poaceae	*Aristida holathera* var. *holathera*							+	

Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Poaceae	**Cenchrus ciliaris*	+	+	+		+	+		+
Poaceae	**Cenchrus setiger*			+	+				
Poaceae	*Chloris pectinata*							+	
Poaceae	*Chrysopogon fallax*	+	+	+				+	
Poaceae	*Cymbopogon ?ambiguus*		+						
Poaceae	*Cymbopogon ambiguus*		+	+	+				+
Poaceae	**Cynodon dactylon*				+				
Poaceae	*Dactyloctenium radulans*	+		+				+	
Poaceae	*Digitaria brownii*			+					
Poaceae	**Echinochloa colona*			+	+				
Poaceae	*Enneapogon lindleyanus*								+
Poaceae	*Eragrostis ?eriopoda*	+							
Poaceae	*Eragrostis ?xerophila*	+							
Poaceae	*Eragrostis eriopoda*	+	+				+	+	
Poaceae	*Eragrostis setifolia*							+	
Poaceae	*Eragrostis* sp.							+	
Poaceae	*Eragrostis tenellula*			+	+				
Poaceae	*Eriachne aristidea*							+	+
Poaceae	*Eriachne benthamii*							+	
Poaceae	*Eriachne flaccida*			+	+			+	
Poaceae	*Eriachne glauca* var. *glauca*							+	
Poaceae	*Eriachne lanata*	+							
Poaceae	*Eriachne mucronata*	+					+	+	+
Poaceae	*Eriachne obtusa*		+	+					
Poaceae	*Eriachne* sp.							+	
Poaceae	*Eulalia aurea*	+		+					
Poaceae	*Iseilema vaginiflorum*							+	
Poaceae	*Panicum decompositum*			+					
Poaceae	*Paspalidium clementii*						+		
Poaceae	*Paspalidium tabulatum*						+		
Poaceae	*Perotis rara*								+
Poaceae	Poaceae sp.			+		+			
Poaceae	*Sorghum plumosum*			+		+		+	
Poaceae	*Sporobolus actinocladus*	+		+				+	
Poaceae	*Sporobolus australasicus*	+			+				
Poaceae	*Themeda triandra*	+							
Poaceae	*Triodia epactia*	+	+	+			+	+	+
Poaceae	*Triodia longiceps*					+			
Poaceae	*Triodia secunda*	+		+		+		+	
Poaceae	*Triodia* sp.					+			
Poaceae	*Xerochloa barbata*	+						+	
Portulacaceae	*Calandrinia* sp.			+					
Portulacaceae	*Portulaca pilosa*						+	+	
Portulacaceae	*Portulaca oleracea*	+		+		+		+	
Portulacaceae	*Portulaca* sp.			+					
Proteaceae	*Grevillea pyramidalis*							+	
Proteaceae	*Grevillea pyramidalis* subsp. *pyramidalis*			+			+		+
Proteaceae	*Grevillea wickhamii* subsp. *macrodonta*			+					
Proteaceae	*Hakea loreus*							+	+

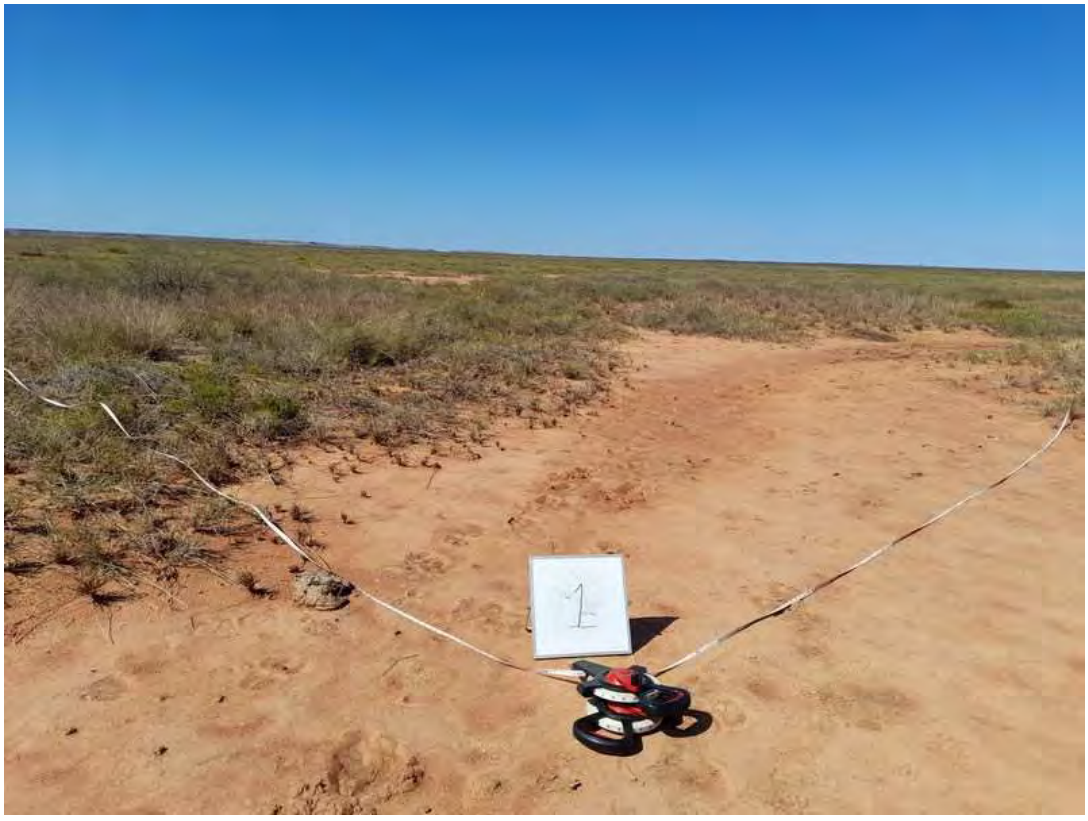
Family	Species Name	AsTe	CfAcTe	CfIoCf	EcAhEf	EvIoCc	FaTeCc	SgEeTs	TcAiTe
Rubiaceae	*Dentella asperata*	+		+	+				
Sapindaceae	*Atalaya hemiglauca*			+	+	+			+
Solanaceae	**Datura leichhardtii* subsp. *leichhardtii*				+				
Solanaceae	*Nicotiana benthamiana*						+		
Solanaceae	*Solanum diversiflorum*	+		+				+	
Solanaceae	*Solanum horridum*						+		+
Solanaceae	*Solanum lachnophyllum*						+		
Solanaceae	*Solanum phlomoides*						+		
Solanaceae	*Solanum* sp.					+	+		
Violaceae	*Afrohybanthus aurantiacus*	+	+	+				+	+
Violaceae	*Afrohybanthus enneaspermus*			+	+				
Zygophyllaceae	*Tribulopis angustifolia*	+							
Zygophyllaceae	*Tribulus hirsutus*	+							

APPENDIX D – QUADRAT AND RELEVÉ DATA

APPENDIX D – QUADRAT AND RELEVÉ DATA

Site 1

Date	25 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	712949mE 7759298mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Brown
Soil Type	clayey loam
Litter	2%
Bare Ground	35%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Triodia secunda	0.4	40.0
Eragrostis eriopoda	0.2	2.0
Corchorus laniflorus		+
Indigofera trita		+
Pluchea tetranthera		+
Pterocaulon serrulatum var. *velutinum*		+
Sclerolaena glabra		+
Trianthema turgidifolium		+

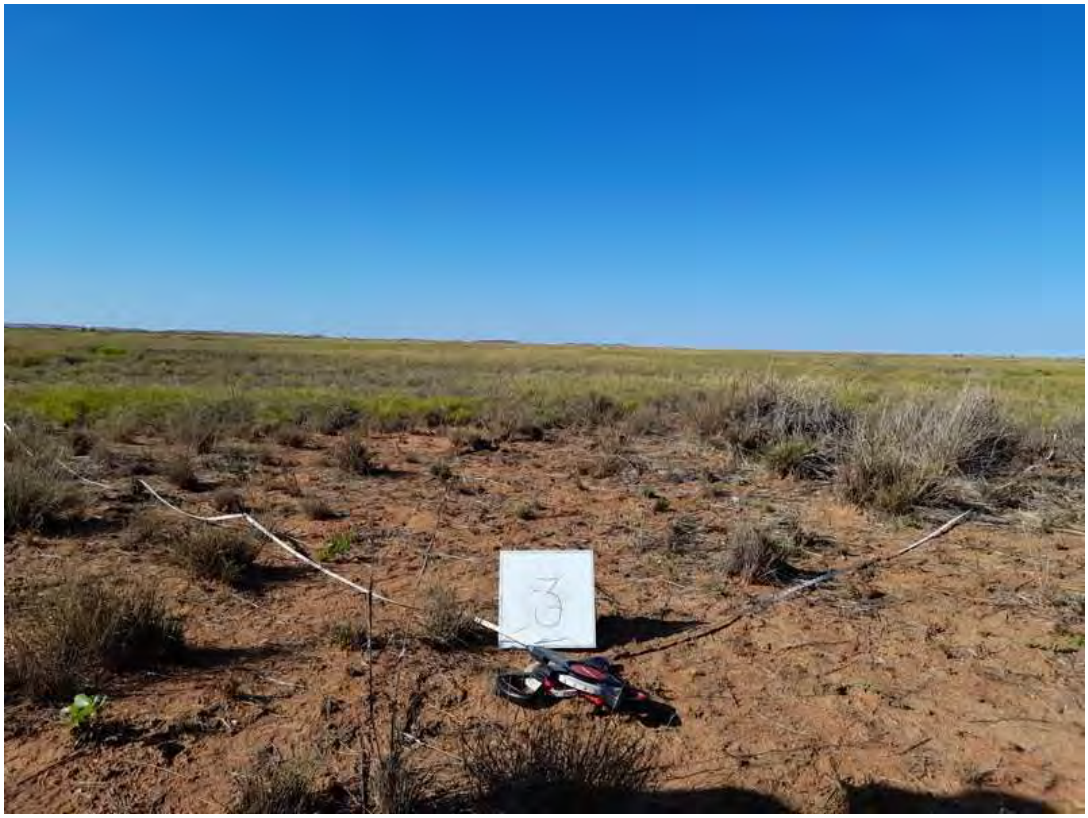
Site 2

Date	25 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	713133mE 7758452mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Brown
Soil Type	loamy sand
Litter	<1%
Bare Ground	30%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Triodia epactia	0.6	70.0
Acacia stellaticeps		+

Site 3

Date	25 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	714415mE 7758108mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Brown
Soil Type	clayey loam
Litter	2%
Bare Ground	10%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Pluchea tetranthera	0.8	0.2
Triodia epactia	0.3	10.0
Triodia secunda	0.2	60.0
Afrohybanthus aurantiacus		+
Boerhavia coccinea		+
Bonamia media		+
Commelina ensifolia		+
Corchorus walcottii		+
Cullen stipulaceum		+
Duperreya commixta		+
Eriachne mucronata		+
Evolvulus alsinoides var. *villosicalyx*		+
Indigofera trita		+
Portulaca pilosa		+
Rhynchosia minima		+
Sclerolaena glabra		+
Solanum diversiflorum		+
Sorghum plumosum		+
**Stylosanthes hamata*		+
Trianthema oxycalyptrum var. *oxycalyptrum*		+
Trianthema turgidifolium		+

Site 4

Date	25 May 202212:24
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	714495mE 7757050mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Brown
Soil Type	loamy sand
Litter	<1%
Bare Ground	40%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock,Weeds,Fire

Species	Height (m)	Cover (%)
Triodia epactia	0.4	60.0
Cassytha sp.		+
Eragrostis eriopoda		+
Pluchea tetranthera		+

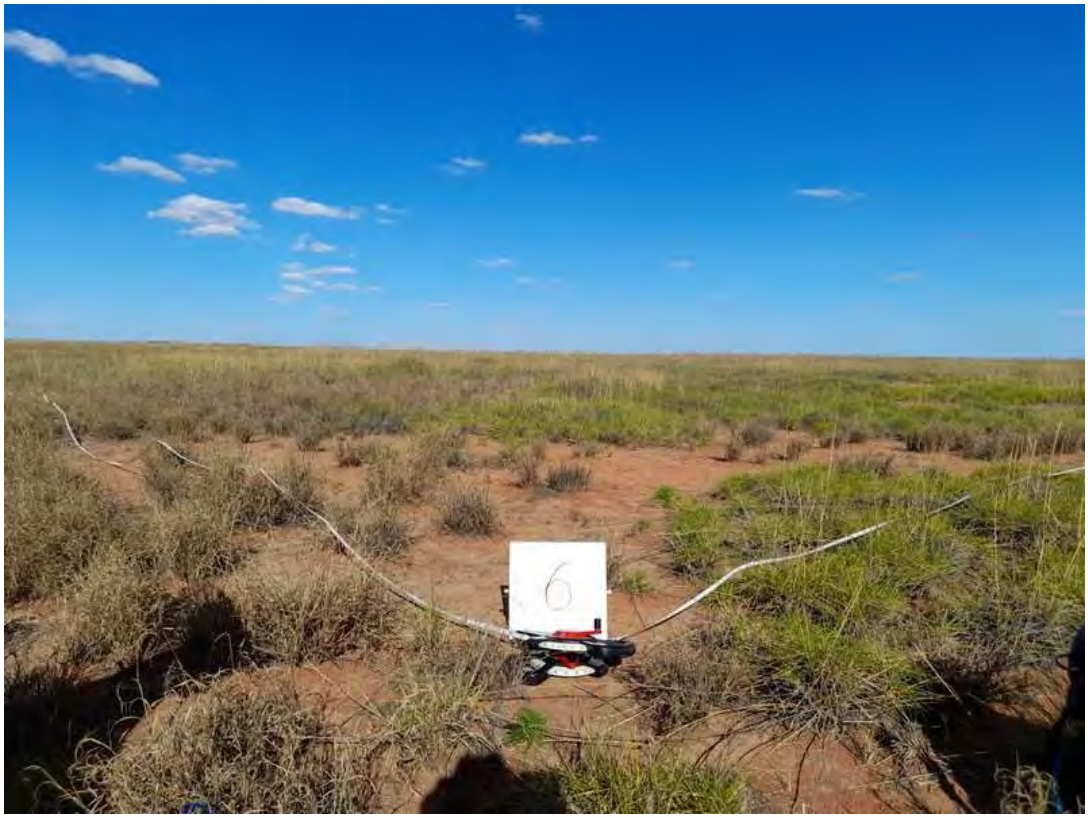
Site 5

Date	25 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	716392mE 7759386mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Medium drainage/floodplain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	50%
Fire Age	3-5 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weed

Species	Height (m)	Cover (%)
Eucalyptus victrix	12.0	5.0
Corymbia flavescens	10.0	15.0
**Indigofera oblongifolia*	1.5	15.0
Eriachne flaccida	0.5	5.0
Chrysopogon fallax	0.5	2.0
Poaceae sp.	0.2	10.0
Alternanthera nodiflora		+
Bonamia ?pannosa		+
Bonamia media		+
Corchorus tridens		+
Dentella asperata		+
Indigofera linifolia		+
Neptunia dimorphantha		+
Pluchea tetranthera		+
Sesbania cannabina		+
Sida fibulifera		+
**Stylosanthes hamata*		+
Vigna lanceolata var. *lanceolata*		+

Site 6

Date	25 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	716290mE 7756462mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Brown
Soil Type	sandy clayey loam
Litter	2%
Bare Ground	30%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Triodia epactia	0.6	15.0
Triodia secunda	0.3	40.0
Eriachne flaccida	0.2	3.0
Bonamia media		+
Eriachne mucronata		+
Portulaca pilosa		+
Sclerolaena glabra		+
Solanum diversiflorum		+
Sorghum plumosum		+
Sporobolus actinocladus		+
Stemodia grossa		+
**Stylosanthes hamata*		+

Site 7R

Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	716752mE 7757372mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy clay loam
Litter	<1%
Bare Ground	60%
Fire Age	
Vegetation Condition	Degraded
Disturbances/Impacts	Weeds,Livestock,Fire

Species	Height (m)	Cover (%)
Corymbia flavescens	10.0	5.0
Ficus aculeata var. *indecora*	2.0	1.0
**Calotropis procera*	1.5	1.0
Carissa lanceolata	1.0	2.0
Eulalia aurea	0.5	20.0
Eragrostis tenellula	0.5	10.0
**Cenchrus ciliaris*	0.5	5.0

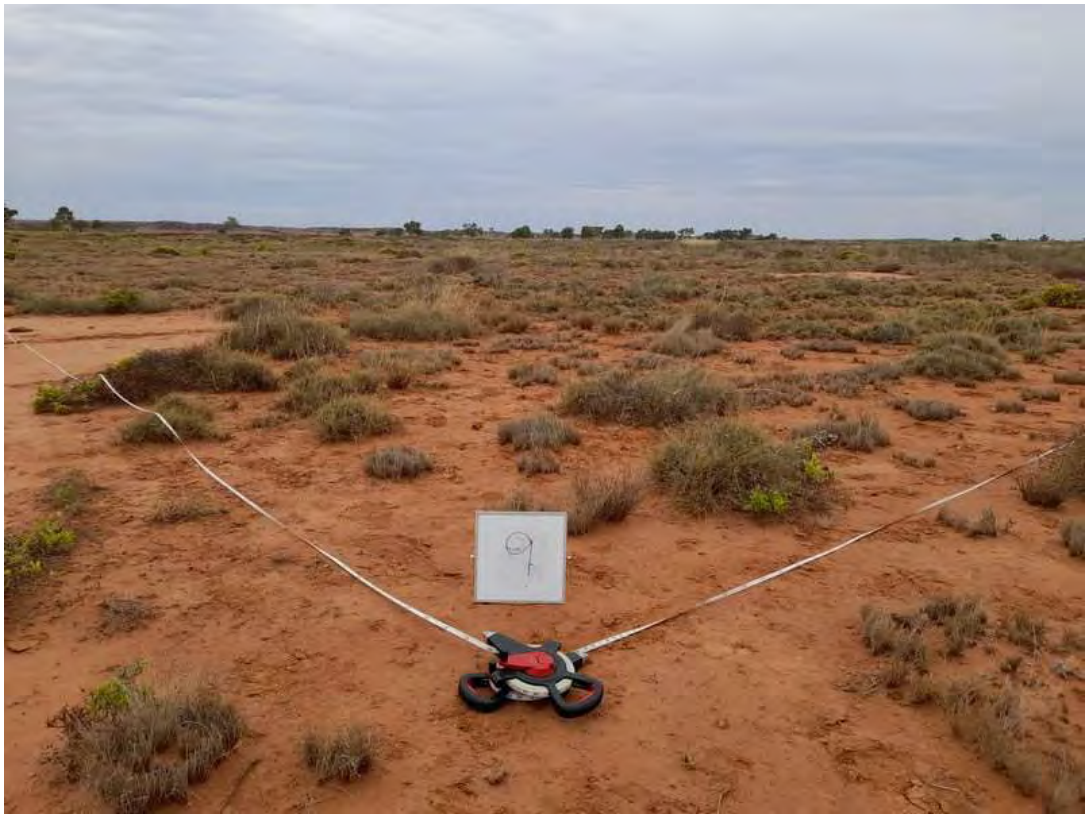
Site 8

Date	25 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	716784mE 7758660mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Sandy clay plain
Soil Colour	Light brown
Soil Type	Sandy clay loam
Litter	2%
Bare Ground	70%
Fire Age	1-3 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Corymbia flavescens	10.0	10.0
**Indigofera oblongifolia*	1.5	15.0
Carissa lanceolata	1.5	5.0
Chrysopogon fallax	0.5	5.0
Eriachne flaccida	0.5	5.0
Poaceae sp.	0.5	5.0
Afrohybanthus enneaspermus		+
Alysicarpus muelleri		+
Atalaya hemiglauca		+
Bonamia ?pannosa		+
Bonamia media		+
**Calotropis procera*		+
Corchorus tridens		+
Dentella asperata		+
Goodenia lamprosperma		+
Indigofera linifolia		+
Ipomoea muelleri		+
Jasminum didymum subsp. *lineare*		+
Neptunia dimorphantha		+
Pluchea tetranthera		+
Senna venusta		+
Solanum diversiflorum		+
**Stylosanthes hamata*		+
Trianthema pilosum		+
Vigna lanceolata var. *lanceolata*		+

Site 9

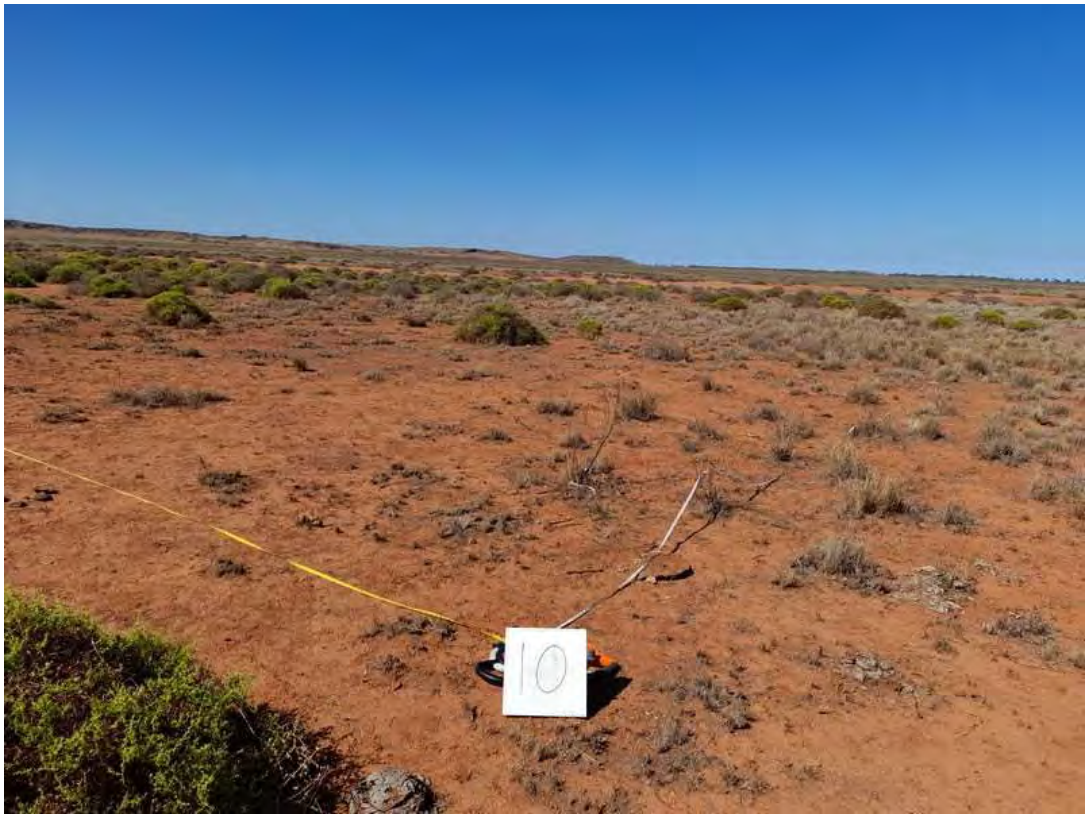
Date	28 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	717476mE 7760798mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Orange brown
Soil Type	loam
Litter	<1%
Bare Ground	40%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Indigofera oblongifolia	0.8	2.0
Sclerolaena glabra	0.6	3.0
Triodia epactia	0.3	20.0
Eriachne flaccida	0.2	5.0
Eragrostis sp.	0.1	2.0
Aristida holathera var. *holathera*		+
Atriplex bunburyana		+
Dactyloctenium radulans		+
Gomphrena canescens subsp. *canescens*		+
Portulaca oleracea		+
Ptilotus murrayi		+
Rhynchosia minima		+
**Suaeda arbusculoides*		+
Trianthema triquetrum		+
Xerochloa barbata		+

Site 10

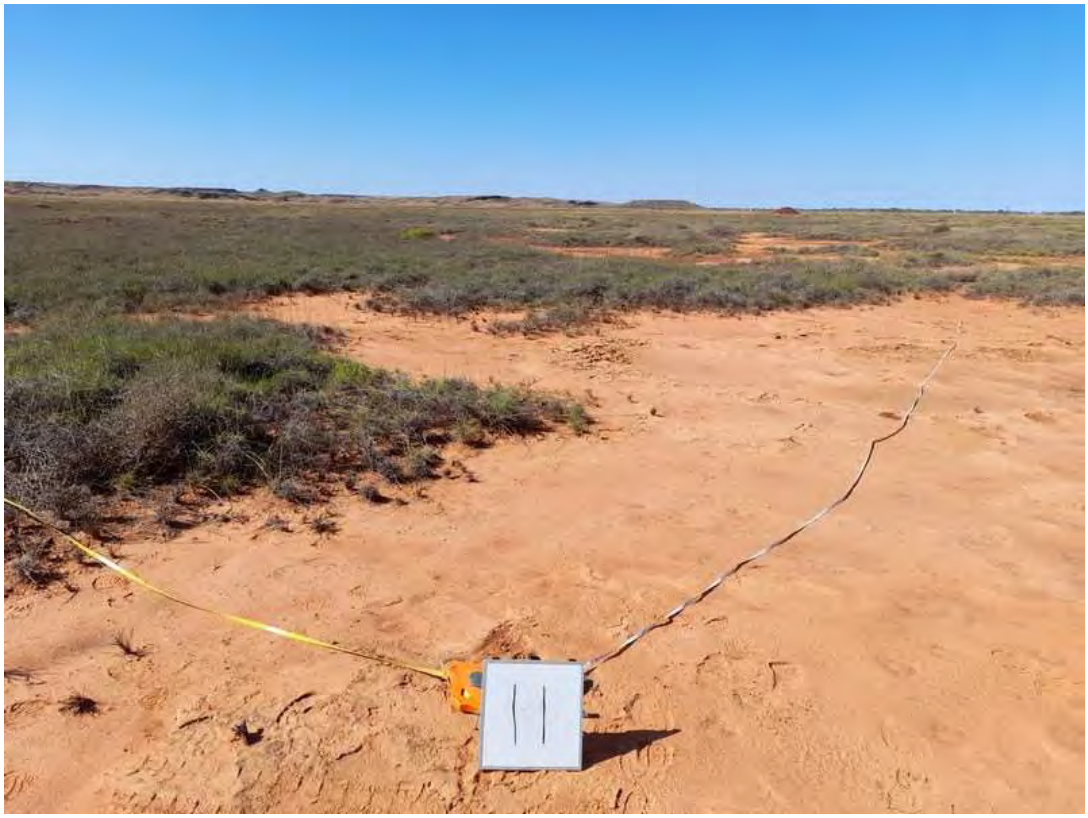
Date	25 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	717325mE 7759744mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay plain
Soil Colour	Orange brown
Soil Type	Sandy clay loam
Litter	2%
Bare Ground	70%
Fire Age	1-3 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Sclerolaena glabra	1.0	15.0
Eragrostis sp.	0.3	25.0
Chrysopogon fallax		+
Neptunia dimorphantha		+
Pluchea tetranthera		+
Ptilotus murrayi		+
Suaeda arbusculoides		+
Triodia secunda		+

Site 11

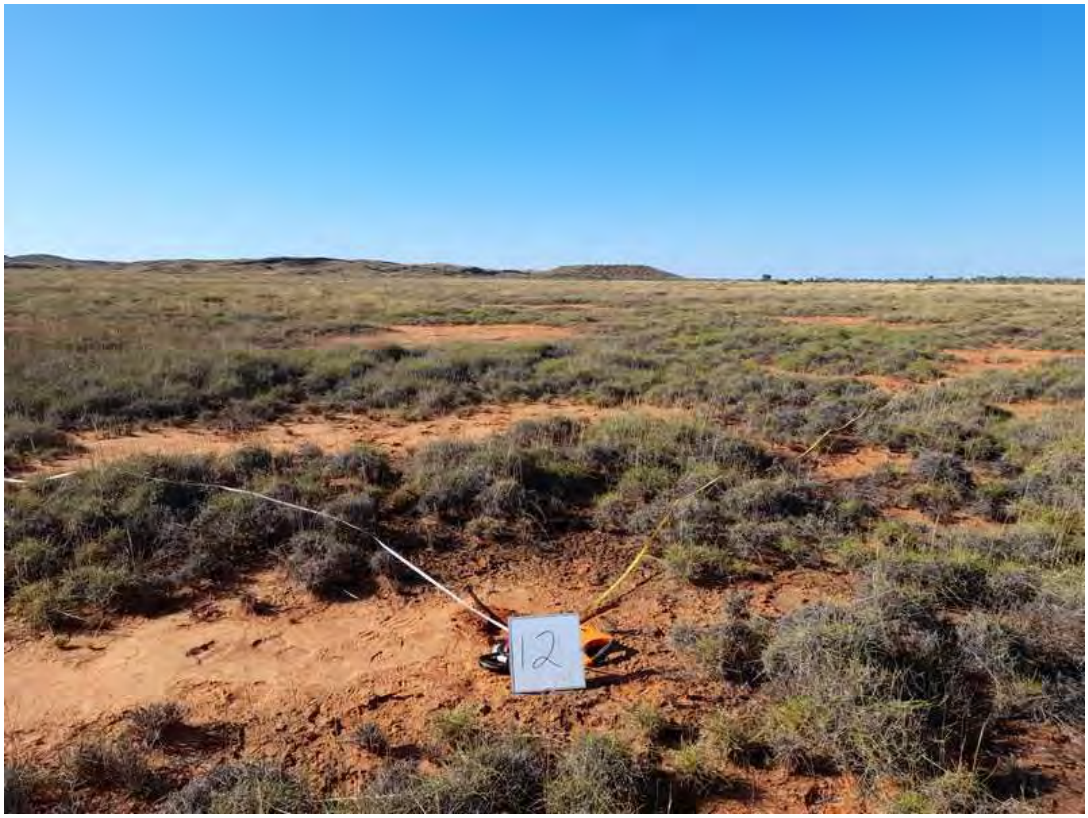
Date	25 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	717196mE 7758914mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay plain
Soil Colour	Orange brown
Soil Type	Sandy clay loam
Litter	<1%
Bare Ground	60%
Fire Age	1-3 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Triodia secunda	0.5	40.0
Triodia epactia	0.5	3.0
Sclerolaena glabra	0.2	1.0
Chrysopogon fallax		+
Commelina ensifolia		+
Eragrostis sp.		+
Eriachne sp.		+
Fimbristylis dichotoma		+
Gomphrena canescens subsp. *canescens*		+
Pluchea tetranthera		+
Portulaca pilosa		+
Suaeda arbusculoides		+

Site 12

Date	25 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	717806mE 7757901mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay plain
Soil Colour	Orange brown
Soil Type	Sandy clay loam
Litter	<1%
Bare Ground	50%
Fire Age	1-3 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Triodia secunda	0.5	40.0
Triodia epactia	0.5	2.0
Sclerolaena glabra	0.3	1.0
Chrysopogon fallax		+
Eragrostis sp.		+
Eriachne sp.		+
Pluchea tetranthera		+
Portulaca pilosa		+
Suaeda arbusculoides		+

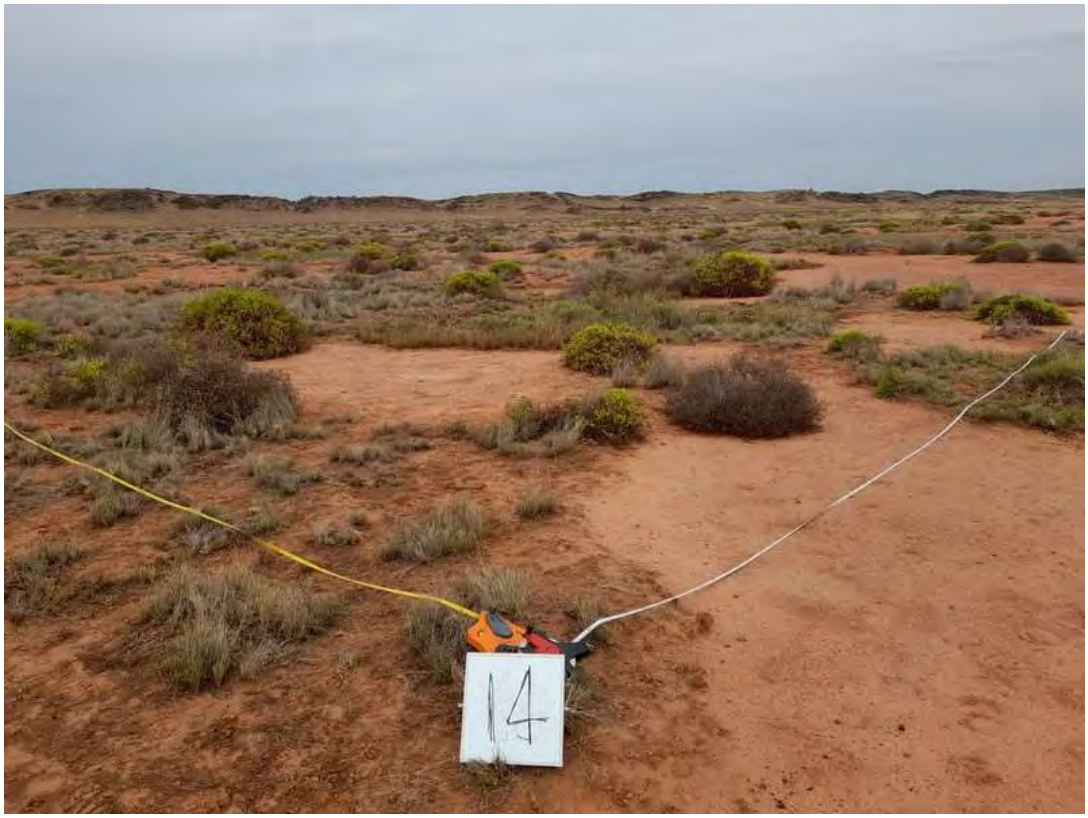
Site 13

Date	28 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	718103mE 7761018mN
Vegetation Unit	EvIoCc - *Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland
Slope	Flat
Landform	Plain
Soil Colour	Orange brown
Soil Type	loam
Litter	15%
Bare Ground	70%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus victrix	7.0	15.0
Atalaya hemiglauca	3.0	5.0
Indigofera oblongifolia	1.0	4.0
**Cenchrus ciliaris*	0.1	2.0
Carissa lanceolata		+

Site 14

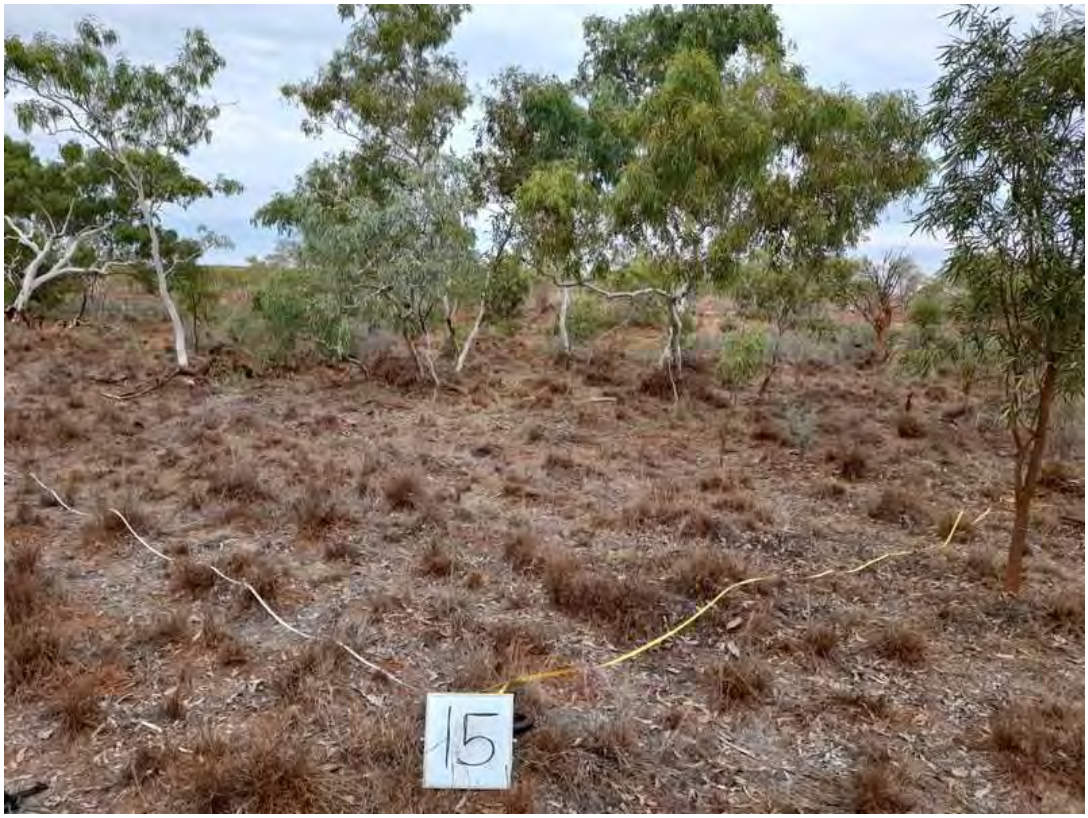
Date	28 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718545mE 7759013mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse Chenopod Shrubland over *Eragrostis eriopoda*, *Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Salt plain flat
Soil Colour	Red Brown
Soil Type	Sandy clay loam
Litter	2%
Bare Ground	60%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Sclerolaena glabra	0.5	10.0
Eriachne flaccida	0.5	2.0
Eragrostis sp.	0.3	30.0
Eriachne aristidea		+
Eriachne benthamii		+
Eriachne mucronata		+
Gomphrena canescens subsp. *canescens*		+
Marsilea sp.		+
Ptilotus murrayi		+
Triodia secunda		+

Site 15

Date	28 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718948mE 7760299mN
Vegetation Unit	EcAhEf - *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* Mid Woodland over *Atalaya hemiglauca* and *Indigofera oblongifolia* Tall Sparse Shrubland over *Eriachne flaccida* and *Cynodon dactylon* Low Open Tussock Grassland.
Slope	Flat
Landform	Major drainage
Soil Colour	Red Brown
Soil Type	Sand
Litter	10%
Bare Ground	40%
Fire Age	1-3 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	12.0	20.0
Atalaya hemiglauca	2.5	2.0
**Indigofera oblongifolia*	1.5	15.0
Eriachne flaccida	0.5	40.0
**Cynodon dactylon*	0.2	10.0
Alternanthera nodiflora		+
Ammannia auriculata		+
Basilicum polystachyon		+
Blumea tenella		+
**Calotropis procera*		+
Carissa lanceolata		+
Crotalaria cunninghamii		+
Cymbopogon ambiguus		+
**Echinochloa colona*		+
Eragrostis tenellula		+
Lysiphyllum cunninghamii		+
Melaleuca argentea		+
Nellica maderaspatensis		+
Schoenoplectus subulatus		+
Vincetoxicum lineare		+

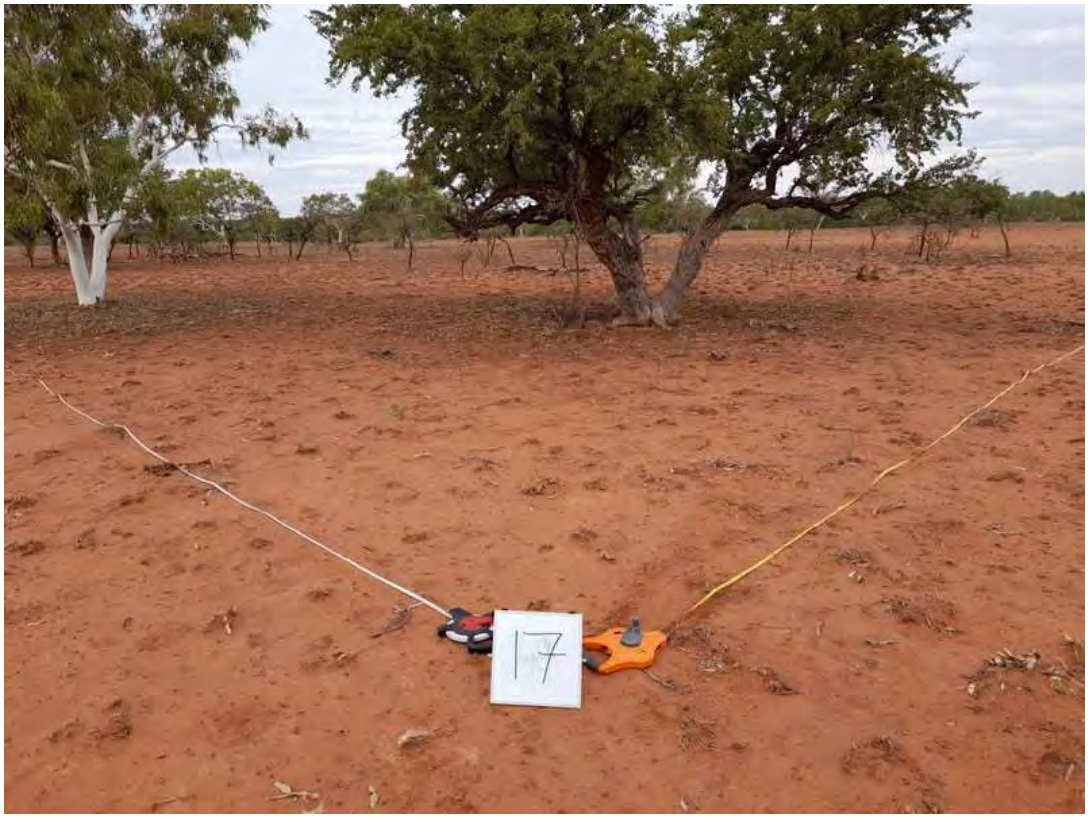
Site 16

Date	29 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	719742mE 7759657mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Moderate
Landform	Ridge / gully
Soil Colour	Orange brown
Soil Type	loam
Litter	5%
Bare Ground	60%
Fire Age	3-5 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Terminalia circumalata	4.5	15.0
Atalaya hemiglauca	3.0	5.0
Triodia epactia	0.5	25.0
**Cenchrus ciliaris*	0.2	5.0
Abutilon lepidum		+
Acacia inaequilatera		+
Boerhavia coccinea		+
Carissa lanceolata		+
Commelina ensifolia		+
Cymbopogon ambiguus		+
Enneapogon lindleyanus		+
Eriachne mucronata		+
Euphorbia australis		+
Gomphrena cunninghamii		+
Indigastrum parviflorum		+
Ptilotus exaltatus		+
Rhynchosia minima		+
Triumfetta clementii		+

Site 17

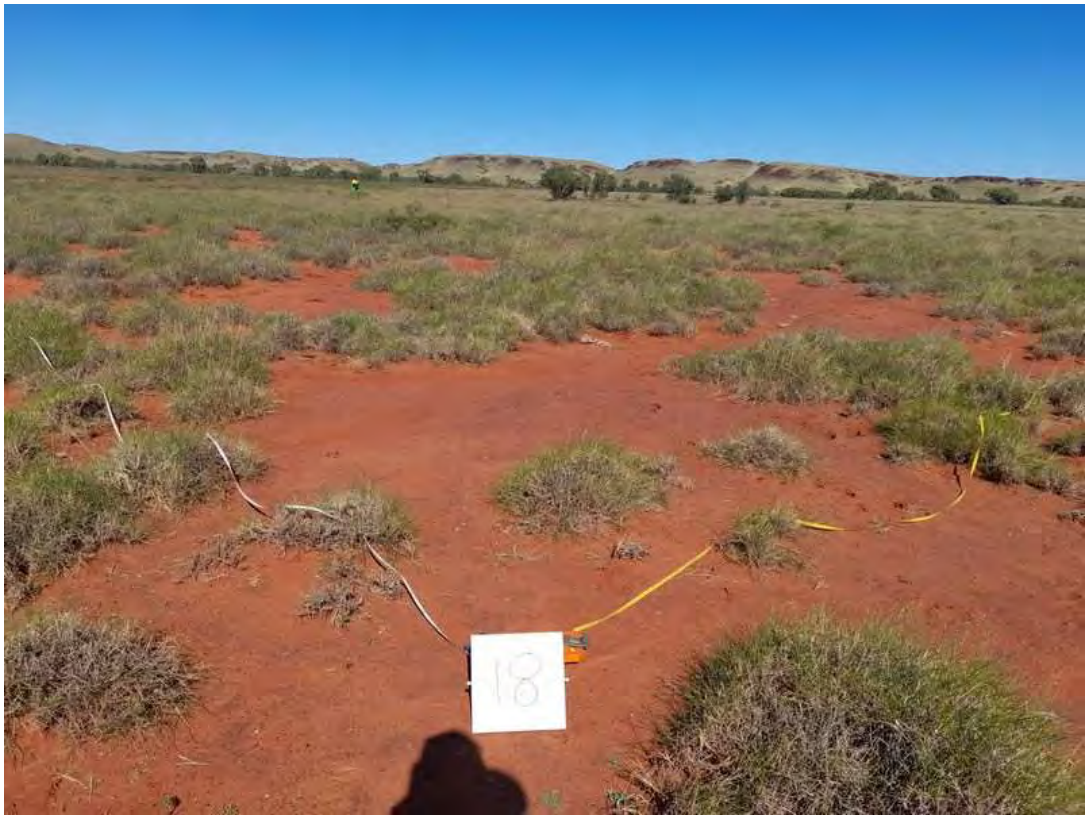
Date	28 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	720864mE 7760760mN
Vegetation Unit	EvIoCc - *Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland
Slope	Flat
Landform	Sandy plain/upland flood plain
Soil Colour	Red Brown
Soil Type	Sand
Litter	<1%
Bare Ground	70%
Fire Age	3-5 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Eucalyptus victrix	10.0	2.0
Lysiphyllum cunninghamii	8.0	4.0
Carissa lanceolata	0.5	2.0
**Indigofera oblongifolia*	0.5	2.0
Triodia sp.	0.5	2.0
**Aerva javanica*		+
Portulaca oleracea		+

Site 18

Date	29 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	720194mE 7756017mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay plain
Soil Colour	Red Brown
Soil Type	Sandy clay loam
Litter	<1%
Bare Ground	30%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Acacia glaucocaesia	3.0	2.0
Triodia epactia	0.5	75.0
Pluchea tetranthera	0.5	5.0
**Cenchrus ciliaris*		+
**Indigofera oblongifolia*		+

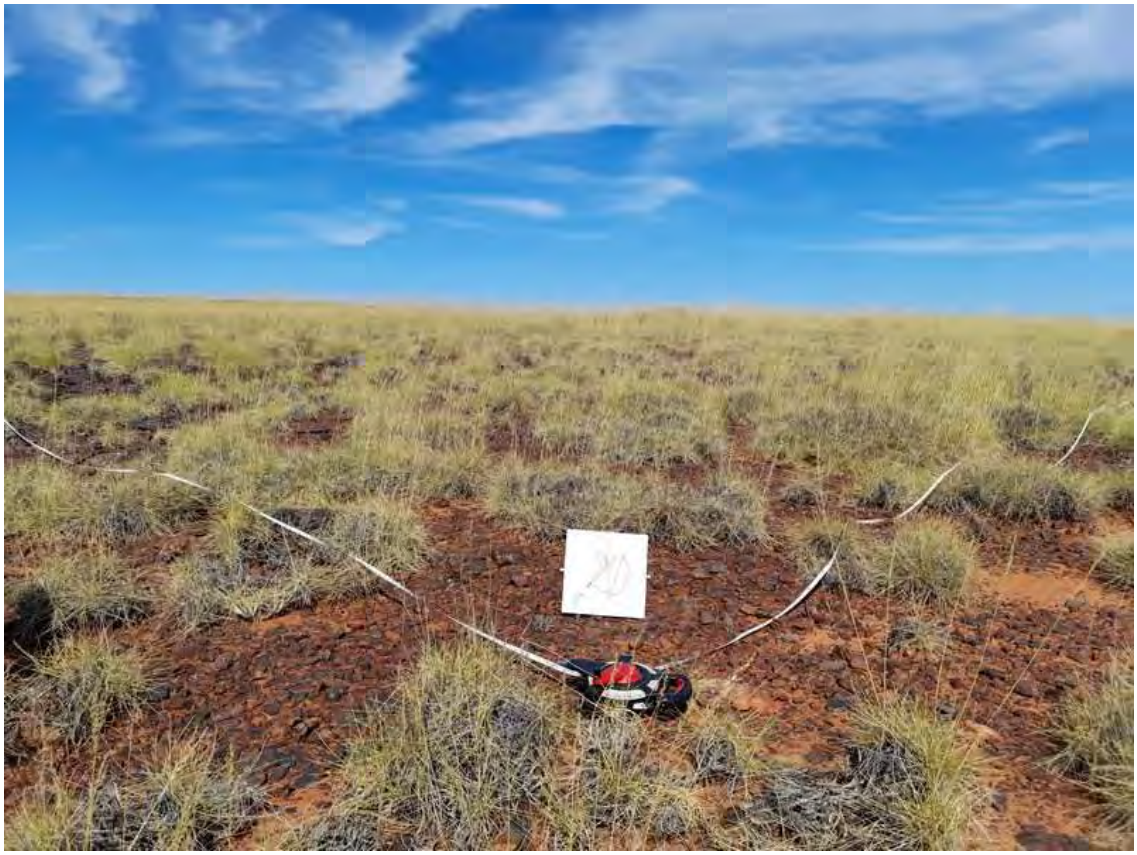
Site 19

Date	29 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	720285mE 7757472mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Steep
Landform	Outcrop
Soil Colour	Orange brown
Soil Type	loam
Litter	<1%
Bare Ground	50%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds

Species	Height (m)	Cover (%)
Terminalia circumalata	3.5	8.0
Atalaya hemiglauca	2.0	1.0
Eriachne mucronata	0.6	5.0
Triodia epactia	0.5	35.0
**Cenchrus ciliaris*	0.2	10.0
Abutilon lepidum		+
Afrohybanthus aurantiacus		+
Arivela viscosa		+
Cucumis variabilis		+
Enneapogon lindleyanus		+
Gomphrena cunninghamii		+
Senna venusta		+
Triumfetta clementii		+

Site 20

Date	26 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	721426mE 7758004mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Gentle
Landform	Hill crest
Soil Colour	Orange
Soil Type	loam
Litter	0.5%
Bare Ground	40%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Triodia epactia	0.5	60.0
Bonamia pilbarensis		+
Corchorus tectus		+

Site 21

Date	26 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	722276mE 7757285mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.**Slope**
	Moderate
Landform	Mid hill slope
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	60%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Acacia tumida	2.0	2.0
Acacia acradenia	1.5	10.0
Acacia bivenosa	1.5	5.0
Eriachne mucronata	0.5	40.0

Site 22

Date	26 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	722577mE 7756156mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Moderate
Landform	Open gully
Soil Colour	Dark Brown
Soil Type	Sandy loam
Litter	5%
Bare Ground	50%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Terminalia circumalata	6.0	15.0
Acacia tumida	3.0	10.0
Acacia bivenosa	2.0	5.0
Acacia acradenia	1.5	2.0
Triodia epactia	0.5	30.0
Eriachne mucronata	0.3	5.0
Acacia inaequilatera		+
Atalaya hemiglauca		+
Carissa lanceolata		+
Clerodendrum floribundum		+
Corchorus tectus		+
Cymbopogon ambiguus		+
Petalostylis labicheoides		+
Rhynchosia sp.		+
Terminalia circumalata		+

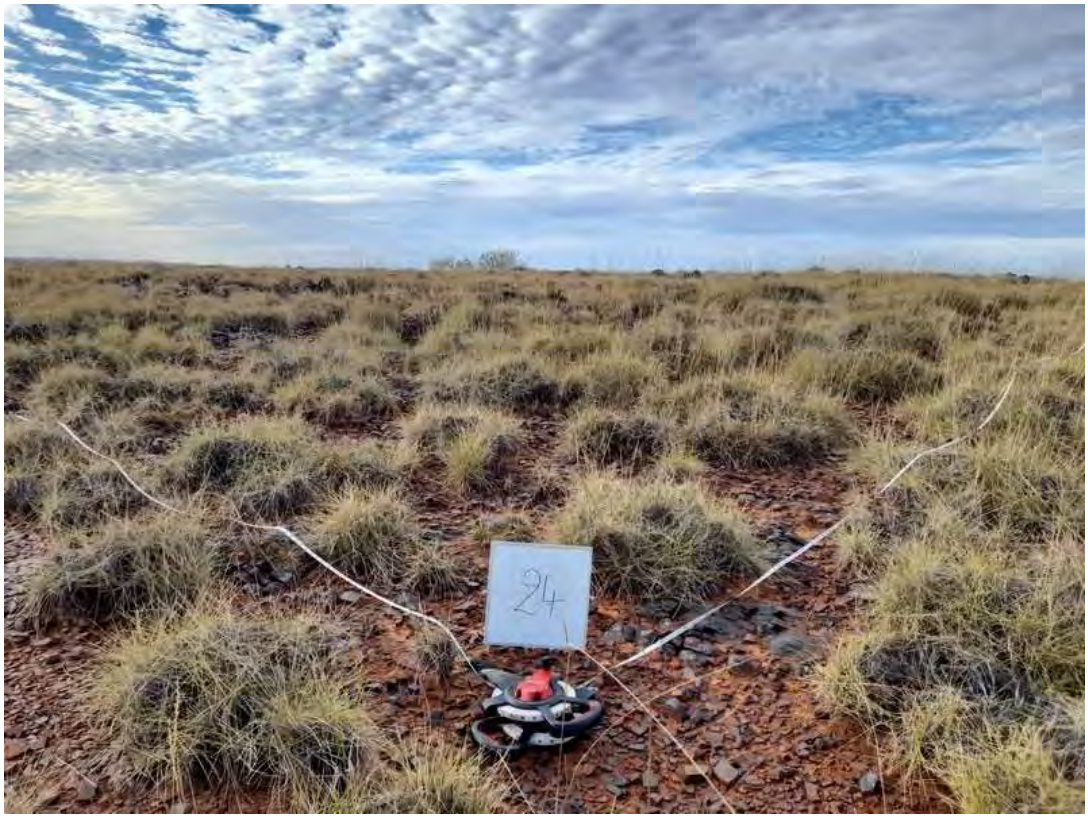
Site 23

Date	26 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	723107mE 7756957mN
Vegetation Unit	CfAcTe - *Corymbia flavescens* Mid Open Woodland over *Acacia colei* and *Acacia acradenia* Tall Open Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Sparse Tussock Grassland.
Slope	Flat
Landform	Drainage / floodplain
Soil Colour	Orange brown
Soil Type	Sandy loam
Litter	15%
Bare Ground	1%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Corymbia ?hamersleyana	8.0	1.0
Acacia colei var. *colei*	6.0	40.0
Triodia epactia	0.8	50.0
**Cenchrus ciliaris*	0.4	30.0
Acacia acradenia		+
Chrysopogon fallax		+
Cucumis variabilis		+
Cymbopogon ?ambiguus		+
Pluchea tetranthera		+
Rhynchosia minima		+
Sida rohlenae subsp. *rohlenae*		+
Sida sp. articulation below (A.A. Mitchell PRP 1605)		+
Tephrosia supina		+
Triumfetta clementii		+

Site 24

Date	27 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	723800mE 7759091mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Gentle
Landform	Hill crest
Soil Colour	Orange
Soil Type	Sandy loam
Litter	2%
Bare Ground	50%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Triodia epactia	0.3	40.0
Acacia acradenia		+
Acacia inaequilatera		+
Bonamia media		+
Hakea loreus		+
Ptilotus calostachyus		+
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		+
Tephrosia supina		+
Corymbia ?hamersleyana		Associated

Site 25

Date	29 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	723423mE 7756987mN
Vegetation Unit	CfAcTe - *Corymbia flavescens* Mid Open Woodland over *Acacia colei* and *Acacia acradenia* Tall Open Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Sparse Tussock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	2%
Bare Ground	2%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds

Species	Height (m)	Cover (%)
Corymbia flavescens	10.0	2.0
Acacia colei	3.0	25.0
Acacia acradenia	3.0	10.0
Triodia epactia	0.5	80.0
?Bonamia sp.		+
?Polymeria mollis		+
Afrohybanthus aurantiacus		+
Bonamia media		+
Cassytha capillaris		+
Corchorus elachocarpus		+
Corchorus sidoides subsp. *vermicularis*		+
Eragrostis eriopoda		+
Eriachne obtusa		+
Goodenia cusackiana		+
Hibiscus burtonii		+
Indigofera trita subsp. *trita*		+
Isotropis atropurpurea		+
Rhynchosia minima		+
Tephrosia supina		+
Trigastrotheca molluginea		+

Site 26

Date	29 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	723657mE 7757967mN
Vegetation Unit	CfAcTe - *Corymbia flavescens* Mid Open Woodland over *Acacia colei* and *Acacia acradenia* Tall Open Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Sparse Tussock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	2%
Bare Ground	20%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds

Species	Height (m)	Cover (%)
Corymbia flavescens	12.0	10.0
Acacia colei	3.0	20.0
Acacia acradenia	3.0	15.0
Triodia epactia	0.5	70.0
Cenchrus ciliaris	0.3	2.0
Acacia stellaticeps		+
Afrohybanthus aurantiacus		+
Bonamia media		+
Eragrostis eriopoda		+
Eriachne obtusa		+
Indigofera trita subsp. *trita*		+
Pluchea tetranthera		+
Rhynchosia minima		+
Tephrosia supina		+
Trigastrotheca molluginea		+

Site 27

Date	27 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	724002mE 7760210mN
Vegetation Unit	EvIoCc - *Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland
Slope	Flat
Landform	Flood plain
Soil Colour	Orange brown
Soil Type	Sandy Clay loam
Litter	10%
Bare Ground	60%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	6.0	5.0
**Indigofera oblongifolia*	1.5	30.0
Bonamia media	0.1	3.0
Abutilon oxycarpum		+
Acacia glaucocaesia		+
**Calotropis procera*		+
Carissa lanceolata		+
Hibiscus sp.		+
Lysiphyllum cunninghamii		+
Poaceae sp.		+
Rostellularia adscendens var. *clementii*		+
Sida fibulifera		+
**Vachellia farnesiana*		+

Site 29

Date	26 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	726095mE 7756743mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Gentle
Landform	Drainage / floodplain
Soil Colour	Orange brown
Soil Type	loam
Litter	8%
Bare Ground	15%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus victrix	8.0	2.0
Corymbia flavescens	8.0	1.0
Acacia inaequilatera	4.0	20.0
Acacia tumida	4.0	2.0
Acacia acradenia	3.0	2.0
Acacia stellaticeps	1.0	2.0
Triodia epactia	0.3	70.0
Cyperaceae sp.	0.3	3.0
Acacia colei var. *colei*		+
Corchorus tectus		+
Eucalyptus odontocarpa		+
Euphorbia careyi		+
Pluchea tetranthera		+
Poaceae sp.		+
Sorghum plumosum		+
Stemodia grossa		+
**Stylosanthes hamata*		+
Tephrosia supina		+
Tephrosia virens		+

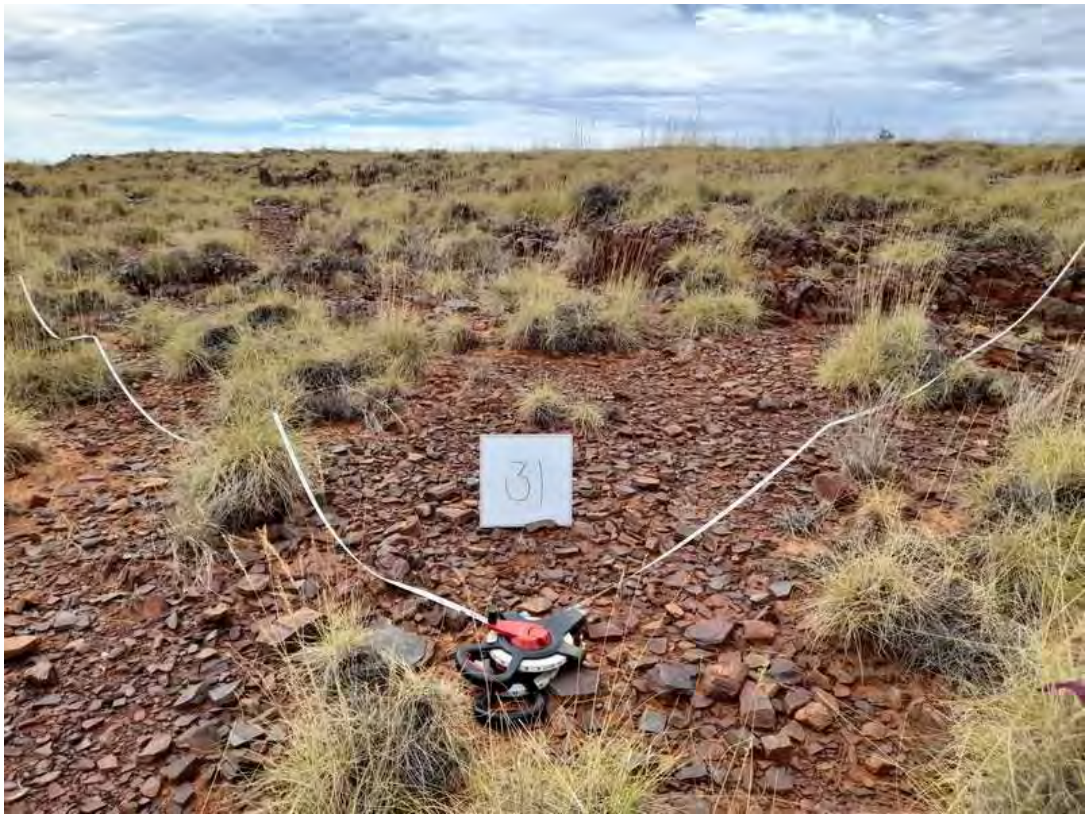
Site 30

Date	27 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	725179mE 7760030mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Plain, minor undulating dunes
Soil Colour	Orange brown
Soil Type	loamy sand
Litter	5%
Bare Ground	60%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Acacia glaucocaesia	3.0	1.0
Triodia epactia	0.2	30.0
**Indigofera oblongifolia*		+
Pluchea tetranthera		+
Sclerolaena glabra		+

Site 31

Date	27 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	725234mE 7759441mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Moderate
Landform	Hill crest
Soil Colour	Orange brown
Soil Type	loam
Litter	3%
Bare Ground	55%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Triodia epactia	0.3	40.0
Acacia inaequilatera		+
Afrohybanthus aurantiacus		+
Boerhavia coccinea		+
Bonamia media		+
Eriachne aristidea		+
Hibiscus sturtii		+
Pluchea tetranthera		+
Ptilotus fusiformis		+
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		+
Triumfetta clementii		+

Site 32

Date	27 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	725941mE 7759620mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Gentle
Landform	Major drainage
Soil Colour	Orange brown
Soil Type	loamy sand
Litter	15%
Bare Ground	60%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	8.0	25.0
Corymbia flavescens	6.5	2.0
Lysiphyllum cunninghamii	6.0	1.0
**Indigofera oblongifolia*	2.5	1.0
Triodia epactia	0.4	3.0
Bonamia media	0.2	15.0
Acacia ampliceps		+
Acacia colei var. *colei*		+
Acacia dictyophleba		+
Acacia inaequilatera		+
Afrohybanthus aurantiacus		+
Carissa lanceolata		+
Cyperaceae sp.		+
Goodenia lamprosperma		+
Pluchea tetranthera		+
Sida rohlenae subsp. *rohlenae*		+
Sorghum plumosum		+
**Stylosanthes hamata*		+
Vigna lanceolata var. *lanceolata*		+

Site 33

Date	28 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	726193mE 7761073mN
Vegetation Unit	EcAhEf - *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* Mid Woodland over *Atalaya hemiglauca* and *Indigofera oblongifolia* Tall Sparse Shrubland over *Eriachne flaccida* and *Cynodon dactylon* Low Open Tussock Grassland.
Slope	Gentle
Landform	Major drainage
Soil Colour	Orange brown
Soil Type	loamy sand
Litter	8%
Bare Ground	75%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	15.0	35.0
Melaleuca argentea	12.0	15.0
**Indigofera oblongifolia*	1.2	2.0
Alternanthera nodiflora		+
Atalaya hemiglauca		+
Basilicum polystachyon		+
Blumea tenella		+
Boerhavia ?coccinea		+
Bulbostylis barbata		+
**Calotropis procera*		+
Carissa lanceolata		+
**Cenchrus setiger*		+
**Cynodon dactylon*		+
**Datura leichhardtii* subsp. *leichhardtii*		+
**Echinochloa colona*		+
Ficus aculeata var. *indecora*		+
Heliotropium crispatum		+
Indigofera linifolia		+
Ipomoea muelleri		+
Operculina aequisepala		+
**Parkinsonia aculeata*		+
**Passiflora foetida* var. *hispida*		+
Ptilotus murrayi		+
**Ricinus communis*		+
Senna notabilis		+
Senna pleurocarpa var. *pleurocarpa*		+
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		+
Sonchus hydrophilus		+
Sporobolus australasicus		+
**Trianthema portulacastrum*		+
Uvedalia linearis var. *linearis*		+
Vigna lanceolata var. *lanceolata*		+

Site 34

Date	28 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	726571mE 7760474mN
Vegetation Unit	EvIoCc - *Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland
Slope	Flat
Landform	Sandy plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock

Species	Height (m)	Cover (%)
Eucalyptus victrix	8.0	15.0
Acacia inaequilatera	2.0	5.0
Carissa lanceolata	2.0	2.0
**Indigofera oblongifolia*	1.5	15.0
Triodia secunda	0.5	10.0
Acacia glaucocaesia		+
Acacia synchronicia		+
Lysiphyllum cunninghamii		+

Site 35

Date	28 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	723048mE 7761130mN
Vegetation Unit	EcAhEf - *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* Mid Woodland over *Atalaya hemiglauca* and *Indigofera oblongifolia* Tall Sparse Shrubland over *Eriachne flaccida* and *Cynodon dactylon* Low Open Tussock Grassland.
Slope	Flat
Landform	Major drainage
Soil Colour	Red Brown
Soil Type	Sand
Litter	10%
Bare Ground	50%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	15.0	20.0
Melaleuca argentea	10.0	5.0
Atalaya hemiglauca	3.0	2.0
**Indigofera oblongifolia*	1.5	10.0
Eriachne flaccida	0.5	20.0
**Cynodon dactylon*	0.1	15.0
Afrohybanthus enneaspermus		+
Alternanthera nodiflora		+
Ammannia auriculata		+
Basilicum polystachyon		+
Blumea tenella		+
**Calotropis procera*		+
Cyperaceae sp.		+
Dentella asperata		+
**Echinochloa colona*		+
Ehretia saligna var. *saligna*		+
Eragrostis tenellula		+
Ficus aculeata var. *indecora*		+
Ipomoea muelleri		+
Nellica maderaspatensis		+
Rostellularia adscendens var. *clementii*		+
Senna pleurocarpa var. *pleurocarpa*		+
**Trianthema portulacastrum*		+
**Vachellia farnesiana*		+
Vigna lanceolata var. *lanceolata*		+

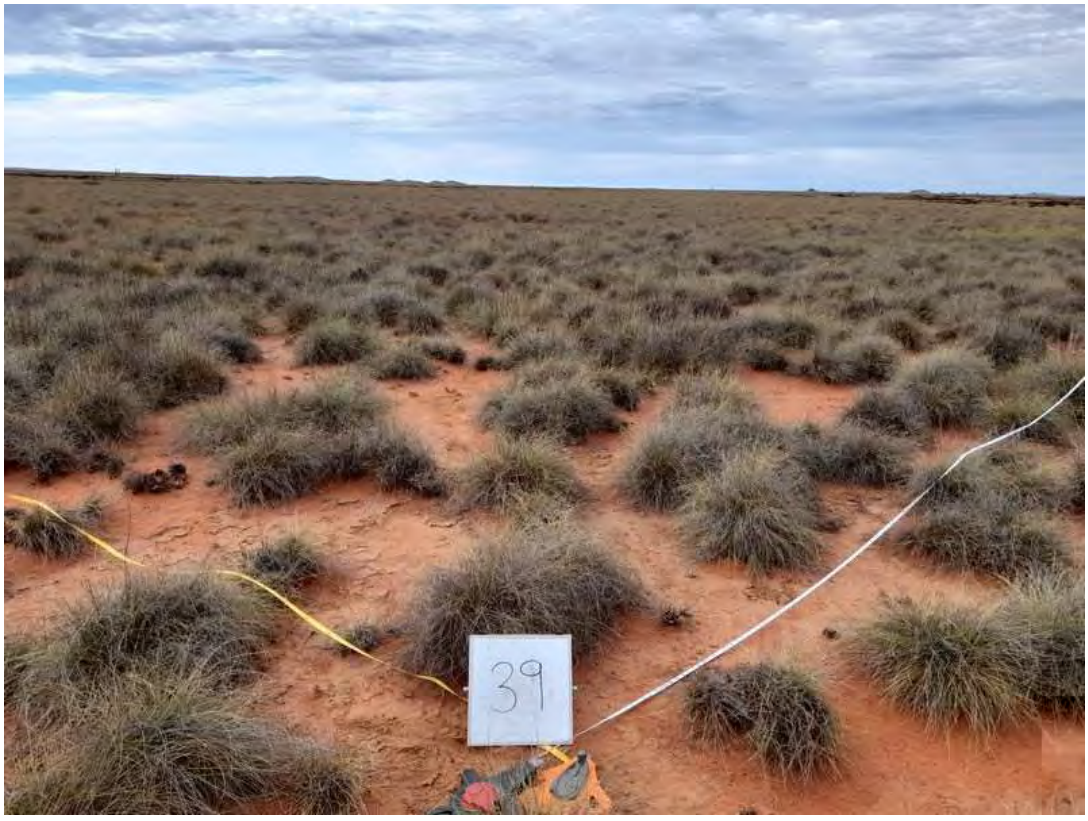
Site 36

Date	28 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	726970mE 7760853mN
Vegetation Unit	EvIoCc - *Eucalyptus victrix* and *Lysiphyllum cunninghamii* Mid Open Woodland over *Indigofera oblongifolia*, *Atalaya hemiglauca*, *Carissa lanceolata* Mid Sparse Shrubland over *Cenchrus ciliaris* Isolated Tussock Grassland
Slope	Gentle
Landform	Floodplain drainage
Soil Colour	Orange brown
Soil Type	Sandy loam
Litter	15%
Bare Ground	55%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds

Species	Height (m)	Cover (%)
Eucalyptus victrix	10.0	15.0
Lysiphyllum cunninghamii	6.0	1.0
**Indigofera oblongifolia*	1.4	40.0
**Cenchrus ciliaris*	0.2	20.0
Acacia glaucocaesia		+
Acacia inaequilatera		+
Achyranthes aspera		+
Carissa lanceolata		+
Sorghum plumosum		+
Triumfetta clementii		+

Site 39

Date	27 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	713074mE 7755662mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy Plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Triodia epactia	0.5	40.0
Pluchea tetranthera	0.2	1.0
Acacia stellaticeps		+
Bonamia linearis		+
Bonamia rosea		+
Cassytha capillaris		+

Site 40

Date	27 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	712668mE 7753322mN
Vegetation Unit	FaTeCc - *Ficus aculeata* var. *indecora*, *Acacia colei* and *Ficus brachypoda* Tall Sparse Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Low Sparse Tussock Grassland over *Stemodia grossa* Low Isolated Herbs.
Slope	Flat
Landform	Granite outcrop
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	2%
Bare Ground	30%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Acacia colei var. *colei*	1.5	5.0
Triodia epactia	0.5	25.0
**Cenchrus ciliaris*	0.5	5.0
Amaranthus undulatus		+
Arivela viscosa		+
Bonamia linearis		+
Bulbostylis barbata		+
Cassytha capillaris		+
Crotalaria medicaginea var. *neglecta*		+
Cucumis variabilis		+
Eragrostis eriopoda		+
Eriachne mucronata		+
Evolvulus alsinoides var. *decumbens*		+
Ficus aculeata var. *indecora*		+
Grevillea pyramidalis subsp. *pyramidalis*		+
Indigofera colutea		+
Indigofera linifolia		+
Pluchea tetranthera		+
Portulaca pilosa		+
Sida rohlenae subsp. *rohlenae*		+
Solanum horridum		+
Solanum lachnophyllum		+
Stemodia grossa		+
Waltheria indica		+

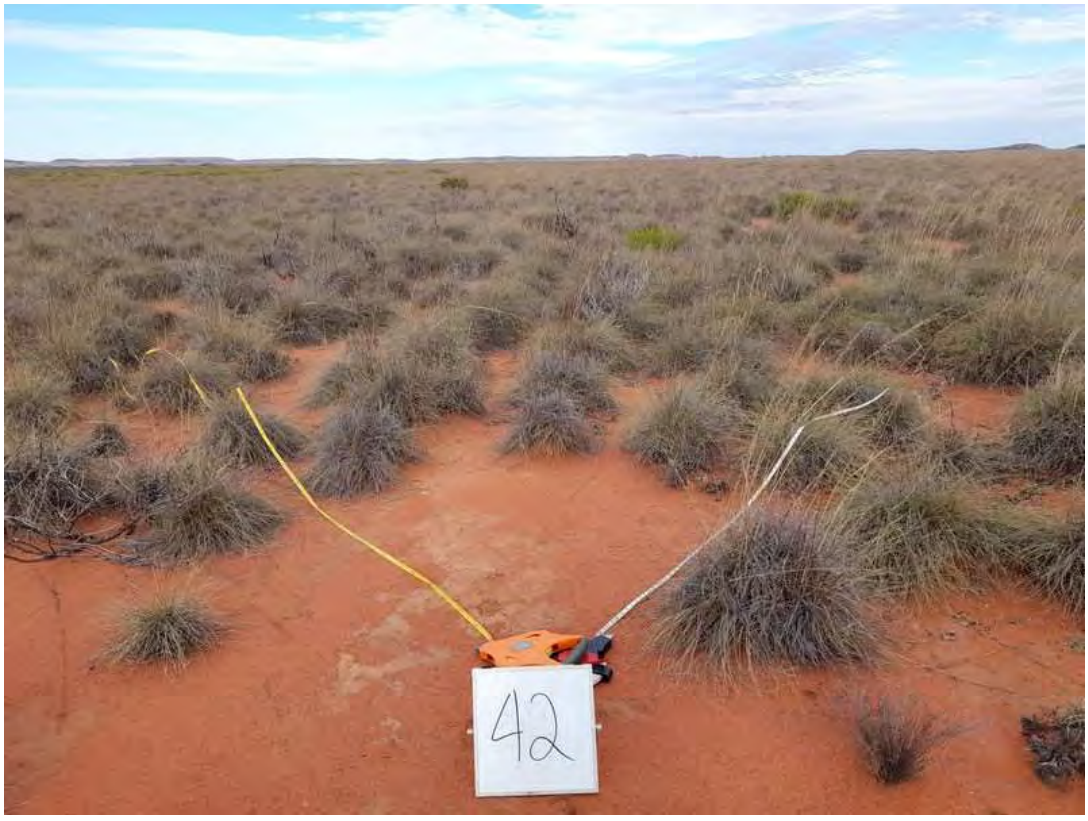
Site 41

Date	26 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	717172mE 7755839mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy Plain
Soil Colour	Light brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock

Species	Height (m)	Cover (%)
Triodia epactia	0.5	50.0
Chrysopogon fallax	0.5	2.0
Pluchea tetranthera	0.5	2.0
Eriachne mucronata		+
Eulalia aurea		+
Sclerolaena glabra		+
Sporobolus actinocladus		+
Stemodia grossa		+

Site 42

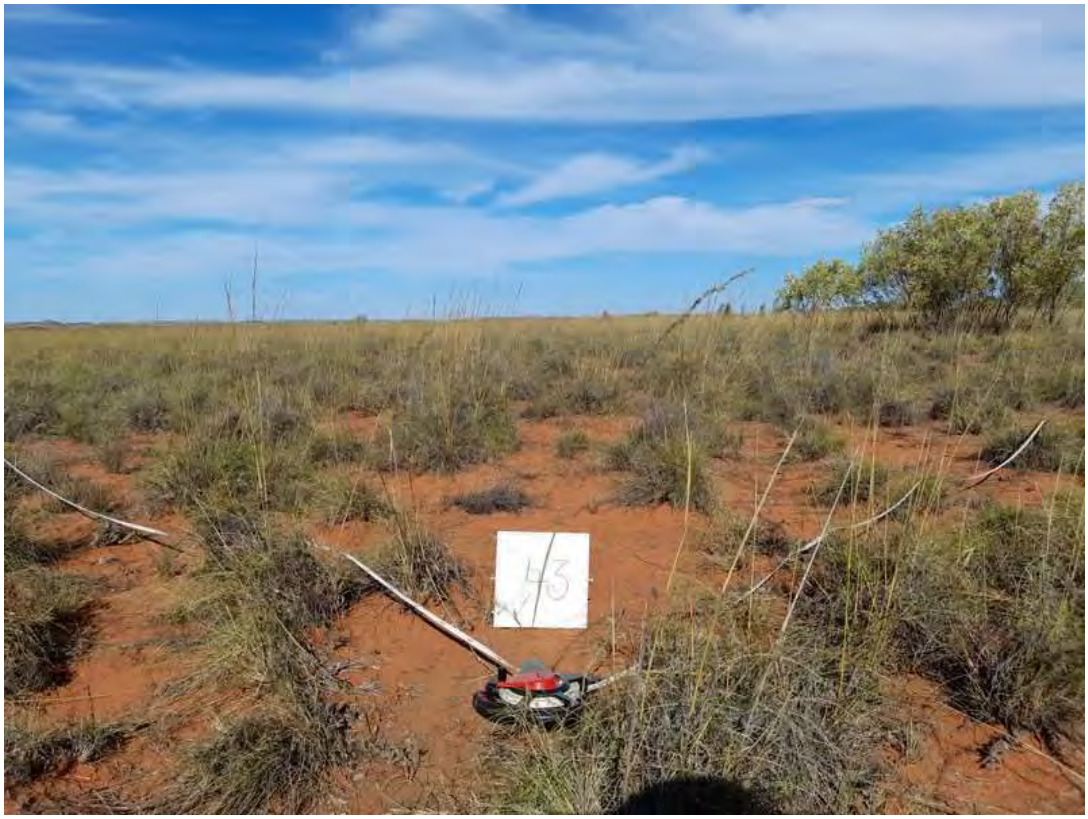
Date	27 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	717425mE 7753101mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Acacia stellaticeps	1.0	2.0
Pluchea tetranthera	1.0	2.0
Triodia epactia	0.5	40.0
Bonamia linearis		+

Site 43

Date	26 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	718356mE 7754174mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Orange brown
Soil Type	loamy sand
Litter	3%
Bare Ground	25%
Fire Age	5-10 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Acacia colei var. *colei*	2.5	1.0
Triodia epactia	0.6	55.0
Afrohybanthus aurantiacus		+
Bonamia linearis		+
Cassytha capillaris		+
Corchorus laniflorus		+
Dentella asperata		+
Evolvulus alsinoides var. *villosicalyx*		+
Pluchea tetranthera		+
Ptilotus auriculifolius		+
Stemodia grossa		+
**Stylosanthes hamata*		+
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)		+

Site 44

Date	27 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718248mE 7752613mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	30%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Acacia stellaticeps	1.0	50.0
Triodia epactia	0.5	30.0
Bonamia linearis		+
Bonamia rosea		+
Cassytha capillaris		+
Chrysopogon fallax		+

Site 45

Date	27 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719370mE 7755327mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	5%
Bare Ground	15%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*	10.0	3.0
Corymbia flavescens	8.0	10.0
Acacia colei ?var. *ileocarpa*	3.0	40.0
**Indigofera oblongifolia*	1.5	2.0
Eulalia aurea	1.0	50.0
Chrysopogon fallax	1.0	10.0
**Cenchrus ciliaris*	0.5	20.0
Achyranthes aspera		+
Carissa lanceolata		+
**Cenchrus setiger*		+
Corchorus incanus subsp. *incanus*		+
Dactyloctenium radulans		+
**Echinochloa colona*		+
Ehretia saligna		+
Ficus aculeata var. *indecora*		+
Neptunia dimorphantha		+
Operculina aequisepala		+
Pluchea tetranthera		+
Rhynchosia sp.		+
**Stylosanthes hamata*		+

Site 46

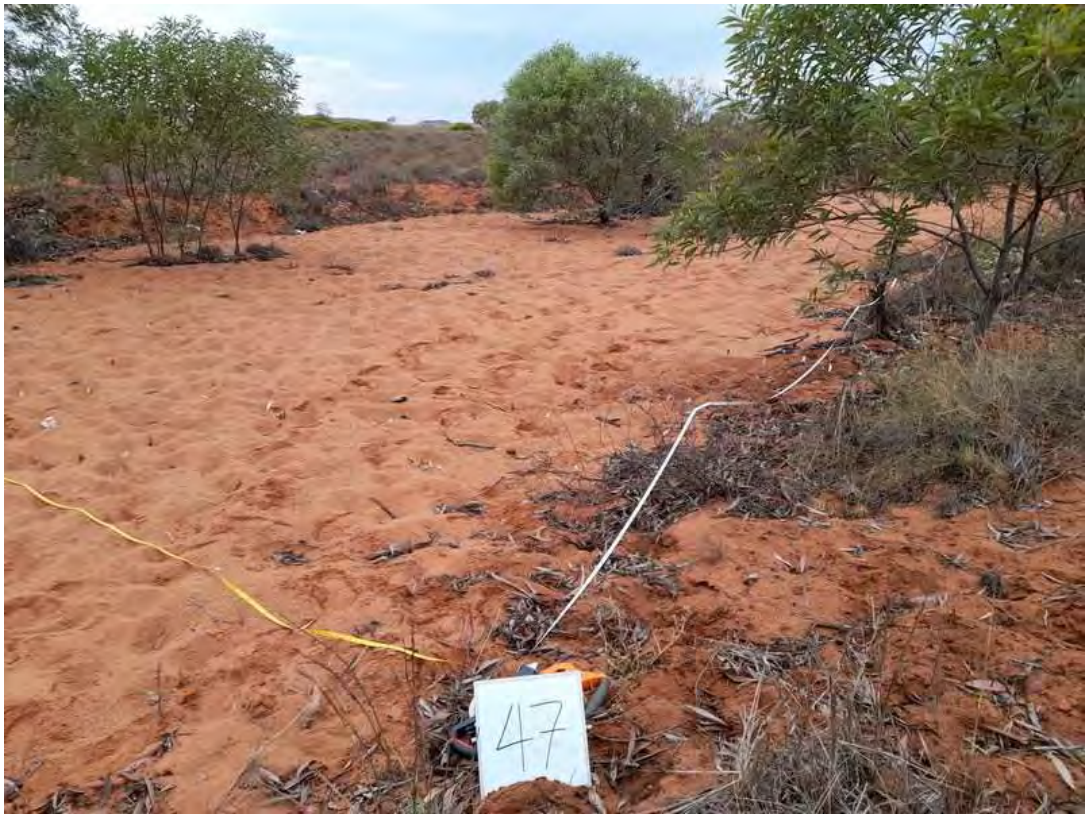
Date	29 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719439mE 7754827mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Gentle
Landform	Medium Drainage
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	10%
Bare Ground	20%
Fire Age	3-5 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Eucalyptus sp.	10.0	15.0
Acacia colei var. *colei*	3.0	25.0
**Indigofera oblongifolia*	1.5	3.0
Triodia epactia	0.5	25.0
Chrysopogon fallax	0.5	5.0

Species	Height (m)	Cover (%)
**Stylosanthes hamata*	0.3	5.0
?Bonamia sp.		+
Acacia inaequilatera		+
Aeschynomene indica		+
Afrohybanthus aurantiacus		+
Amaranthus undulatus		+
Arivela viscosa		+
Basilicum polystachyon		+
Boerhavia burbidgeana		+
Bonamia media		+
Calandrinia sp.		+
**Calotropis procera*		+
**Cenchrus ciliaris*		+
Corchorus incanus subsp. *incanus*		+
Cymbopogon ambiguus		+
Cyperus ?concinnus		+
Dentella asperata		+
Eriachne obtusa		+
Euphorbia coghlanii		+
Euploca cunninghamii		+
Fimbristylis ?dichotoma		+
Fimbristylis dichotoma		+
Goodenia sp.		+
Indigofera hirsuta		+
Ipomoea muelleri		+
**Malvastrum americanum*		+
Murdannia graminea		+
Panicum decompositum		+
Pluchea tetranthera		+
Portulaca oleracea		+
Ptilotus gomphrenoides		+
Sida rohlenae subsp. *rohlenae*		+
Sporobolus actinocladus		+
Triodia secunda		+
Vigna lanceolata		+
Waltheria indica		+

Site 47

Date	29 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719611mE 7753071mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Medium drainage
Soil Colour	Light brown
Soil Type	Sand
Litter	10%
Bare Ground	60%
Fire Age	1-3 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Acacia colei var. *colei*	3.0	30.0
Triodia epactia	0.5	10.0
Corchorus laniflorus	0.2	3.0
?Waltheria indica		+
Acacia trachycarpa		+
Afrohybanthus aurantiacus		+
Arivela viscosa		+
Bonamia linearis		+
Citrullus amarus		+
Crotalaria ramosissima		+
Dentella asperata		+
Euploca tenuifolia		+
Goodenia lamprosperma		+
Ipomoea muelleri		+
Lysiphyllum cunninghamii		+
Pluchea tetranthera		+
Stemodia grossa		+
Trianthema pilosum		+
Waltheria indica		+

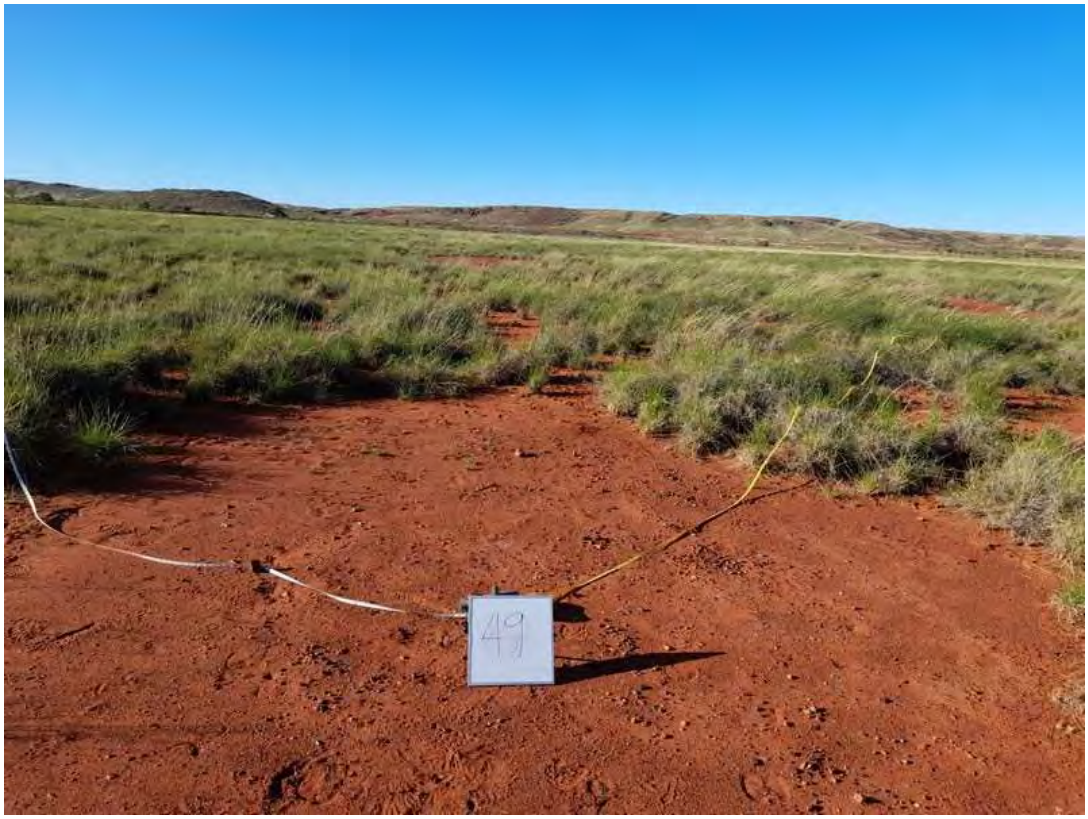
Site 48

Date	29 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	720987mE 7753633mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Gentle
Landform	Low rise outcrop
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	30%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Triodia epactia	0.5	40.0
Boerhavia gardneri		+
Bonamia pilbarensis		+
Ptilotus calostachyus		+
Solanum horridum		+
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)		+

Site 49

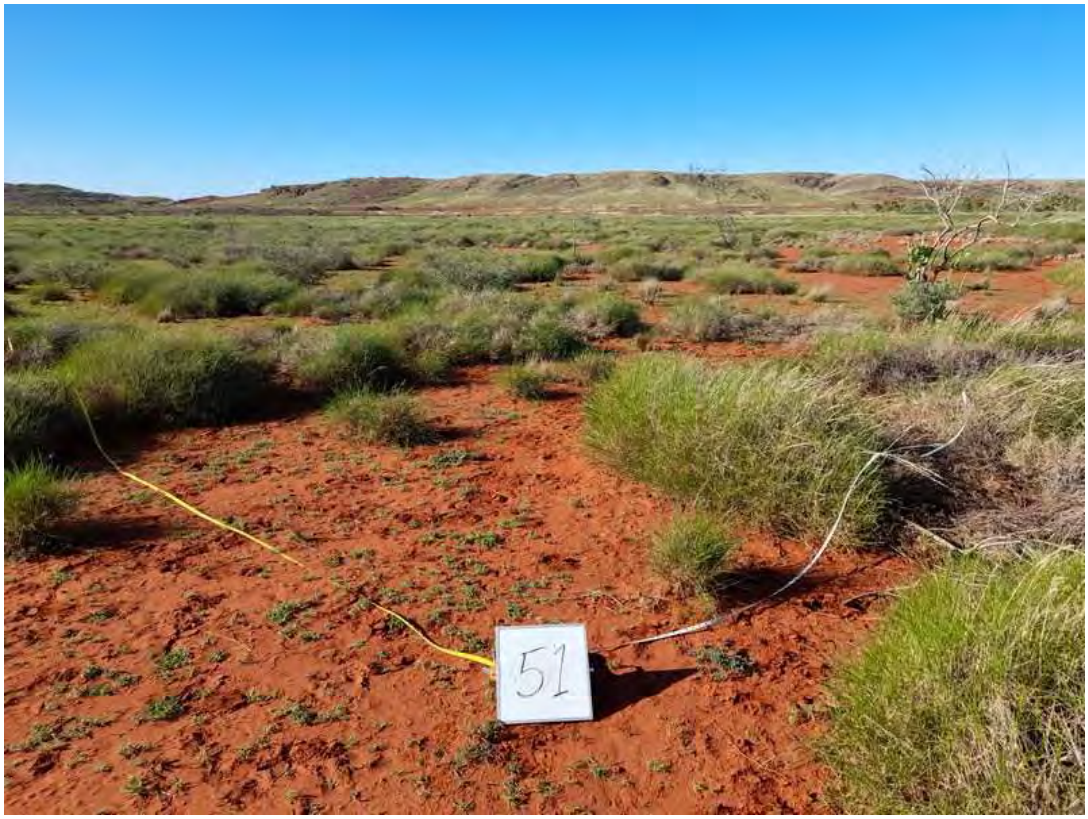
Date	30 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	722793mE 7751164mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Stoney/ Sand plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Triodia epactia	0.5	60.0
Pluchea tetranthera	0.5	5.0
Boerhavia coccinea		+
Dactyloctenium radulans		+
Eriachne lanata		+
Fimbristylis dichotoma		+
Neptunia dimorphantha		+
Sporobolus actinocladus		+
Sporobolus australasicus		+
Trigastrotheca molluginea		+

Site 51

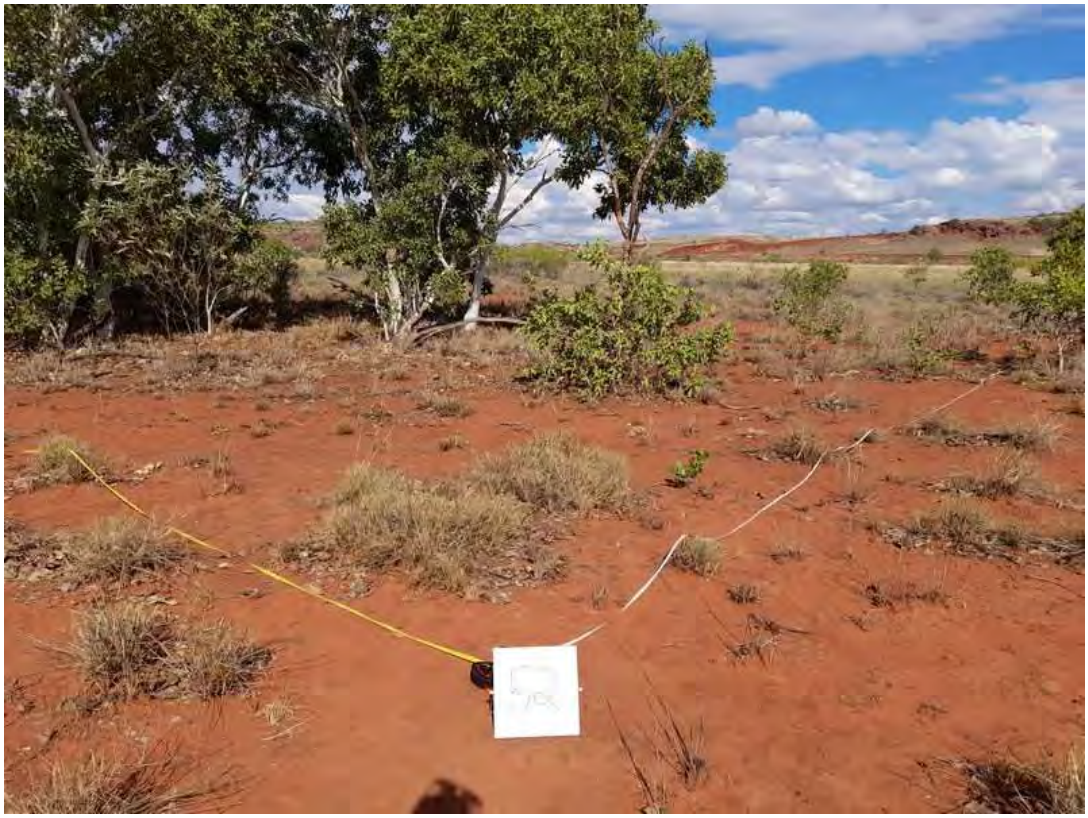
Date	30 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	722718mE 7750735mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sand/clay flat
Soil Colour	Red Brown
Soil Type	Sandy clay loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
**Indigofera oblongifolia*	1.0	5.0
Triodia epactia	0.5	60.0
Eragrostis ?xerophila	0.5	5.0
Acacia pyrifolia var. *pyrifolia*		+
**Calotropis procera*		+
Dactyloctenium radulans		+
Gomphrena canescens		+
Neptunia dimorphantha		+
Portulaca oleracea		+
Ptilotus gomphrenoides		+
Solanum diversiflorum		+
Stemodia grossa		+

Site 52

Date	24 May 2022
Botanist	Megan Gray and Olga Nazarova
Quadrat Size	50 x 50 m
NW Corner Coordinates	723424mE 7750607mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Sand plain
Soil Colour	Light brown
Soil Type	Sandy loam
Litter	5%
Bare Ground	40%
Fire Age	1-3 Years
Vegetation Condition	Good
Disturbances/Impacts	Livestock,Weeds



Species	Height (m)	Cover (%)
Corymbia flavescens	8.0	15.0
Acacia acradenia	2.5	1.0
Triodia epactia	0.4	10.0
Chrysopogon fallax	0.3	3.0
**Cenchrus ciliaris*	0.2	2.0
Acacia colei var. *colei*		+
Acacia inaequilatera		+
Achyranthes aspera		+
Afrohybanthus aurantiacus		+
Carissa lanceolata		+
Dampiera candicans		+
Eulalia aurea		+
Hibiscus sturtii		+
**Indigofera oblongifolia*		+
Pluchea tetranthera		+
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		+
**Stylosanthes hamata*		+

Site 53

Date	27 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	722793mE 7749943mN
Vegetation Unit	CfIoCf - *Corymbia flavescens*, *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* Low Open Woodland over *Indigofera oblongifolia* Mid Sparse Shrubland over *Chrysopogon fallax* and *Eriachne flaccida* Low to Mid Sparse Tussock Grassland over *Triodia epactia* Low Sparse Hummock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	10%
Bare Ground	15%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Corymbia flavescens	8.0	3.0
Acacia acradenia	2.0	70.0
Triodia epactia	0.5	60.0
Chrysopogon fallax	0.5	15.0
**Cenchrus ciliaris*	0.5	2.0
Carissa lanceolata		+
Digitaria brownii		+
Ehretia saligna		+
Eriachne flaccida		+
Eriachne obtusa		+
Goodenia nuda		+
Grevillea pyramidalis subsp. *pyramidalis*		+
Grevillea wickhamii subsp. *macrodonta*		+
Portulaca sp.		+

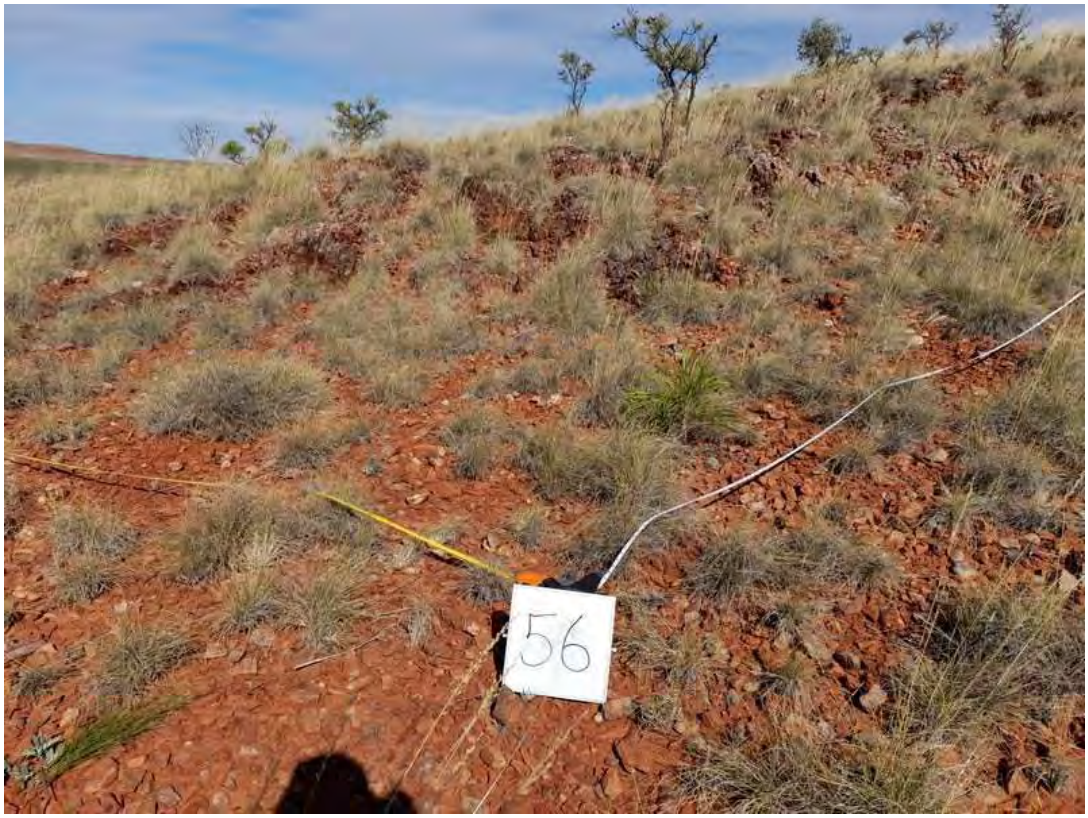
Site 54

Date	27 May 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718655mE 7750370mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA

Species	Height (m)	Cover (%)
Acacia stellaticeps	1.0	60.0
Triodia epactia	0.5	30.0
Bonamia linearis		+
Chrysopogon fallax		+
Pluchea ferdinandi-muelleri		+
Pluchea tetranthera		+

Site 56

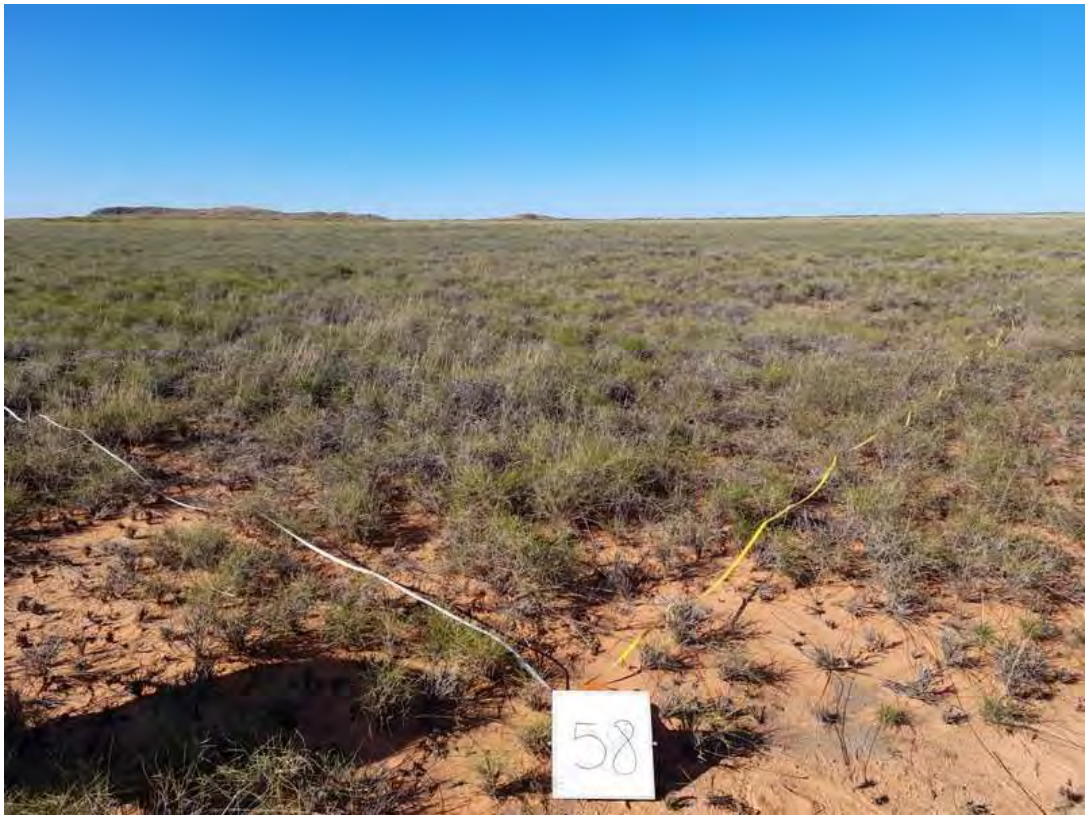
Date	27 May 2022 13:39
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718696mE 7749834mN
Vegetation Unit	TcAiTe - Occasional *Terminalia circumalata* Open Woodland over *Acacia inaequilatera*, *Atalaya hemiglauca* and *Acacia bivenosa* Mid to Tall Sparse Shrubland over *Triodia epactia* Low Hummock Grassland.
Slope	Moderate
Landform	Outcopping hill
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	50%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Acacia inaequilatera	1.5	2.0
Grevillea pyramidalis subsp. *pyramidalis*	1.5	2.0
Triodia epactia	0.5	40.0
Acacia orthocarpa		+
Senna glutinosa subsp. *pruinosa*		+

Site 58

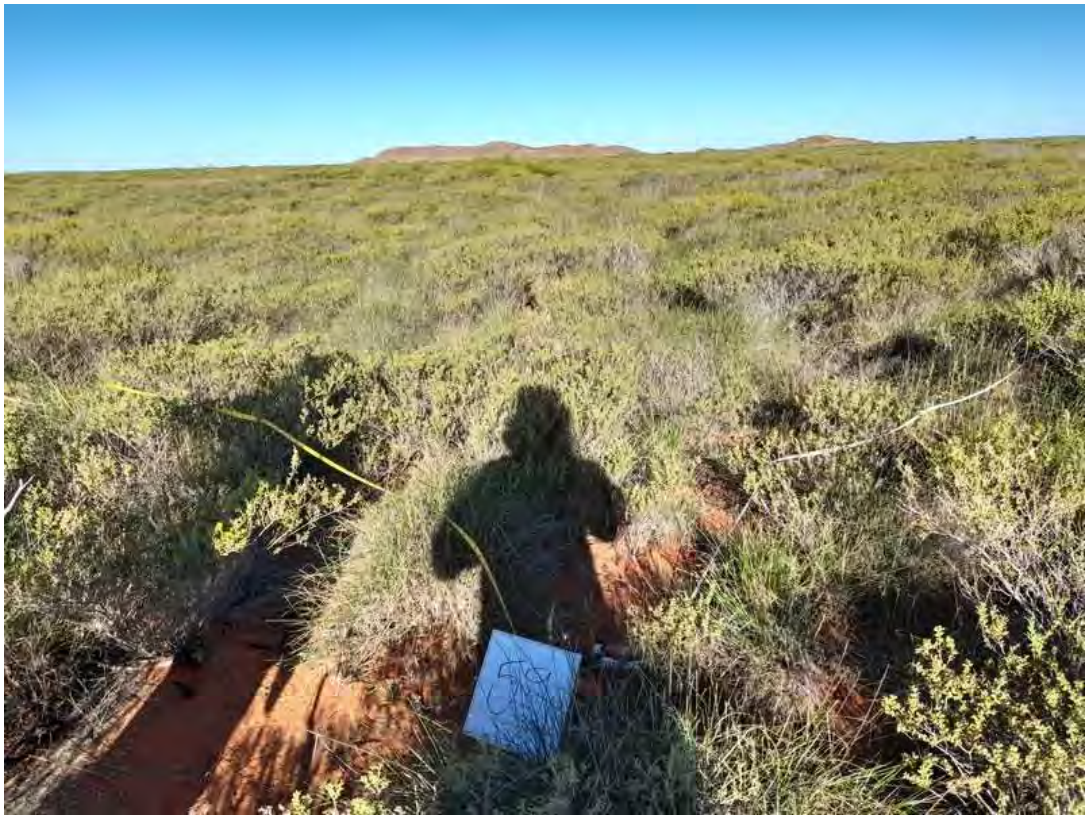
Date	1 July 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719251mE 7749414mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay flat
Soil Colour	Creamy brown
Soil Type	Sand
Litter	<1%
Bare Ground	10%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Triodia secunda	0.5	90.0
Eriachne lanata		+
Pluchea tetranthera		+
Sporobolus actinocladus		+
Triodia epactia		+

Site 59

Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719275mE 7748973mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sand plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	20%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Acacia stellaticeps	1.0	80.0
Triodia epactia	0.5	10.0
Bonamia rosea		+
Eragrostis ?eriopoda		+
Evolvulus alsinoides var. *decumbens*		+
Pluchea ferdinandi-muelleri		+
Pluchea tetranthera		+
Sporobolus actinocladus		+

Site 60

Date	1 July 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	719506mE 7749599mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sandy clay flat
Soil Colour	Creamy brown
Soil Type	Sand
Litter	<1%
Bare Ground	30%
Fire Age	1-3 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock

Species	Height (m)	Cover (%)
Triodia secunda	0.5	70.0
Sporobolus actinocladus	0.3	5.0
Cassytha capillaris		+
Eriachne lanata		+
Pluchea ferdinandi-muelleri		+
Pluchea tetranthera		+

Site 61

Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	712885mE 7752615mN
Vegetation Unit	FaTeCc - *Ficus aculeata* var. *indecora*, *Acacia colei* and *Ficus brachypoda* Tall Sparse Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Low Sparse Tussock Grassland over *Stemodia grossa* Low Isolated Herbs.
Slope	Gentle
Landform	Granite outcrop
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	60%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Acacia colei	2.0	10.0
Ficus aculeata var. *indecora*	2.0	3.0
Triodia epactia	0.5	35.0
Stemodia grossa	0.5	2.0
**Cenchrus ciliaris*	0.5	1.0
Achyranthes aspera		+
Amaranthus undulatus		+
Bergia perennis subsp. *perennis*		+
Boerhavia ?coccinea		+
Capparis spinosa subsp. *nummularia*		+
Corchorus incanus subsp. *incanus*		+
Crotalaria cunninghamii		+
Cyperus sp.		+
Eragrostis eriopoda		+
Evolvulus alsinoides		+
Ipomoea muelleri		+
Paspalidium clementii		+
Pluchea tetranthera		+
Sida rohlenae subsp. *rohlenae*		+
**Stylosanthes hamata*		+
Tephrosia leptoclada		+
Trianthema pilosum		+
Waltheria indica		+

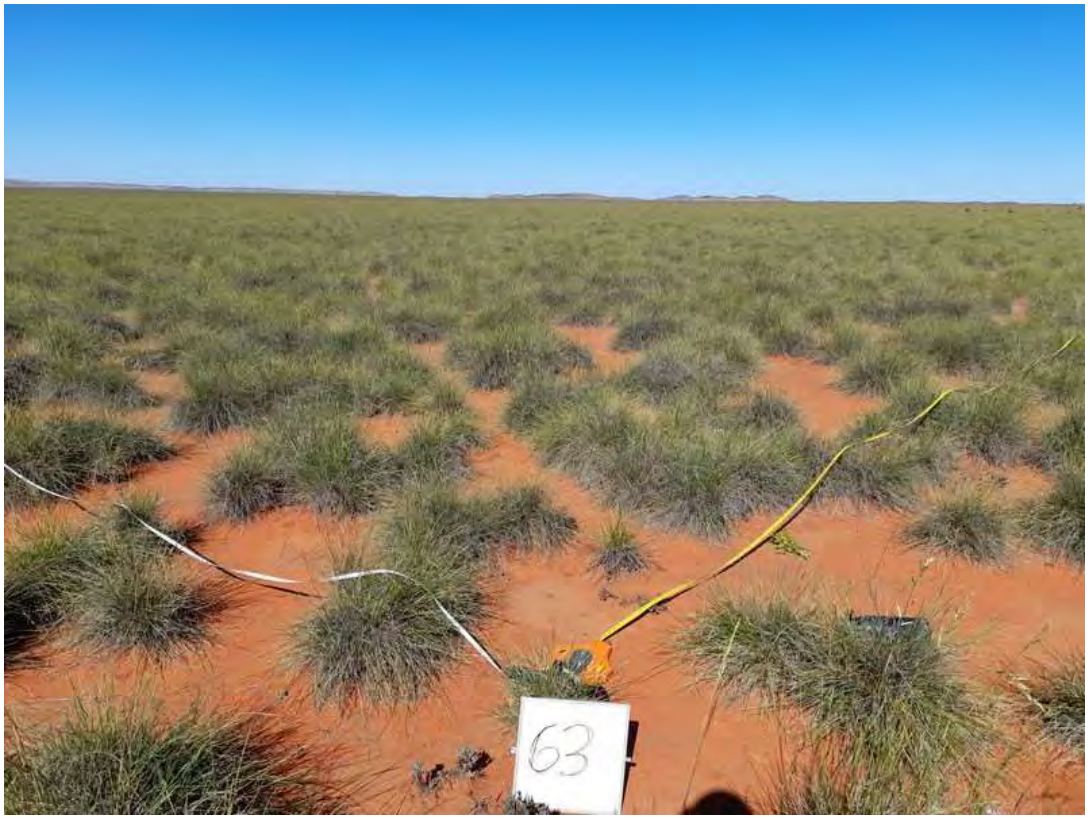
Site 62

Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	713543mE 7752435mN
Vegetation Unit	FaTeCc - *Ficus aculeata* var. *indecora*, *Acacia colei* and *Ficus brachypoda* Tall Sparse Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Low Sparse Tussock Grassland over *Stemodia grossa* Low Isolated Herbs.
Slope	Flat
Landform	Granite outcrop
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	60%
Fire Age	5-10 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Ficus brachypoda	3.0	4.0
Ficus aculeata var. *indecora*	2.0	2.0
Triodia epactia	0.5	30.0
**Cenchrus ciliaris*	0.5	15.0
Stemodia grossa	0.5	3.0
Acacia colei		+
Acacia stellaticeps		+
Achyranthes aspera		+
Amaranthus undulatus		+
Bergia perennis subsp. *perennis*		+
Capparis spinosa subsp. *nummularia*		+
Crotalaria cunninghamii		+
Cucumis argenteus		+
Eragrostis eriopoda		+
Evolvulus alsinoides var. *decumbens*		+
Gomphrena cunninghamii		+
Indigofera linifolia		+
Ipomoea muelleri		+
Nicotiana benthamiana		+
Paspalidium clementii		+
Paspalidium tabulatum		+
Pluchea tetranthera		+
Portulaca pilosa		+
Senna venusta		+
Sida rohlenae subsp. *rohlenae*		+
Solanum phlomoides		+
Solanum sp.		+
**Stylosanthes hamata*		+
Tinospora smilacina		+
Waltheria indica		+

Site 63

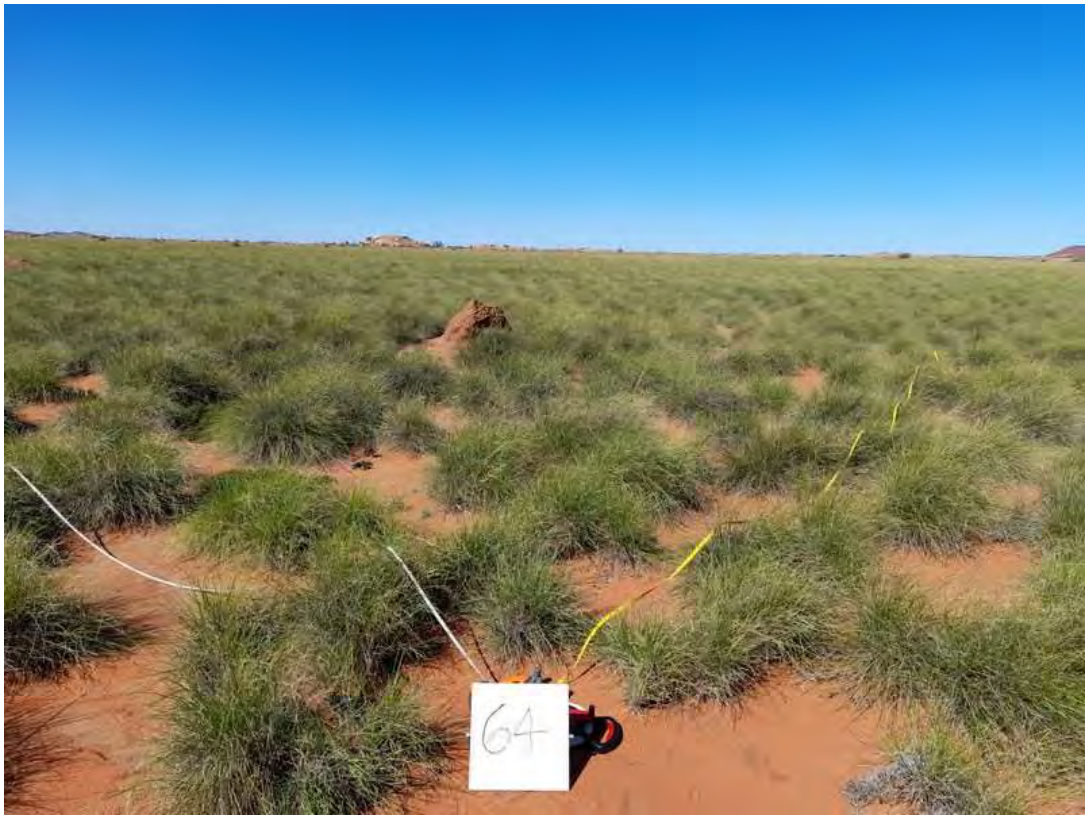
Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	714704mE 7754569mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Gentle
Landform	Sand plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	40%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	NA



Species	Height (m)	Cover (%)
Triodia epactia	0.5	60.0
Pluchea tetranthera	0.5	1.0
Bonamia linearis		+
Stemodia grossa		+

Site 64

Date	28 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	712525mE 7752722mN
Vegetation Unit	AsTe - *Acacia stellaticeps* and *Pluchea tetranthera* Low Open Shrubland over *Triodia epactia* Low Open Hummock Grassland.
Slope	Flat
Landform	Sanp plain
Soil Colour	Red Brown
Soil Type	Sandy loam
Litter	<1%
Bare Ground	30%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Weeds



Species	Height (m)	Cover (%)
Triodia epactia	0.5	70.0
Pluchea tetranthera	0.5	1.0
Bergia perennis subsp. *perennis*		+
Bonamia linearis		+
Stemodia grossa		+

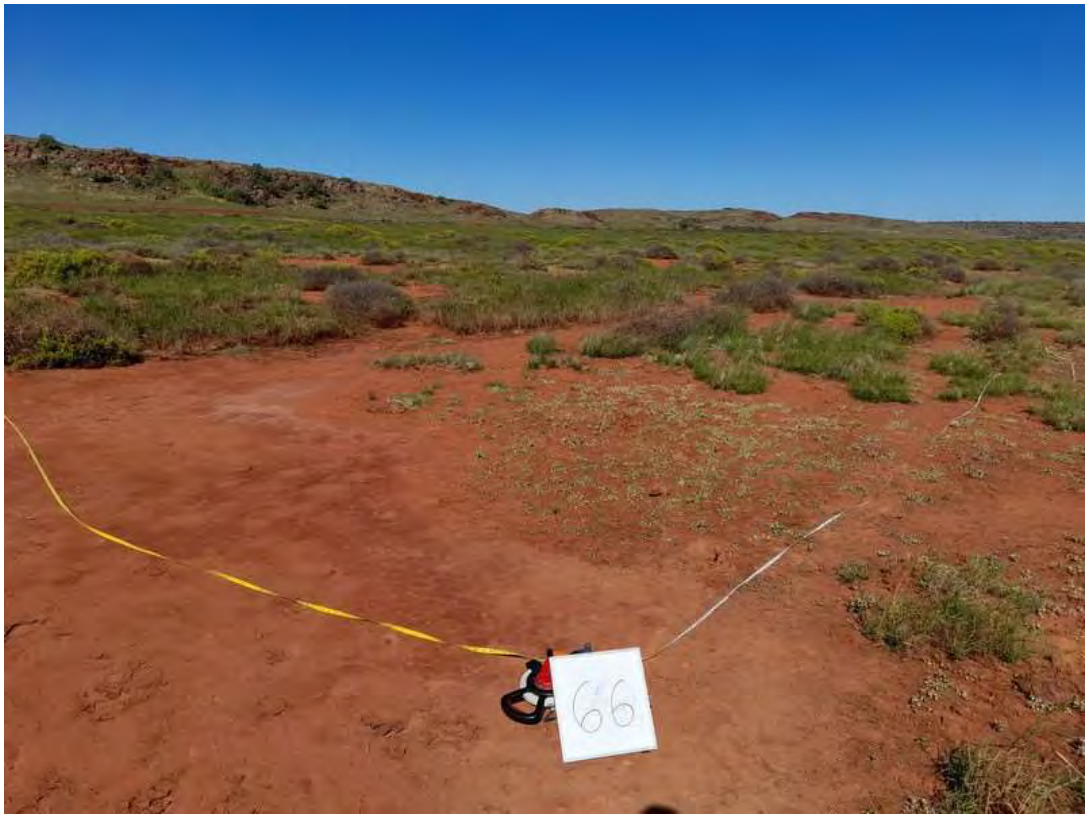
Site 65

Date	29 June 2022
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	723095mE 7757774mN
Vegetation Unit	CfAcTe - *Corymbia flavescens* Mid Open Woodland over *Acacia colei* and *Acacia acradenia* Tall Open Shrubland over *Triodia epactia* Low Open Hummock Grassland over *Cenchrus ciliaris* Sparse Tussock Grassland.
Slope	Flat
Landform	Flood plain
Soil Colour	Red Brown
Soil Type	Sandy clay loam
Litter	5%
Bare Ground	15%
Fire Age	5-10 Years
Vegetation Condition	Very Good
Disturbances/Impacts	Weeds,Livestock

Species	Height (m)	Cover (%)
Corymbia flavescens	12.0	3.0
Acacia colei	3.0	30.0
Acacia acradenia	3.0	20.0
Triodia epactia	0.5	50.0
**Cenchrus ciliaris*	0.3	15.0
?Bonamia sp.		+
Afrohybanthus aurantiacus		+
Bonamia media		+
Bonamia rosea		+
Cymbopogon ambiguus		+
Eriachne obtusa		+
Indigofera trita subsp. *trita*		+
Rhynchosia minima		+
Tephrosia supina		+
Trigastrotheca molluginea		+

Site 66

Date	30 June 2022 13:28
Botanist	Daniel Roberts
Quadrat Size	50 x 50 m
NW Corner Coordinates	718599mE 7758264mN
Vegetation Unit	SgEeTs - *Sclerolaena glabra* Low Sparse *Chenopod* Shrubland over *Eragrostis eriopoda, Eriachne flaccida* and *Eragrostis setifolia* Low Sparse Tussock Grassland over *Triodia secunda* Low Open Hummock Grassland.
Slope	Flat
Landform	Clay flats
Soil Colour	Red Brown
Soil Type	Clay loam
Litter	<1%
Bare Ground	30%
Fire Age	3-5 Years
Vegetation Condition	Excellent
Disturbances/Impacts	Livestock



Species	Height (m)	Cover (%)
Sclerolaena glabra	1.0	5.0
Eragrostis setifolia	0.5	40.0
Eriachne benthamii	0.5	15.0
Aeschynomene indica		+
Alysicarpus muelleri		+
Chloris pectinata		+
Eriachne glauca var. *glauca*		+
Gomphrena canescens		+
Iseilema vaginiflorum		+
Marsilea ?hirsuta		+
Nellica maderaspatensis		+
Portulaca oleracea		+
Ptilotus gomphrenoides		+
Sida fibulifera		+
Xerochloa barbata		+

APPENDIX E – WEEDS OF NATIONAL SIGNIFICANCE AND DECLARED PEST PLANT LOCATIONS

Species	Minimum No. of Individuals Recorded	WoNS	DP	Coordinates (GDA2020, MGA Zone50)	
				Easting (mE)	Northing (mN)
Parkinsonia aculeata	10	X	X	718835	7760221
Parkinsonia aculeata	7	X	X	718951	7760218
Parkinsonia aculeata	5	X	X	718754	7760287
Parkinsonia aculeata	5	X	X	718721	7760325
Parkinsonia aculeata	2	X	X	726524	7761093
Parkinsonia aculeata	1	X	X	726214	7761048
Parkinsonia aculeata	1	X	X	726179	7761092
Parkinsonia aculeata	1	X	X	717941	7760314
Parkinsonia aculeata	1	X	X	719033	7760201
Parkinsonia aculeata	1	X	X	719068	7760221
Parkinsonia aculeata	1	X	X	722158	7760781
Parkinsonia aculeata	1	X	X	726193	7761073
Calotropis procera	1	X	X	715637	7757584
Calotropis procera	100		X	719748	7752755
Calotropis procera	50		X	713907	7758816
Calotropis procera	50		X	726207	7760928
Calotropis procera	10		X	720013	7760642
Calotropis procera	10		X	713387	7759220
Calotropis procera	8		X	719490	7750021
Calotropis procera	8		X	716181	7759407
Calotropis procera	6		X	716587	7757355
Calotropis procera	5		X	726213	7761051
Calotropis procera	4		X	726564	7760976
Calotropis procera	2		X	713695	7758924
Calotropis procera	2		X	719786	7760630
Calotropis procera	2		X	719777	7760626
Calotropis procera	2		X	722305	7760792
Calotropis procera	2		X	726194	7761023
Calotropis procera	1		X	720392	7758881
Calotropis procera	1		X	719568	7754842
Calotropis procera	1		X	723249	7750577
Calotropis procera	1		X	722722	7756688
Calotropis procera	1		X	716551	7756985
Calotropis procera	1		X	724017	7760176
Calotropis procera	1		X	719110	7748681
Calotropis procera	1		X	716498	7757126
Calotropis procera	1		X	713804	7759010
Calotropis procera	1		X	713934	7758789
Calotropis procera	1		X	723305	7750568
Calotropis procera	1		X	723337	7750584
Calotropis procera	1		X	716309	7758032
Calotropis procera	1		X	716147	7757886
Calotropis procera	1		X	723247	7750569
Calotropis procera	1		X	716230	7759473
Calotropis procera	1		X	719725	7755135
Calotropis procera	1		X	716494	7757141

Species	Minimum No. of Individuals Recorded	WoNS	DP	Coordinates (GDA2020, MGA Zone50)	
				Easting (mE)	Northing (mN)
Calotropis procera	1		X	716752	7757372
Calotropis procera	1		X	718948	7760299
Calotropis procera	1		X	724002	7760210
Calotropis procera	1		X	726193	7761073
Calotropis procera	1		X	723047	7761130
Calotropis procera	1		X	719439	7754827
Calotropis procera	1		X	722718	7750735
Calotropis procera	1		X	716784	7758660