RUTILA RESOURCES RAILWAY CORRIDOR FLORA AND VEGETATION ASSESSMENT

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ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS	
ARRP Act 1976	Western Australian *Agriculture and Related Resource Protection Act 1976* (superseded by the *BAM Act 1997*)
BAM Act 2007	Western Australian *Biosecurity and Agriculture Management Act 2007*
BoM	Bureau of Meteorology
C1, C2, C3	Declared Pest categories under the *BAM Act 2007*
CALM	Department of Conservation and Land Management (prior to becoming DEC)
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation (now, in part, DPaW)
DPaW	Western Australian Department of Parks and Wildlife
DoE	Commonwealth Department of the Environment
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DoE)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act 1986	Western Australian *Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act 1999	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystem
Graben	Geomorphology: a depressed block of land bordered by parallel faults (a rift valley)
IBRA	Interim Biogeographic Regionalisation for Australia
IDE	Inflow Dependent Ecosystem
NHT	National Heritage Trust
NVIS	National Vegetation Inventory System
PEC	Priority Ecological Community
PF	Priority Flora
PIL1, 2, 3, 4	Pilbara biogeographic subregions
PIOP	Flinders Mines Pilbara Iron Ore Project
PMST	Protected Matters Search Tool
P1, P2, P3, P4, P5	Priority; for PF and PEC rankings
Rutila	Rutila Resources Pty Ltd
SFDV	Sheet Flow Dependent Vegetation
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
TEC	Threatened Ecological Community
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF, in Western Australia)
var.	Variety (infrataxon)
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WC Act 1950	Western Australian *Wildlife Conservation Act 1950*
WONS	Weeds of National Significance
*	Introduced species

SUMMARY

Rutila Resources Pty Ltd has been granted State and Commonwealth approvals to develop the Balla Balla Project, including port facilities, near Whim Creek in the Pilbara Region of Western Australia. In order to increase the viability of this project, Rutila is investigating the possibility of connecting the proposed port to stranded mineral resources in the Hamersley Range via a new railway line. The proposed railway is approximately 200 km in length, and has, in part, two route options totaling 274 km. The survey covers an average 2 km wide alignment, plus all proposed borrow pits and access points.

Ecoscape (Australia) Pty Ltd has been appointed to undertake a Level 2 flora and vegetation survey of the 690.7 km^2 (69 070 ha) study area. This report comprises the desktop assessment and results of a reconnaissance survey of the alignment (Phase 1), conducted in May 2014. Further detailed field surveys, required to satisfy the expectations of a Level 2 flora and vegetation assessment (Phase 2), are planned for June and July of 2014.

The desktop assessment identified:

- most of the alignment had not been subject to previous environmental surveys, with the only known information relating to the Balla Balla Project area at the north of the alignment, and the Flinders Mines Pilbara Iron Ore Project at the south
- eighty one conservation significant flora species were identified as having potential to occur within the study area, based on the results of database searches and Ecoscape experience, and are included for targeted searches during the Phase 2 field surveys
- an undescribed (new to science), unnamed *Josephinia* sp., recorded from within the Flinders Mines tenement (but not within the proposed alignment) was considered to be significant by the Environmental Protection Authority, and is also included for targeted searches
- two Priority Ecological Communities (PECs), P1-P3 'Four plant assemblages of the Wona Land System' and P3 'Horseflat Land System of the Roebourne Plains', are known to occur within the study area alignment
- Groundwater Dependent Ecosystems (GDEs) are known within the study area
- Sheet Flow Dependent Vegetation (SFDV Mulga communities) may occur within the study area.

The reconnaissance survey and subsequent assessment:

- identified access issues through part of the alignment, and that some parts had been recently burnt and were not suitable for intensive Level 2 field survey
- identified target habitat for conservation significant flora searches during the Phase 2 field surveys
- confirmed that Threatened Flora species are highly unlikely to occur within the study area due to lack of suitable habitat and distance to known occurrences
- confirmed that the previously known PECs did occur within the alignment, and there may be an additional area of PEC; this will be targeted for field survey
- confirmed the presence of Class 2 and Class 3 GDEs within the study area
- recorded no SFDV Mulga communities
- confirmed that the proposed field survey timing of June and July 2014 for the Level 2 survey is suitable to identify approximately 61% of potential conservation significant flora species.

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Rutila Resources Pty Ltd (Rutila) has been granted State and Commonwealth approvals to develop the Balla Balla Project, near Whim Creek in the Pilbara Region of Western Australia.

To increase the project's viability, by further developing the export facilities, Rutila is investigating the potential to connect the port to 'stranded' third party miners via a new rail line. The proposed railway connects the Flinders Mines Blacksmith tenement in the Hamersley Range to the Balla Balla Export Facility stockpile area; a distance of approximately 200 km.

Preston Consulting has been appointed to gather and manage the planning, preparation and submission of approvals documents for the proposed railway, and in turn appointed Ecoscape (Australia) Pty Ltd (Ecoscape) to undertake a Level 2 flora and vegetation assessment of the alignment as part of the Western Australian and Commonwealth environmental approvals process. Phase 1 of the flora and vegetation assessment, the desktop assessment and reconnaissance survey results, are included in this report. Phase 2 is anticipated to comprise the flora and vegetation field survey and subsequent reporting.

1.1.1 Study Area Location

The proposed Rutila railway is located in the Pilbara region of Western Australia, between Balla Balla on the coast and the Flinders Mines Blacksmith tenement, also known as the Pilbara Iron Ore Project (PIOP), in the Hamersley Range, northwest of Tom Price. The proposed alignment traverses a number of pastoral leases and areas of Unallocated Crown Land through the Shires of Ashburton and Roebourne.

The proposed railway alignment is approximately 200 km in length, and includes two alternative routes towards the north, totalling 274 km. The flora and vegetation survey area (the study area) covers an average 2 km-wide alignment that includes all rail, borrow pit and access within its boundaries, totalling 690.7 km^2 (69 070 ha).

The location of the study area is shown in **Figure 1**.

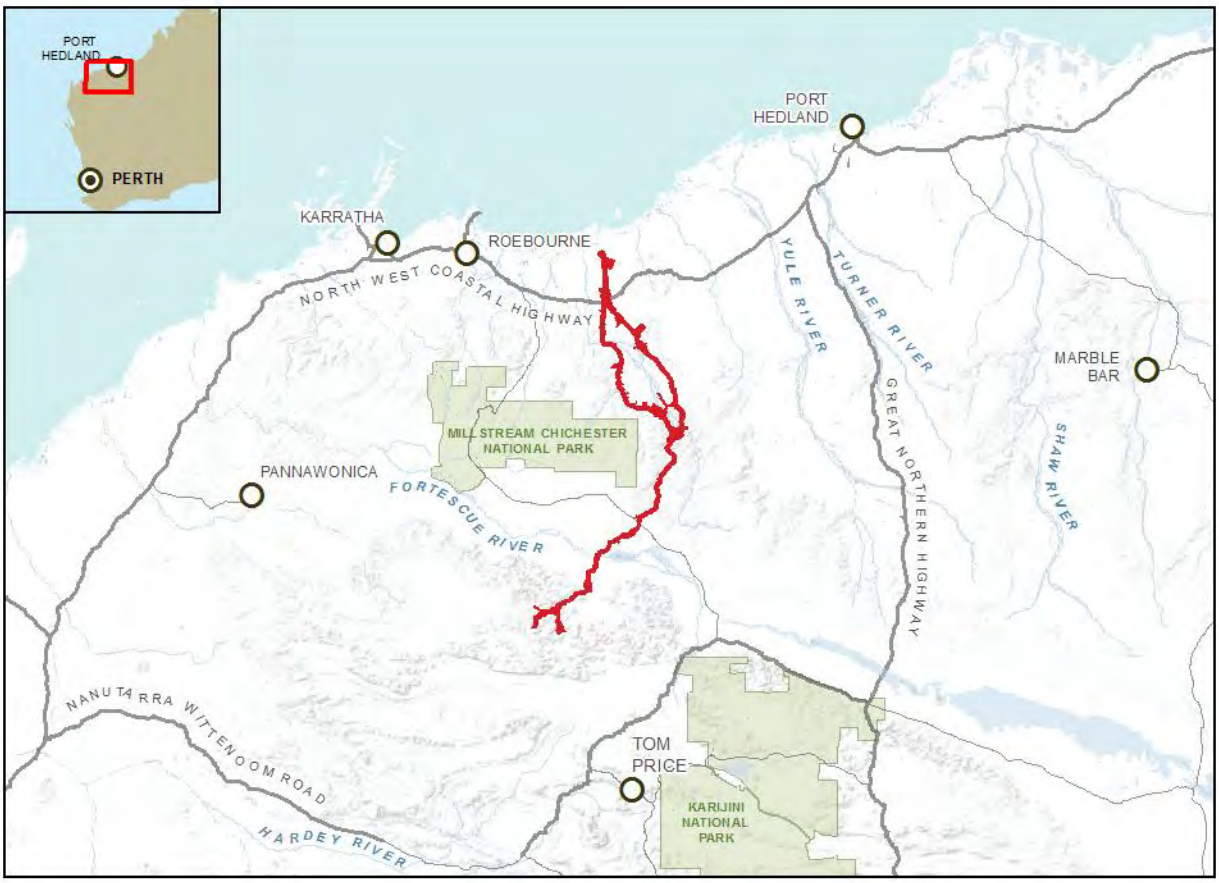

Figure 1: Study area

1.2 PROJECT OBJECTIVES

This report includes the results of the desktop and reconnaissance survey portion (Phase 1) of a Level 2 flora and vegetation assessment.

The works were conducted to:

- be compliant with the Environmental Protection Authority (EPA) expectations of a Level 2 survey
- provide sufficient information to allow for an assessment of potential impacts
- follow *Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia* (EPA 2004)
- follow *Position Statement No.* 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002).

Phase 1 of assessment consisted of:

- a desktop assessment identifying the physical and biological attributes of the study area
- a reconnaissance survey to provide additional detail about the study area in order to assist field survey planning, identify key landscape characteristics and ground truth habitat for later conservation significant flora searches
- identification of targeted survey areas for future field surveys.

1.3 LEGISLATION AND POLICIES

This assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

- Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*
- Western Australian *Environmental Protection (EP) Act* 1986
- Western Australian *Wildlife Conservation (WC) Act 1950*
- Department of Environment Water Heritage and the Arts (2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.

In addition to those listed above, the assessment complied with the EPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2000) *Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia*
- EPA (2006) *Guidance Statement No. 10: Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region* (known as *Guidance Statement No. 10*)
- EPA (2008) *Guidance Statement No. 33: Environmental Guidance for Planning and Development*
- EPA (2004) *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia*, known as *Guidance Statement No. 51*
- EPA (2003) *Guidance Statement No. 55: Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process.*

1.4 PERMITS

The flora and vegetation reconnaissance survey was conducted under the following permits issued by the Western Australian Department of Parks and Wildlife (DPaW):

- flora collecting permit SL010883 (JK Nelson)
- flora collecting permit SL010888 (LJ Atkins).

1.5 PREVIOUS SURVEYS

Flora and vegetation survey reports and other documents from the northern and southern ends were reviewed to gather background information relating to the study area. These reports and documents are listed or referenced in **Section 3.3.7**.

2.0 PHYSICAL ENVIRONMENT

The results of the desktop assessment relating to the physical environment are included below.

2.1.1 Climate

The study area traverses much of the Pilbara region that experiences an arid climate, which is influenced by two air masses, the Indian tropical maritime air moving in from the west or north-west, and the tropical continental air from the inland. During the warmer part of the year, there is a hot low-pressure system over the region resulting in clear skies and very high temperatures from November to February with average maximum temperatures generally between 35°C and 40°C. During the winter months the average maximum temperature generally falls to between 22°C and 30°C, the range of which is generally greater in inland areas away from the moderating effects of onshore winds common in coastal areas (Australian Natural Resources Atlas 2009).

The Pilbara lies south of the area normally penetrated by the northwest monsoon in the summer months, and is only occasionally influenced by weather systems of the westerly circulation in the winter months. Rainfall is therefore low and variable. The majority of rainfall occurs between December and March, as the result of moist tropical storms and cyclones originating in the north, with a pronounced dry period between August and November (Australian Natural Resources Atlas 2009).

According to the Köppen-Geiger climate classification, the study area is considered as having a dry climate, Class B, subclasses BWh and BSh (Sustainable Development Department & Food and Agricultural Organisation of the United Nations 1999). Class B climates are arid regions where annual evaporation exceeds annual precipitation; subclass BWh is a desert climate and subclass BSh is a steppe climate where the average temperatures exceeds 18°. Only a small portion of the study area, near the coast is considered to be BSh.

The nearest Bureau of Meteorology (BoM) station to the northern end of the study area alignment is Whim Creek, however there are significant data gaps for this station. The nearest northern BoM station with continuous long-term data is Roebourne (004035), 60 km to the west. The nearest BoM station with continuous long-term data to the southern end of the study area alignment is Wittenoom (005026), 90 km to the east. Roebourne BoM station has been active since 1919; Wittenoom BoM station has been active since 1951.

Mean rainfall and mean daily maxima and minima for these BoM stations are shown in **Figure 2** (BoM 2014b; 2014c). December is the hottest month at both stations; Roebourne has an annual mean maximum temperature of 34.0° whilst Wittenoom's annual mean maximum temperature is 32.9°, 1.1° cooler. July is the coolest month at both stations; Roebourne has a mean July minimum of 20.5° whilst Wittenoom's mean July minimum is 19.7°, 0.8° cooler. Mean rainfall for the two stations differ significantly.

The annual mean rainfall for the Roebourne station is 315.6 mm, whilst the annual mean for the Wittenoom station is 465.6 mm, a difference of 150 mm annually. Wittenoom is located approximately 180 km to the south east of Roebourne. Rains occur following the same seasonal pattern at both locations with majority of rainfall occurring from December to March.

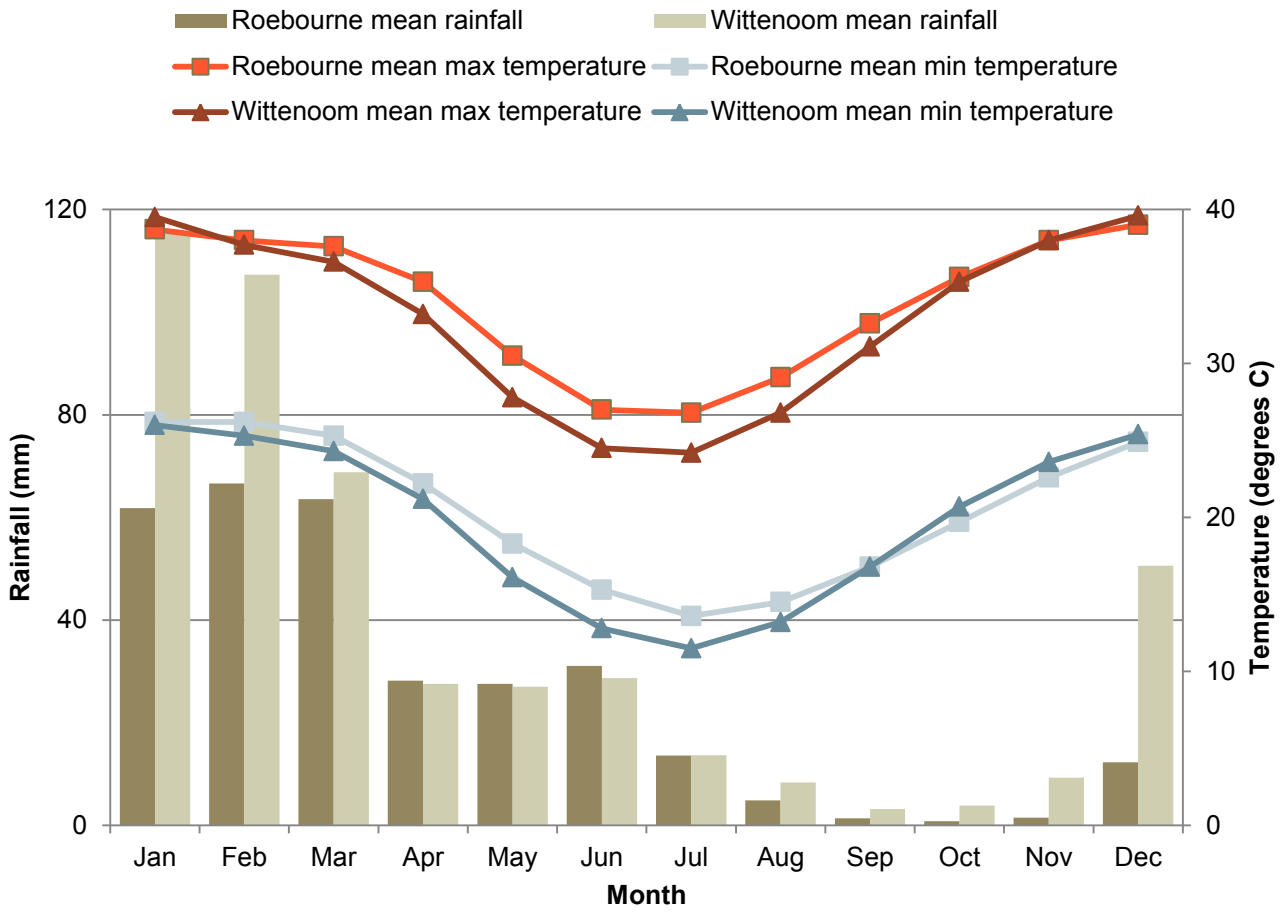

Figure 2: Monthly rainfall and daily maxima and minima for Roebourne and Wittenoom (BoM 2014b; 2014c)

2.1.2 Geology

There are 65 geological units mapped by the Geological Survey of Western Australia within the study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996), shown in **Table 9** in **Appendix Two**.

2.1.3 Land Systems

As part of the rangeland resource surveys, the then-Department of Agriculture comprehensively described and mapped the biophysical resources of the Pilbara, together with an evaluation of the condition of the soils and vegetation (from an agricultural perspective) (Van Vreeswyk *et al*. 2004). As part of this process an inventory of land types, land systems and land units with particular use capabilities, habitats or conservation values were established to assist in land use planning. According to this mapping, 11 land types and 24 land systems (grouped according to land type on the basis of a combination of landform, soil, vegetation, and drainage characteristics) intersect with the study area (**Table 10** in **Appendix Two**). **Map 1** shows the land systems intersecting with the study area.

The extent of these land systems within the study area are shown in **Table 1**.

Table 1: Extent of land systems within the study area and regional representation (Van Vreeswyk *et al*. 2004)

LAND SYSTEM	EXTENT WITHIN STUDY AREA (km^2)	PROPORTION OF STUDY AREA (%)	PILBARA EXTENT (km^2)	PROPORTION OF TOTAL WITHIN THE STUDY AREA (%)
Black	17.19	2.49	165	10.42
Boolaloo	5.80	0.84	1502	0.39
Boolgeeda	154.51	22.37	7748	1.99
Calcrete	3.45	0.50	1444	0.24
Capricorn	16.08	2.33	5296	0.30
Cheerawarra	0.09	0.01	197	0.05
Coolibah	1.77	0.26	1014	0.17
Granitic	15.92	2.30	4020	0.40
Hooley	0.15	0.02	590	0.03
Horseflat	45.69	6.61	1261	3.62
Jurrawarrina	3.68	0.53	664	0.55
Macroy	10.87	1.57	13095	0.08
Mallina	36.27	5.25	2557	1.42
Mckay	12.87	1.86	4202	0.31
Newman	37.41	5.42	14580	0.26
Pyramid	16.74	2.42	142	11.79
River	52.67	7.63	4088	1.29
Rocklea	77.56	11.23	22993	0.34
Ruth	56.27	8.15	346	16.26
Satirist	9.27	1.34	377	2.46
Sherlock	22.54	3.26	192	11.74
Uaroo	67.11	9.72	7681	0.87
Urandy	25.14	3.64	1311	1.92
Wona	1.67	0.24	1815	0.09

2.1.4 Drainage

The northern portion of the study area alignment is associated with the Sherlock River, crossing the river and corresponding with its floodplain and tributaries. Near the centre of the study area the alignment crosses the Fortescue River. The southern portion of the study area is associated with Weelumurra Creek and its tributaries that flow into the Fortescue River.

3.0 BIOLOGICAL ENVIRONMENT

The results of the desktop assessment relating to the biological environment are detailed below.

3.1 BIOGEOGRAPHIC REGION

Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna and are defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Department of Sustainability Environment Water Population and Communities (DSEWPaC) 2011).

The study area is located entirely within the Pilbara biogeographic region that includes four subregions; Chichester, Fortescue Plains, Hamersley and Roebourne (Thackway & Cresswell 1995), all of which the study area intersect with (**Map 2**). These subregions are described in the 2002 Biodiversity Audit of Western Australia's 53 Biogeographical Subregions (McKenzie *et al.* 2003) as:

Chichester (PIL1, Kendrick & McKenzie 2002):

> *The Chichester subregion comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by* Acacia inaequilatera *over* Triodia wiseana *(formerly* Triodia pungens*) hummock grasslands, while* Eucalyptus leucophloia *tree steppes occur on ranges. The climate is Semi-desert-tropical and receives 300 mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock). Subregional area is 9 044 560 ha.*

Fortescue Plains (PIL2, Kendrick 2002a)

> *Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River Gum woodlands fringe the drainage lines. Northern limit of Mulga (*Acacia aneura*). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of River Gum and Cadjeput* Melaleuca *woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300 mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west. Subregional area is 2 041 914 ha.*

Hamersley (PIL3, Kendrick 2002b):

> *Mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and* Eucalyptus leucophloia *over* Triodia brizoides *on skeletal soils of the ranges. The climate is semi-desert tropical, average 300 mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue to the north, the Ashburton to the south, or the Robe to the west. Subregional area is 6 215 092 ha.*

Roebourne (PIL4, Kendrick & Stanley 2002)

> *Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of* Acacia stellaticeps *or* A. pyrifolia *and* A. inaequilatera. *Uplands are dominated by* Triodia *hummock grasslands.*

Ephemeral drainage lines support Eucalyptus victrix *or* Corymbia hamersleyana *woodlands. Samphire,* Sporobolus *and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. Climate is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually. Subregional area is 2 008 983 ha.*

3.2 FLORA

3.2.1 Conservation Significant Flora

For the purposes of this report, conservation significant flora species are those that are listed by the DPaW, as TF and PF. Flora species are classified as TF or listed as PF where populations are geographically restricted or threatened by local processes.

TF species (previously known in Western Australian as Declared Rare Flora (DRF)) are listed by the DPaW and are protected under the Western Australian *WC Act 1950.* Rare flora species, as they are termed in the *WC Act*, are gazetted under Sub-section 2 of Section 23F, thereby making it an offence to remove or damage rare flora without Ministerial approval.

Some TF species have additional legislative protection by being listed under the Commonwealth *EPBC Act 1999*. Definitions of the Commonwealth *EPBC Act* categories are provided in **Table 5** in **Appendix One**.

There are seven categories covering State-listed TF and PF species (DPaW 2013), which are outlined in **Table 6** in **Appendix One**. PF for Western Australia are regularly reviewed by the DPaW whenever new information becomes available, with species status altered or removed from the list when data indicates that they no longer meet the requirements outlined in **Table 6**.

3.2.2 Commonwealth Protected Matters Search

A Commonwealth Department of the Environment (DoE) online database search (*Protected Matters Search Tool* (*PMST*, Australian Government and DoE 2014)) was conducted and Commonwealth *Species Profile and Threats Database* (DoE 2014) lists were reviewed to identify threatened flora with Commonwealth protection nearby.

The *PMST* search of an early version of the study area and 25 km buffer identified one species that is known to occur within the search area or have habitat that is likely to occur; *Lepidium catapycnon*, listed as Vulnerable under the *EPBC Act*. The nearest record of this species, estimated using the *NatureMap* (Department of Environment and Conservation [DEC] 2007-2014) measuring tool, is approximately 50 km south of the study area.

The *PMST* result is included in **Table 11** in **Appendix Two**.

3.2.3 DPaW Threatened and Priority Flora Database Search

A DPaW Threatened Flora database search (DPaW reference 20-0514FL) of an early version of the study area and 40 km buffer identified 78 vascular conservation significant taxa (species, subspecies and varieties) with validated populations within the search area buffer, shown on **Map 3** and included in **Table 11**. These conservation significant flora include two TF, 23 P1, 16 P2, 32 P3 and five P4 taxa. The taxa previously identified within 10 km of the current study area are:

- P1 taxa *Helichrysum oligochaetum*, *Heliotropium muticum*, *Josephinia* sp. Marandoo (M.E. Trudgen 1554) (P1), although the specimen is identified as being questionable on *FloraBase* (Western Australian Herbarium [WAH] 2014), and *Sida* sp. Hamersley Range (K. Newbey 10692)
- P2 taxon *Paspalidium retiglume*
- P3 taxa *Acacia daweana*, *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301), *Iotasperma sessilifolium* and *Rostellularia adscendens* var. *latifolia*
- P4 taxon *Goodenia nuda*, recorded from within the study area.

The DPaW Threatened Flora database search does not identify other significant flora species, described in *Guidance Statement No. 51* (EPA 2004) as including keystone or relictual species, those having anomalous features, range extremities, range extensions, population outliers, restricted subtaxa and hybrids, local endemics or poorly reserved species.

3.2.4 NatureMap Search

NatureMap (DEC 2007-2014) was reviewed to identify conservation significant flora species that have been recorded from within and near the study area using a simplified version of the early study area and 25 km buffer (**Figure 3**). The *NatureMap* search, conducted in May 2014, identified 22 conservation significant flora species, 21 of which were also identified by the DPaW database search (**Section 3.2.3** above). The *NatureMap* search results are incorporated in **Table 11**.

3.2.5 Significant Species According to Guidance Statement No. 51

Other significant flora species, as described in *Guidance Statement No. 51* (EPA 2004), include keystone or relictual species, those having anomalous features, range extremities, range extensions, population outliers, restricted subtaxa and hybrids, local endemics or poorly reserved species.

Undescribed (new to science) species can also considered as significant according to *Guidance Statement No. 51* (e.g. EPA 2012b). Additionally, Saunders *et al.* (1998), in the Commonwealth *State of the Environment* report, includes undescribed species as having significance as a biodiversity indicator.

Flora and vegetation survey reports from nearby were reviewed to identify any species considered to be significant for reasons other than being listed as TF or PF.

An unnamed *Josephinia* sp. was recorded from a number of locations close to the southern terminus of the study area (Ecoscape 2011a; 2012b; 2012h). Whilst there has been no progress in relation to applying a phrase name to this species, it was considered of significance by the EPA during the Flinders Mines environmental approvals process (EPA 2012b). This species is also included in **Table 11**.

Flora and vegetation survey reports from the northern (Balla Balla) end of the study area alignment were also reviewed to identify if there were any other significant species. None, other than Priority Flora species that were also recorded by the database searches, were identified as significant according to these reports (Astron Environmental Services 2005; Mattiske Consulting Pty Ltd 2006; 2008; 2013).

3.2.6 Ecoscape Experience

Ecoscape has undertaken a number of flora and vegetation surveys in the Pilbara, including several near the southern end of the study area (e.g. Ecoscape 2011a; 2012a; 2012b; 2012c; 2012e; 2013e) and in near-coastal areas close to Karratha/Roebourne and Port Hedland (Ecoscape 2012g; 2013a; 2013d). Ecoscape considers that *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P1) and *Vigna* sp. rockpiles (R. Butcher et al. RB 1400) (P3) may also occur in the study area; neither were identified by any of the database searches, but have been included in **Table 11**.

3.2.7 Introduced Species

The Western Australian Organism List (WAOL; Department of Agriculture and Food [DAFWA] 2013) details organisms listed as Declared Pests under the *Biosecurity and Agriculture Management (BAM) Act 2007* that replaces the *Agriculture and Related Resources Protection (ARRP) Act 1976*. Under the *BAM Act 2007*, Declared Pests are listed as one of three 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.

Some of the more invasive introduced species are also included in a number of other weed lists maintained by DoE and Weeds Australia, including Weeds of National Significance (WONS, Weeds Australia 2012b), the National Environmental Alert List (DSEWPaC 2012a), Sleeper Weeds (DSEWPaC 2012b), Species Targeted for Eradication (DSEWPaC 2012c) and Target Species for Biological Control (Weeds Australia 2012a).

Introduced species (weeds) are commonly recorded, particularly in disturbed areas including those targeted for grazing by stock. Plants are regarded as introduced if they are listed as 'alien' on *FloraBase* (WAH 1998-2014). *FloraBase* (WAH 1998-2014) lists 112 introduced species as having been collected within the Pilbara bioregion, 49 within the Chichester (PIL1) subregion, 31 within the Fortescue Plains (PIL2) subregion, 61 within the Hamersley (PIL3) subregion, 70 within the Roebourne (PIL4) subregion, 47 within the Shire of Roebourne and 78 within the Shire of Ashburton.

3.3 VEGETATION AND ECOLOGICAL COMMUNITIES

3.3.1 Vegetation Association Mapping

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250 000 in the south-west and at a scale of 1:1 000 000 in less developed areas. The vegetation survey of Western Australia maps and explanatory memoirs (1974-1981) are credited to J.S. Beard (or Beard with various co-authors).

Beard's vegetation maps attempt to depict the native vegetation as it was presumed to be at the time of settlement, and is known as the pre-European vegetation type and extent. They have since been developed in digital form by Shepherd *et al.* (2002), and updated by the Department of Agriculture and Food Western Australia (DAFWA 2012).

The pre-European vegetation associations identified from the study area (DAFWA 2012) and their pre-European and current extents are listed in **Table 2** (Government of Western Australia 2013) and shown on **Map 2**. The total extent of the Pilbara bioregion is 17 808 657.06 ha.

Table 2: Pre-European vegetation associations within the study area (Government of Western Australia 2013)

VEGETATION ASSOCIATION	PILBARA BIOREGION			EXTENT WITHIN THE STUDY AREA	
	PRE-EUROPEAN EXTENT (ha)	CURRENT EXTENT (ha)	% REMAINING	EXTENT (ha)	PROPORTION (%)
11	15,973.94	15,973.94	100.00	102.64	0.64
82	2,563,583.23	2,550,898.98	99.51	3566.48	0.14
93	3,042,114.29	3,038,471.70	99.88	15979.83	0.53
152	177,945.83	177,845.21	99.94	1010.35	0.57
173	1,752,520.89	1,747,677.63	99.72	1389.12	0.08
175	507,860.18	507,466.82	99.92	3465.83	0.68
196	87,403.03	87,403.03	100.00	77.30	0.09
565	108,956.73	108,945.16	99.99	5195.76	4.77
569	59,337.69	59,337.69	100.00	1458.29	2.46
587	580,728.60	580,696.99	99.99	8437.30	1.45
589	728,768.20	724,695.82	99.44	10841.81	1.50
607	120,789.19	120,599.81	99.84	1622.66	1.35
626	117,724.44	117,198.13	99.55	3843.84	3.28
629	37,190.83	37,178.16	99.97	29.66	0.08
640	17,505.69	17,505.69	100.00	1149.36	6.57
641	18,327.78	18,327.73	100.00	1386.66	7.57
644	27,199.82	27,068.69	99.52	2674.54	9.88
645	84,670.25	84,658.03	99.99	565.83	0.67
647	195,859.95	191,710.98	97.88	2260.03	1.18
649	40,364.42	40,178.20	99.54	4013.13	9.99

3.3.2 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are categorised at both Commonwealth (Commonwealth of Australia 1999) and State (DEC 2010) level, whilst Priority Ecological Communities (PECs) are categorised at State level (DEC 2010). The definitions of Commonwealth and State categories are summarised in **Table 5** and **Table 6** respectively in **Appendix One**.

Review of the DPaW TEC list (DPaW Species & Communities Branch2014a) indicates that the only TEC in the Pilbara defined by vegetation is the vulnerable '*Themeda* grasslands on cracking clay (Hamersley Station, Pilbara)'.

There are no Commonwealth-listed TECs within the Pilbara bioregion (DoE 2014), consequently none were identified by the PMST search (Australian Government and DoE 2014).

There are 30 PECs known from the Pilbara DPaW region; review of the DPaW list (DPaW Species & Communities Branch 2014b) indicates that a number of these occur on land systems that intersect with the study area and may occur within it.

DPaW Ecological Communities Database Search

A DPaW Ecological Communities database search (reference 21-0514EC) was conducted for the study area and a 40 km buffer. The search results are shown on **Map 3**.

The search identified the TEC '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' as occurring within the 40 km search buffer area. The TEC was identified as occurring in two areas, one approximately 22 km to the south and the other 25 km to the south east of the southernmost branches of the study area. The study area is outside the administrative buffer associated with the TEC.

Two PECs were identified by the database search as occurring within the study area, with a further two identified within the search area buffer (but not known to occur within the study area); these are described below (DPaW Species & Communities Branch 2014b).

The two PECs known to occur within the study area are the P1-P3 'Four plant assemblages of the Wona Land System (previously 'Cracking clays of the Chichester and Mungaroona Range') and the P3 'Horseflat Land System of the Roebourne Plains', described below.

The 'Four plant assemblages of the Wona Land System' PEC, located in the vicinity of Mt Florance homestead, extends approximately 150 m into the study area with the 500 m administrative buffer extending further into it, is described as:

> *a system of basalt upland gilgai plains with tussock grasslands occurs throughout the Chichester Range in the Chichester-Millstream National Park, Mungaroona Range Nature Reserve and on adjacent pastoral leases. There are a series of community types identified within the Wona Land System gilgai plains that are considered susceptible to known threats such as grazing or have constituent rare/restricted species, as follows:*
>
> *P1 Cracking clays of the Chichester and Mungaroona Range. This grassless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa*
>
> *P1 Annual Sorghum grasslands on self mulching clays. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range*
>
> *P3(iii) Mitchell grass plains (*Astrebla *spp.) on gilgai*
>
> *P3(iii) Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai (typical type, heavily grazed).*

The P3 'Horseflat Land System of the Roebourne Plains' PEC is mapped as occurring across all of the northern 20 km of the study area, with an additional section shown intersecting the study area in the vicinity of Croydon Outstation homestead. The PEC is described as:

> *extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include* Eragrostis xerophila *(Roebourne Plains grass) and other* Eragrostis *spp.,* Eriachne *spp. and* Dichanthium *spp. The community also supports a suite of annual grasses including Sorghum spp. and rare* Astrebla *spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne. This community incorporates Unit 3 (Gilgai plains), Unit 5 (Alluvial Plains) with some Unit 7 (Drainage Depressions) described in Van Vreeswyk* et al. *2004.*

Two PECs were identified as occurring within the search area buffer but outside the study area; P1 'Brockman Iron cracking clay communities of the Hamersley Range' and P4 'Invertebrate assemblages (Errawallana Spring type) Coolawanya Station'. Only the former is described in terms of vegetation, and is within the scope of this survey.

The 'Brockman Iron cracking clay communities of the Hamersley Range' occurs approximately 17 km to the south of the southern end of the study area. The PEC is described as:

> *rare tussock grassland dominated by* Astrebla lappacea *in the Hamersley Range, on the Newman land system. Tussock grassland on cracking clays-derived in valley floors, depositional floors. This is a rare community and the landform is rare. Known from near West Angeles, Newman, Tom Price and boundary of Hamersley and Brockman Stations*

3.3.3 Groundwater Dependent Ecosystems

Groundwater Definition

Groundwater is water that is found in the saturated zone of the soil, where all soil pores are filled with water. It occurs below the water table in an unconfined aquifer or may be held under pressure in a confined aquifer. Groundwater may also occur as a perched aquifer where is located above unsaturated rock formations as a result of a discontinuous permeable layer (Goulburn-Murray Water 2010).

Groundwater Dependent Ecosystems Definition

Groundwater Dependent Ecosystems (GDEs) have been defined as ecosystems that are dependent on groundwater for their survival at some stage or stages of their lifecycle, however groundwater use cannot be equated with groundwater dependence (Eamus 2009b).

Hatton and Evans (1998) identified four types of GDEs based on their geographic setting: terrestrial vegetation (vegetation communities and dependent fauna that have seasonal or episodic dependence on groundwater), river base flow systems (aquatic and riparian ecosystems that exist in or adjacent to streams that are fed by groundwater base flow), aquifer and cave ecosystems, and wetlands.

Eamus *et al.* (2006) identified three primary classes based on type of groundwater reliance:

1. Aquifer and cave ecosystems.
2. All ecosystems dependent on the surface expression of groundwater:
    a) river base flows
    b) wetlands, swamplands
    c) seagrass beds in estuaries
    d) floodplains
    e) mound springs
    f) riparian vegetation
    g) saline discharge to lakes
    h) low lying forests.
3. All ecosystems dependent on the subsurface presence of groundwater, often accessed via the capillary fringe (non-saturated zone above the water table) when roots penetrate this zone:
    a) River Red Gum (*Eucalyptus camaldulensis*) forests
    b) Banksia woodlands
    c) Riparian vegetation in the wet/dry tropics.

GDEs in the Pilbara are generally determined to be vegetation associated with riparian areas. GDEs dependent on the surface expression of groundwater (Eamus *et al*. 2006 class 2) includes vegetation

associated with wetlands (permanent or semi-permanent pools) within riparian areas, and generally includes *Melaleuca argentea* in association with other species described below. GDEs associated with the subsurface presence of groundwater (Eamus *et al*. 2006 class 3) includes riparian vegetation characterised by the phreatophytic species described below.

Phreatophytic Species

Phreatophytic species rely on groundwater sources for water intake (e.g. Maunsell Australia Pty Ltd 2006); essentially the water requirements of phreatophytes are greater than can be provided from the surface soil profile (e.g. riparian vegetation) or they are dependent on free water availability (e.g. wetland species). They frequently show low tolerance to extended water stress due to a lack of physiological and/or morphological adaptation to drought, and respond to significant water deficit by a decline in health and eventual death (*ibid.*).

Obligate phreatophytes are dependent on free access to water (i.e. they are wetland species) whereas facultative phreatophytes can switch their water source between the soil surface profile in times of rain, to groundwater in times of drought when the soil surface profile (vadosphere) is depleted (Grierson 2010).

Phreatophytic species that are known from nearby are:

- *Eucalyptus camaldulensis* subsp. *refulgens*, which is regarded as a facultative phreatophyte that is dependent on groundwater for part of its lifecycle and/or in times of drought. This species has been reported to be tolerant of groundwater falls of up to 4 m per year (Maunsell Australia Pty Ltd 2006), has both lateral and sinker roots and is tolerant of waterlogging (Grierson 2010).
- *Eucalyptus victrix*, which may be regarded as a facultative phreatophyte. It is considered to be relatively drought tolerant and likely to be tolerant of gradual declines to the water table (to a degree) (Maunsell Australia Pty Ltd 2006). *Eucalyptus victrix* has lateral and sinker roots (i.e. a dimorphic root system) but is not tolerant of waterlogging (Grierson 2010). There is some conjecture that this species is actually a vadophyte (i.e. relies on water from within the soil surface profile, and is independent of groundwater) or, at best, weakly phreatophytic (Resource and Environmental Management Pty Ltd 2007).

Vegetation containing *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* are considered to represent GDEs.

It should be noted, however, that there is supporting evidence that, at least in some circumstances (Batini 2009; Eamus 2009a; EPA and Hamersley Iron Pty Ltd 2010; Resource and Environmental Management Pty Ltd 2007), *Eucalyptus victrix* does not always depend on groundwater. Therefore vegetation containing this species may not always be definitive of a GDE.

Atlas of Groundwater Dependent Ecosystems

The *Atlas of Groundwater Dependent Ecosystems* (BoM 2014a) was interrogated to determine the presence of known GDEs and Inflow Dependent Ecosystems (IDEs) within the study area.

An Inflow Dependent Ecosystem is one in which the vegetation within the landscape is likely to be accessing water in addition to rainfall, from soil or surface water or groundwater, assessed using remotely sensed data. The likelihood of a landscape using additional water is rated from one to 10 (low to high), with a rating above six indicating that a landscape is likely to be inflow dependent (BoM 2014a).

The *Atlas* was interrogated using a polygon covering the study area and an adequate buffer. Interrogation of the *Atlas* identified several areas within the study area either mapped in previous desktop surveys as being a GDE or being identified as having a high potential for groundwater interaction due to association with major

drainages. The type of GDE and the geomorphology associated with these ecosystem types, which are likely to be encountered within the study area are described below in **Table 3**.

Table 3: Type of GDE, likelihood and associated geomorphology potentially occurring within the study area (BoM 2014a)

NAME	POTENTIAL FOR GDE	IDE LIKELIHOOD	LANDSCAPE POSITION	GEOMORPHOLOGY
Ecosystem Type: River				
WEELUMURRA CREEK	High potential for groundwater interaction	10	Low Lying	Mainly alluvial lowland with hardpan wash plains and sandplain, possibly a graben.
FORTESCUE RIVER	High potential for groundwater interaction	8-10	Low Lying	Mainly alluvial lowland with hardpan wash plains and sandplain, possibly a graben.
SHERLOCK RIVER	High potential for groundwater interaction	7	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
SHERLOCK RIVER	High potential for groundwater interaction	10	Low Lying	Floodplains and deltaic plains with stony plains and sandplains; tidal flats and some metamorphic, volcanic and granitic hills and islands.
SHERLOCK RIVER	High potential for groundwater interaction	8	Low Lying	Narrow range of hills and dissected plateaus on basalt and sedimentary rocks.
Ecosystem Type: Permanent Pools				
Pool	Identified in previous study: desktop	9-10	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
Ecosystem Type: Pool				
Pool	Identified in previous study: desktop	6-10	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
Pool	Identified in previous study: desktop	7-10	Low Lying	Floodplains and deltaic plains with stony plains and sandplains; tidal flats and some metamorphic, volcanic and granitic hills and islands.
Pool	Identified in previous study: desktop	5-10	Low Lying	Narrow range of hills and dissected plateaus on basalt and sedimentary rocks.
Pool	Identified in previous study: desktop	9-10	Slope	Dissected bold plateaus and ranges of flat lying or moderately folded sandstone, quartzite and volcanic rocks.

3.3.4 Mulga Communities

Mulga is the common name for a group of closely related *Acacia* species that were formerly known as *Acacia aneura* and its subtaxa. A recent taxonomic review (Maslin & Reid 2012) has resulted in a revision of this group, and Mulga now includes *Acacia aneura*, *A. aptaneura*, *A. ayersiana*, *A. caesaneura*, *A. craspedocarpa*, *A. fuscaneura*, *A. incurvaneura*, *A. macraneura*, *A. minyura*, *A. mulganeura*, *A. paraneura* and *A. pteraneura*, although not all are present in the Pilbara.

Mulga community types can be considered as significant, and are recognised as such in a number of publications including the *Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (Department of Conservation and Land Management [CALM] 2002) – see below, and various EPA approvals documents where environmental objectives are set or conditions imposed to restrict impacts on Mulga

vegetation (e.g. EPA 2010; 2012a). Despite being recognised as a significant, there is currently no statutory protection for any Mulga community.

Sheet Flow Dependent Mulga (also known more generally as Sheet Flow Dependent Vegetation, SFDV) occurs in groves or bands and can be inferred from species composition, community structure and topography. SFDV relies on overland (sheet) flow of water across a relatively flat landscape to regenerate (Muller 2005; The University of Western Australia *et al*. 2012), and as such changes in topography caused by mining or infrastructure, including roads and railways, can have a significant impact.

3.3.5 Ecosystems at Risk

'Ecosystems at Risk' were identified by regional ecologists and others as part of the *Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (CALM 2002), however they do not have any formal legislative protection.

'Ecosystems at Risk' identified from the Chichester subregion (PIL1) of the Pilbara (Kendrick & McKenzie 2002) that may occur in or near the study area include:

- the vulnerable 'Cracking clay communities of the Chichester Range and Mungaroona Range' (now a PEC).

'Ecosystems at Risk' identified from the Fortescue Plains subregion (PIL2) of the Pilbara (Kendrick 2002a) that may occur in or near the study area include:

- 'Perennial grassland communities in the Fortescue Valley'; no status given.

'Ecosystems at Risk' identified from the Hamersley subregion (PIL3) of the Pilbara bioregion (Kendrick 2002b) that may occur in or near the study area include:

- the vulnerable 'Grove/inter-grove mulga, eastern Hamersley Range' ecosystem
- the vulnerable 'Valley floor mulga' ecosystem
- the vulnerable 'All major ephemeral water courses'.

No 'Ecosystems at Risk' were identified from the Roebourne subregion (Kendrick & Stanley 2002) that may occur in or near the study area (other than those now considered to represent a PEC).

The above listed 'Ecosystems at Risk' do not include ecosystems currently listed TECs or PECs.

3.3.6 Significant Vegetation According to Guidance Statement No. 51

Guidance Statement No. 51 (EPA 2004) also lists a number of reasons why vegetation may of conservation interest, in addition to being listed as a TEC or PEC or because the extent is below a minimum threshold. These reasons, which may apply at a number of scales but are not defined in detail, include:

- scarcity
- unusual species
- novel combinations of species
- role as a refuge
- role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species
- being representative of the range of a unit (particularly a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extension or isolated outliers of the main range)
- restricted distribution.

Flora and vegetation reports from nearby areas were reviewed to identify vegetation that was considered significant according to *Guidance Statement No. 51*. A number of vegetation types having restricted distributions were identified as being locally significant including:

- riparian vegetation in the Flinders Blacksmith tenement (Ecoscape 2011a), Fortescue Metals Group (FMG) Central Pilbara Project Area (Ecoscape 2012b) and Balla Balla Vanadium project area (Mattiske Consulting 2006), characterised by *Eucalyptus victrix* and/or *E. camaldulensis*
- vegetation characterised by *Carissa spinarum* (probably now known as *C. lanceolata*) over *Triodia wiseana* and *T. epactia* in the Balla Balla Vanadium project area (Mattiske Consulting 2006)
- vegetation restricted to gorges in the Flinders Blacksmith tenement (Ecoscape 2011a) and FMG Central Pilbara Project Area (Ecoscape 2012b)
- vegetation restricted to high hilltops, characterised by *Eucalyptus kingsmillii* and *E. gamophylla*, in the FMG Central Pilbara Project Area (Ecoscape 2012b)
- *Acacia maitlandii* Shrubland on low hills in the Flinders Blacksmith tenement (Ecoscape 2011a)
- *Acacia orthocarpa* (atypical form) Shrubland in the Flinders Blacksmith tenement (Ecoscape 2011a)
- sheet flow dependent Mulga in the FMG Central Pilbara Project Area (Ecoscape 2012b).

3.3.7 Previous Surveys

There are very few known (publicly available) flora and vegetation surveys that have been conducted in areas corresponding with or close to the study area. Reports associated with previous surveys from areas close to the northern (Balla Balla) and southern (Flinders Blacksmith tenement and Fortescue Metals Group Solomon Project) ends of the study area that have been reviewed in association with this project are:

- Balla Balla:
    - Mattiske Consulting (2013) *Flora and vegetation survey of the Balla Balla export facilities, proposed infrastructure corridor within L47/690*
    - Mattiske Consulting (2008) *Flora and vegetation survey of the Balla Balla pipeline*
    - Mattiske Consulting (2006) *Flora and vegetation survey of the Balla Balla Vanadium Project*
    - Astron Environmental Services (2005) *Balla Balla Vanadium Project Vegetation and Flora Survey*
- Flinders Blacksmith tenement:
    - WorleyParsons (2010) *Pilbara Iron Ore Project: Preliminary Desktop Environmental Study at E47/882*
    - Ecoscape (2011a) *Pilbara Iron Ore Project – Blacksmith Flora and Vegetation Survey*
    - Ecoscape (2012c) *Groundwater Dependent Ecosystem Mapping*
- Fortescue Metals Group Solomon Project:
    - Coffey Environments (2010b) *Flora and Vegetation Assessment, Solomon Rail Project - Volume 1*
    - Ecoscape (2010a) *Level Two Flora and Vegetation Assessment, Firetail Mining Area*
    - Ecoscape (2010c) *Solomon Project Airstrip Flora and Vegetation Assessment*
    - Ecoscape (2010d) *Solomon Project Rail Re-alignment Flora and Vegetation Assessment*
    - ENV Australia (2010) *Solomon Project: Kings Flora and Vegetation Assessment.*

Ecoscape has also undertaken a number of unpublished surveys near the southern end of the study area and has received survey reports from other consultants as reference material for these:

- Ecoscape (2013b) *Delphine Level 2 Flora and Vegetation Survey (Phase 2)*
- Ecoscape (2013c) *Eliwana and Flying Fish Level 2 Flora and Vegetation Survey (Phase 2)*
- Ecoscape (2013e) *Western Hub Rail Link Level 2 Flora and Vegetation Survey*
- Ecoscape (2012a) 'Themeda *Grasslands on Cracking Clay' TEC Assessment*
- Ecoscape (2012b) *Central Pilbara Project Level 2 Flora and Vegetation Assessment*

- Ecoscape (2012d) *Groundwater Dependent Ecosystem Mapping and Conservation Significant Flora Survey*
- Ecoscape (2012e) *Level 1 Vegetation, Flora and Fauna Assessment, and Targeted Conservation Significant Flora and Fauna Survey: Mt Macleod West*
- Ecoscape (2012f) *Mt Farquhar Phase One Flora and Vegetation Survey*
- Ecoscape (2012h) *Vegetation, Flora and Fauna Assessment, and Targeted Conservation Significant Flora and Fauna Survey: Raven*
- Coffey Environments (2010a) *Flora and Vegetation Assessment, Solomon Project and Investigator - Volume 1*
- Coffey Environments (2011) *Robe pisolite assessment and targeted Gompholobium karijini (P2) survey, Solomon Mine Project.*

Ecoscape has also undertaken flora and vegetation surveys near the northern end of the study area alignment, largely in the Karratha/Roebourne and Port Hedland areas:

- Ecoscape (2013a) *Cape Lambert to Wickham 33kV Line: Targeted Flora and Fauna Surveys*
- Ecoscape (2013d) *Pilbara Vegetation Asset Intersect Review*
- Ecoscape (2012g) *Pippingarra Quarry Priority Flora Survey and Delineation*
- Ecoscape (2011b) *Pippingarra Quarry Vascular Flora and Vegetation Survey*
- Ecoscape (2010b) *Port Hedland Water Supply Flora and Vegetation Assessment.*

Results of these surveys are confidential however the reports have been reviewed for relevant information.

3.3.7.1 Environmental Approval Documentation

Environmental approvals documents for the Balla Balla and Flinders Blacksmith areas include:

- EPA (2009) *Report and recommendations of the Environmental Protection Authority: Balla Balla Magnetite Project, Ferro Metals Australia Pty Ltd. Report 1309*
- EPA (2012b) *Report and recommendations of the Environmental Protection Authority: Flinders Pilbara Iron Ore Project - Stage 1. Report 1456*
- EPA (2013) *Report and recommendations of the Environmental Protection Authority: Balla Balla Export Facilities, Forge Resources Swan Pty Ltd. Report 1481*.

The EPA (2013) report identified the following as being significant in relation to the Balla Balla Export Facility, although there were no environmental conditions set in response:

- no TF or TECs were identified from the study area
- P1 *Heliotropium muticum* had previously been recorded from close to the survey area, although there was no indication that it was recorded from within it
- parts of the study area resemble the P3 'Horseflat land system of the Roebourne Plains' PEC, however the proportion of the PEC as a whole that may be impacted was small.

The EPA (2009) report identified the following as being significant in relation to the Balla Balla Magnetite Mine, however no environmental conditions were set in response as the proponent had taken steps to minimise impacts:

- no TF or TECs were identified from the study area
- there may have been Priority Flora species within the survey area however they could not be identified with certainty as they were in vegetative condition; the EPA considered that, even if the potential species were PF, that the impacts would be low
- there may have been vegetation representative of the P3 'Roebourne Plains coastal grassland' PEC, however this could not be confirmed due to grazing and fire impacts; the EPA considered that the proposed clearing would not impact on the conservation status of the PEC
- impacts to groundwater dependent vegetation would be minimal.

The EPA (2012b) report identified the following as being significant in relation to the Flinders Blacksmith tenement, with some conditions set as listed below:

- no TF, TECs or PECs were identified from the study area
- three P3 and two P4 species were recorded
- an undescribed *Josephinia* sp. was identified from study area however it was recorded in an area outside the impact zone; the EPA supports additional surveys but did not impose them as a condition
- a groundwater dependent vegetation monitoring and management plan would be required
- residual impacts management measures and offset conditions were imposed.

4.0 METHODS

4.1 RECONNAISSANCE SURVEY

A reconnaissance survey was undertaken by Lyn Atkins and Jared Nelson during May 26-29, 2014. The purposes of this survey were to:

- identify access opportunities and constraints for future flora and vegetation surveys
- commence vegetation type assessment and mapping to identify potential representative floristic quadrat locations and potentially significant vegetation types
- commence ground truthing of habitat types of conservation significant flora to better target future searches.

The survey was undertaken by driving to and, where possible, along the study area alignment and recording relevant information.

4.1.1 Vegetation Type Assessment and Mapping Methodology

Preliminary vegetation types are determined in the field by a combination of their dominant and characteristic species, the life forms of these and, at times, the landform on which they occur.

Vegetation types are determined and described using the National Vegetation Inventory System (NVIS) methodology (National Heritage Trust [NHT] 2003), recorded at Level V (Association). Up to three species per stratum from each of the tree main strata (upper, mid and ground) were used to describe the vegetation. NVIS Level V descriptions are also used to describe the vegetation within floristic quadrats. Preliminary vegetation types are later refined following Level 2 flora and vegetation surveys and floristic analysis.

Vegetation types are mapped in the field by hand drawing boundaries of vegetation on printed aerial imagery, for later digitisation.

During the reconnaissance survey, these preliminary vegetation types were used to identify potential future locations of floristic quadrats that are positioned in representative areas of each vegetation type.

4.2 CONSERVATION SIGNIFICANT FLORA LIKELIHOOD ASSESSMENT

A conservation significant flora likelihood assessment was undertaken prior to the Level 2 flora and vegetation survey. The desktop portion of this assessment (identifying likely species using database searches and assessing proximity information) was undertaken prior to the reconnaissance survey, with habitat information recorded during this survey.

The purpose of this assessment was to identify conservation significant flora species that are likely to occur within the study area and identify target search areas prior to the field survey.

The likelihood assessment included identifying key attributes of each species identified by the database searches as having potential to occur in the study area, using available information included on *FloraBase* (WAH 1998-2014), *NatureMap* (DEC 2007-2014) and any taxonomic literature available. These attributes were:

- broad soil type usually associated with the species
- broad landform/habitat usually associated with the species
- usual vegetation (characteristic species or structural type) with which the species is usually associated

- species having previously been recorded from within approximately 50 km of the study area (considered as 'nearby').

A likelihood rating was assigned to each likely species using the following categories:

- Known: there are recent reliable historical records (i.e. the location details are considered to be accurate and the vegetation condition has not changed significantly since the recording)
- Possible: it may occur within the study; broadly, 2-4 of the required attributes (but always including records from nearby) are present in the study area
- Unlikely: it could occur but is not expected; 1-3 of the required attributes are present in the study area but;
    - it is not known from nearby, or
    - it is known from nearby but has no other required attributes, or
    - it is known from nearby but has at least one well-defined attribute that does not occur in the study area (e.g. it is associated with a specific landform or soil type that does not occur in the study area)
- Highly Unlikely: the species characteristics include none of the required attributes of soil, landform, associated vegetation and having previously been recorded nearby, or a critical element (often landform) is not within the study area and as such it almost certainly does not occur within the study area.

5.0 RESULTS

5.1 RECONNAISSANCE SURVEY

5.1.1 Access

As much of the study area as possible was traversed by vehicle during the reconnaissance survey. Some of the tracks occurring on the supplied GIS dataset either; did not exist (i.e. there was no evidence of former access); previously existed but were no longer passable by car; or were fencelines that may have previously had an associated track that was now overgrown and non-navigable. Part of the central portion of the study area, south of the Nunyerri Gap (in the northern part of the Chichester Range), was not accessed due to time and safety constraints. Reports from the leaseholder on the southern end of this section indicated that heritage surveyors had managed to traverse this section a day prior and as such, despite the unknown condition of the track, is expected to be rough but accessible.

Map 4 identifies the tracks that were driven (i.e. known access tracks) and tracks that were observed but not traversed (i.e. the tracks are known to exist and are likely to be useable). Tracks that were unusable are also identified on this map.

The reconnaissance survey identified a number of areas with poor access. Rutila has offered the use of quad bikes to assist with the survey; if these are available during future surveys there will be no survey constraints in these areas where they are north of the Chichester Range. Areas with restricted access south of the Chichester Range will be accessed by walking into them; the only area that occurs a significant distance from tracks (i.e. is too far to adequately survey by walking) has been recently burnt and is therefore unsuitable for intensive botanical survey within the available timeframe.

Some parts of the study area alignment occurred in valleys (gorges) between high and steep hills. Whilst it is important to describe all of the vegetation types within the entire study area, for safety reasons (and also considering that a railway will not be located on high and undulating areas due to the requirement to minimise grades), these areas will be surveyed at a lower intensity than valley floor areas that are more likely to be impacted.

5.1.2 Vegetation Types

Vegetation types were broadly mapped during the reconnaissance survey traverses. In general, vegetation type changes corresponded with land system boundaries, or could be easily identified using aerial imagery (e.g. creek line vegetation within a larger area is frequently a different vegetation type, or by colour changes on the imagery).

These preliminary vegetation types, in association with accessibility constraints, will be used to identify potential locations of floristic quadrats.

5.1.3 TECs and PECs

No TECs have been previously recorded within the study area. No vegetation similar to the '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' was observed during the field survey.

Significant parts of the northern section of the study area were considered highly likely to represent the 'Horseflat Land System of the Roebourne Plains' PEC, in general corresponding with known occurrences (**Plate 1**).

Plate 1: 'Horseflat Land Systems of the Roebourne Plains' PEC

The section of the study area corresponding with a known occurrence of the 'Four plant assemblages of the Wona Land System' PEC was accessible and will be assessed to confirm that it corresponds with one of the relevant plant assemblages. Another occurrence of the Wona land system, but not included in the PEC, occurs to the north of this; this was not accessible during the reconnaissance survey but will be included in the Level 2 field survey.

5.1.3.1 Groundwater Dependent Ecosystems

Class 2 GDEs, defined by the presence of *Eucalyptus camaldulensis* subsp. *refulgens* and frequently *Melaleuca argentea* and corresponding with the larger drainage lines (Sherlock River), were observed north of the Chichester Range, and may occur in pockets within the Nunyerri Gap. They may also be associated with the Fortescue River and are almost certainly associated with Weelumurra Creek, however not necessarily within the study area.

Plate 2: Class 2 GDE, Sherlock River

Class 3 GDEs, largely defined by the presence of *Eucalyptus victrix* (at times with *Eucalyptus camaldulensis* subsp. *refulgens*), occurred in riparian areas (major and midsized drainage lines and floodplains) throughout much of the study area.

These will be mapped as separate vegetation types (possibly several types, depending on other species) and defined as GDEs during the Level 2 field survey.

5.1.3.2 Mulga Communities

Valley floor Mulga vegetation was common on the clay soils south of the Chichester Range; in the Fortescue Valley. No Sheet Flow Dependent Mulga was observed in any of the accessible areas, and review of aerial imagery of other areas indicates that none are likely within the study area.

Valley floor Mulga is considered to represent an 'Ecosystem at Risk', however it has no conservation significance.

5.1.3.3 'Ecosystems at Risk'

Vegetation that may represent 'Ecosystems at Risk' includes PECs, GDEs and Mulga communities described above. The undefined 'Perennial grassland communities in the Fortescue Valley' may also occur within the study area, on Coolawanyah Station.

5.1.3.4 Burnt Areas

A significant part of the eastern arm of the southern portion up to Weelamurra Creek has been recently burnt. Whilst the burnt areas cannot be surveyed for flora and vegetation, there are at times sufficient unburnt areas (pockets) to permit vegetation mapping. However, few of these pockets are large enough to contain a 50 m x 50 m floristic quadrat. Vegetation mapping will be conducted where it is possible to do so.

5.1.3.5 Conservation Significant Flora

Conservation significant flora was observed opportunistically, but locations not recorded. No targeted searches were conducted.

The only potentially significant finding, that will require confirmation as no flowering or fruiting material was observed during the reconnaissance survey, may be a large contiguous population of *Acacia daweana* (P3) in the southern section of the alignment. If the identification is confirmed, it will be a minor range extension (less than 10 km), but a significant new population as the plant in question was a dominant mid stratum species where it was observed. *Goodenia nuda* (P4) was also observed; this species is already known to occur within the study area.

5.1.3.6 Introduced Species

Introduced species (weeds) were observed during the reconnaissance survey. Buffel Grass (**Cenchrus ciliaris*) was a common component in grazed grasslands and associated with drainage lines; Kapok Bush (**Aerva javanica*) was associated with drainage lines and Date Palm (**Phoenix dactylifera*) was observed outside the study area (but nearby, in the Sherlock River bed) and will be recorded if it is recorded during the Level 2 survey.

5.2 CONSERVATION SIGNIFICANT FLORA LIKELIHOOD

Using the methodology described in **Section 4.2**, desktop data, Ecoscape experience and field-based observations, 45 of the 82 conservation and otherwise significant flora species identified during the desktop assessment were considered 'Possible' to occur within the study area. They consisted of 11 P1, nine P2, 22 P3, one P4 and one (*Josephinia* sp.) considered as significant according to *Guidance Statement No. 51*.

Table 4 lists the conservation significant flora species identified by the desktop assessment as having potential to occur in the study area, and the assessed likelihood of their occurrence.

The two TF species identified by the database searches were assessed as being 'Highly Unlikely' to occur within the study area due to their known occurrences being a significant distance away and on a landform (high hills) that is not in the study area.

Table 4: Assessed likelihood of conservation significant flora occurring in the study area

TF	P1	P2	P3	P4
Known				
				Goodenia nuda
Possible				
	Abutilon sp. Pritzelianum (S. van Leeuwen 5095), *Acacia leeuweniana*, *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662), *Euphorbia inappendiculata* var. *queenslandica*, *Helichrysum oligochaetum*, *Heliotropium muticum*, *Hibiscus* sp. Mt Brockman (E. Thoma ET 1354), *Josephinia* sp. Marandoo (M.E. Trudgen 1554), *Nicotiana heterantha*, *Sida* sp. Hamersley Range (K. Newbey 10692), *Teucrium pilbaranum*	*Cladium procerum*, *Euphorbia australis* var. *glabra*, *Euphorbia inappendiculata* var. *inappendiculata*, *Ipomoea racemigera*, *Oxalis* sp. Pilbara (M.E. Trudgen 12725), *Paspalidium retiglume*, *Pentalepis trichodesmoides* subsp. *hispida*, *Spartothamnella puberula*, *Trianthema* sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023), *Vigna* sp. central (M.E. Trudgen 1626)	*Acacia daweana*, *Astrebla lappacea*, *Calotis latiuscula*, *Eragrostis crateriformis*, *Eragrostis surreyana*, *Fimbristylis sieberiana*, *Geijera salicifolia*, *Glycine falcata*, *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727), *Gymnanthera cunninghamii*, *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301), *Iotasperma sessilifolium*, *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479), *Polymeria distigma*, *Ptilotus subspinescens*, *Rhagodia* sp. Hamersley (M. Trudgen 17794), *Rostellularia adscendens* var. *latifolia*, *Sida* sp. Barlee Range (S. van Leeuwen 1642), *Solanum albostellatum*, *Stackhousia clementii*, *Swainsona thompsoniana*, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431)	*Rhynchosia bungarensis*
Unlikely				
	Bothriochloa decipiens var. *cloncurrensis*, *Calotis squamigera*, *Senna* sp. Millstream (E. Leyland s.n. 30/8/1990), *Tephrosia rosea* var. Port Hedland (A.S. George 1114), *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684)	*Eremophila forrestii* subsp. Pingandy (M.E. Trudgen 2662)	*Acacia subtiliformis*, *Indigofera* sp. Gilesii (M.E. Trudgen 15869), *Olearia mucronata*, *Owenia acidula*, *Vigna* sp. rockpiles (R. Butcher et al. RB 1400)	
Highly Unlikely				
Lepidium catapycnon, *Thryptomene wittweri*	*Eragrostis* sp. Mt Robinson (S. van Leeuwen 4109), *Eremophila* sp. Hamersley Range (K. Walker KW 136), *Eremophila* sp. Snowy Mountain (S. van Leeuwen 3737), *Eremophila* sp. West Angelas (S. van Leeuwen 4068), *Eremophila spongiocarpa*, *Eucalyptus lucens*, *Sporobolus pulchellus*, *Tetratheca fordiana*, *Triodia* sp. Karijini (S. van Leeuwen 4111)	*Adiantum capillus-veneris*, *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708), *Pilbara trudgenii*, *Scaevola* sp. Hamersley Range basalts (S. van Leeuwen 3675)	*Dampiera anonyma*, *Dampiera metallorum*, *Eremophila magnifica* subsp. *velutina*, *Pleurocarpaea gracilis*, *Solanum kentrocaule*, *Triodia* sp. Mt Ella (M.E. Trudgen 12739), *Triodia* sp. Robe River (M.E. Trudgen et al. MET 12367)	*Acacia bromilowiana*, *Eremophila magnifica* subsp. *magnifica*, *Livistona alfredii*

Many of the species considered as possibly occurring in the study area are known from gorges, thus are only likely to be located within a small portion of the study area. Other landforms that will be targeted for conservation significant flora searches during the Phase 2 field surveys include clay soil plains and rock piles.

5.3 LEVEL 2 FIELD SURVEY TIMING

Flowering times of conservation significant flora, corresponding with the optimal period to identify them, are shown in **Table 13** in **Appendix Three**.

The proposed dates for the Level 2 field surveys (in June and July) are indicated by bold outlines around the flowering month cells in **Table 13**. Fifty of the 82 potential conservation significant flora and otherwise significant flora (61%), are known to flower during this period, thus there are no constraints in relation to survey timing for this aspect of the survey. Flowering times were taken from information available on *FloraBase* (WAH 1998-2014), however actual flowering periods may be longer.

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MAPS

506000 526000 546000 566000 586000 606000 626000 646000

7700000 7680000 7660000 7640000 7620000 7600000 7580000 7560000

ROEBOURNE PRISON
ROEBOURNE
CHERRATTA ROAD
WOODBROOK
WARAMBIE
LOCKYER GAP
COOYA POOYA
YANNERY RIVER
JONES RIVER
PYRAMID
BLACK HILLS
HICKS GAP
BOOKARGINNER OUTCAMP
HARDING RIVER
NGURAWAANA COMMUNITY
EERALA
CAMP CURLEWIS
GEORGE RIVER
MILLSTREAM HOMESTEAD VISITOR CENTRE
PANNAWONICA MILLSTREAM ROAD
CHICHESTER DOWNS
KANJENJIE
FORTESCUE RIVER
HAMERSLEY RANGE
PILBARA
TOM PRICE RAILWAY ROAD
CAMP ANDERSON
HUGH BLUFF
SHERLOCK
WHIM CREEK
BALLA BALLA RIVER
YIRRAKULANHA HILLS
POVERTY CROSSING
PEAWAH RIVER
NORTH WEST COASTAL HIGHWAY
MALLINA
COORUNGCOORANA
YULE RIVER
KANGAN
MOUNT SATIRIST
THE SISTERS
COPPERMINE HILLS
CROYDON OUTSTATION
TAMBREY
ROEBOURNE WITTENOOM ROAD
CHICHESTER RANGE
SHERLOCK RIVER
MOUNT FLORANCE
COOLAWANYAH
HOOLEY
YANDEYARRA
YANDEYARRA ROAD
POWDAR CREEK
MULGA DOWNS
MULGA DOWNS ROAD
RIVERINA (HESTERS CAMP)

286Ch 281Hf 281Ma 281Hf 289Mc 289Rt 281Ua 289Bg 289Cp 281Ca 281Hf 289Ma 289Ca 281Mc 289Rt 281Ri 281Bo 289Bo 289Rk 289Sk 289Rt 289Py 289Bl 282Bg 289St 282Rk 282Ri 282Cp 282Bo 282Mc 282Gr 282Mk 282Wo 284Bg 284Hy 284Ju 284Co 284Ur 285Ne 285Bg 285Ri

BASEMAP SOURCE: Sources: Esri, USGS, NOAA

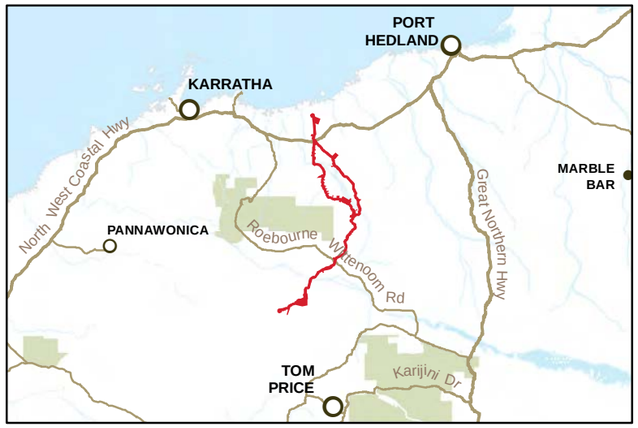
GDA 1994 MGA Zone 50

LEGEND

- Populated Places
- Homesteads
- Place Names
- Principal Road
- Secondary Road
- Minor Road
- Drainage Lines
- Land subject to inundation
- Saline coastal flat
- RPBFS Corridor revC

Land Systems (DAFWA 2012)

- Black System
- Boolaloo System
- Boolgeeda System
- Calcrete System
- Capricorn System
- Cheerawarra System
- Coolibah System
- Granitic System
- Hooley System
- Horseflat System
- Jurrawarrina System
- Macroy System
- Mallina System
- McKay System
- Newman System
- Pyramid System
- River System
- Rocklea System
- Ruth System
- Satirist System
- Sherlock System
- Uaroo System
- Urandy System
- Wona System



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DATE: MAY-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

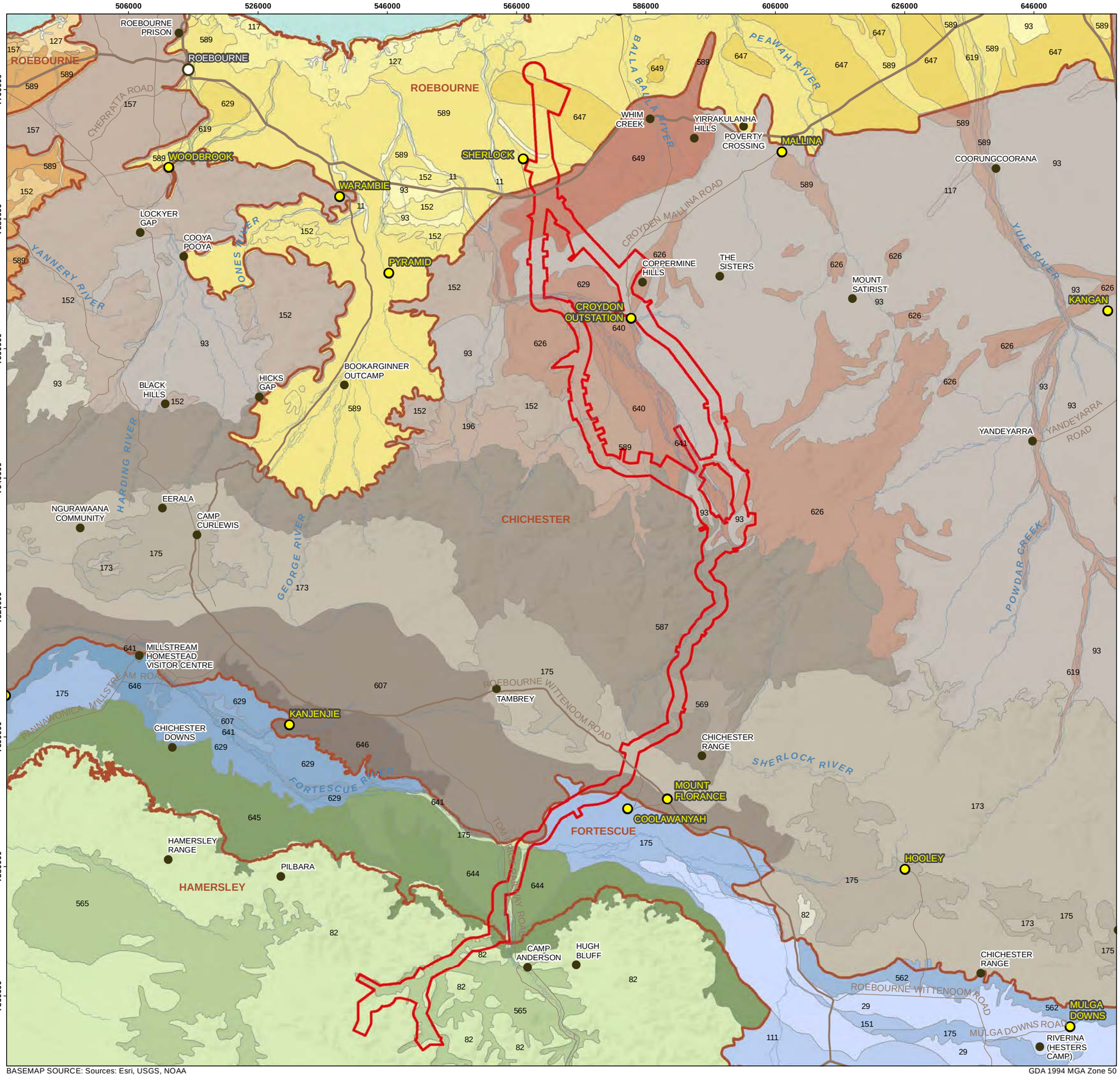
CLIENT: RUTILA RESOURCES

LAND SYSTEMS

MAP 1

SCALE 1:580,000 @ A3

0 10 20 30 km



LEGEND

- Populated Places
- Homesteads
- Place Names
- Principal Road
- Secondary Road
- Minor Road
- Drainage Lines
- RPBFS Corridor revC
- IBRA Version7 Subregions

Pre-European Vegetation Associations within Corridor

Abydos Plain - Chichester System

- 93: Hummock grasslands, shrub steppe; kanji over soft spinifex
- 152: Hummock grasslands, grass steppe; soft & hard spinifex soft spinifex
- 196: Hummock grasslands, shrub steppe; kanji over *Triodia wiseana* on hills of dolerite and
- 587: Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrub-steppe; kanji over *Triodia pungens*
- 589: Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex
- 626: Hummock grasslands, shrub-steppe; kanji over soft spinifex and *Triodia*
- 629: Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana*
- 640: Sedgeland; sedges with scattered medium trees; coolabah & river gum over various sedges
- 641: Medium woodland; coolabah & river gum
- 649: Sedgeland; Various sedges with very sparse snakewood

Abydos Plain System

- 11: Medium woodland; coolabah (*Eucalyptus microtheca*)
- 589: Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex
- 647: Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex

Chichester System

- 173: Hummock grasslands, shrub steppe; kanji over soft spinifex and *Triodia wiseana* on
- 569: Hummock grasslands, low tree steppe; bloodwood over soft spinifex and *Triodia*
- 587: Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrub-steppe; kanji over *Triodia pungens*
- 607: Hummock grasslands, low tree steppe; snappy gum and bloodwood over soft spinifex and *Triodia wiseana*

Hamersley System

- 82: Hummock grasslands, low tree steppe; snappy gum over *Triodia*
- 175: Short bunch grassland - savanna/grass plain (Pilbara)
- 565: Hummock grasslands, low tree steppe; bloodwood over soft spinifex
- 644: Hummock grasslands, open low tree steppe; mulga and snakewood over soft spinifex and *Triodia basedowii*
- 645: Hummock grasslands, shrub steppe; kanji and snakewood over soft spinifex and *Triodia*

Fortescue System

- 175: Short bunch grassland - savanna/grass plain (Pilbara)

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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

IBRA AND PRE-EURO VEGETATION

MAP 2

SCALE 1:580,000 @ A3

0 10 20 30 km

BASEMAP SOURCE: Sources: Esri, USGS, NOAA

GDA 1994 MGA Zone 50

446000 466000 486000 506000 526000 546000 566000 586000 606000 626000 646000 666000

7720000 7700000 7680000 7660000 7640000 7620000 7600000 7580000 7560000 7540000 7520000

DAMPIER
POINT SAMSON
WICKHAM
COSSACK
KARRATHA
ROEBOURNE
MOUNT PRINSEP
KARRATHA
WOODBROOK
SHERLOCK
WARAMBIE
LOCKYER GAP
CHERRATTA
COOYA POOYA
PYRAMID
YANYARE RIVER
YANNERY RIVER
JONES RIVER
BLACK HILLS
HICKS GAP
BOOKARGINNER OUTCAMP
NGURAWAANA COMMUNITY
EERALA
CAMP CURLEWIS
BALLA BALLA
PEAWAH RIVER
WHIM CREEK
POVERTY CROSSING
NORTH WEST COASTAL HIGHWAY
YIRRAKULANHA HILLS
MALLINA
BABBACOORINGANNA
GREAT NORTHERN HIGHWAY
COORUNGCOORANA
YULE RIVER
CROYDON MALLINA ROAD
COPPERMINE HILLS
THE SISTERS
MOUNT SATIRIST
KANGAN
CROYDON OUTSTATION
WODGINA WEST
YANDEYARRA ROAD
YANDEYARRA
MILLSTREAM HOMESTEAD VISITOR CENTRE
MILLSTREAM OUTCAMP
PANNAWONICA MILLSTREAM ROAD
YALLALONG
KANJENJIE
CHICHESTER DOWNS
FORTESCUE RIVER
ROEBOURNE WITTENOOM ROAD
TAMBREY
CHICHESTER RANGE
SHERLOCK RIVER
MOUNT FLORANCE
COOLAWANYAH
YANDEYARRE OUTSTATION
MUNGAROONA RANGE
HAMERSLEY RANGE
PILBARA
ROBE RIVER
TOM PRICE RAILWAY ROAD
HUGH BLUFF
CAMP ANDERSON
HOOLEY
HOOLEY ROAD
CHICHESTER RANGE
CHICHESTER RANGE
HAMERSLEY RANGE
HAMERSLEY
RIVERINA (HESTERS CAMP)
ROEBOURNE WITTENOOM ROAD
NANUTARRA WITTENOOM ROAD
WITTENOOM
MUNJINA WITTENOOM ROAD
DRILLERS RIDGE
MOUNT BROCKMAN ROAD
MOUNT BROCKMAN
HAMERSLEY
NAMMULDI RIDGE
BROCKMAN
ROSELLA SIDING
BANJIMA DRIVE
DALES GORGE LOOKOUT

BASEMAP SOURCE: Sources: Esri, USGS, NOAA

GDA 1994 MGA Zone 50

LEGEND

- Populated Places
- Homesteads
- Place Names

DPaW Flora Databases

Conservation Status

- P1
- P2
- P3
- P4

- Principal Road
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Saline coastal flat
- RPBFS Corridor revC
- 40 km search buffer

DPaW Ecological Community Database

Community Name

- Brockman Iron cracking clay communities of the Hamersley Range
- Four plant assemblages of the Wona Land System (previously 'Cracking clays of the Chichester and Mungaroona Range')
- Horseflat Land System of the Roebourne Plains
- Invertebrate assemblages (Errawallana Spring type) Coolawanya Station
- Themeda grasslands on cracking clays (Hamersley Station, Pilbara)

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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

DPAW DATABASE SEARCH RESULTS

MAP 3

SCALE 1:750,000 @ A3

0 10 20 30 40 km

506000 526000 546000 566000 586000 606000 626000 646000

7700000 7680000 7660000 7640000 7620000 7600000 7580000 7560000

ROEBOURNE PRISON
ROEBOURNE
CHERRATTA ROAD
WOODBROOK
WARAMBIE
SHERLOCK
BALLA BALLA RIVER
WHIM CREEK
YIRRAKULANHA HILLS
POVERTY CROSSING
PEAWAH RIVER
NORTH WEST COASTAL HIGHWAY
MALLINA
COORUNGCOORANA
LOCKYER GAP
COOYA POOYA
JONES RIVER
YANNERY RIVER
PYRAMID
CROYDEN MALLINA ROAD
COPPERMINE HILLS
THE SISTERS
MOUNT SATIRIST
YULE RIVER
KANGAN
CROYDON OUTSTATION
BOOKARGINNER OUTCAMP
HICKS GAP
BLACK HILLS
HARDING RIVER
YANDEYARRA
YANDEYARRA ROAD
EERALA
NGURAWAANA COMMUNITY
CAMP CURLEWIS
GEORGE RIVER
POWDAR CREEK
MILLSTREAM HOMESTEAD VISITOR CENTRE
PANNAWONICA MILLSTREAM ROAD
ROEBOURNE WITTENOOM ROAD
TAMBREY
KANJENJIE
CHICHESTER DOWNS
CHICHESTER RANGE
SHERLOCK RIVER
FORTESCUE RIVER
COOLAWANYAH
MOUNT FLORANCE
HAMERSLEY RANGE
PILBARA
TOM PRICE RAILWAY ROAD
HOOLEY
HOOLEY ROAD
HUGH BLUFF
CAMP ANDERSON
CHICHESTER RANGE
ROEBOURNE WITTENOOM ROAD
MULGA DOWNS
MULGA DOWNS ROAD
RIVERINA (HESTERS CAMP)

BASEMAP SOURCE: Sources: Esri, USGS, NOAA

GDA 1994 MGA Zone 50

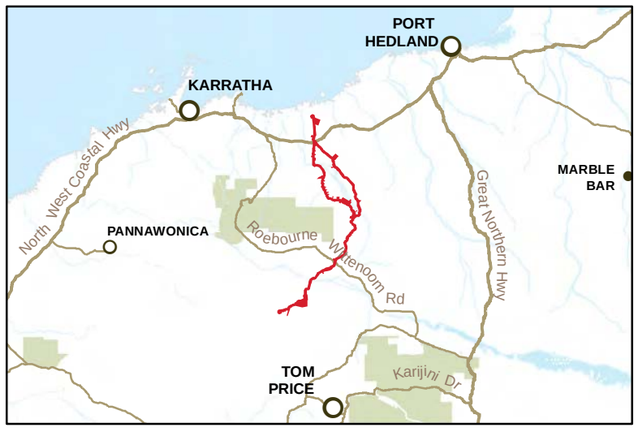
LEGEND

- Populated Places
- Homesteads
- Place Names
- Principal Road
- Secondary Road
- Minor Road

Access Recon. Survey

Track Observation

- Driven
- Likely to be usable
- Unlikely to be usable
- Drainage Lines
- Land subject to inundation
- Saline coastal flat
- RPBFS Corridor revC



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

ACCESS

MAP 4

SCALE 1:580,000 @ A3

0 10 20 30 km

APPENDIX ONE: DEFINITIONS AND CRITERIA

Table 5: *EPBC Act 1999* categories for flora and fauna (Commonwealth of Australia 1999)

EPBC ACT CATEGORY	DEFINITION
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Table 6: Conservation codes for Western Australian flora and fauna (DPaW 2013)

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA AND FAUNA	
T	**Threatened species** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora). Species* which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Fauna and Flora are further recognised by the Department according to their level of threat using IUCN Red List criteria: **CR:** Critically Endangered – considered to be facing an extremely high risk of extinction in the wild. **EN:** Endangered – considered to be facing a very high risk of extinction in the wild. **VU:** Vulnerable – considered to be facing a high risk of extinction in the wild.
X	**Presumed extinct species** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora). Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	**Migratory birds protected under an international agreement** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice. Birds that are subject to an agreement between governments of Australia and Japan, China and The Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
S	**Other specially protected fauna** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.
Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation Dependent species are placed in Priority 5.	
P1	**Priority One: Poorly-known species** Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, rail reserves and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two: Poorly-known species** Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes
P3	**Priority Three: Poorly-known species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them
P4	**Priority Four: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five: Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.
*Species includes all taxa (plural of taxon-a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).	

Table 7: *EPBC Act* categories for TECs (DSEWPaC 2009)

EPBC Act CATEGORY	DEFINITION
Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	If, at that time, it is not critically endangered, and is facing a very high risk of extinction in the wild in the new future.
Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the medium-term future.

Table 8: DPaW definitions and criteria for TECs and PECs (DEC 2010)

CRITERIA	DEFINITION
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

CRITERIA	DEFINITION
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

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

APPENDIX TWO: DESKTOP ASSESSMENT RESULTS

Table 9: Geological units in the study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al.* 1996)

UNIT	DESCRIPTION	EXTENT IN STUDY AREA (ha)	PROPORTION OF STUDY AREA (%)
AaO	Opaline Well Intrusion: fine- to coarse-grained, mafic intrusive rock; includes olivine gabbro and minor pyroxenite and dunite; minor extrusive mafic rock; metamorphosed	318.87	0.46
AaS	Sherlock Intrusion: fine- to coarse-grained mafic intrusive rock; includes gabbro, olivine gabbro, leucogabbro, and granophyric gabbro; metamorphosed	136.02	0.20
ABe	Louden Volcanics: undivided basalt, komatiitic basalt, and pyroxene spinifex-textured basalt; interbedded clastic units and chert; metamorphosed	452.51	0.65
Abk	Komatiitic basalt, pyroxene spinifex textured, and olivine basalt; metamorphosed	91.44	0.13
Acc	Chert; metamorphosed	475.38	0.69
ACf	Mons Cupri Volcanics: metamorphosed felsic volcanic and volcaniclastic rocks; lavas and pyroclastic rock, with feldspar and quartz phenocrysts; dacite to rhyolite composition; locally spherulitic	264.08	0.38
ACr	Rushall Slate: metamorphosed well-laminated shale and siltstone; locally graphitic; minor sandstone; may be equivalent to lower part of Mallina Formation	23.54	0.03
ADcsc	Conglomerate, pebbly sandstone, and coarse-grained lithic sandstone; metamorphosed	34.55	0.05
ADcsh	Laminated shale; locally includes minor beds of poorly sorted subarkose, siltstone, ferruginous siltstone, shale, and iron formation; metamorphosed	519.90	0.75
ADcstf	Poorly sorted subarkose; includes wacke; lesser interbeds of shale; rare graded beds; metamorphosed	2075.33	3.00
ADcsw	Wacke; locally subarkosic; fine to coarse grained; well-developed graded units; minor pebble beds and shale; turbiditic; metamorphosed	1925.62	2.79
ADm	Mallina Formation: interbedded shale, siltstone, and medium-to fine-grained wacke; minor layers of chert; metamorphosed	449.87	0.65
Ae	Louden Volcanics: undivided basalt and high-Mg basalt; interbedded clastic units and chert; metamorphosed	689.09	1.00
AFdc	Cooya Pooya Dolerite: fine- to medium-grained dolerite	346.21	0.50
Afdp	Porphyritic dacite; metamorphosed	49.12	0.07
AFh	Sandstone, conglomerate, siltstone, shale, and felsic pyroclastic rocks	213.05	0.31
AFhsc	Conglomerate; polymictic	15.89	0.02
AFhst	Medium- to coarse-grained, poorly sorted sandstone and minor well-laminated siltstone	348.57	0.50
AFhy	Lyre Creek Member: felsic agglomerate and felsic pyroclastic rocks	4.67	0.01
AFjo	Woodiana Member: quartz-rich sandstone, chert, chert breccia, and mudstone; locally includes lithic volcaniclastic sandstone	262.19	0.38
AFjsl	Variegated, light-coloured mudstone and siltstone	417.00	0.60
AFjslg	Carbonaceous mudstone and siltstone, chert, and local dolomite beds	455.68	0.66
AFk	Kylena Formation: massive or amygdaloidal basalt, basaltic andesite, and dacite; local komatiitic basalt and rhyolite	442.71	0.64
AFm	Maddina Formation: massive, vesicular, and amygdaloidal basalt and basaltic andesite	759.39	1.10
AFr	Mount Roe Basalt: massive, vesicular, and glomeroporphyritic basalt	3219.64	4.66

UNIT	DESCRIPTION	EXTENT IN STUDY AREA (ha)	PROPORTION OF STUDY AREA (%)
AFt	Tumbiana Formation: mafic to felsic volcaniclastic sandstone, pyroclastic rocks, and fine- to medium-grained clastic sedimentary rock; minor basalt, chert, dolomite, and limestone	587.52	0.85
AFtc	Meentheena Member: dark grey stromatolitic dolomite and limestone, carbonate-rich pyroclastic rocks, mudstone, and siltstone	84.40	0.12
Agja	Jallagnoonina Granodiorite: tonalite and granodiorite; metamorphosed	662.46	0.96
AGl	Cleaverville Formation: banded iron-formation, jaspilite, chert, siltstone, shale, and minor felsic volcaniclastic rock; metamorphosed	114.79	0.17
AGlfv	Felsic volcaniclastic rock, lithic volcaniclastic sandstone, and siltstone; metamorphosed	59.99	0.09
Agpe	Peawah Granodiorite: hornblende-biotite high-Mg diorite, granodiorite, and tonalite; metamorphosed	119.10	0.17
AgR	Granitoid gneiss and foliated granitoid rock	195.07	0.28
AgRg	Bookingarra Granite: medium- to coarse-grained monzogranite to syenogranite; locally strongly foliated; metamorphosed	25.51	0.04
Agrl	Nerrely Leucogranite: biotite(-tourmaline)-bearing leucogranite; unfoliated	21.26	0.03
Agsa	Satirist Granite: metamorphosed biotite(-hornblende) granite	2876.15	4.16
AgYel	Ellawarrina Monzogranite: biotite-bearing monzogranite; metamorphosed	440.37	0.64
AgYfr	Flat Rocks Tonalite: biotite-bearing tonalite; strongly foliated; locally interleaved with abundant massive to weakly foliated, K-feldspar porphyritic monzogranite; metamorphosed	1445.95	2.09
AgYmh	Hornblende-bearing monzogranite to granodiorite, undivided; metamorphosed	141.31	0.20
AHd	Wittenoom Formation: metamorphosed thin- to medium-bedded dolomite, dolomitic pelite, chert, and volcanic sandstone	222.28	0.32
AHm	Marra Mamba Iron Formation: chert, banded iron-formation, mudstone, and siltstone	340.10	0.49
AHs	Mount McRae Shale and Mount Sylvia Formation: mudstone, siltstone, chert, banded iron-formation, and dolomite	429.36	0.62
Aog	Metagabbro, medium to coarse grained	2003.96	2.90
Aoge	Melanogabbro; typically low-Ti tholeiitic; metamorphosed	48.29	0.07
Aombs	Fine- to medium-grained actinolite-chlorite(-serpentine-plagioclase) schist; boninitic composition	114.13	0.17
At	Mount Negri Volcanics: metamorphosed variolitic and vesicular basalt; undivided	347.26	0.50
Auk	Serpentine-talc-tremolite rock after komatiite; pseudomorphed olivine spinifex textures	4.06	0.01
Aus	Serpentinized ultramafic rock	40.51	0.06
Czc	Colluvium - dissected consolidated clay, silt, sand, and gravel deposits; derived from adjacent rock outcrop	3915.78	5.66
Czcb	Colluvium, dissected by present-day drainage, with gilgai surface in areas of expansive clay	200.97	0.29
Czcf	Ferruginous colluvium, derived from adjacent iron formation; includes hematite-rich conglomerate (canga) that contains iron ore	162.10	0.23
Czrk	Residual calcrete; massive, nodular, and cavernous limestone; mainly silicified	242.33	0.35
d	Dolerite dykes; interpreted from aeromagnetic data where dashed	94.84	0.14
PLHb	Brockman Iron Formation: banded iron-formation, chert, and pelite	1908.10	2.76
Qa	Alluvium - unconsolidated silt, sand, and gravel; in drainage channels and adjacent floodplains	2092.87	3.03
Qaa	Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains	4442.37	6.43

UNIT	DESCRIPTION	EXTENT IN STUDY AREA (ha)	PROPORTION OF STUDY AREA (%)
Qab	Alluvial sand, silt, and clay in floodplains, with gilgai surface in areas of expansive clay	5983.87	8.66
Qac	Clay and silt in claypans on floodplains	50.85	0.07
Qao	Alluvial sand, silt, and clay in floodplains adjacent to main drainage channels	6195.66	8.96
Qc	Colluvium - sand, silt, and gravel in outwash fans; scree and talus; proximal mass-wasting deposits	5003.24	7.24
Qhms	Coastal sand in beach deposits and dunes; chiefly marine sand reworked by wind, but includes some reworked alluvium near deltas; shelly sand contains Anadara granosa	20.35	0.03
Qw	Low-gradient sheetwash deposits - silt, sand, and pebbles on distal outwash fans; no defined drainage	3303.44	4.78
Qwb	Sand, silt, and clay in distal outwash fans, with gilgai surface in areas of expansive clay	2055.51	2.97
Qwc	Sheetwash sand, silt, and clay in distal outwash fans, with numerous claypans and minor clay-filled drainages	516.24	0.75
Qwf	Ferruginous sheetwash sand, silt, and clay in outwash fans, with clasts of iron formation	1855.68	2.68
Qws	Sand in distal outwash fans; no defined drainage	6774.67	9.80
TOTAL		**69,133.02**	**100**

Table 10: Land Descriptions of land types and systems within the study area (Van Vreeswyk *et al*. 2004)

UNIT	DESCRIPTION
Land type 1	**Hills and ranges with spinifex grasslands**
Black land system	Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits.
Booaloo land system	Granite hills, domes, tor fields and sandy plains supporting spinifex grasslands with scattered shrubs.
Capricorn land system	Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs.
Granitic land system	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.
McKay land system	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.
Newman land system	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands
Rocklea land system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands
Ruth land system	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands.
Land type 8	**Stony plains with spinifex grasslands**
Boolgeeda land system	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
Macroy land system	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands.
Pyramid land system	Stony gilgai plains supporting hard spinifex grasslands and minor tussock grasslands.
Satirist land system	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands.
Land type 9	**Stony gilgai plains with tussock grasslands and spinifex grasslands**
Wona land system	Basalt upland gilgai plains supporting Roebourne Plains grass and Mitchell grass tussock grasslands, minor hard spinifex grasslands or annual grasslands/herbfields.

UNIT	DESCRIPTION
Land type 11	**Sandplains with spinifex grasslands**
Uaroo land system	Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs.
Land type 12	**Wash plains on hardpan with groved mulga shrublands (sometimes spinifex understory)**
Jurrawarrina land system	Hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses.
Land type 13	**Alluvial plains with soft spinifex grasslands**
Mallina land system	Sandy surfaced alluvial plains supporting soft spinifex grasslands and minor hard spinifex and tussock grasslands.
Urandy land system	Stony plains, alluvial plains and drainage lines supporting shrubby soft spinifex grasslands.
Land type 14	**Alluvial plains with tussock grasslands or grassy shrublands**
Horseflat land system	Gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands.
Land type 15	**Alluvial plains with snakewood shrublands**
Hooley land system	Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands.
Sherlock land system	Stony alluvial plains supporting snakewood shrublands with patchy tussock grasses and spinifex grasslands
Land type 17	**River plains with grassy woodlands and shrublands, and tussock grasslands**
Coolibah land system	Flood plains with weakly gilgaied clay soils supporting coolibah woodlands with tussock grass understorey.
River land system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.
Land type 18	**Calcrete drainage plains with shrublands or spinifex grasslands**
Calcrete land system	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands.
Land type 19	**Coastal plains, dunes, mudflats and beaches with tussock grasslands, soft spinifex grasslands and halophytic shrublands**
Cheerawarra land system	Sandy coastal plains and saline clay plains supporting soft and hard spinifex grasslands and minor tussock grasslands.

APPENDIX THREE: DATABASE SEARCH RESULTS

Table 11: Combined flora database search results

Database searches: 1 = DPaW, 2 = *NatureMap* (**Figure 3**), 3 = *PMST*, 4 = Ecoscape records

SPECIES	DATABASE	*EPBC ACT* STATUS	DPaW STATUS
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	4	-	P1
Acacia bromilowiana	1	-	P4
Acacia daweana	1,2	-	P3
Acacia leeuweniana	1	-	P1
Acacia subtiliformis	1	-	P3
Adiantum capillus-veneris	1	-	P2
Astrebla lappacea	1,2,4	-	P3
Bothriochloa decipiens var. *cloncurrensis*	1	-	P1
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	1	-	P1
Calotis latiuscula	1	-	P3
Calotis squamigera	1	-	P1
Cladium procerum	1,2	-	P2
Dampiera anonyma	1,2,4	-	P3
Dampiera metallorum	1	-	P3
Eragrostis crateriformis	1	-	P3
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	1	-	P1
Eragrostis surreyana	1	-	P3
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	1	-	P2
Eremophila magnifica subsp. *magnifica*	1,2,4	-	P4
Eremophila magnifica subsp. *velutina*	1,2,4	-	P3
Eremophila sp. Hamersley Range (K. Walker KW 136)	1	-	P1
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	1	-	P1
Eremophila sp. West Angelas (S. van Leeuwen 4068)	1	-	P1
Eremophila spongiocarpa	1	-	P1
Eucalyptus lucens	1	-	P1
Euphorbia australis var. *glabra*	1	-	P2
Euphorbia inappendiculata var. *inappendiculata*	1	-	P2
Euphorbia inappendiculata var. *queenslandica*	1	-	P1
Fimbristylis sieberiana	1	-	P3
Geijera salicifolia	1	-	P3
Glycine falcata	1,4		P3
Goodenia nuda	1,2,4	-	P4
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	1	-	P3
Gymnanthera cunninghamii	1	-	P3

SPECIES	DATABASE	*EPBC ACT* STATUS	DPaW STATUS
Helichrysum oligochaetum	1,2	-	P1
Heliotropium muticum	1,2,4	-	P1
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	1	-	P2
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	1	-	P1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	1,2,4	-	P3
Indigofera sp. Gilesii (M.E. Trudgen 15869)	1	-	P3
Iotasperma sessilifolium	1,2,4	-	P3
Ipomoea racemigera	1	-	P2
Josephinia sp. Marandoo (M.E. Trudgen 1554)	2	-	P1
Lepidium catapycnon	1,3	Vulnerable	T
Livistona alfredii	1	-	P4
Nicotiana heterantha	1,2	-	P1
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	1,2,4	-	P3
Olearia mucronata	1	-	P3
Owenia acidula	1	-	P3
Oxalis sp. Pilbara (M.E. Trudgen 12725)	1	-	P2
Paspalidium retiglume	1,2,4	-	P2
Pentalepis trichodesmoides subsp. *hispida*	1	-	P2
Pilbara trudgenii	1	-	P2
Pleurocarpaea gracilis	1	-	P3
Polymeria distigma	1	-	P3
Ptilotus subspinescens	1	-	P3
Rhagodia sp. Hamersley (M. Trudgen 17794)	1,4	-	P3
Rhynchosia bungarensis	1,2,4	-	P4
Rostellularia adscendens var. *latifolia*	1,2,4	-	P3
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	1	-	P2
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	1	-	P1
Sida sp. Barlee Range (S. van Leeuwen 1642)	1,2,4	-	P3
Sida sp. Hamersley Range (K. Newbey 10692)	1,2,4	-	P1
Solanum albostellatum	1,4	-	P3
Solanum kentrocaule	1	-	P3
Spartothamnella puberula	1	-	P2
Sporobolus pulchellus	1	-	P1
Stackhousia clementii	1	-	P3
Swainsona thompsoniana	1,2	-	P3
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1,2,4	-	P1
Tetratheca fordiana	1	-	P1
Teucrium pilbaranum	1	-	P1
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	1,4	-	P3
Thryptomene wittweri	1	Vulnerable	T

SPECIES	DATABASE	*EPBC ACT* STATUS	DPaW STATUS
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	1	-	P2
Triodia sp. Karijini (S. van Leeuwen 4111)	1	-	P1
Triodia sp. Mt Ella (M.E. Trudgen 12739)	1	-	P3
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	1	-	P3
Vigna sp. central (M.E. Trudgen 1626)	1,2,4	-	P2
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	4	-	P3
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	1	-	P1

Barbula ehrenbergii (P1), identified by the DPaW database search, was removed from the list as it is not a vascular plant and surveys for mosses are not within the scope of the project.

Figure 3: *NatureMap* (DEC 2007-2014) search area

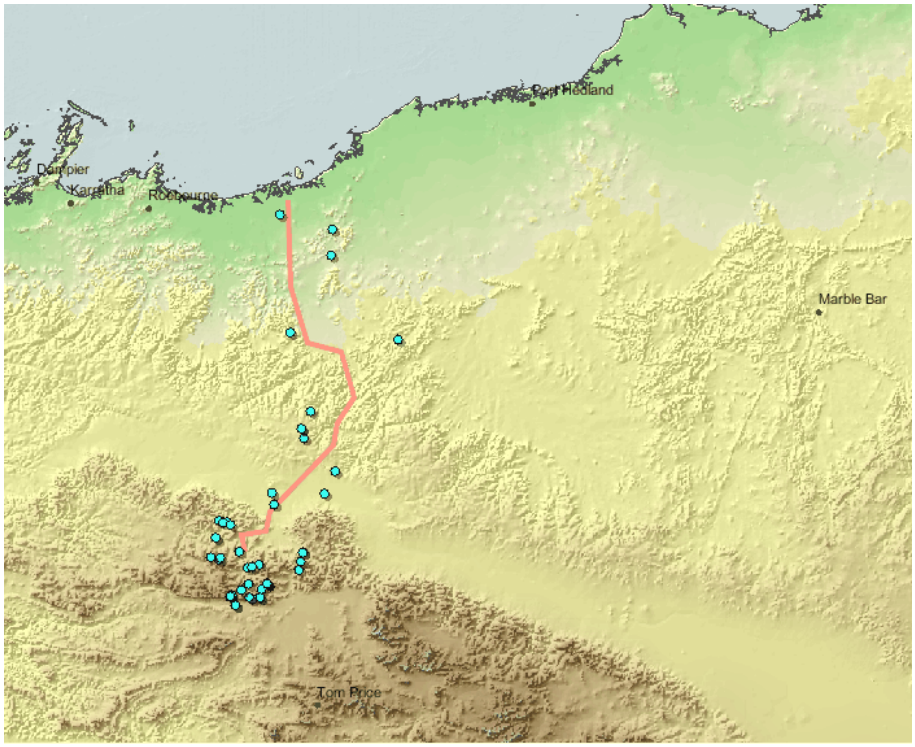

Table 12: Conservation significant flora details

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
		T			
Lepidium catapycnon	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag, white flowers	Oct	Skeletal	Hillsides	*Triodia wiseana* hummock grassland. With *Acacia bivenosa, A. inaequilatera, A. pruinocarpa, A. pyrifolia, Triodia* sp. Shovelanna Hill
Thryptomene wittweri	Spreading or rounded shrub, 0.5–1.5(–2.1) m high	Apr/Jul/Aug	Skeletal red stony soils	Breakaways, stony creek beds	*Eucalyptus kingsmillii*
		P1			
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Erect shrub to 3 m, yellow or orange flowers	Jun-Nov	Orange brown sandy loam, red sand, clay	Sandplain, dunes, floodplain	Grassland, shrubland, *Acacia* shrubland
Acacia leeuweniana	Narrow, obconic tree, to 14 m high, bark minni ritchi	Apr-May	Granitic sandy loam	Granite outcrop high in landscape	*Acacia retivenea, A. tumida, Terminalia canescens*
Bothriochloa decipiens var. *cloncurrensis*	Perennial grass to 1.4 m high	May	Loam, clay	Damp depression, clay pan	*Eucalyptus camaldulensis*, Mulga
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Annual herb to 40 cm, purple/blue/white/pink flowers	Mar-Sep	Clay	Flats	Mulga, grassland
Calotis squamigera	Procumbent annual, herb, to 0.21 m high	Jul	Pebbly loam	Plain	*Acacia xiphophylla*, Mulga
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Tussock-forming perennial, grass-like or herb, to 0.3 m high	Sep	Red-brown skeletal soils, ironstone	Steep slopes, summits	*Eucalyptus kingsmillii*
Eremophila sp. Hamersley Range (K. Walker KW 136)	Shrub to 2 m tall, rounded crowded canopy, Flowers white-cream-yellow-pink-purple	Aug-Sep	Ironstone	Hill crest, cliff top , gorge top	Mulga
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Shrub to 1 m high, rounded	-	Ironstone	High hill	*Eucalyptus leucophloia, Corymbia hamersleyana*, Mulga
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Spindly shrub to 3 m high	Sep	Banded ironstone	High in landscape, hill summit, scree	*Eucalyptus gamophylla, E. kingsmillii*, Mulga
Eremophila spongiocarpa	Compact, succulent-leaved shrub, to 1 m high	May/Sep	Alluvium	Weakly saline alluvial plain on margins of marsh	*Tecticornia* spp., Mulga, *Frankenia* sp.
Eucalyptus lucens	Mallee, to 4.5 m high, bark smooth, white, sometimes slightly powdery; leaves glossy green	Jan-Apr	Ironstone	Rocky slopes and mountain tops, high in the landscape	*Eucalyptus kingsmillii*
Euphorbia inappendiculata var. *queenslandica*	Herb to 2 cm high	May-Jun	Cracking clay	Clay plain, depression	*Eriachne benthamii, Themeda* sp. Hamersley Station, grassland
Helichrysum oligochaetum	Annual herb to 25 cm, yellow flowers	Aug-Nov	Red clay	Alluvial plains, drainage lines	*Eucalyptus camaldulensis, E. victrix*
Heliotropium muticum	Ascending to spreading perennial herb to 0.3 m, white flowers	May-Nov	Sand, clayey sand, granite	Sandplain, floodplain	*Acacia* shrubland, *Acacia stellaticeps, Triodia*
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Shrub to 2.5 m high, purple flowers	Jul-Sep	Ironstone	Gorges, crevices, gullies	*Corymbia ferriticola*
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Erect shrub or herb, to 30 cm, pink flowers	Aug	Alluvial	Drainage lines, plains	Mulga, *Acacia* spp.

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Nicotiana heterantha	Annual or short-lived perennial herb to 0.5 m. White-cream flowers	Mar-Sep	Black clay, alluvial sand, sandy clay	Seasonally wet flats, floodplain, creeklines	*Tecticornia, Eucalyptus victrix*
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Open shrub to 1.2 m high	Aug	Cracking clay	Creek bed	-
Sida sp. Hamersley Range (K. Newbey 10692)	Open shrub to 2 m, yellow flower. Discolorous leaves with white margins	Apr-Oct	Scree, skeletal soil	Gorge, cliff	*Acacia pruinocarpa, Corymbia ferriticola, Eucalyptus gamophylla, E. leucophloia,*
Sporobolus pulchellus	Ephemeral grass to 0.4 m high	Feb-Nov	Sand, sandstone, sandy ironstone	Rocky hills	-
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Erect or sprawling shrub, maroon-red-purple or pink flowers	Mar-Oct	Sand, sandy loam	Coastal dunes, plains	*Acacia coriacea, Triodia epactia, Spinifex longifolius, Acacia stellaticeps, *Cenchrus ciliaris*
Tetratheca fordiana	Dwarf shrub, 0.3–0.4 m high	Jul	Ironstone	Cliff, crest, ridge	*Eucalyptus kingsmillii, Triodia wiseana*
Teucrium pilbaranum	Rounded shrub, to 0.4 m high, white flowers	May-Sep	Clay, calcrete	Crab hole plain in a river floodplain, margin of calcrete table	*Chrysopogon fallax, Eucalyptus victrix*, *Eriachne benthamii*
Triodia sp. Karijini (S. van Leeuwen 4111)	Hummock grass to 1 m high	May-Sep	Ironstone, banded ironstone	Hilltops, upper slopes, high hills	*Eucalyptus kingsmillii, Eucalyptus leucophloia, Corymbia hamersleyana*
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Tall daisy to 1 m , open canopy, in late flower and dehiscing fruit, cream/white flowers	May/Sep	Clay loam	Plain	*Acacia* thicket over mixed grassland. *Acacia aneura, Eucalyptus ?xerothermica, Themeda ?triandra.*
P2					
Adiantum capillus-veneris	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-	-	Moist, sheltered sites in gorges and on cliff walls	-
Cladium procerum	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov	Alluvium	Perennial pools, coastal swamps, gorges	*Cyperus, Typha*, date palms
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Low shrub 0.5 m tall with red or pinky flowers with long exerted stamens	May-Jul	Stony	Slopes, flats, drainage lines	Mulga, *Corymbia hamersleyana*
Euphorbia australis var. *glabra*	Annual herb	-	Alluvium, cracking clay	Flats, drainage lines	*Eucalyptus victrix*, grassland
Euphorbia inappendiculata var. *inappendiculata*	Prostrate annual herb to 5 cm	May-Aug	Clay, cracking clay	Floodplain, plain, high in landscape	*Aristida* and *Astrebla* grasslands, *Acacia xiphophylla*
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Spindly upright shrub to 3 m tall, purple flower	May-Aug	Stony soil, Brockman Iron Formation	Hill summits, high in landscape	*Eucalyptus kingsmillii, E, leucophloia* & *E. gamophylla* over *Acacia aneura, A. rhodophloia* over *Scaevola acacioides, Eremophila latrobei* over *Triodia wiseana*
Ipomoea racemigera	Creeping annual herb, climber, white flowers	Apr	Basalt, ?alluvium	Valley	Grassland
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Small herb to 10 cm tall. Leaves green above, purple below; yellow flowers	May/Sep	Red-brown pebbly/rocky loam amongst boulders	Drainage lines, gullies	Mulga, *Triodia* grassland, *Eucalyptus leucophloia*

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Paspalidium retiglume	Annual grass to 0.5 m high	Apr-May	Clay, cracking clay	Plain	Grassland, *Neptunia*
Pentalepis trichodesmoides subsp. *hispida*	Spreading shrub to 1.3 m high x 2 m wide, yellow flowers	Apr-Dec	Basalt, loam, stony clay sand, alluvium	Screes, drainage lines, hills	*Triodia*
Pilbara trudgenii	Gnarled, aromatic shrub, to 1 m high	Sep	Ironstone, skeletal soil	Hill summits, steep slopes, screes, cliff faces	*Corymbia ferriticola*, Mulga, *Eucalyptus kingsmillii, Astrotricha hamptonii*
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Shrub, to 1 m high	Jul-Aug.	Skeletal, brown gritty soil over basalt	Summits of hills, steep hills	*Eucalyptus kingsmillii* and *Eucalyptus* aff. *hamersleyana* over *Acacia hamersleyensis* over *Ptilotus rotundifolius* over *Triodia* sp. (SVL 2476).
Spartothamnella puberula	Shrub, 0.35–1.5 m high, blue-white flowers	Sep-Nov	Rocky loam, sandy or skeletal soils, clay	Hills, gorges	*Eucalyptus leucophloia, Corymbia ferriticola*
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Low succulent herb with pink-white flowers	Mar-Jul	Sand, gibber plain	Plain	*Triodia longiceps, T. pungens*
Vigna sp. central (M.E. Trudgen 1626)	Prostrate creeper 50 cm high x 50 cm wide	Jan-Oct	Clay, alluvium	Valleys	*Triodia epactia*, Mulga, *Corymbia hamersleyana*
P3					
Acacia daweana	Spreading shrub, 0.3–1.5(–2) m high	Jul-Sep	Stony red loam, colluvium	Low rocky rises, along drainage lines, scree	*Eucalyptus gamophylla, Corymbia deserticola, C. hamersleyana*
Acacia subtiliformis	Spindly, slender, erect shrub, to 3.5 m high	Jun	Calcrete	On rocky calcrete plateau	*Eucalyptus leucophloia, Triodia wiseana, T. basedowii*
Astrebla lappacea	Tufted perennial, grass, 0.1–0.5 m high	Apr	Clay	Plain	*Acacia xiphophylla*, grassland
Calotis latiuscula	Erect herb, to 0.5 m high	Jun-Oct	Sand, loam, clay, calcrete	Rocky hillsides, floodplains, rocky creeks or river beds	*Themeda triandra*, Mulga
Dampiera anonyma	Multistemmed perennial, herb, to 0.5(-1) m high, purple flowers	Jun-Sep	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite	Hill summits, upper slopes	*Eucalyptus leucophloia, E. kingsmillii, Acacia hamersleyensis*
Dampiera metallorum	Rounded, multistemmed perennial, herb, to 0.5 m high	Apr-Oct	Skeletal red-brown gravely soils over banded ironstone	Steep slopes and summits	*Eucalyptus gamophylla, E. kingsmillii, E. leucophloia*
Eragrostis crateriformis	Annual, grass-like or herb, 0.17–0.42 m high	Jan-Jul	Clayey loam or clay	Creek banks, depressions	Grassland, *Acacia* spp, *Triodia* spp., Buffel grass
Eragrostis surreyana	Tufted annual herb 5-8 (-13) cm high	May-Sep	Red-brown clay	Drainage line	*Eucalyptus victrix, E. camaldulensis, Melaleuca*
Eremophila magnifica subsp. *velutina*	Shrub, 0.5–1.5 m high, purple flowers	Aug-Sep	Skeletal soils over ironstone	Summits, hills, rocky areas on slopes	*Eucalyptus leucophloia*
Fimbristylis sieberiana	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25–0.6 m high	May-Jun	Mud, skeletal soil pockets	Pool edges, sandstone cliffs	*Cyperus, Eleocharis, Cladium*

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Geijera salicifolia	Tree, 1.5–6 m high	Sep	Skeletal soils, stony soils	Massive rock scree, gorges	*Eucalyptus leucophloia, E. xerothermica*
Glycine falcata	Mat-forming perennial, herb, to 0.2 m high. Fl. blue, purple	May-Jul	Black clayey sand	Floodplains. Along drainage depressions in crabhole plains on river	*Eriachne* grassland,
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect annual or biennial, herb, to 0.2 m high, yellow flowers	Feb-Sep	Red-brown clay soil, calcrete	Low undulating plain, swampy plains	*Melaleuca eleuterostachya*, *Acacia bivenosa* over *Triodia wiseana, Triodia angusta*
Gymnanthera cunninghamii	Erect shrub 1-2 m high, cream-yellow-green flowers	Jan-Dec	Sand, clay loam	River bed, floodplain	*Eucalyptus victrix, E. camaldulensis*, near Mangroves
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Erect shrub to 2.3 m high, red-pink flowers	Jul-Oct	Alluvium	Creeks and gorges	*Corymbia hamersleyana, Eucalyptus xerothermica, E. victrix*
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Shrub, to 1.5 m high, dull pink flowers	May/Aug	Pebbly loam amongst boulders & outcrops, Brockman Iron Formation	Hills	*Eucalyptus gamophylla, E. leucophloia, Corymbia ferriticola*
Iotasperma sessilifolium	Erect herb. Fl. pink.	May-Sep	Cracking clay, black loam.	Edges of waterholes, plains, drainage line	Herbland, grassland
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05–0.1 m high	Mar	Cracking clay, basalt	Gently undulating plain with large surface rocks, flat crabholed plain	*Astrebla, Eriachne* and *Themeda* grasslands
Olearia mucronata	Densely branched, unpleasantly aromatic shrub, 0.6–1 m high. Fl. white, yellow	Aug-Jan	Ironstone	Cliffs, hills, upper slopes	*Eucalyptus leucophloia, Astrotricha hamptonii,* Mulga
Owenia acidula	Small tree to 8 m high, pendulous branches	Apr-Sep	-	Creek	-
Pleurocarpaea gracilis	Rounded shrub, to 0.4 m high	Oct	Skeletal, brown gritty soil over ironstone	Hill summit	*Eucalyptus leucophloia* and *E. gamophylla* over *Senna pruinosa, Acacia bivenosa, A. maitlandii* and *A. pyrifolia* over *A. marramamba* over *Triodia* sp.
Polymeria distigma	Prostrate herb, pink flowers	Apr-Jul	Sandy soil, clay	Coastal plain, floodplain	*Astrebla pectinata*
Ptilotus subspinescens	Compact shrub, to 0.8 m high. Fl. pink	Sep–Oct	Ironstone, basalt, quartz	Gentle rocky slopes, screes and the bases of screes	*Triodia angusta, T. longiceps, T. wiseana, Eucalyptus leucophloia*, Mulga
Rhagodia sp. Hamersley (M. Trudgen 17794)	Erect shrub	Apr-Nov	Sandy loam, alluvium	Floodplain / lower slopes	Mulga, *Eucalyptus leucophloia, E. xerothermica*
Rostellularia adscendens var. *latifolia*	Herb or shrub, 0.1–0.3 m high, purple flowers	Apr-May	Ironstone, calcrete	Near creeks, rocky hills	*Eucalyptus victrix, Corymbia ferriticola*, Mulga, *E. xerothermica, E. kingsmillii*
Sida sp. Barlee Range (S. van Leeuwen 1642)	Spreading shrub, to 0.5 m high	Aug	Skeletal red soils pockets	Steep slope, drainage lines, gullies	*Eucalyptus leucophloia, Acacia citrinoviridis, A. pruinocarpa, Corymbia ferriticola*
Solanum albostellatum	Sub-shrub to 40 cm, mauve flowers	Mar-May	Cracking clay	Plain, floodplain	Grassland

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Solanum kentrocaule	Shrub to 1.5 m high, extremely prickly. Purple flowers	Jul-Oct	Ironstone, basalt	Hills, occasionally creeks	*Eucalyptus leucophloia, E. kingsmillii*
Stackhousia clementii	Herb or shrub to 45 cm high, yellow-brown flowers	Apr-Oct	Clay	Floodplain	Grassland (*Themeda* sp. Hamersley Station), *Eucalyptus victrix*
Swainsona thompsoniana	Prostrate annual, herb, to 0.1 m high	Mar	Clay	Flat crabholed plain	Open *Eremophila maculata* shrubland over moderately dense herbs, tussock grassland of *Astrebla pectinata*
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	Aug	Red clay	Clay pan, grass plain	*Polymeria* sp. Hamersley (M.E. Trudgen 11353) herbland with *Chrysopogon fallax, Astrebla pectinata, Aristida latifolia* very open tussock grassland
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Perennial, grass-like or herb, 0.4 m high	May-Aug	Light orange-brown, pebbly loam	Amongst rocks & outcrops, gully slopes, scree	*Eucalyptus leucophloia*, Mulga
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Perennial hummock grass to 0.6 m high	Feb-Oct	Ironstone, pisolite (Robe land system)	Rocky hills and mesas	*Eucalyptus leucophloia, Triodia wiseana*
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Annual climbing herb, yellow flowers	Mar-Jun	Skeletal	Rock piles, scree	*Triodia epactia, T. angusta, Terminalia supranitifolia, Brachychiton acuminatus, Acacia inaequifolia*
P4					
Acacia bromilowiana	Tree or shrub, to 12 m high	Jul-Aug	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt	Rocky hills, breakaways, scree slopes, gorges, creek beds	*Eucalyptus leucophloia, Corymbia hamersleyana*
Eremophila magnifica subsp. *magnifica*	Shrub, 0.5-1.5 m high	Aug-Nov	Skeletal soils over ironstone.	Rocky screes	*Eucalyptus leucophloia, Corymbia hamersleyana*
Goodenia nuda	Erect to ascending herb, to 0.5 m high Fl. yellow	Apr-Aug	Red--brown clay loam, ironstone	Mostly low lying areas (floodplains, outwash areas), occasionally hills	*Acacia tumida* tall shrubland with mixed grass understorey including *Triodia epactia*
Livistona alfredii	Palm to 10 m high	Jun-Sep	-	Edges of permanent pools, with flowing water	*Eucalyptus camaldulensis*
Rhynchosia bungarensis	Compact, prostrate shrub, to 0.5 m high	Mar-Nov	Pebbly, coarse sand	Banks of flow line	*Corymbia hamersleyana, Eucalyptus camaldulensis, Triodia wiseana, E. victrix*
Significant According to *Guidance Statement No. 51*					
Unnamed *Josephinia* sp.	Annual? low rounded hairy shrub 40-50 cm high, pink flowers	May	Rocky outcrops	Hills, gorges	*Acacia monticola, Triodia wiseana, Corymbia hamersleyana, Eucalyptus leucophloia*

Table 13: Conservation significant flora flowering times

SPECIES NAME	DESCRIPTION	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
TF														
Lepidium catapycnon	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag, white flowers	Oct										■		
Thryptomene wittweri	Spreading or rounded shrub, 0.5–1.5(–2.1) m high	Apr/Jul/Aug				■			■	■				
P1														
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Erect shrub to 3 m, yellow or orange flowers	Jun-Nov						■	■	■	■	■	■	
Acacia leeuweniana	Narrow, obconic tree, to 14 m high, bark minni ritchi	Apr-May				■	■							
Bothriochloa decipiens var. *cloncurrensis*	Perennial grass to 1.4 m high	May					■							
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Annual herb to 40 cm, purple/blue/white/pink flowers	Mar-Sep			■	■	■	■	■	■	■			
Calotis squamigera	Procumbent annual, herb, to 0.21 m high	Jul							■					
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Tussock-forming perennial, grass-like or herb, to 0.3 m high	Sep									■			
Eremophila sp. Hamersley Range (K. Walker KW 136)	Shrub to 2 m tall, rounded crowded canopy, Flowers white-cream-yellow-pink-purple	Aug-Sep								■	■			
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Shrub to 1 m high, rounded	-												
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Spindly shrub to 3 m high	Sep									■			
Eremophila spongiocarpa	Compact, succulent-leaved shrub, to 1 m high	May/Sep					■	■	■	■	■			
Eucalyptus lucens	Mallee, to 4.5 m high, bark smooth, white, sometimes slightly powdery; leaves glossy green	Jan-Apr	■	■	■	■								
Euphorbia inappendiculata var. *queenslandica*	Prostrate annual herb to 5 cm	May-Aug					■	■	■	■				
Helichrysum oligochaetum	Annual herb to 25 cm, yellow flowers	Aug-Nov								■	■	■	■	
Heliotropium muticum	Ascending to spreading perennial herb to 0.3 m, white flowers	May-Nov					■	■	■	■	■	■	■	
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Shrub to 2.5 m high, purple flowers	Jul-Sep							■	■	■			
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Erect shrub or herb, to 30 cm, pink flowers	Aug								■				
Nicotiana heterantha	Annual or short-lived perennial herb to 0.5 m. White-cream flowers	Mar-Sep			■	■	■	■	■	■	■			
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Open shrub to 1.2 m high	Aug								■				

SPECIES NAME	DESCRIPTION	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Sida sp. Hamersley Range (K. Newbey 10692)	Open shrub to 2 m, yellow flower. Discolorous leaves with white margins	Apr-Oct												
Sporobolus pulchellus	Ephemeral grass to 0.4 m high	Feb-Nov												
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Erect or sprawling shrub, maroon-red-purple or pink flowers	Mar-Oct												
Tetratheca fordiana	Dwarf shrub, 0.3–0.4 m high	Jul												
Teucrium pilbaranum	Rounded shrub, to 0.4 m high, white flowers	May-Sep												
Triodia sp. Karijini (S. van Leeuwen 4111)	Hummock grass to 1 m high	May-Sep												
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Tall daisy to 1 m , open canopy, in late flower and dehiscing fruit, cream/white flowers	May/Sep												
P2														
Adiantum capillus-veneris	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-												
Cladium procerum	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov												
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Low shrub 0.5 m tall with red or pinky flowers with long exerted stamens	May-Jul												
Euphorbia australis var. *glabra*	Annual herb	-												
Euphorbia inappendiculata var. *inappendiculata*	Herb to 2 cm high	May-Jun												
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Spindly upright shrub to 3 m tall	May-Aug												
Ipomoea racemigera	Creeping annual herb, climber, white flowers	Apr												
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Small herb to 10 cm tall. Leaves green above, purple below; yellow flowers	May/Sep												
Paspalidium retiglume	Annual grass to 0.5 m high	Apr-May												
Pentalepis trichodesmoides subsp. *hispida*	Spreading shrub to 1.3 m high x 2 m wide, yellow flowers	Apr-Dec												
Pilbara trudgenii	Gnarled, aromatic shrub, to 1 m high	Sep												
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Shrub, to 1 m high	Jul-Aug.												
Spartothamnella puberula	Shrub, 0.35–1.5 m high, blue-white flowers	Sep-Nov												
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Low succulent herb with pink-white flowers	Mar-Jul												
Vigna sp. central (M.E. Trudgen 1626)	Prostrate creeper 50 cm high x 50 cm wide	Jan-Oct												
P3														
Acacia daweana	Spreading shrub, 0.3–1.5(–2) m high	Jul-Sep												
Acacia subtiliformis	Spindly, slender, erect shrub, to 3.5 m high	Jun												

SPECIES NAME	DESCRIPTION	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Astrebla lappacea	Tufted perennial, grass, 0.1–0.5 m high	Apr				■								
Calotis latiuscula	Erect herb, to 0.5 m high	Jun-Oct							■	■	■	■		
Dampiera anonyma	Multistemmed perennial, herb, to 0.5(-1) m high, purple flowers	Jun-Sep						■	■	■	■			
Dampiera metallorum	Rounded, multistemmed perennial, herb, to 0.5 m high	Apr-Oct				■	■	■	■	■	■	■		
Eragrostis crateriformis	Annual, grass-like or herb, 0.17–0.42 m high	Jan-Jul	■	■	■	■	■	■	■					
Eragrostis surreyana	Tufted annual herb 5-8 (-13) cm high	May-Sep					■	■	■	■	■			
Eremophila magnifica subsp. *velutina*	Shrub, 0.5–1.5 m high, purple flowers	Aug-Sep								■	■			
Fimbristylis sieberiana	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25–0.6 m high	May-Jun					■	■						
Geijera salicifolia	Tree, 1.5–6 m high	Sep									■			
Glycine falcata	Mat-forming perennial, herb, to 0.2 m high. Fl. blue, purple	May-Jul					■	■	■					
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect annual or biennial, herb, to 0.2 m high, yellow flowers	Feb-Sep		■	■	■	■	■	■	■	■			
Gymnanthera cunninghamii	Erect shrub 1-2 m high, cream-yellow-green flowers	Jan-Dec	■	■	■	■	■	■	■	■	■	■	■	■
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Erect shrub to 2.3 m high, red-pink flowers	Jul-Oct					■	■	■	■	■	■		
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Shrub, to 1.5 m high, dull pink flowers	May/Aug					■	■	■	■	■			
Iotasperma sessilifolium	Erect herb. Fl. pink.	May-Sep					■	■	■	■	■			
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05–0.1 m high	Mar			■									
Olearia mucronata	Densely branched, unpleasantly aromatic shrub, 0.6–1 m high. Fl. white, yellow	Aug-Jan	■							■	■	■	■	■
Owenia acidula	Small tree to 8 m high, pendulous branches	Apr-Sep				■	■	■	■	■	■			
Pleurocarpaea gracilis	Rounded shrub, to 0.4 m high	Oct				■	■	■	■	■	■	■		
Polymeria distigma	Prostrate herb, pink flowers	Apr-Jul				■	■	■	■					
Ptilotus subspinescens	Compact shrub, to 0.8 m high. Fl. pink	Sep–Oct									■	■		
Rhagodia sp. Hamersley (M. Trudgen 17794)	Erect shrub	Apr-Nov				■	■	■	■	■	■	■	■	
Rostellularia adscendens var. *latifolia*	Herb or shrub, 0.1–0.3 m high, purple flowers	Apr-May				■	■							
Sida sp. Barlee Range (S. van Leeuwen 1642)	Spreading shrub, to 0.5 m high	Aug								■				
Solanum albostellatum	Sub-shrub to 40 cm, mauve flowers	Mar-May			■	■	■							
Solanum kentrocaule	Shrub to 1.5 m high, extremely prickly. Purple flowers	Jul-Oct							■	■	■	■		

SPECIES NAME	DESCRIPTION	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Stackhousia clementii	Herb or shrub to 45 cm high, yellow-brown flowers	Apr-Oct												
Swainsona thompsoniana	Prostrate annual, herb, to 0.1 m high	Mar												
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	Aug												
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Perennial, grass-like or herb, 0.4 m high	May-Aug												
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Perennial hummock grass to 0.6 m high	Feb-Oct												
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Annual climbing herb, yellow flowers	Mar-Jun												
P4														
Acacia bromilowiana	Tree or shrub, to 12 m high	Jul-Aug												
Eremophila magnifica subsp. *magnifica*	Shrub, 0.5-1.5 m high	Aug-Nov												
Goodenia nuda	Erect to ascending herb, to 0.5 m high Fl. yellow	Apr-Aug												
Livistona alfredii	Palm to 10 m high	Jun-Sep												
Rhynchosia bungarensis	Compact, prostrate shrub, to 0.5 m high	Mar-Nov												
Significant according to *Guidance Statement No. 51*														
Unnamed *Josephinia* sp.	Annual? low rounded hairy shrub 40-50 cm high, pink flowers	May												

APPENDIX FOUR: CONSERVATION SIGNIFICANT FLORA LIKELIHOOD ASSESSMENT

Table 14: Conservation significant flora likelihood assessment

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
T								
Lepidium catapycnon	Skeletal	Hillsides	*Triodia wiseana*, *Acacia bivenosa, A. inaequilatera, A. pruinocarpa, A. pyrifolia, T.* sp. Shovelanna Hill	Y	N	Y	50-100 km*	Highly unlikely
Thryptomene wittweri	Skeletal red stony soils	Breakaways, stony creek beds	*Eucalyptus kingsmillii*	Y	N	N	>100 km*	Highly unlikely
P1								
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Orange brown sandy loam, red sand, clay	Sandplain, dunes, floodplain	Grassland, shrubland, *Acacia* shrubland	Y	Y	Y	20-50 km*	Possible
Acacia leeuweniana	Granitic sandy loam	Granite outcrop high in landscape	*Acacia retivenea, A. tumida, Terminalia canescens*	Y	Y	Y	20-50 km	Possible
Bothriochloa decipiens var. *cloncurrensis*	Loam, clay	Damp depression, clay pan	*Eucalyptus camaldulensis*, Mulga	Y	Y	Y	50-100 km*	Unlikely
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Clay	Flats	Mulga, grassland	Y	Y	Y	20-50 km	Possible
Calotis squamigera	Pebbly loam	Plain	*Acacia xiphophylla*, Mulga	Y	Y	Y	50-100 km*	Unlikely
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Red-brown skeletal soils, ironstone	Steep slopes, summits	*Eucalyptus kingsmillii*	Y	Y	N	>100 km*	Highly unlikely
Eremophila sp. Hamersley Range (K. Walker KW 136)	Ironstone	Hill crest, cliff top , gorge top	Mulga	Y	Y	Y	>100 km*	Highly unlikely
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Ironstone	High hill	*Eucalyptus leucophloia, Corymbia hamersleyana*, Mulga	Y	N	Y	>100 km*	Highly unlikely
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Banded ironstone	High in landscape, hill summit, scree	*Eucalyptus gamophylla, E. kingsmillii*, Mulga	Y	N	N	>100 km*	Highly unlikely
Eremophila spongiocarpa	Alluvium	Weakly saline alluvial plain on margins of marsh	*Tecticornia* spp., Mulga, *Frankenia* sp.	Y	N	N	>100 km*	Highly unlikely
Eucalyptus lucens	Ironstone	Rocky slopes and mountain tops, high in the landscape	*Eucalyptus kingsmillii*	Y	N	N	50-100 km*	Highly unlikely

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Euphorbia inappendiculata var. *queenslandica*	Cracking clay	Clay plain, depression	*Eriachne benthamii, Themeda* sp. Hamersley Station, grassland	Y	Y	Y	20-50 km	Possible
Helichrysum oligochaetum	Red clay	Alluvial plains, drainage lines	*Eucalyptus camaldulensis, E. victrix*	Y	Y	Y	<10 km	Possible
Heliotropium muticum	Sand, clayey sand, granite	Sandplain, floodplain	*Acacia* shrubland, *Acacia stellaticeps, Triodia*	Y	Y	Y	<10 km	Possible
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Ironstone	Gorges, crevices, gullies	*Corymbia ferriticola*	Y	Y	Y	20-50 km	Possible
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Alluvial	Drainage lines, plains	Mulga, *Acacia* spp.	Y	Y	Y	<10 km* †	Possible
Nicotiana heterantha	Black clay, alluvial sand, sandy clay	Seasonally wet flats, floodplain, creeklines	*Tecticornia, Eucalyptus victrix*	Y	Y	N	10-20 km	Possible
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Cracking clay	Creek bed	-	Y	Y	Y	50-100 km*	Unlikely
Sida sp. Hamersley Range (K. Newbey 10692)	Scree, skeletal soil	Gorge, cliff	*Acacia pruinocarpa, Corymbia ferriticola, Eucalyptus gamophylla, E. leucophloia,*	Y	Y	Y	<10 km	Possible
Sporobolus pulchellus	Sand, sandstone, sandy ironstone	Rocky hills	-	Y	N	N	No records*	Highly unlikely
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Sand, sandy loam	Coastal dunes, plains	*Acacia coriacea, Triodia epactia, Spinifex longifolius, Acacia stellaticeps, *Cenchrus ciliaris*	Y	N	N	10-20km	Unlikely
Tetratheca fordiana	Ironstone	Cliff, crest, ridge	*Eucalyptus kingsmillii, Triodia wiseana*	Y	N	N	>100 km*	Highly unlikely
Teucrium pilbaranum	Clay, calcrete	Crab hole plain in a river floodplain, margin of calcrete table	*Chrysopogon fallax*, *Eucalyptus victrix*, *Eriachne benthamii*	Y	Y	Y	20-50 km*	Possible
Triodia sp. Karijini (S. van Leeuwen 4111)	Ironstone, banded ironstone	Hilltops, upper slopes, high hills	*Eucalyptus kingsmillii, Eucalyptus leucophloia, Corymbia hamersleyana*	Y	Y	Y	>100 km*	Highly unlikely
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Clay loam	Plain	*Acacia* thicket over mixed grassland. *Acacia aneura, Eucalyptus ?xerothermica, Themeda ?triandra*	Y	Y	Y	>100 km*	Unlikely
P2								
Adiantum capillus-veneris	-	Moist, sheltered sites in gorges and on cliff walls	-	?	Y	?	20-50 km*	Highly unlikely

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Cladium procerum	Alluvium	Perennial pools, coastal swamps, gorges	*Cyperus, Typha*, date palms	Y	Y	Y	10-20 km	Possible
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Stony	Slopes, flats, drainage lines	Mulga, *Corymbia hamersleyana*	Y	Y	Y	>100 km*	Unlikely
Euphorbia australis var. glabra	Alluvium, cracking clay	Flats, drainage lines	*Eucalyptus victrix*, grassland	Y	Y	Y	20-50 km	Possible
Euphorbia inappendiculata var. *inappendiculata*	Clay, cracking clay	Floodplain, plain, high in landscape	*Aristida* and *Astrebla* grasslands, *Acacia xiphophylla*	Y	Y	Y	20-50 km	Possible
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Stony soil, Brockman Iron Formation	Hill summits, high in landscape	*Eucalyptus kingsmillii, E, leucophloia* & *E. gamophylla* over *Acacia aneura, A. rhodophloia* over *Scaevola acacioides, Eremophila latrobei* over *Triodia wiseana*	Y	N	N	>100 km*	Highly unlikely
Ipomoea racemigera	Basalt, ?alluvium	Valley	Grassland	Y	Y	Y	50-100 km*	Possible
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Red-brown pebbly/rocky loam amongst boulders	Drainage lines, gullies	Mulga, *Triodia* grassland, *Eucalyptus leucophloia*	Y	Y	Y	50-100 km††	Possible
Paspalidium retiglume	Clay, cracking clay	Plain	Grassland, *Neptunia*	Y	Y	Y	<10 km	Possible
Pentalepis trichodesmoides subsp. *hispida*	Basalt, loam, stony clay sand, alluvium	Screes, drainage lines, hills	*Triodia*	Y	Y	Y	50-100 km*	Possible
Pilbara trudgenii	Ironstone, skeletal soil	Hill summits, steep slopes, screes, cliff faces	*Corymbia ferriticola*, Mulga, *Eucalyptus kingsmillii, Astrotricha hamptonii*	Y	N	N	>100 km*	Highly unlikely
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Skeletal, brown gritty soil over basalt	Summits of hills, steep hills	*Eucalyptus kingsmillii* and *Eucalyptus* aff. *hamersleyana* over *Acacia hamersleyensis* over *Ptilotus rotundifolius* over *Triodia* sp. (SVL 2476).	Y	N	N	50-100 km*	Highly unlikely
Spartothamnella puberula	Rocky loam, sandy or skeletal soils, clay	Hills, gorges	*Eucalyptus leucophloia, Corymbia ferriticola*	Y	Y	Y	20-50 km	Possible
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Sand, gibber plain	Plain	*Triodia longiceps, T. pungens*	Y	Y	Y	50-100 km*	Possible
Vigna sp. central (M.E. Trudgen 1626)	Clay, alluvium	Valleys	*Triodia epactia*, Mulga, *Corymbia hamersleyana*	Y	Y	Y	10-20 km	Possible
P3								
Acacia daweana	Stony red loam, colluvium	Low rocky rises, along drainage lines, scree	*Eucalyptus gamophylla, Corymbia deserticola, C. hamersleyana*	Y	Y	Y	<10 km	Possible

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Acacia subtiliformis	Calcrete	On rocky calcrete plateau	*Eucalyptus leucophloia, Triodia wiseana, T. basedowii*	Y	Y	Y	>100 km*	Unlikely
Astrebla lappacea	Clay	Plain	*Acacia xiphophylla*, grassland	Y	Y	Y	10-20 km	Possible
Calotis latiuscula	Sand, loam, clay, calcrete	Rocky hillsides, floodplains, rocky creeks or river beds	*Themeda triandra*, Mulga	Y	Y	Y	20-50 km	Possible
Dampiera anonyma	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite	Hill summits, upper slopes	*Eucalyptus leucophloia, E. kingsmillii, Acacia hamersleyensis*	Y	N	N	10-20 km	Highly unlikely
Dampiera metallorum	Skeletal red-brown gravely soils over banded ironstone	Steep slopes and summits	*Eucalyptus gamophylla, E. kingsmillii, E. leucophloia*	Y	N	N	>100 km*	Highly unlikely
Eragrostis crateriformis	Clayey loam or clay	Creek banks, depressions	Grassland, *Acacia* spp, *Triodia* spp., Buffel grass	Y	Y	Y	50-100 km*	Possible
Eragrostis surreyana	Red-brown clay	Drainage line	*Eucalyptus victrix, E. camaldulensis, Melaleuca*	Y	Y	Y	20-50 km	Possible
Eremophila magnifica subsp. *velutina*	Skeletal soils over ironstone	Summits, hills, rocky areas on slopes	*Eucalyptus leucophloia*	Y	N	Y	10-20 km	Highly unlikely
Fimbristylis sieberiana	Mud, skeletal soil pockets	Pool edges, sandstone cliffs	*Cyperus, Eleocharis, Cladium*	Y	Y	Y	20-50 km*	Possible
Geijera salicifolia	Skeletal soils, stony soils	Massive rock scree, gorges	*Eucalyptus leucophloia, E. xerothermica*	Y	Y	Y	50-100 km*	Possible
Glycine falcata	Black clayey sand	Floodplains. Along drainage depressions in crabhole plains on river	*Eriachne* grassland,	Y	Y	Y	20-50 km	Possible
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Red-brown clay soil, calcrete	Low undulating plain, swampy plains	*Melaleuca eleuterostachya, Acacia bivenosa* over *Triodia wiseana, Triodia angusta*	Y	Y	Y	20-50 km	Possible
Gymnanthera cunninghamii	Sand, clay loam	River bed, floodplain	*Eucalyptus victrix, E. camaldulensis*, near Mangroves	Y	Y	Y	20-50 km	Possible
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Alluvium	Creeks and gorges	*Corymbia hamersleyana, Eucalyptus xerothermica, E. victrix*	Y	Y	Y	<10 km	Possible
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Pebbly loam amongst boulders & outcrops, Brockman Iron Formation	Hills	*Eucalyptus gamophylla, E. leucophloia, Corymbia ferriticola*	Y	Y	Y	50-100 km*	Unlikely

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Iotasperma sessilifolium	Cracking clay, black loam.	Edges of waterholes, plains, drainage line	Herbland, grassland	Y	Y	Y	<10 km	Possible
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Cracking clay, basalt	Gently undulating plain with large surface rocks, flat crabholed plain	*Astrebla, Eriachne* and *Themeda* grasslands	Y	Y	Y	10-20 km	Possible
Olearia mucronata	Ironstone	Cliffs, hills, upper slopes	*Eucalyptus leucophloia, Astrotricha hamptonii,* Mulga	Y	Y	Y	50-100 km*	Unlikely
Owenia acidula	-	Creek	-	?	Y	?	50-100 km*	Unlikely
Pleurocarpaea gracilis	Skeletal, brown gritty soil over ironstone	Hill summit	*Eucalyptus leucophloia* and *E. gamophylla* over *Senna pruinosa, Acacia bivenosa, A. maitlandii* and *A. pyrifolia* over *A. marramamba* over *Triodia* sp.	Y	N	Y	50-100 km*	Highly unlikely
Polymeria distigma	Sandy soil, clay	Coastal plain, floodplain	*Astrebla pectinata*	Y	Y	?	20-50 km	Possible
Ptilotus subspinescens	Ironstone, basalt, quartz	Gentle rocky slopes, screes and the bases of screes	*Triodia angusta, T. longiceps, T. wiseana, Eucalyptus leucophloia*, Mulga	Y	Y	Y	20-50 km	Possible
Rhagodia sp. Hamersley (M. Trudgen 17794)	Sandy loam, alluvium	Floodplain / lower slopes	Mulga, *Eucalyptus leucophloia, E. xerothermica*	Y	Y	Y	20-50 km	Possible
Rostellularia adscendens var. *latifolia*	Ironstone, calcrete	Near creeks, rocky hills	*Eucalyptus victrix, Corymbia ferriticola*, Mulga, *E. xerothermica, E. kingsmillii*	Y	Y	Y	<10 km	Possible
Sida sp. Barlee Range (S. van Leeuwen 1642)	Skeletal red soils pockets	Steep slope, drainage lines, gullies	*Eucalyptus leucophloia, Acacia citrinoviridis, A. pruinocarpa, Corymbia ferriticola*	Y	Y	Y	10-20 km	Possible
Solanum albostellatum	Cracking clay	Plain, floodplain	Grassland	Y	Y	Y	20-50 km	Possible
Solanum kentrocaule	Ironstone, basalt	Hills, occasionally creeks	*Eucalyptus leucophloia, E. kingsmillii*	Y	Y	N	50-100 km*	Highly unlikely
Stackhousia clementii	Clay, tidal silt	Floodplain, saline silt	Grassland (*Themeda* sp. Hamersley Station), *Eucalyptus victrix*	Y	Y	Y	10-20 km	Possible
Swainsona thompsoniana	Clay	Flat crabholed plain	Open *Eremophila maculata* shrubland over moderately dense herbs, tussock grassland of *Astrebla pectinata*	Y	Y	N	10-20 km	Possible
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Red clay	Clay pan, grass plain	*Polymeria* sp. Hamersley (M.E. Trudgen 11353) herbland with *Chrysopogon fallax, Astrebla pectinata, Aristida latifolia* very open tussock grassland	Y	Y	Y	20-50 km	Possible

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Light orange-brown, pebbly loam	Amongst rocks & outcrops, gully slopes, scree	*Eucalyptus leucophloia*, Mulga	Y	Y	Y	>100 km*	Highly unlikely
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Ironstone, pisolite (Robe land system)	Rocky hills and mesas	*Eucalyptus leucophloia, Triodia wiseana*	N	Y	Y	50-100 km*	Highly unlikely
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Skeletal	Rock piles, scree	*Triodia epactia, T. angusta, Terminalia supranitifolia, Brachychiton acuminatus, Acacia inaequifolia*	Y	Y	Y	50-100 km*	Unlikely
P4								
Acacia bromilowiana	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt	Rocky hills, breakaways, scree slopes, gorges, creek beds	*Eucalyptus leucophloia, Corymbia hamersleyana*	Y	N	Y	20-50 km	Highly unlikely
Eremophila magnifica subsp. *magnifica*	Skeletal soils over ironstone.	Rocky screes	*Eucalyptus leucophloia, Corymbia hamersleyana*	Y	N	Y	10-20 km	Highly unlikely
Goodenia nuda	Red--brown clay loam, ironstone	Mostly low lying areas (floodplains, outwash areas), occasionally hills	*Acacia tumida* tall shrubland with mixed grass understorey including *Triodia epactia*	Y	Y	Y	Within alignment	Known
Livistona alfredii	-	Edges of permanent pools, with flowing water	*Eucalyptus camaldulensis*	?	N	Y	20-50 km	Highly unlikely
Rhynchosia bungarensis	Pebbly, coarse sand	Banks of flow line	*Corymbia hamersleyana, Eucalyptus camaldulensis, Triodia wiseana, E. victrix*	Y	Y	Y	<10 km	Possible
Significant According to *Guidance Statement No. 51*								
Unnamed *Josephinia* sp.	Rocky outcrops	Hills, gorges	*Acacia monticola, Triodia wiseana, Corymbia hamersleyana, Eucalyptus leucophloia*	Y	Y	Y	<10 km††	Possible

* estimated using *NatureMap* (DEC 2007-2014)measuring tool; other distances are from DPaW database search results or Ecoscape records

† record is listed as *Josephinia* ?sp. Marandoo on *NatureMap* (DEC 2007-2014); the nearest verified record is over 50 km distant

†† Ecoscape record

RUTILA RESOURCES RAILWAY CORRIDOR FLORA AND VEGETATION ASSESSMENT

Preston Consulting

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- pastoral station leasees and managers.

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS	
ARRP Act 1976	Western Australian *Agriculture and Related Resource Protection Act 1976* (superseded by the *BAM Act 1997*)
BAM Act 2007	Western Australian *Biosecurity and Agriculture Management Act 2007*
BoM	Bureau of Meteorology
C1, C2, C3	Declared Pest categories under the *BAM Act 2007*
CALM	Department of Conservation and Land Management (prior to becoming DEC)
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation (now, in part, DPaW)
DPaW	Western Australian Department of Parks and Wildlife
DoE	Commonwealth Department of the Environment
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DoE)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act 1986	Western Australian *Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act 1999	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Flinders	Flinders Mines Ltd
FMG	Fortescue Metals Group Ltd
GDA 94	Geographic Datum of Australia 1994
GDE	Groundwater Dependent Ecosystem
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
IDE	Inflow Dependent Ecosystem
MGA	Map Grid of Australia
NHT	National Heritage Trust
NVIS	National Vegetation Inventory System
PEC	Priority Ecological Community
PF	Priority Flora
PIL1, 2, 3, 4	Pilbara biogeographic subregions
PIOP	Flinders Mines Pilbara Iron Ore Project
PMST	Protected Matters Search Tool
P1, P2, P3, P4, P5	Priority, used for PF and PEC rankings
Rutila	Rutila Resources Pty Ltd
sens. lat.	(Latin) *sensu lato*, in the broad sense
SFDV	Sheet Flow Dependent Vegetation
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
TEC	Threatened Ecological Community
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF, in Western Australia)
var.	Variety (infrataxon)
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WC Act 1950	Western Australian *Wildlife Conservation Act 1950*

ACRONYMS AND ABBREVIATIONS	
WONS	Weeds of National Significance
*	Introduced species

SUMMARY

Rutila Resources Pty Ltd has been granted State and Commonwealth approvals to develop the Balla Balla Mine and Port, including port facilities, near Whim Creek in the Pilbara Region of Western Australia. In order to increase the Port's viability, Rutila is investigating the possibility of connecting the proposed port to stranded mineral resources in the Hamersley Range via a new railway line. The proposed railway is approximately 200 km in length. The survey covers an average 2 km wide alignment, plus all proposed borrow pits, water and access points.

Ecoscape (Australia) Pty Ltd has been appointed to undertake a Level 2 flora and vegetation survey of the 570.63 km^2 (57 063 ha) study area. A reconnaissance survey was undertaken in May 2014, and Level 2 flora and vegetation surveys in July and July-August 2014.

The desktop assessment identified:

- most of the alignment had not been subject to previous environmental surveys
- eighty one conservation significant flora species had potential to occur within the study area, based on the results of database searches and Ecoscape experience
- an undescribed (new to science), unnamed *Josephinia* sp., recorded from within the Flinders Mines tenement (but not within the proposed alignment) was considered to be significant by the Environmental Protection Authority, and is also included for targeted searches
- two Priority Ecological Communities (PECs), P1-P3 'Four plant assemblages of the Wona Land System' and P3 'Horseflat Land System of the Roebourne Plains', have previously been mapped within the study area alignment, or their buffers occur within it
- Groundwater Dependent Ecosystems (GDEs) are known within the study area
- Sheet Flow Dependent Vegetation (SFDV Mulga communities) may occur within the study area.

The flora and vegetation field survey included establishment and scoring of 156 unmarked quadrats and detailed relevès, mapping and describing the vegetation types and vegetation condition, and conducting targeted searches for conservation significant flora. The field surveys consisted of a reconnaissance survey in May and a single phase Level 2 survey conducted in July and August, 2014.

The Level 2 flora and vegetation assessment identified:

- 474 vascular flora taxa including:
    - nine Priority Flora; P1 taxa *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095), *Helichrysum oligochaetum*, *Heliotropium muticum,* P2 taxon *Pentalepis trichodesmoides* subsp. *hispida,* P3 taxa *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301), *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479), *Sida* sp. Barlee Range (S. van Leeuwen 1642), P4 taxa *Goodenia nuda*, *Rhynchosia bungarensis*
    - two taxa having a significant range extension (*Gyrostemon tepperi* and *Sid*a sp. Rabbit Flat (B.J. Carter 626))
    - one potentially new to science undescribed species, known as *Acacia* sp. in this report that was, at times, a dominant component of the mid stratum
    - 16 introduced species, none of which were Declared Pest plants or listed on any weed register
- 58 vegetation types plus one mosaic, including:
    - one vegetation type considered to represent the P3 'Horseflat Land System of the Roebourne Plains' PEC (vegetation type **Ex_1**), and another four vegetation types that may represent other subtypes of this PEC (vegetation types **Te(1)**, **Tw(1)**, Mattiske **FPg1**, and **Cc_2AbEb**)
    - one vegetation type that may represent the P1 'Cracking clays of the Chichester and Mungaroona Range' subtype of the 'Four plant assemblages of the Wona land system' PEC

(vegetation type **Sb**), although an area mapped as being the PEC may be within the buffer, but not the PEC as the vegetation doesn't match the PEC descriptions

- three vegetation types that represent a Groundwater Dependent Ecosystem, being characterised by *Eucalyptus camaldulensis* and/or *Melaleuca argentea* (vegetation types **EvMlCv**, **MaMgCv** and **MaMlCv**) and vegetation that may represent a GDE, characterised by *Eucalyptus victrix* (vegetation types **EvApCc$_1$**, **EvApTe**, **EvAt1Te**, **EvCb** and **EvMgEb**)
- other vegetation types that may be significant according to *Guidance Statement No. 51*. due to having small representation/restricted distribution (vegetation types (**ElAs3Tm**, **FbGpEm** and **AmEe**)
- vegetation types having an association with poorly represented land systems (**AmEe** and **As$_3$** associated with the Gregory land system)
- vegetation types having an association with a poorly represented pre-European vegetation association (**AiTe(1)**, **AiTe(3)**, **AiTw(3)**, **AmEe**, **ChAa$_1$Ta**, **MaMgCv** and **Ta**, although all vegetation associations have more than 95% of their original extent remaining in the Pilbara)
- similar to vegetation considered significant in other areas (vegetation types **ElEgTw**)

- 90.64% of the vegetation was assessed as being in Excellent condition, with areas mapped in lesser condition impacted by cattle grazing and weed invasion.

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Rutila Resources Pty Ltd (Rutila) has been granted State and Commonwealth approvals to develop the Balla Balla Mine and Port, near Whim Creek in the Pilbara Region of Western Australia.

To increase the Port's viability, Rutila is investigating the potential to connect the port to 'stranded' third party miners via a new rail line. The proposed railway (known in this report as 'Rutila rail') connects the Flinders Mines Ltd (Flinders) Blacksmith tenement in the Hamersley Range to the Balla Balla Port stockpile area; a distance of approximately 200 km.

Preston Consulting has been appointed to gather and manage the planning, preparation and submission of approvals documents for the proposed railway, and in turn appointed Ecoscape (Australia) Pty Ltd (Ecoscape) to undertake a Level 2 flora and vegetation assessment of the alignment as part of the Western Australian and Commonwealth environmental approvals process.

In October 2014 Preston Consulting requested a desktop review of an alternative alignment through the Chichester Range, in the central portion of the rail corridor. This is presented at the end of this document.

1.1.1 Study Area Location

The proposed Rutila railway is located in the Pilbara region of Western Australia, between Balla Balla on the coast and the Flinders Blacksmith tenement, also known as the Pilbara Iron Ore Project (PIOP), in the Hamersley Range, northwest of Tom Price. The proposed alignment traverses a number of pastoral leases and areas of Unallocated Crown Land through the Shires of Ashburton and Roebourne.

The proposed railway alignment is approximately 200 km in length. The flora and vegetation survey area (the study area) covers an average 2 km-wide alignment that includes all rail, borrow pit, water and access within its boundaries, totalling 570.63 km^2 (57 063 ha).

The location of the study area is shown in **Figure 1**.

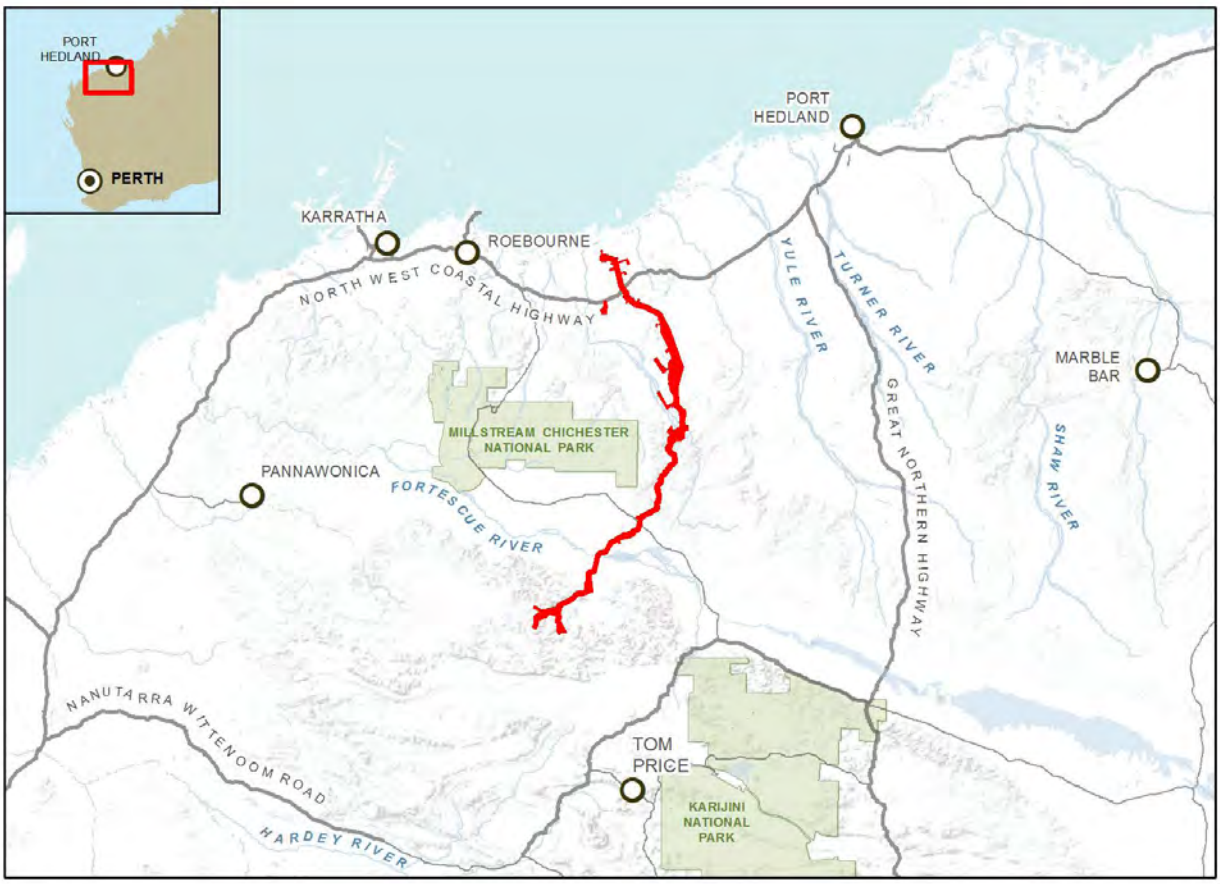

Figure 1: Study area

1.2 PROJECT OBJECTIVES

This report includes the results of a desktop, reconnaissance and single season field survey that comprise a Level 2 flora and vegetation assessment. The works were conducted to:

- be compliant with the Environmental Protection Authority (EPA) expectations of a Level 2 survey
- provide sufficient information to allow for an assessment of potential impacts
- follow *Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia* (EPA 2004)
- follow *Position Statement No.* 3 – *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002).

It is anticipated, based on the results included in this report, that the EPA will provide guidance in regard to the requirement for a second season of field survey that is frequently required in order to fully satisfy the requirements of a Level 2 survey.

1.3 LEGISLATION AND POLICIES

This assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

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

- Department of Environment Water Heritage and the Arts (2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.

In addition to those listed above, the assessment complied with the EPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2000) *Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia*
- EPA (2008) *Guidance Statement No. 33: Environmental Guidance for Planning and Development*
- EPA (2004) *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia*, known as *Guidance Statement No. 51*
- EPA (2003) *Guidance Statement No. 55: Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process.*

1.4 PERMITS

The flora and vegetation surveys were conducted under the following permits issued by the Western Australian Department of Parks and Wildlife (DPaW):

- flora collecting permit SL010883 (JK Nelson)
- flora collecting permit SL010888 (LJ Atkins)
- flora collecting permit SL010884 (AD Fry)
- flora collecting permit SL010878 (SO Kern)
- flora collecting permit SL010887 (SM Bateman)
- flora collecting permit SL010882 (JD Scanlon).

1.5 PREVIOUS SURVEYS

Flora and vegetation survey reports and other documents from the northern and southern ends were reviewed to gather background information relating to the study area. These reports and documents are listed or referenced in **Section 3.3.7**.

2.0 PHYSICAL ENVIRONMENT

The results of the desktop assessment relating to the physical environment are included below.

2.1 CLIMATE

The study area traverses much of the Pilbara region that experiences an arid climate, which is influenced by two air masses, the Indian tropical maritime air moving in from the west or north-west, and the tropical continental air from the inland. During the warmer part of the year, there is a hot low-pressure system over the region resulting in clear skies and very high temperatures from November to February with average maximum temperatures generally between 35°C and 40°C. During the winter months the average maximum temperature generally falls to between 22°C and 30°C, the range of which is generally greater in inland areas away from the moderating effects of onshore winds common in coastal areas (Australian Natural Resources Atlas 2009).

The Pilbara lies south of the area normally penetrated by the northwest monsoon in the summer months, and is only occasionally influenced by weather systems of the westerly circulation in the winter months. Rainfall is therefore low and variable. The majority of rainfall occurs between December and March, as the result of moist tropical storms and cyclones originating in the north, with a pronounced dry period between August and November (Australian Natural Resources Atlas 2009).

According to the Köppen-Geiger climate classification, the study area is considered as having a dry climate, Class B, subclasses BWh and BSh (Sustainable Development Department & Food and Agricultural Organisation of the United Nations 1999). Class B climates are arid regions where annual evaporation exceeds annual precipitation; subclass BWh is a desert climate and subclass BSh is a steppe climate where the average temperatures exceeds 18°. Only a small portion of the study area, near the coast is considered to be BSh.

The nearest Bureau of Meteorology (BoM) station to the northern end of the study area alignment is Whim Creek, however there are significant data gaps for this station. The nearest northern BoM station with continuous long-term data is Roebourne (004035), 60 km to the west. The nearest BoM station with continuous long-term data to the southern end of the study area alignment is Wittenoom (005026), 90 km to the east. Roebourne BoM station has been active since 1919; Wittenoom BoM station has been active since 1951.

Mean rainfall and mean daily maxima and minima for these BoM stations are shown in **Figure 2** (BoM 2014b; 2014c). December is the hottest month at both stations; Roebourne has an annual mean maximum temperature of 34.0° whilst Wittenoom's annual mean maximum temperature is 32.9°, 1.1° cooler. July is the coolest month at both stations; Roebourne has a mean July minimum of 20.5° whilst Wittenoom's mean July minimum is 19.7°, 0.8° cooler. Mean rainfall for the two stations differ significantly.

The annual mean rainfall for the Roebourne station is 315.6 mm, whilst the annual mean for the Wittenoom station is 465.6 mm, a difference of 150 mm annually. Wittenoom is located approximately 180 km to the south east of Roebourne. Rains occur following the same seasonal pattern at both locations with majority of rainfall occurring from December to March.

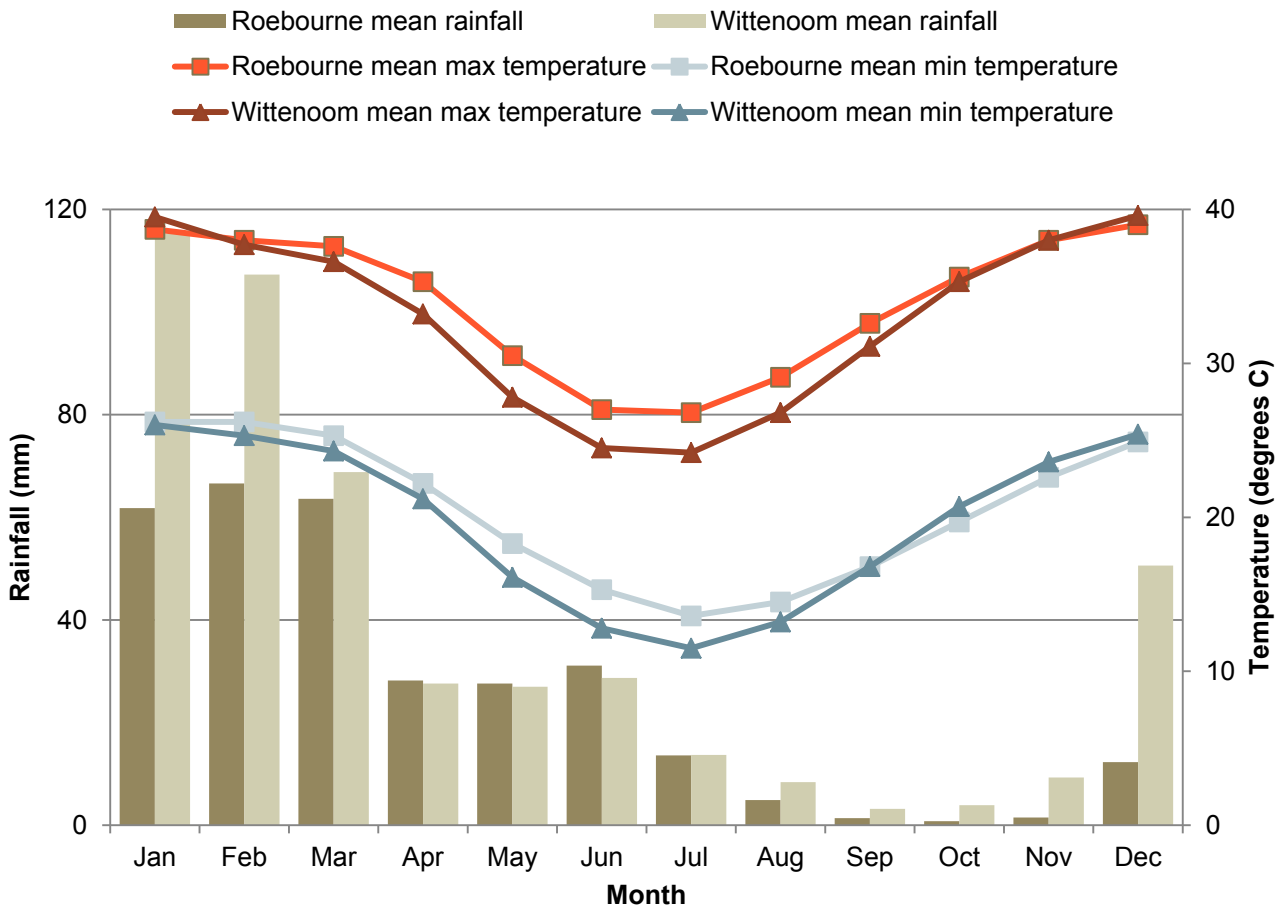

Figure 2: Monthly rainfall and daily maxima and minima for Roebourne and Wittenoom (BoM 2014b; 2014c)

2.2 GEOLOGY

There are 67 geological units mapped by the Geological Survey of Western Australia within the study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996), shown in **Table 21** in **Appendix Two**.

2.3 LAND SYSTEMS

As part of the rangeland resource surveys, the then-Department of Agriculture comprehensively described and mapped the biophysical resources of the Pilbara, together with an evaluation of the condition of the soils and vegetation (from an agricultural perspective) (Van Vreeswyk et al. 2004). As part of this process an inventory of land types, land systems and land units with particular use capabilities, habitats or conservation values were established to assist in land use planning. According to this mapping, 11 land types and 24 land systems (grouped according to land type on the basis of a combination of landform, soil, vegetation, and drainage characteristics) intersect with the study area (**Table 22** in **Appendix Two**). **Map 1** shows the land systems intersecting with the study area.

The extent of these land systems are shown in **Table 1**.

Table 1: Extent of land systems within the study area and regional representation (Van Vreeswyk *et al*. 2004)

LAND SYSTEM	EXTENT WITHIN STUDY AREA (KM^2)	PROPORTION OF STUDY AREA (%)	PILBARA EXTENT (KM^2)	PROPORTION OF TOTAL WITHIN THE STUDY AREA (%)
Black	4.79	0.84	165.00	2.90
Boolaloo	20.38	3.57	1502.00	1.36
Boolgeeda	116.51	20.42	7748.00	1.50
Calcrete	3.86	0.68	1444.00	0.27
Capricorn	4.68	0.82	5296.00	0.09
Coolibah	1.77	0.31	1014.00	0.17
Granitic	15.92	2.79	4020.00	0.40
Gregory	5.26	0.92	113.00	4.65
Hooley	0.15	0.03	590.00	0.02
Horseflat	14.20	2.49	1261.00	1.13
Jurrawarrina	3.68	0.65	664.00	0.55
Macroy	18.37	3.22	13095.00	0.14
Mallina	33.03	5.79	2557.00	1.29
McKay	12.87	2.25	4202.00	0.31
Newman	37.41	6.56	14580.00	0.26
River	29.53	5.18	4088.00	0.72
Rocklea	68.13	11.94	22993.00	0.30
Ruth	46.52	8.15	346.00	13.45
Satirist	4.71	0.83	377.00	1.25
Sherlock	0.34	0.06	192.00	0.18
Uaroo	101.73	17.83	7681.00	1.32
Urandy	25.14	4.41	1311.00	1.92
Wona	1.67	0.29	1815.00	0.09
TOTAL	**570.65**	**100**		

2.4 DRAINAGE

The northern portion of the study area alignment is associated with the Sherlock River, crossing the river and corresponding with its floodplain and tributaries. A portion of the study area corresponds with Nunyerry Creek, which is a tributary of the Sherlock River.

Towards the south of the study area the alignment crosses the Fortescue River. The southern portion of the study area is associated with Weelumurra Creek and its tributaries that flow into the Fortescue River.

3.0 BIOLOGICAL ENVIRONMENT

The results of the desktop assessment relating to the biological environment are detailed below.

3.1 BIOGEOGRAPHIC REGION

Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna and are defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Department of Sustainability Environment Water Population and Communities (DSEWPaC) 2011).

The study area is located entirely within the Pilbara biogeographic region that includes four subregions; Chichester, Fortescue Plains, Hamersley and Roebourne (Thackway & Cresswell 1995), all of which the study area intersect with (**Map 2**). These subregions are described in the 2002 Biodiversity Audit of Western Australia's 53 Biogeographical Subregions (McKenzie *et al.* 2003) as:

Chichester (PIL1, Kendrick & McKenzie 2002):

> *The Chichester subregion comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by* Acacia inaequilatera *over* Triodia wiseana *(formerly* Triodia pungens*) hummock grasslands, while* Eucalyptus leucophloia *tree steppes occur on ranges. The climate is Semi-desert-tropical and receives 300 mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock). Subregional area is 9 044 560 ha.*

Fortescue Plains (PIL2, Kendrick 2002a):

> *Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River Gum woodlands fringe the drainage lines. Northern limit of Mulga (*Acacia aneura*). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of River Gum and Cadjeput* Melaleuca *woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300 mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west. Subregional area is 2 041 914 ha.*

Hamersley (PIL3, Kendrick 2002b):

> *Mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and* Eucalyptus leucophloia *over* Triodia brizoides *on skeletal soils of the ranges. The climate is semi-desert tropical, average 300 mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue to the north, the Ashburton to the south, or the Robe to the west. Subregional area is 6 215 092 ha.*

Roebourne (PIL4, Kendrick & Stanley 2002):

> *Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of* Acacia stellaticeps *or* A. pyrifolia *and* A. inaequilatera. *Uplands are dominated by* Triodia *hummock grasslands.*

Ephemeral drainage lines support Eucalyptus victrix *or* Corymbia hamersleyana *woodlands. Samphire,* Sporobolus *and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. Climate is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually. Subregional area is 2 008 983 ha.*

3.2 FLORA

3.2.1 Conservation Significant Flora

For the purposes of this report, conservation significant flora species are those that are listed by the DPaW, as Threatened Flora (TF) and Priority Flora (PF). Flora species are classified as TF or listed as PF where populations are geographically restricted or threatened by local processes.

TF species (previously known in Western Australian as Declared Rare Flora (DRF)) are listed by the DPaW and are protected under the Western Australian *WC Act 1950.* Rare flora species, as they are termed in the *WC Act*, are gazetted under Sub-section 2 of Section 23F, thereby making it an offence to remove or damage rare flora without Ministerial approval.

Some TF species have additional legislative protection by being listed under the Commonwealth *EPBC Act 1999*. Definitions of the Commonwealth *EPBC Act* categories are provided in **Table 14** in **Appendix One**.

There are seven categories covering State-listed TF and PF species (DPaW 2013), which are outlined in **Table 15** in **Appendix One**. PF for Western Australia are regularly reviewed by the DPaW whenever new information becomes available, with species status altered or removed from the list when data indicates that they no longer meet the requirements outlined in **Table 15**.

3.2.2 Commonwealth Protected Matters Search

A Commonwealth Department of the Environment (DoE) online database search (*Protected Matters Search Tool* (*PMST*, Australian Government and DoE 2014)) was conducted and Commonwealth *Species Profile and Threats Database* (DoE 2014) lists were reviewed to identify threatened flora with Commonwealth protection nearby.

The *PMST* search of an early version of the study area and 25 km buffer identified one species that is known to occur within the search area or have habitat that is likely to occur; *Lepidium catapycnon*, listed as Vulnerable under the *EPBC Act 1999*. The nearest record of this species, estimated using the *NatureMap* (Department of Parks and Wildlife [DPaW] 2007-2014) measuring tool, is approximately 50 km south of the study area.

The *PMST* result is included incorporated **Table 23** in **Appendix Two**.

3.2.3 DPaW Threatened and Priority Flora Database Search

A DPaW Threatened Flora database search (DPaW reference 20-0514FL) of an early version of the study area and 40 km buffer identified 78 vascular conservation significant taxa (species, subspecies and varieties) with validated populations within the search area buffer, shown on **Map 3** and included in **Table 23**. These conservation significant flora include two TF, 23 P1, 16 P2, 32 P3 and five P4 taxa. The taxa previously identified within 10 km of the current study area are:

- P1 taxa *Helichrysum oligochaetum*, *Heliotropium muticum* and *Sida* sp. Hamersley Range (K. Newbey 10692)

- P1 taxon *Josephinia* sp. Marandoo (M.E. Trudgen 1554) (P1), although the specimen is identified as being questionable on *FloraBase* (Western Australian Herbarium [WAH] 2014)
- P2 taxon *Paspalidium retiglume*
- P3 taxa *Acacia daweana*, *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301), *Iotasperma sessilifolium* and *Rostellularia adscendens* var. *latifolia*
- P4 taxon *Goodenia nuda*, recorded from within the study area.

The DPaW Threatened Flora database search does not identify other significant flora species, described in *Guidance Statement No. 51* (EPA 2004) as including keystone or relictual species, those having anomalous features, range extremities, range extensions, population outliers, restricted subtaxa and hybrids, local endemics or poorly reserved species.

3.2.4 NatureMap Search

NatureMap (DPaW 2007-2014) was reviewed to identify conservation significant flora species that have been recorded from within and near the study area using a simplified version of the early study area and 25 km buffer (**Figure 7**). The *NatureMap* search, conducted in May 2014, identified 22 conservation significant flora species, 21 of which were also identified by the DPaW database search (**Section 3.2.3** above). The *NatureMap* search results are incorporated in **Table 23**.

3.2.5 Significant Species According to Guidance Statement No. 51

Other significant flora species, as described in *Guidance Statement No. 51* (EPA 2004), include keystone or relictual species, those having anomalous features, range extremities, range extensions, population outliers, restricted subtaxa and hybrids, local endemics or poorly reserved species.

Undescribed (new to science) species can also considered as significant according to *Guidance Statement No. 51* (e.g. EPA 2012b). Additionally, Saunders *et al.* (1998), in the Commonwealth *State of the Environment* report, includes undescribed species as having significance as a biodiversity indicator.

Flora and vegetation survey reports from nearby were reviewed to identify any species considered to be significant for reasons other than being listed as TF or PF.

An unnamed *Josephinia* sp. was recorded from a number of locations close to the southern terminus of the study area (Ecoscape 2011a; 2012b; 2012k). Whilst there has been no progress in relation to applying a phrase name to this species, it was considered of significance by the EPA during the Flinders Mines environmental approvals process (EPA 2012b). This species is also included in **Table 23**.

Flora and vegetation survey reports from the northern (Balla Balla) end of the study area alignment were also reviewed to identify if there were any other significant species. None, other than Priority Flora species that were also recorded by the database searches, were identified as significant according to these reports (Astron Environmental Services 2005; Mattiske Consulting Pty Ltd 2006; 2008; 2013a).

3.2.6 Ecoscape Experience

Ecoscape has undertaken a number of flora and vegetation surveys in the Pilbara, including several near the southern end of the study area (e.g. Ecoscape 2011a; 2012a; 2012b; 2012d; 2012f; 2013e) and in near-coastal areas close to Karratha/Roebourne and Port Hedland (Ecoscape 2012j; 2013a; 2013d). Ecoscape considers that *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P1) and *Vigna* sp. rockpiles (R. Butcher et al. RB 1400) (P3) may also occur in the study area; neither were identified by any of the database searches, but have been included in **Table 23**.

3.2.7 Introduced Species

The Western Australian Organism List (WAOL; Department of Agriculture and Food [DAFWA] 2013) details organisms listed as Declared Pests under the *Biosecurity and Agriculture Management (BAM) Act 2007* that replaces the *Agriculture and Related Resources Protection (ARRP) Act 1976*. Under the *BAM Act 2007*, Declared Pests are listed as one of three 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.

Some of the more invasive introduced species are also included in a number of other weed lists maintained by DoE and Weeds Australia, including Weeds of National Significance (WONS, Weeds Australia 2012b), the National Environmental Alert List (DSEWPaC 2012a), Sleeper Weeds (DSEWPaC 2012b), Species Targeted for Eradication (DSEWPaC 2012c) and Target Species for Biological Control (Weeds Australia 2012a).

Introduced species (weeds) are commonly recorded, particularly in disturbed areas including those targeted for grazing by stock. Plants are regarded as introduced if they are listed as 'alien' on *FloraBase* (WAH 1998-2014). *FloraBase* (WAH 1998-2014) lists 112 introduced species as having been collected within the Pilbara bioregion, 49 within the Chichester (PIL1) subregion, 31 within the Fortescue Plains (PIL2) subregion, 61 within the Hamersley (PIL3) subregion, 70 within the Roebourne (PIL4) subregion, 47 within the Shire of Roebourne and 78 within the Shire of Ashburton.

3.3 VEGETATION AND ECOLOGICAL COMMUNITIES

3.3.1 Vegetation Association Mapping

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250 000 in the south-west and at a scale of 1:1 000 000 in less developed areas. The vegetation survey of Western Australia maps and explanatory memoirs (1974-1981) are credited to J.S. Beard (or Beard with various co-authors).

Beard's vegetation maps attempt to depict the native vegetation as it was presumed to be at the time of settlement, and is known as the pre-European vegetation type and extent. They have since been developed in digital form by Shepherd *et al.* (2002), and updated by the Department of Agriculture and Food Western Australia (DAFWA 2012).

The pre-European vegetation associations identified from the study area (DAFWA 2012) and their pre-European and current extents are listed in **Table 2** (Government of Western Australia 2013) and shown on **Map 2**. The total extent of the Pilbara bioregion is 17 808 657.06 ha.

Table 2: Pre-European vegetation associations within the study area (Government of Western Australia 2013)

VEGETATION ASSOCIATION	PILBARA BIOREGION			EXTENT WITHIN THE STUDY AREA	
	PRE-EUROPEAN EXTENT (ha)	CURRENT EXTENT (ha)	% REMAINING	EXTENT (ha)	PROPORTION (%)
82	2,563,583.23	2,550,898.98	99.51	3,566.51	0.14
93	3,042,114.29	3,038,471.70	99.88	18,508.89	0.61
173	1,752,520.89	1,747,677.63	99.72	1,389.12	0.08
175	507,860.18	507,466.82	99.92	3,465.84	0.68
565	108,956.73	108,945.16	99.99	5,195.78	4.77
569	59,337.69	59,337.69	100.00	1,458.30	2.46
587	580,728.60	580,696.99	99.99	6,962.94	1.20
589	728,768.20	724,695.82	99.44	1,400.74	0.19
607	120,789.19	120,599.81	99.84	1,622.66	1.34
626	117,724.44	117,198.13	99.55	2,874.57	2.44
641	18,327.78	18,327.73	100.00	1,016.26	5.54
644	27,199.82	27,068.69	99.52	2,674.53	9.83
645	84,670.25	84,658.03	99.99	565.83	0.67
647	195,859.95	191,710.98	97.88	3,198.19	1.63
649	40,364.42	40,178.20	99.54	3,163.18	7.84

3.3.2 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are categorised at both Commonwealth (Commonwealth of Australia 1999) and State (DEC 2010) level, whilst Priority Ecological Communities (PECs) are categorised at State level (DEC 2010). The definitions of Commonwealth and State categories are summarised in **Table 16** and **Table 17** respectively in **Appendix One**.

Review of the DPaW TEC list (DPaW Species & Communities Branch 2014a) indicates that the only TEC in the Pilbara defined by vegetation is the vulnerable '*Themeda* grasslands on cracking clay (Hamersley Station, Pilbara)'.

There are no Commonwealth-listed TECs within the Pilbara bioregion (DoE 2014), consequently none were identified by the *PMST* search (Australian Government and DoE 2014).

There are 30 PECs known from the Pilbara DPaW region; review of the DPaW list (DPaW Species & Communities Branch 2014b) indicates that a number of these occur on land systems that intersect with the study area and may occur within it.

3.3.2.1 DPaW Ecological Communities Database Search

A DPaW Ecological Communities database search (reference 21-0514EC) was conducted for an earlier version of the study area and a 40 km buffer. The search results are shown on **Map 3**.

The search identified the TEC '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' as occurring within the 40 km search buffer area. This TEC was identified as occurring in two areas, one approximately 22 km to the south and the other 25 km to the south east of the southernmost branches of the study area. The study area is outside the administrative buffer associated with the TEC.

The PECs identified by the database search are described below (DPaW Species & Communities Branch 2014b).

Two PECs are mapped as occuring within the study area; the P1-P3 'Four plant assemblages of the Wona Land System' (previously 'Cracking clays of the Chichester and Mungaroona Range') and the P3 'Horseflat Land System of the Roebourne Plains', described below.

The 'Four plant assemblages of the Wona Land System' PEC is located in the vicinity of Mt Florance homestead and extends approximately 150 m into the study area, with the 500 m administrative buffer extending further into it. It is described as:

> *a system of basalt upland gilgai plains with tussock grasslands occurs throughout the Chichester Range in the Chichester-Millstream National Park, Mungaroona Range Nature Reserve and on adjacent pastoral leases. There are a series of community types identified within the Wona Land System gilgai plains that are considered susceptible to known threats such as grazing or have constituent rare/restricted species, as follows:*
>
> *P1 Cracking clays of the Chichester and Mungaroona Range. This grassless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa*
>
> *P1 Annual Sorghum grasslands on self mulching clays. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range*
>
> *P3(iii) Mitchell grass plains (*Astrebla *spp.) on gilgai*
>
> *P3(iii) Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai (typical type, heavily grazed).*

The P3 'Horseflat Land System of the Roebourne Plains' PEC is mapped as occurring across all of the northern 20 km of the study area. The PEC is described as:

> *extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include* Eragrostis xerophila *(Roebourne Plains grass) and other* Eragrostis *spp.,* Eriachne *spp. and* Dichanthium *spp. The community also supports a suite of annual grasses including* Sorghum *spp. and rare* Astrebla *spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne. This community incorporates Unit 3 (Gilgai plains), Unit 5 (Alluvial Plains) with some Unit 7 (Drainage Depressions) described in Van Vreeswyk* et al. *2004.*

Two PECs were identified as occurring within the search area buffer but outside the study area; P1 'Brockman Iron cracking clay communities of the Hamersley Range' and P4 'Invertebrate assemblages (Errawallana Spring type) Coolawanya Station'. Only the former is described in terms of vegetation, and is within the scope of this survey.

The 'Brockman Iron cracking clay communities of the Hamersley Range' occurs approximately 17 km to the south of the southern end of the study area. The PEC is described as:

> *rare tussock grassland dominated by* Astrebla lappacea *in the Hamersley Range, on the Newman land system. Tussock grassland on cracking clays-derived in valley floors, depositional floors. This is a rare community and the landform is rare. Known from near West Angeles, Newman, Tom Price and boundary of Hamersley and Brockman Stations*

3.3.3 Groundwater Dependent Ecosystems

3.3.3.1 Groundwater Definition

Groundwater is water that is found in the saturated zone of the soil, where all soil pores are filled with water. It occurs below the water table in an unconfined aquifer or may be held under pressure in a confined aquifer. Groundwater may also occur as a perched aquifer where is located above unsaturated rock formations as a result of a discontinuous permeable layer (Goulburn-Murray Water 2010).

3.3.3.2 Groundwater Dependent Ecosystems Definition

Groundwater Dependent Ecosystems (GDEs) have been defined as ecosystems that are dependent on groundwater for their survival at some stage or stages of their lifecycle, however groundwater use cannot be equated with groundwater dependence (Eamus 2009b).

Hatton and Evans (1998) identified four types of GDEs based on their geographic setting: terrestrial vegetation (vegetation communities and dependent fauna that have seasonal or episodic dependence on groundwater), river base flow systems (aquatic and riparian ecosystems that exist in or adjacent to streams that are fed by groundwater base flow), aquifer and cave ecosystems, and wetlands.

Eamus *et al.* (2006) identified three primary classes based on type of groundwater reliance:

1. Aquifer and cave ecosystems.
2. All ecosystems dependent on the surface expression of groundwater:
    a) river base flows
    b) wetlands, swamplands
    c) seagrass beds in estuaries
    d) floodplains
    e) mound springs
    f) riparian vegetation
    g) saline discharge to lakes
    h) low lying forests.
3. All ecosystems dependent on the subsurface presence of groundwater, often accessed via the capillary fringe (non-saturated zone above the water table) when roots penetrate this zone:
    a) River Red Gum (*Eucalyptus camaldulensis*) forests
    b) Banksia woodlands
    c) Riparian vegetation in the wet/dry tropics.

GDEs in the Pilbara are generally determined to be vegetation associated with riparian areas. GDEs dependent on the surface expression of groundwater (Eamus *et al*. 2006 class 2) includes vegetation associated with wetlands (permanent or semi-permanent pools) within riparian areas, and generally includes *Melaleuca argentea* in association with other species described below. GDEs associated with the subsurface presence of groundwater (Eamus *et al*. 2006 class 3) includes riparian vegetation characterised by the phreatophytic species described below.

3.3.3.3 Phreatophytic Species

Phreatophytic species rely on groundwater sources for water intake (e.g. Maunsell Australia Pty Ltd 2006); essentially the water requirements of phreatophytes are greater than can be provided from the surface soil profile (e.g. riparian vegetation) or they are dependent on free water availability (e.g. wetland species). They frequently show low tolerance to extended water stress due to a lack of physiological and/or morphological adaptation to drought, and respond to significant water deficit by a decline in health and eventual death (*ibid.*).

Obligate phreatophytes are dependent on free access to water (i.e. they are wetland species) whereas facultative phreatophytes can switch their water source between the soil surface profile in times of rain, to groundwater in times of drought when the soil surface profile (vadosphere) is depleted (Grierson 2010).

Phreatophytic species that are known from nearby are:

- *Eucalyptus camaldulensis* subsp. *refulgens*, which is regarded as a facultative phreatophyte that is dependent on groundwater for part of its lifecycle and/or in times of drought. This species has been reported to be tolerant of groundwater falls of up to 4 m per year (Maunsell Australia Pty Ltd 2006), has both lateral and sinker roots and is tolerant of waterlogging (Grierson 2010).
- *Eucalyptus victrix*, which may be regarded as a facultative phreatophyte. It is considered to be relatively drought tolerant and likely to be tolerant of gradual declines to the water table (to a degree) (Maunsell Australia Pty Ltd 2006). *Eucalyptus victrix* has lateral and sinker roots (i.e. a dimorphic root system) but is not tolerant of waterlogging (Grierson 2010). There is some conjecture that this species is actually a vadophyte (i.e. relies on water from within the soil surface profile, and is independent of groundwater) or, at best, weakly phreatophytic (Resource and Environmental Management Pty Ltd 2007).

Vegetation containing *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* are considered to represent GDEs.

It should be noted, however, that there is supporting evidence that, at least in some circumstances (Batini 2009; Eamus 2009a; EPA and Hamersley Iron Pty Ltd 2010; Resource and Environmental Management Pty Ltd 2007), *Eucalyptus victrix* does not always depend on groundwater. Therefore vegetation containing this species may not always be definitive of a GDE.

3.3.3.4 Atlas of Groundwater Dependent Ecosystems

The *Atlas of Groundwater Dependent Ecosystems* (BoM 2014a) was interrogated to determine the presence of known GDEs and Inflow Dependent Ecosystems (IDEs) within the study area.

An Inflow Dependent Ecosystem is one in which the vegetation within the landscape is likely to be accessing water in addition to rainfall, from soil or surface water or groundwater, assessed using remotely sensed data. The likelihood of a landscape using additional water is rated from one to 10 (low to high), with a rating above six indicating that a landscape is likely to be inflow dependent (BoM 2014a).

The *Atlas* was interrogated using a polygon covering the study area and an adequate buffer. Interrogation of the *Atlas* identified several areas within the study area either mapped in previous desktop surveys as being a GDE or being identified as having a high potential for groundwater interaction due to association with major drainages. The type of GDE and the geomorphology associated with these ecosystem types, which are likely to be encountered within the study area are described below in **Table 3**.

Table 3: Type of GDE, likelihood and associated geomorphology potentially occurring within the study area (BoM 2014a)

NAME	POTENTIAL FOR GDE	IDE LIKELIHOOD	LANDSCAPE POSITION	GEOMORPHOLOGY
Ecosystem Type: River				
Weelumurra Creek	High potential for groundwater interaction	10	Low Lying	Mainly alluvial lowland with hardpan wash plains and sandplain, possibly a graben.
Fortescue River	High potential for groundwater interaction	8-10	Low Lying	Mainly alluvial lowland with hardpan wash plains and sandplain, possibly a graben.
Sherlock River	High potential for groundwater interaction	7	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
Sherlock River	High potential for groundwater interaction	10	Low Lying	Floodplains and deltaic plains with stony plains and sandplains; tidal flats and some metamorphic, volcanic and granitic hills and islands.
Sherlock River	High potential for groundwater interaction	8	Low Lying	Narrow range of hills and dissected plateaus on basalt and sedimentary rocks.
Ecosystem Type: Permanent Pools				
Pool	Identified in previous study: desktop	9-10	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
Ecosystem Type: Pool				
Pool	Identified in previous study: desktop	6-10	Low Lying	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.
Pool	Identified in previous study: desktop	7-10	Low Lying	Floodplains and deltaic plains with stony plains and sandplains; tidal flats and some metamorphic, volcanic and granitic hills and islands.
Pool	Identified in previous study: desktop	5-10	Low Lying	Narrow range of hills and dissected plateaus on basalt and sedimentary rocks.
Pool	**Identified in previous study: desktop**	**9-10**	**Slope**	**Dissected bold plateaus and ranges of flat lying or moderately folded sandstone, quartzite and volcanic rocks.**

3.3.4 Mulga Communities

Mulga is the common name for a group of closely related *Acacia* species that were formerly known as *Acacia aneura* and its subtaxa. A recent taxonomic review (Maslin & Reid 2012) has resulted in a revision of this group, and Mulga now includes *Acacia aneura*, *A. aptaneura*, *A. ayersiana*, *A. caesaneura*, *A. craspedocarpa*, *A. fuscaneura*, *A. incurvaneura*, *A. macraneura*, *A. minyura*, *A. mulganeura*, *A. paraneura* and *A. pteraneura*, although not all are present in the Pilbara.

Mulga community types can be considered as significant, and are recognised as such in a number of publications including the *Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (Department of Conservation and Land Management [CALM] 2002) – see below, and various EPA approvals documents where environmental objectives are set or conditions imposed to restrict impacts on Mulga vegetation (e.g. EPA 2010; 2012a). Despite being recognised as a significant, there is currently no statutory protection for any Mulga community.

Sheet Flow Dependent Mulga (also known more generally as Sheet Flow Dependent Vegetation, SFDV) occurs in groves or bands and can be inferred from species composition, community structure and topography. SFDV relies on overland (sheet) flow of water across a relatively flat landscape to regenerate (Muller 2005; The University of Western Australia *et al*. 2012), and as such changes in topography caused by mining or infrastructure, including roads and railways, can have a significant impact.

3.3.5 Ecosystems at Risk

'Ecosystems at Risk' were identified by regional ecologists and others as part of the *Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (CALM 2002), however they do not have any formal legislative protection. Some have since been identified as TECs or PECs.

'Ecosystems at Risk' identified from the Chichester subregion (PIL1) of the Pilbara (Kendrick & McKenzie 2002) that may occur in or near the study area are now included in the 'Four plant assemblages of the Wona Land System' PEC.

'Ecosystems at Risk' identified from the Fortescue Plains subregion (PIL2) of the Pilbara (Kendrick 2002a) that may occur in or near the study area include:

- 'Perennial grassland communities in the Fortescue Valley'; no status given.

'Ecosystems at Risk' identified from the Hamersley subregion (PIL3) of the Pilbara bioregion (Kendrick 2002b) that may occur in or near the study area include:

- the vulnerable 'Grove/inter-grove mulga, eastern Hamersley Range' ecosystem
- the vulnerable 'Valley floor mulga' ecosystem
- the vulnerable 'All major ephemeral water courses'.

No 'Ecosystems at Risk' were identified from the Roebourne subregion (Kendrick & Stanley 2002) that may occur in or near the study area (other than those now considered to represent a PEC).

3.3.6 Significant Vegetation According to Guidance Statement No. 51

Guidance Statement No. 51 (EPA 2004) also lists a number of reasons why vegetation may of conservation interest, in addition to being listed as a TEC or PEC or because the extent is below a minimum threshold. These reasons, which may apply at a number of scales but are not defined in detail, include scarcity, unusual species, novel combinations of species, role as a refuge, role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species, being representative of the range of a unit (particularly a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extension or isolated outliers of the main range) and restricted distribution.

Flora and vegetation reports from nearby areas were reviewed to identify vegetation that was considered significant according to *Guidance Statement No. 51*. A number of vegetation types having restricted distributions were identified as being locally significant including:

- riparian vegetation in the Flinders Blacksmith tenement (Ecoscape 2011a), Fortescue Metals Group (FMG) Central Pilbara Project Area (Ecoscape 2012b) and Balla Balla Vanadium project area (Mattiske Consulting 2006), characterised by *Eucalyptus victrix* and/or *E. camaldulensis*
- vegetation characterised by *Carissa spinarum* (now known as *C. lanceolata*) over *Triodia wiseana* and *T. epactia* in the Balla Balla Vanadium project area (Mattiske Consulting 2006)
- vegetation restricted to gorges in the Flinders Blacksmith tenement (Ecoscape 2011a) and FMG Central Pilbara Project Area (Ecoscape 2012b)
- vegetation restricted to high hilltops, characterised by *Eucalyptus kingsmillii* and *E. gamophylla*, in the FMG Central Pilbara Project Area (Ecoscape 2012b)

- *Acacia maitlandii* Shrubland on low hills in the Flinders Blacksmith tenement (Ecoscape 2011a)
- *Acacia orthocarpa* (atypical form) Shrubland in the Flinders Blacksmith tenement (Ecoscape 2011a)
- sheet flow dependent Mulga in the FMG Central Pilbara Project Area (Ecoscape 2012b).

3.3.7 Previous Surveys

There are very few known (publicly available) flora and vegetation surveys that have been conducted in areas corresponding with or close to the study area. Reports associated with previous surveys from areas close to the northern (Balla Balla) and southern (Flinders Blacksmith tenement and Fortescue Metals Group Solomon Project) ends of the study area that have been reviewed in association with this project are:

- Balla Balla:
    - Mattiske Consulting (2013a) *Flora and vegetation survey of the Balla Balla export facilities, proposed infrastructure corridor within L47/690*
    - Mattiske Consulting (2008) *Flora and vegetation survey of the Balla Balla pipeline*
    - Mattiske Consulting (2006) *Flora and vegetation survey of the Balla Balla Vanadium Project*
    - Astron Environmental Services (2005) *Balla Balla Vanadium Project Vegetation and Flora Survey*
- Flinders Blacksmith tenement:
    - WorleyParsons (2010) *Pilbara Iron Ore Project: Preliminary Desktop Environmental Study at E47/882*
    - Ecoscape (2011a) *Pilbara Iron Ore Project – Blacksmith Flora and Vegetation Survey*
    - Ecoscape (2012d) *Groundwater Dependent Ecosystem Mapping*
- Fortescue Metals Group Solomon Project:
    - Coffey Environments (2010b) *Flora and Vegetation Assessment, Solomon Rail Project - Volume 1*
    - Ecoscape (2010a) *Level Two Flora and Vegetation Assessment, Firetail Mining Area*
    - Ecoscape (2010c) *Solomon Project Airstrip Flora and Vegetation Assessment*
    - Ecoscape (2010d) *Solomon Project Rail Re-alignment Flora and Vegetation Assessment*
    - ENV Australia (2010) *Solomon Project: Kings Flora and Vegetation Assessment.*

Ecoscape has also undertaken a number of unpublished surveys near the southern end of the study area and has received survey reports from other consultants as reference material for these:

- Ecoscape (2013b) *Delphine Level 2 Flora and Vegetation Survey (Phase 2)*
- Ecoscape (2013c) *Eliwana and Flying Fish Level 2 Flora and Vegetation Survey (Phase 2)*
- Ecoscape (2013e) *Western Hub Rail Link Level 2 Flora and Vegetation Survey*
- Ecoscape (2012a) 'Themeda *Grasslands on Cracking Clay' TEC Assessment*
- Ecoscape (2012b) *Central Pilbara Project Level 2 Flora and Vegetation Assessment*
- Ecoscape (2012e) *Groundwater Dependent Ecosystem Mapping and Conservation Significant Flora Survey*
- Ecoscape (2012f) *Level 1 Vegetation, Flora and Fauna Assessment, and Targeted Conservation Significant Flora and Fauna Survey: Mt Macleod West*
- Ecoscape (2012h) *Mt Farquhar Phase One Flora and Vegetation Survey*
- Ecoscape (2012k) *Vegetation, Flora and Fauna Assessment, and Targeted Conservation Significant Flora and Fauna Survey: Raven*
- Coffey Environments (2010a) *Flora and Vegetation Assessment, Solomon Project and Investigator - Volume 1*
- Coffey Environments (2011) *Robe pisolite assessment and targeted Gompholobium karijini (P2) survey, Solomon Mine Project.*

Ecoscape has also undertaken flora and vegetation surveys near the northern end of the study area alignment, largely in the Karratha/Roebourne and Port Hedland areas:

- Ecoscape (2013a) *Cape Lambert to Wickham 33kV Line: Targeted Flora and Fauna Surveys*
- Ecoscape (2013d) *Pilbara Vegetation Asset Intersect Review*
- Ecoscape (2012j) *Pippingarra Quarry Priority Flora Survey and Delineation*
- Ecoscape (2011b) *Pippingarra Quarry Vascular Flora and Vegetation Survey*
- Ecoscape (2010b) *Port Hedland Water Supply Flora and Vegetation Assessment.*

Results of these surveys are confidential however the reports have been reviewed for relevant information.

3.3.7.1 Environmental Approval Documentation

Environmental approvals documents for the Balla Balla and Flinders Blacksmith areas include:

- EPA (2009) *Report and recommendations of the Environmental Protection Authority: Balla Balla Magnetite Project, Ferro Metals Australia Pty Ltd. Report 1309*
- EPA (2012b) *Report and recommendations of the Environmental Protection Authority: Flinders Pilbara Iron Ore Project - Stage 1. Report 1456*
- EPA (2013) *Report and recommendations of the Environmental Protection Authority: Balla Balla Export Facilities, Forge Resources Swan Pty Ltd. Report 1481*.

The EPA (2013) report identified the following as being significant in relation to the Balla Balla Export Facility, although there were no environmental conditions set in response:

- no TF or TECs were identified from the study area
- P1 *Heliotropium muticum* had previously been recorded from close to the survey area, although there was no indication that it was recorded from within it
- parts of the study area resemble the P3 'Horseflat land system of the Roebourne Plains' PEC, however the proportion of the PEC as a whole that may be impacted was small.

The EPA (2009) report identified the following as being significant in relation to the Balla Balla Magnetite Mine, however no environmental conditions were set in response as the proponent had taken steps to minimise impacts:

- no TF or TECs were identified from the study area
- there may have been Priority Flora species within the survey area however they could not be identified with certainty as they were in vegetative condition; the EPA considered that, even if the potential species were PF, that the impacts would be low
- there may have been vegetation representative of the P3 'Roebourne Plains coastal grassland' PEC, however this could not be confirmed due to grazing and fire impacts; the EPA considered that the proposed clearing would not impact on the conservation status of the PEC
- impacts to groundwater dependent vegetation would be minimal.

The EPA (2012b) report identified the following as being significant in relation to the Flinders Blacksmith tenement, with some conditions set as listed below:

- no TF, TECs or PECs were identified from the study area
- three P3 and two P4 species were recorded
- an undescribed *Josephinia* sp. was identified from study area however it was recorded in an area outside the impact zone; the EPA supports additional surveys but did not impose them as a condition
- a groundwater dependent vegetation monitoring and management plan would be required
- residual impacts management measures and offset conditions were imposed.

4.0 METHODS

4.1 FLORA AND VEGETATION ASSESSMENT

The Rutila rail survey was conducted as a single season Level 2 flora and vegetation assessment that, as much as possible, complied with the guidelines listed in **Section 1.3** and the vegetation condition rating scale included in EPA and DEC (2012) *Draft Technical Guide - Flora and Vegetation Surveys for Environmental Impact Assessment. Version 1, February 2012*. The EPA is anticipated to provide guidance if a second season of survey will be required, based on the results of this assessment.

Level 2 surveys incorporate background research and a reconnaissance survey as preparation for a more intensive and detailed survey conducted over one or more visits in the main flowering season, followed by visits in other seasons. Level 2 surveys also involve replication of the survey, greater coverage than a Level 1 survey and displacement of plots over the target area.

Data collected during the field survey was used to:

- describe and map the vegetation types of the study area to indicate the distribution and relative abundance of each vegetation type
- document the vascular flora of the study area and provide a measure of the overall floristic richness
- identify species and vegetation types of particular conservation significance.

4.1.1 Reconnaissance Survey

The reconnaissance survey was undertaken by Lyn Atkins and Jared Nelson during May 26-29, 2014. The purposes of this survey were to:

- identify access opportunities and constraints for future flora and vegetation surveys
- commence vegetation type assessment and mapping to identify potential representative floristic quadrat locations and potentially significant vegetation types
- commence ground truthing of habitat types of conservation significant flora to better target future searches.

The survey was undertaken by driving to and, where possible, along the study area alignment and recording relevant information, however between the reconnaissance survey and Level 2 survey part of the proposed alignment changed.

A preliminary conservation significant flora likelihood assessment was undertaken (see **Section 4.2.2** below) following the reconnaissance survey to identify target areas for conservation significant flora searches during the Level 2 survey. The final conservation significant flora likelihood assessment included in **Appendix Nine** was conducted following the field surveys.

4.1.2 Level 2 Flora and Vegetation Survey

The Level 2 field surveys were undertaken over two separate field trips.

The first field survey, undertaken during July 7-17 2014, assessed the northern end of the alignment, south to the Nunyerry Gap at the northern edge of the Chichester Range. The field personnel were:

- Lyn Atkins B.App.Sc. (Multi. Sc.)
- Richard Daniel B.Sc. (Env. Biol.)
- Andrew Fry B.Sc. (Env. Sc., Hons)
- Sonya Bateman B.Sc. (Geog., Hons).

The second field survey, undertaken during July 28-August 7 2014, assessed the alignment south of the Nunyerry Gap. The field personnel were:

- Jared Nelson B.Sc (Agric., Hons)
- Stephen Kern B.Sc. (Plant Sc., Hons)
- Andrew Fry (as above)
- John Scanlon B.Sc.(Biol., Hons.), PhD.

The field survey included:

- establishing and scoring floristic quadrats (abbreviated to 'quadrats') and some detailed relevès (unbounded areas) where the location was not appropriate regularly-shaped quadrats
- collection of an opportunistic flora inventory (species within the study area that were not recorded in quadrats)
- preliminary vegetation type mapping
- vegetation condition assessment and mapping
- targeted conservation significant flora searches and recording opportunistic observations.

DPaW flora collecting permits are listed in **Section 1.4**.

4.1.2.1 Floristic Survey

Vegetation and floristic data were collected and described from 152 quadrats 50 m x 50 m in dimension or equivalent area if linear (e.g. along a drainage line), which is in line with the DPaW's (Department of Conservation and Land Management [CALM] 2003) *Draft Botanical Survey Requirements for the Pilbara Region* and EPA (2004) *Guidance Statement No. 51*. Four detailed relevès were also recorded in areas where it was not possible to accurately measure area (e.g. a rocky knoll), however the survey intensity was comparatable to quadrats thus the level of detail was equivalent.

Floristic, biological and physical data were collected and recorded from each of these quadrats and relevès. The flora records provide the names used in the vegetation descriptions and contribute to the flora species lists and frequency of occurrence data. Various parameters relating to the individual quadrats were used to assist in both the description of vegetation types and the determination of flora distribution, particularly in terms of defining associated landforms.

The quadrats and relevès were spatially distributed over the study area in areas of representative vegetation, as determined during the reconnaissance survey, with additional quadrats and relevès added as necessary to represent less common vegetation types identified during the field survey.

At the request of one of the pastoralists the quadrats were not marked in any way, however their area was accurately measured (**Plate 1**). Quadrats were oriented in a north-south and east-west direction, except where they were located in linear vegetation types (e.g. drainage lines). Quadrats and most relevès were numbered using the protocol of R14xxx, where R = Rutila, 14 =2014 and xxx represents the three digit quadrat number. One relevè was numbered R14R1.

Plate 1: Measured quadrat example

The following parameters were recorded at each quadrat and relevè:

- MGA coordinates recorded in GDA 94 datum using a hand-held Global Positioning System (GPS), to an accuracy usually within 5 m
- National Vegetation Inventory System (NVIS) vegetation description based on the height and estimated cover of dominant species (National Heritage Trust [NHT] 2003); **Table 18** and **Table 19** in **Appendix One**
- an inventory of all species, with estimated maximum height and percent foliage cover
- description of landform and habitat
- broad description of surface soil type and stony surface mantle
- percentage of litter cover and depth
- percentage of bare ground
- evidence of grazing, mining exploration activities, weed invasion, frequent fires etc. Fire effects were only considered a negative impact if they were caused by repeated burning (e.g. for pastoral purposes).

Photographs of the vegetation at each site were taken from the north-west corner (or nearest equivalent for linear quadrats) of each quadrat.

Flora species were also opportunistically recorded on traverses between quadrat locations.

4.1.2.2 Flora Identification and Data Entry

Voucher specimens were collected of all species that could not be identified with confidence in the field and at least one specimen of each potential conservation significant flora species. Each voucher specimen was assigned a unique number to facilitate tracking of data, and pressed in the field. Specimens collected were dried and treated in accordance with the requirements of the WAH.

These voucher specimens were identified by Ecoscape (mostly Stephen Kern) to infrataxa (subspecies, variety, affinity or hybrid) level where possible, using appropriate publications, and comparison with pressed specimens housed at the WAH. The identification of all suspected conservation significant flora and various other taxonomically complex species were verified by ME Trudgen.

Nomenclature was checked against the current listing of scientific names recognised by the WAH and listed on *FloraBase* (WAH 1998-2014) and updated as necessary.

All raw site data was entered into a Microsoft Access database, with species names entered following formal identification of the collected specimens.

4.1.2.3 Conservation Significant Flora Searches

Due to the size of the study area, no systematic grid search of the study area for conservation significant flora was undertaken. However, when traversing between sites, every opportunity was taken to search for conservation significant flora species, especially where preferred habitats were encountered. The search spacing between surveyors was approximately 20-30 m (i.e. when walking between sites, the two surveyors walked parallel lines, searching either side of the walked line for species identified by the database searches).

Targeted searches were also conducted in areas identified by the conservation significant flora likelihood assessment conducted following the reconnaissance survey.

In order to assist with identification in the field, survey teams had access to literature (including images) of conservation significant species identified by the database searches. Specimens of all PF species were collected for identification purposes. Locations and population estimates were recorded for all populations of PF identified during the field survey.

4.1.2.4 Significant Flora

TF and PF are considered to be conservation significant. Other significant flora are considered such according to *Guidance Statement No. 51* (EPA 2004). Significant flora includes species that are:

- a range extension, defined as a new population/s or occurrence/s more than 100 km from the nearest vouchered specimen included in the WAH, or where it occurs in a new IBRA subregion, irrespective of distance
- a range edge or end of the extreme continuous distribution limit of vouchered specimens
- a disjunct population or outlier that is more than 100 km from the outer limits of the main vouchered continuus distribution
- endemics that are confined to a particular area, in most case a Biogeographical region
- narrow endemics that are restricted to a range of less than 150 km.

No specific searches for significant flora searches (other than for conservation significant flora) were conducted.

4.1.2.5 Introduced Species

Flora species were considered to be introduced (weeds) if they are listed as ‘alien’ on *FloraBase* (WAH 1998-2014).

No specific searches were conducted for introduced species; they were recorded as a cover value where they were recorded within quadrats, or recorded opportunistically.

Declared Pest plants listed under the *BAM Act 2007* had their locations recorded.

4.1.2.6 Vegetation Descriptions

Vegetation was described from each of the quadrats using the height and estimated cover of dominant and characteristic species of each stratum based on NVIS (2003) (**Table 18** and **Table 19** in **Appendix One**), recorded at Level V. Up to three species per stratum from each stratum (upper, mid and ground) were used to formulate vegetation descriptions for each quadrat and each vegetation type.

Vegetation codes are formulated using initials for dominant and characteristic species in each strata. For example the (not real) vegetation code '**ElAs$_4$Te(1)**' has *Eucalyptus leucophloia subsp. leucophloia* ('El') as the most dominant species of the upper stratum, *Acacia arida* ('As$_4$') as the most dominant species of the mid stratum, *Triodia epactia* (Te) as the most dominant species of the ground stratum and (1) to represent that this is the first vegetation type with the same combination of dominant species. Not all strata may be present in all vegetation types.

4.1.2.7 Vegetation Condition

The vegetation condition at quadrats was assessed using the adapted Keighery Vegetation Condition Scale for Eremaean and Northern Botanical Provinces included in the *Draft Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA & DEC 2012). This rating scale is outlined in **Table 20** in **Appendix One**.

The vegetation condition of the study area was assessed by extrapolating the value recorded for each quadrat and applying the condition to the vegetation type in the vicinity and from 'spot' evaluations recorded during traverses through the study area.

4.2 FLORA AND VEGETATION SIGNIFICANCE

4.2.1 Determination of Flora Significance

Flora taxa are significant if they are listed as TF or PF (conservation significant), or are significant according to *Guidance Statement No. 51* (EPA 2004).

All flora taxa recorded during the field survey are assessed for significance.

4.2.2 Conservation Significant Flora Likelihood Assessment

Whilst both targeted and opportunistic searches for conservation significant flora species were undertaken during the field survey, it was not possible to access all areas to carry out intensive searches. Therefore, whilst some species identified by the database searches (**Table 23** in **Appendix Two**) were recorded during the survey, some of the remaining listed potential species may occur. In order to achieve a better understanding of the likelihood of conservation significant species occurring within the study area, a likelihood assessment of possible taxa was undertaken (**Table 29** in **Appendix Ten**).

The likelihood of a species occurring in the study area is based on the following attributes, as listed on *FloraBase* (WAH 1998-2014; 2014) and tailored to Pilbara populations and including information from recent nearby surveys. The attributes were:

- broad soil type usually associated with the species
- broad landform usually associated with the species
- usual vegetation (characteristic species) with which the species is usually associated
- species having previously been recorded from within approximately 50 km of the study area (considered as 'nearby').

The likelihood rating is assigned using the following categories:

- Known (recorded): it does occur within the study area and was recorded during the field survey or there are reliable historical records of it occurring in the study area
- Possible: it may occur within the study area (but was not recorded); broadly, 2-4 of the required attributes (but always including records from nearby) are present in the study area
- Unlikely: it could occur but is not expected; 1-3 of the required attributes are present in the study area but:
    - it is not known from nearby, or
    - it is known from nearby but has no other required attributes, or

- it is known from nearby but has at least one well-defined attribute that does not occur in the study area (e.g. it is associated with a specific landform or soil type that does not occur in the study area)

- Highly Unlikely: the species characteristics include none of the required attributes of soil, landform, associated vegetation and having previously been recorded nearby, or a critical element (often landform) is not within the study area and as such it almost certainly does not occur within the study area.

The conservation significant flora likelihood assessment was initially conducted following the reconnaissance survey to identify potential habitat areas for targeted searches. The assessment was then reviewed following the field survey using more detailed information to identify the likelihood of species occurring in the study area.

4.2.3 Vegetation Significance Assessment

A calculation matrix was developed to assess local and regional vegetation significance. Vegetation was considered as potentially significant if it was confirmed or considered likely to be representative of a TEC or PEC, if it was significant according to *Guidance Statement No. 51*, was considered significant in other nearby areas, or had other significant attributes. Ecoscape's interpretation of these attributes is given below.

Significant According to *Guidance Statement No. 51*

The vegetation of the study area was assessed to determine if it meets any of the criteria for significance listed in *Guidance Statement No. 51* (see **Section 3.3.6**). For this assessment, the *Guidance Statement No. 51 (GS51)* criteria were interpreted to include:

- 'scarcity' and 'restricted distribution' are included in 'small extent within the study area'
- 'role of refuge' and 'role as key habitat' are included in 'supports PF/new spp.' and other specific habitat attributes ('restricted landform', 'riparian' and 'Mulga')
- 'unusual species' are defined as species interpreted to occur in areas other than their usual habitat, and included in 'significant according to *GS51*'
- 'novel combination of species' is interpreted as being a combination of species that the senor botanist did not expect, given their experience, and included in 'significant according to *GS51* or significant nearby'
- 'being representative of a range of a unit/good example' is interpreted, based on the senior botanist's experience, as being a particularly good representative of a vegetation type or a range edge, extension or outlier of a vegetation type, and included 'significant according to *GS51* or significant nearby'.

Significant in Nearby Areas

The vegetation types recorded from the study area were compared with those considered as significant in nearby areas (see **Section 3.3.7**). This comparison was based on both species composition and landscape position/landform, where known.

Vegetation considered similar to significant vegetation from nearby is included in 'significant according to *GS51* or significant nearby'.

4.2.4 Floristic Analysis

PATN© software (Belbin & Collins 2006) was used to undertake statistical analysis to generate floristic groups using the data collected from the floristic quadrats detailed relevès, in order to better understand local significance of floristic units. PATN analysis has been used for several local floristic analyses including Gibson *et al.* (1994) for the Swan Coastal Plain, and is routinely used for regional floristic analysis in the Pilbara by ME Trudgen and E Griffin (e.g. Ecoscape 2010a; 2011a).

PATN is a multivariate analysis tool that generates estimates of association (resemblance, affinity, distance) between sets of objects described by a suite of variables (attributes), and classifies the objects into groups and condenses the information and displays the patterns in the data graphically.

PATN offers a choice of data transformations prior to multivariate analysis.

Floristic groups, identified using a dendrogram output of the analysis, are used as a tool to inform vegetation type groups at various levels and scales. Floristic quadrat data is used for the analysis.

Prior to conducting the floristic analysis the data is 'cleaned' to 'remove noise' by deleting singletons (i.e. species that only occurred in one quadrat) and any species where there was doubt that it was unique. For this analysis, the Kulczynski similarity coefficient was the appropriate association to use as it has proven to be a good estimation of association for ecological applications (Belbin & Collins 2006). This was followed by Flexible UPMGA (Un-weighted Pair Group Using Arithmetic Averaging) fusion to produce clusters of related objects (species); these are the floristic groups that are displayed as a dendrogram.

Interpretation of these purely floristic groups into recognisable and mappable on-ground units is a tool used to identify vegetation types. Generally, quadrats that are closely floristically related on the dendrogram form identifiable vegetation units, however, as presence-absence data is usually used in the analysis and there is no weighting given to dominant species, at times the floristic groups are not easily related to on-ground vegetation types. Vegetation types are therefore determined as a combination of floristic analysis and on-ground interpretation using dominant and characteristic species.

4.3 ADEQUACY OF SAMPLING

In order to demonstrate adequacy of sampling, a species accumulation curve was generated by the computer programme Species Diversity and Richness (Pisces Conservation Ltd 2007) using five random selections of sample order, and using only quadrat data.

A taxa by area plot was also created using floristic quadrat data for the study area and nearby. This plot gives an indication of relative species richness, and can also provide an indication of survey adequacy.

Adequacy of sampling is also assessed in terms of representation of various attributes, including vegetation types and representation of land systems.

5.0 RESULTS

5.1 FLORA ASSESSMENT

5.1.1 Flora Inventory

Quadrat and relevè details are included in **Appendix Four**, and the complete flora inventory (**Table 26**) in **Appendix Five**. The quadrat and relevè species matrix (**Table 27**) is included in **Appendix Six**.

A total of 474 vascular flora taxa (including species, subspecies, varieties, hybrids, affinities and forms, including native and introduced species) were recorded from the 156 quadrats and relevès, opportunistic observations and conservation significant flora searches. Of these, nine were of conservation significance (**Section 5.1.2.3**) and 16 were introduced (**Table 5**).

Due to lack of reproductive material, 23 taxa could only be identified to genus level and one to family level, totalling 5% of taxa. It is possible that some of the unidentified taxa are represented as a named taxon in the flora inventory. One (*Acacia* sp.) was identified as potential unidentified (new to science) taxa.

Sixty three families and 189 genera are represented in the study area. The most commonly represented families are:

- Fabaceae; 106 taxa (one introduced)
- Poaceae; 68 taxa (four introduced)
- Malvaceae; 57 taxa (two introduced)
- Amaranthaceae; 23 taxa (one introduced)
- Asteraceae; 20 taxa (four introduced).

The most commonly represented genera are *Acacia* (40 taxa), *Sida* (16 taxa), *Ptilotus* (15 taxa), *Senna* (15 taxa), *Goodenia* (11 taxa) and *Euphorbia* (10 taxa).

The most commonly encountered taxa were *Triodia epactia*, recorded from 119 quadrats and relevès, *Acacia pyrifolia* var. *pyrifolia* (75), *Indigofera monophylla* (73), *Triodia wiseana* (64), *Corchorus tectus* (58), *Corymbia hamersleyana* (58), *Acacia ancistrocarpa* (56), *Ptilotus astrolasius* (56), *Acacia inaequilatera* (45) and *Rhynchosia minima* (45).

5.1.2 Conservation Significant Flora

5.1.2.1 Environment Protection and Biodiversity Conservation Act 1999

No plant taxon recorded in the study area is listed as Threatened under the *EPBC Act 1999*.

5.1.2.2 Wildlife Conservation Act 1950

No plant taxon recorded in the survey is gazetted as a TF pursuant to Subsection 2 of Section 23F of the *WC Act 1950*.

5.1.2.3 Priority Flora

Nine PF were recorded from the study area: three P1, one P2, three P3 and two P4. The PF were:

- *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P1)
- *Goodenia nuda* (P4)
- *Helichrysum oligochaetum* (P1)
- *Heliotropium muticum* (P1)

- *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) (P3)
- *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
- *Pentalepis trichodesmoides* subsp. *hispida* (P2)
- *Rhynchosia bungarensis* (P4)
- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)

Targeted searches were conducted in areas of potential habitat as identified by the conservation significant flora likelihood assessment.

Despite targeted searches being conducted at the interface between granite or basalt rocks and the surrounding landform in the northern portion of the study area, there was no transitional habitat or vegetation observed in these areas, except that shrubs were frequently larger or slightly more dense, but of the same species as in the surrounding area, and the immediately adjacent area was frequently more weedy (e.g. **Cenchrus ciliaris*, **Aerva javanica*).

Priority Flora Descriptions

***Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P1)**

Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (**Plate 2**) is a shrub to 3m high. According to *FloraBase* (WAH 1998-2014) it is associated with predominantly sandy soils, on plains and dunes. There are 29 records listed on *NatureMap* (DPaW 2007-2014), mainly in the Pilbara and Carnarvon bioregions. Most Pilbara records are from the area south to southwest of Port Hedland, within 70 km of the town.

One population consisting of 181 individuals of *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) was recorded during the field surveys, on sandy soil to the east of Croydon outstation. The area where this taxon was recorded was disturbed, probably as a result of lightning strike rather human disturbance,

Plate 2: *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) habit

***Goodenia nuda* (P4)**

Goodenia nuda (**Plate 3**) is a herb to 50 cm high. According to *FloraBase* (WAH 1998-2014) it is associated with clay loam and ironstone soils, mostly on floodplains and outwash areas but occasionally on hills. There are 84 records listed on *NatureMap* (DPaW 2007-2014), mostly in the Pilbara bioregion associated with the Hamersley Range or Fortescue River floodplain.

Goodenia nuda was widely, but sporadically, distributed with a total of 150 plants recorded from 24 populations encountered across the entire length of the rail corridor. It was generally associated with broad drainage and outwash areas.

Plate 3: *Goodenia nuda*

***Helichrysum oligochaetum* (P1)**

Helichrysum oligochaetum (**Plate 4** and **Plate 5**) is a herb to 25 cm high. According to *FloraBase* (WAH 1998-2014) it is occurs on clay soils, on plains or associated with drainage lines. There are 10 records listed on *NatureMap* (DPaW 2007-2014), in the Pilbara and Gascoyne bioregions.

A single population of *Helichrysum oligochaetum* with an estimated 56 individuals was recorded during the field surveys. Within the study area, this population was confined to the riverbed of the Fortescue River, which differed to other drainage lines of the study area in having soils with high clay content. The population

Plate 4: *Helichrysum oligochaetum* flower

Plate 5: *Helichrysum oligochaetum* habit

was observed to extend outside of the study area along the river. Due to the specific habitat within which this *Helichrysum oligochaetum* was recorded, it is not considered likely to occur elsewhere across the study area.

***Heliotropium muticum* (P1)**

Heliotropium muticum (**Plate 6** and **Plate 7**) is a herb to 30 cm high. According to *FloraBase* (WAH 1998-2014) it is associated with plains, with a variety of soil types. There are 13 records listed on *NatureMap* (DPaW 2007-2014), all in the Pilbara bioregion, including near Whim Creek and south to southeast of Port Hedland.

Approximately 14 populations comprising 540 individuals of *Heliotropium muticum* were recorded from sandy plains in the northern quarter of the survey corridor. Populations of this species were more dense in disturbed (e.g. recently burnt) areas, indicating that it may be a disturbance opportunist.

Plate 6: *Heliotropium muticum* flowers

Plate 7: *Heliotropium muticum* habit

***Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) (P3)**

Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301) (**Plate 8** and **Plate 9**) is a shrub to 2.3 m high. According to *FloraBase* (WAH 1998-2014) it is associated with creeks and gorges. There are 24 records listed on *NatureMap* (DPaW 2007-2014), all in the Pilbara bioregion and within or close to the western part of the Hamersley Range.

Six populations comprising approximately 140 individuals of *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) were recorded during the field surveys, within creeklines and gorge areas of the Hamersley Range

Plate 8: *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) flower and foliage

Plate 9: *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) habit

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) (**Plate 10**) is a low, spreading annual herb. According to *FloraBase* (WAH 1998-2014) it is associated with cracking clay soils. There are 13 records listed on *NatureMap* (DPaW 2007-2014), all in the Pilbara bioregion, most of which are associated with the Hamersley Range.

One population of *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) with an estimated 140 individuals was recorded during the field surveys, from associated with cracking clay of the Wona land system.

Plate 10: *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479)

***Pentalepis trichodesmoides* subsp. *hispida* (P2)**

Pentalepis trichodesmoides subsp. *hispida* (**Plate 11**) is a form to m high. According to *FloraBase* (WAH 1998-2014) it is associated with cracking clay and basalt soils. There are six records listed on *NatureMap* (DPaW 2007-2014), all in the Pilbara bioregion. This taxon has only recently been described (Orchard & Cross 2012). It is relatively under-collected as the species *sens. lat* is easily identified and, prior to the circumscription, there was no need for botanists to collect it for identification purposes. Ecoscape has collected this subsp. from two of its study areas in the western Hamersley Range ((Ecoscape 2014a; 2014b, both assessed in 2013) and considers it more common than its listing as P2 suggests.

One population (of a single individual plant) of *Pentalepis trichodesmoides* subsp. *hispida* was recorded during the field surveys, on basalt-derived soils of the Rocklea land system. It is considered likely that additional plants may be scattered at low density within this land system elsewhere within the study area.

Plate 11: *Pentalepis trichodesmoides* subsp. *hispida*

***Rhynchosia bungarensis* (P4)**

Rhynchosia bungarensis (**Plate 12** and **Plate 13**) is a sticky shrub to 50 cm high, but frequently close to prostrate. According to *FloraBase* (WAH 1998-2014) it is associated with drainage lines and gorges. There are 69 records listed on *NatureMap* (DPaW 2007-2014), mostly in the Pilbara bioregion, associated with the Hamersley Range or Burrup Peninsula Dampier Archipelago.

Approximately 450 individuals of *Rhynchosia bungarensis* were recorded from eight populations associated with gorge areas within the Hamersley Range.

Plate 12: *Rhynchosia bungarensis* flower and foliage

Plate 13: *Rhynchosia bungarensis* habit

Sida sp. Barlee Range (S. van Leeuwen 1642) (P3)

Sida sp. Barlee Range (S. van Leeuwen 1642) (**Plate 14** and **Plate 15**) is a spreading shrub to 50 cm high. According to *FloraBase* (WAH 1998-2014) it occurs on skeletal soils associated with slopes and gullies There are 34 records listed on *NatureMap* (DPaW 2007-2014), mostly in the Pilbara bioregion, associated with the Hamersley Range.

Two populations with an approximate total of 15 individuals of *Sida* sp. Barlee Range (S. van Leeuwen 1642) were recorded during the field surveys, from sheltered, south-facing gorges near the southern western extent of the study area.

Plate 14: *Sida* sp. Barlee Range (S. van Leeuwen 1642) flower and foliage

Plate 15: *Sida* sp. Barlee Range (S. van Leeuwen 1642) habit

5.1.3 Other Significant Flora

5.1.3.1 Range Extension, Range Edges and Outlier Populations

Based on the records included on *NatureMap* (DPaW 2007-2014), the taxa shown in **Table 4**, none of which are of conservation significance, are recorded as being range extensions. Two of these (highlighted) are considered significant range extensions of 100 km or greater. Range extensions were assessed using the *NatureMap* (DPaW 2007-2014) distance measuring tool. The potential significance of range extensions, many of which are considered a result of a paucity of records from the area rather than true range extensions is discussed in **Section 6.1.3.1**.

Table 4: Range extensions and other significant attributes of flora taxa

TAXON	RANGE EXTENSION
Acacia monticola x tumida var. *pilbarensis*	This hybrid is only recorded from approximately 200 km to the northeast. However the parent species of this hybrid are widespread in the Pilbara and commonly co-occur
Eragrostis speciosa	Poorly collected in the region and fills in a range gap
Goodenia armitiana	Poorly collected in the Pilbara and fills in a range gap
Gyrostemon tepperi	Western range extension of greater than 200 km. Most populations occur to the east of the Pilbara bioregion
Hibiscus sturtii var. *grandiflorus*	Poorly collected in the Pilbara and several hundred km from nearest record, but known to be more abundant than this
Sida sp. Rabbit Flat (B.J. Carter 626)	Western range extension of approximately 100 km
Tephrosia remotiflora	Only known from one record in the Pilbara bioregion which is broadly close to the study area, with most records from the Kimberley
Zornia albiflora	Poorly collected in the region and fills in a range gap
Zornia muelleriana	**Southern range extension of up to 90 km**

5.1.3.2 New (Undescribed) Species

A species of *Acacia* (listed as '*Acacia* sp.' in data), **Plate 16**, was collected from vegetation types (**AiTw(3)**, **ElAs$_2$Te(1)** and **ElAs$_2$Te(2)**) associated with the Granitic, Capricorn and McKay land systems near Mt Florance Station in the Chichester Range. It was recorded from seven quadrats (R14088, R14090, R14091, R14092, R14095, R14101 and R14156). Its range therefore encompasses approximately 13 km linear length of the study area. It was typically recorded as a dominant species of the mid-stratum (**Plate 17**).

Specimens were examined by Malcolm Trudgen who is an expert with Pilbara Flora. He has not encountered this taxon before and could not assign the identification to any known species. Trudgen recommends that this unknown species requires further study, additional collections with fruiting material would be ideal. Bruce Maslin, WAH's *Acacia* specialist, is currently on extended leave and could not be contacted for advice.

Plate 16: Scan of Ecoscape collection of *Acacia* sp.

Plate 17: Quadrat R14101 showing the form and habitat of *Acacia* sp.

5.1.3.3 Significant According to Guidance Statement No. 51

***Acacia trachycarpa* (dwarf variant)**

A low habit form of *Acacia trachycarpa* was recorded from 10 quadrats towards the southern end of the study area. This form is recognised as 'dwarf variant' by Maslin *et al.* (2010), but considered unworthy of any formal rank. Typical *Acacia trachycarpa* was also recorded from the study area. Apart from being an unusual form, this taxon has no formal conservation significance.

5.1.3.4 Introduced Flora

Sixteen introduced species were recorded during the field surveys. Their locations are shown on **Map 6**.

There were no Declared Pest plants as listed for the relevant local areas under the *BAM Act 2007*.

The introduced flora recorded from the study area are shown in **Table 5** with their ratings against the lists in **Section 3.2.7**.

Table 5: Introduced flora ratings

SPECIES	DP	WONS	DEC WEED PRIORITIZATION RANK+			ALERT LIST	SLEEPER	TARGET. ERADIC.	BIOL. CONTROL	PERMITTED ENTRY
			Ecol. Impact	Invasive-ness	Control					
**Acetosa vesicaria*	-	-	H	R	H	-	-	-	-	-
**Aerva javanica*	-	-	H	R	H-M	-	-	-	-	-
**Argemone ochroleuca* subsp. *ochroleuca*	-	-	L	R	L	-	-	-	-	-
**Bidens bipinnata*	-	-	U	R	L	-	-	-	-	-
**Cenchrus ciliaris*	-	-	H	R	L	-	-	-	-	-
**Cenchrus setiger*	-	-	H	R	L	-	-	-	-	-
**Cucumis melo*	Not in any list									
**Cynodon dactylon*	-	-	H	R	L	-	-	-	-	-
**Flaveria trinervia*	Not in any list									
**Malvastrum americanum*	-	-	H	R	L	-	-	-	-	-
**Melochia pyramidata*	-	-	L	S	U	-	-	-	-	-
**Passiflora foetida* var. *hispida*	-	-	H	R	U	-	-	-	-	-
**Setaria verticillata*	-	-	H	R	L	-	-	-	-	-
**Sigesbeckia orientalis*	-	-	U	R-M	L	-	-	-	-	-
**Sonchus oleraceus*	-	-	L	R	L	-	-	-	-	-
**Vachellia farnesiana*	-	-	H	R	L	-	-	-	-	-

+DEC Weed Prioritization Rank (DEC 2011a; 2011b):

- Ecological Impact: High, Medium, Low, Unknown
- Invasiveness: Rapid, Moderate, Slow, Unknown
- Feasibility of Control: High, Medium, Low, Unknown.

Brief descriptions of the introduced flora are provided below.

**Acetosa vesicaria* (Ruby Dock) is a fleshy annual herb to 1 m high (WAH 1998-2014) but usually smaller, found over much of Western Australia except the far southern, far northern and desert regions. It is readily identified by its bright red fruit. **Acetosa vesicaria* was recorded from one quadrat and one opportunistic observation, associated with drainage lines.

**Aerva javanica* (Kapok Bush) is a perennial herb to 1.6 m high (WAH 1998-2014) but was usually closer to 0.5 m high, and has white fluffy flowers and fruit on elongated branches. It occurs over much of the northern parts of Western Australia. Within the study area it was recorded from five quadrats, relevès and opportunistically, preferring alluvial soils. **Aerva javanica* was observed more commonly in grazed or otherwise disturbed areas, including along drainage lines and tracks.

**Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy) is a spiny, grey leaved annual herb to 1 m high (WAH 1998-2014) but was smaller (juvenile) in the study area. It occurs from near Perth northwards, particularly in the Gascoyne, Carnarvon and Pilbara bioregions. It was recorded from one quadrats and one opportunistic observation, and was associated with a riparian areas.

**Bidens bipinnata* (Bipinnate Beggartick) is a dived-leaved annual herb to 1.5 high (WAH 1998-2014) but was typically less than 0.5 m high in the study area. It is found throughout much of northern Western Australia. **Bidens bipinnata* was recorded from two quadrats and was associated with clay drainage lines in the Fortescue River valley.

**Cenchrus ciliaris* (Buffel Grass) is a perennial tussock-forming grass to 1.5 m high (WAH 1998-2014) but usually grazed to a lower height. It is found throughout much of Western Australia. Within the study area it was recorded from 40 quadrats and relevès and opportunistically observed along almost all drainage lines and more sparsely in grasslands on clay soils. **Cenchrus ciliaris* was either deliberately planted for pasture

or accidently introduced (Van Vreeswyk *et al*. 2004), and has been known from the Pilbara bioregion since the early 1900s (Keighery 2010).

**Cenchrus setiger* (Birdwood Grass) is a perennial tussock-forming grass to 0.5 m high found throughout much of northern Western Australia (WAH 1998-2014). Within the study area it was recorded from two quadrats and was associated with drainage lines, generally growing with Buffel Grass.

Cucumis melo* subsp. *agrestis* (Ulcardo Melon) is a climbing or sprawling annual herb found over much of the northern part of Western Australia (WAH 1998-2014). Within the study area it was recorded from two quadrats and was associated with clay soils. **Cucumis melo* subsp. *agrestis* is listed as 'alien' on *FloraBase* (WAH 1998-2014) however it is not included on the DEC Weed Prioritization list (DEC 2011a; 2011b) nor any other list in **Section 3.2.7, nor in Hussey *et al.* (2007) indicating there is doubt that it is introduced. Recent taxonomy (Telford *et al*. 2011) considers the subspecies to be irrelevant and the species (*Cucumis melo sens. lat.*) to be native.

**Cynodon dactylon* (Couch) is a stoloniferous, rhizomatous perennial grass found over much of Western Australia (WAH 1998-2014). Within the study area it was recorded from two quadrats and was associated with drainage lines.

Flaveria trinervia* (Speedy Weed) is an annual herb with distinctive red stems and three-veined leaves, found over much of northern Western Australia. Within the study area it was recorded from one quadrat and was associated with a broad drainage lines in the Hamersley Range. **Flaveria trinervia* is listed as 'alien' on *FloraBase* (WAH 1998-2014) however it is not included on the DEC Weed Prioritization list (DEC 2011a; 2011b) nor any other list in **Section 3.2.7, nor in Hussey *et al.* (2007) or the WAOL (DAFWA 2014), indicating there is doubt that it is introduced.

**Malvastrum americanum* (Spiked Malvastrum) is a perennial herb or shrub to 1.3 m high (WAH 1998-2014), although it was generally less than 0.5 m high in the study area. It is found over much of northern Western Australia. Within the study area **Malvastrum americanum* was recorded from 20 quadrats and relevès/opportunistic observations and was associated with drainage lines.

**Melochia pyramidata* is an annual or perennial herb or shrub to 1.5 m high (WAH 1998-2014); within the study area it was a shrub over 1 m high when associated with a clay drainage of the Fortescue River, and elsewhere, when associated with the Sherlock River, was more herbaceous. Its known distribution includes the Pilbara and Kimberley bioregions.

**Passiflora foetida* var. *hispida* is a woody climber (WAH 1998-2014); within the study area it was recorded from one quadrat and was associated with the major drainage line through the northern portion of the rail corridor; the Sherlock River. Its known distribution includes the Pilbara, Kimberley and Gascoyne bioregions.

**Setaria verticillata* (Whorled Pigeon Grass) is an annual grass to 1 m high although usually less, and is found over much of Western Australia (WAH 1998-2014). Within the study area **Setaria verticillata* was recorded from five quadrats and relevès/opportunistic observations and was associated with drainage lines.

**Sigesbeckia orientalis* (Indian Weed) is an erect annual herb with yellow flowers to 1 m high. It has several disjunct occurrences within Western Australia, including the Pilbara (WAH 1998-2014). Within the study area **Sigesbeckia orientalis* was recorded from one opportunistic observation and was associated with drainage lines.

Sonchus oleraceus (Common Sowthistle) is an erect annual herb to 1.5 m high, found over much of Western Australia (WAH 1998-2014). Within the study area *Sonchus oleraceus* was recorded from one quadrats and was associated with drainage lines.

Vachellia farnesiana (Mimosa Bush) is a thorny shrub or tree to 4 m high, found over much of Western Australia except southern and eastern parts (WAH 1998-2014). Within the study area *Vachellia farnesiana* was recorded from 14 quadrats and relevès/opportunistic observations and was associated with grazed drainage lines and flat clay areas.

5.2 VEGETATION ASSESSMENT

5.2.1 Vegetation Types

Fifty eight vegetation types, plus a mosaic of two of these, were recorded from the study area, including one that was identified earlier by Mattiske Consulting (2006). Their extents are detailed in **Table 6** and species codes in **Table 7**. Detailed descriptions of each vegetation type are presented in **Appendix Eight**.

Some areas could not be mapped because they had been recently burnt. A small area on the Hooley land system could not be accessed at the time of survey; this too is unmapped.

Table 6: Vegetation types and their extents within the study area

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
Aa_3Te	*Acacia ancistrocarpa, Acacia bivenosa* and *Acacia arida* tall-mid open to scattered shrubland over *Triodia epactia* and *Triodia wiseana* mid-low open hummock grassland	R14006, R14009, R14010, R14012, R14019, R14057	3,656.28	6.41
Aa_3Tl	*Acacia ancistrocarpa, Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall-mid open-sparse shrubland over *Triodia lanigera, Triodia epactia* and *Acacia stellaticeps* mid-low hummock grassland/shrubland with occasional *Corymbia hamersleyana* and *Corymbia deserticola* subsp. *deserticola* low scattered trees	R14017, R14018, R14020, R14021, R14023, R14024, R14029, (R14030), R14032, R14034, R14035, R14036, R14037, R14038, R14042, R14048, R14049, R14064, R14071	15,385.36	26.97
Aa_3Tl/Ts	Mosaic of: *Acacia ancistrocarpa, Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall-mid open-sparse shrubland over *Triodia lanigera, Triodia epactia* and *Acacia stellaticeps* mid-low hummock grassland/shrubland with occasional *Corymbia hamersleyana* and *Corymbia deserticola* subsp. *deserticola* low scattered trees And *Triodia secunda, Triodia wiseana* and *Triodia epactia* mid hummock grassland		13.32	0.02
Aa_4As_3	*Acacia arida* mid sparse shrubland over *Acacia stellaticeps, Triodia epactia* and *Bonamia erecta* low shrubland/hummock grassland with *Corymbia hamersleyana* scattered low trees	R14007	40.91	0.07
Aa_4Tl	*Acacia arida* and *Acacia ancistrocarpa* mid open shrubland over *Triodia lanigera, Acacia spondylophylla* and *Triodia epactia* mid (low) hummock grassland/shrubland	R14050, R14054	802.41	1.41

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
Aa_5Tw	*Acacia atkinsiana, Hakea chordophylla* and *Acacia ancistrocarpa* tall-mid sparse shrubland over *Triodia wiseana* and *Triodia epactia* low hummock grassland with *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees	R14115, R14129, R14138	964.74	1.69
Ac_1ApTe	*Acacia citrinoviridis* low woodland or tall to mid shrubland over *Acacia pyrifolia* var. *pyrifolia*, *Acacia trachycarpa* and *Acacia pruinocarpa* tall-mid shrubland over *Triodia epactia* mid hummock grassland	R14086, R14104, R14130	605.61	1.06
Ac_1Te	*Acacia citrinoviridis* and *Corymbia hamersleyana* low woodland over *Triodia epactia, Themeda triandra* and *Chrysopogon fallax* mid-low hummock grassland/tussock grassland	R14105, R14141	115.05	0.20
AiTe(1)	*Acacia inaequilatera* and *Acacia acradenia* tall sparse shrubland over *Triodia epactia* and *Triodia wiseana* mid tussock grassland	R14043	880.28	1.54
AiTe(2)	*Acacia inaequilatera* and *Acacia ancistrocarpa* tall-mid sparse-scattered shrubland over *Triodia epactia* mid hummock grassland	R14110, R14145	1,167.65	2.05
AiTe(3)	*Acacia inaequilatera* and *Acacia trachycarpa* mid sparse shrubland over *Triodia epactia* and *Pluchea tetranthera* mid(low) hummock grassland/shrubland with *Corymbia hamersleyana* low scattered trees	R14135	75.53	0.13
AiTw(1)	*Acacia inaequilatera* tall sparse or scattered shrubland over *Triodia wiseana* and *Triodia epactia* mid-low hummock grassland	R14096, R14155	344.92	0.60
AiTw(2)	*Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia* and *Hakea lorea* subsp. *lorea* tall sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia brizoides* mid-low hummock grassland	R14051, R14052, R14072, R14077, R14078, R14083, R14131	6,158.36	10.79
AiTw(3)	*Acacia inaequilatera, Grevillea pyramidalis* subsp. *leucadendron* and *Acacia* sp. tall sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia* aff. *melvillei* hummock grassland with *Corymbia hamersleyana* low scattered trees	R14084, R14087, R14090, R14091	1,430.74	2.51
AmEe	*Acacia melleodora* tall open shrubland over *Eragrostis eriopoda* and *Aristida holathera* var. *holathera* mid open tussock grassland	R14063	26.42	0.05
AoTe	*Acacia orthocarpa* and *Acacia pyrifolia* var. *pyrifolia* tall open shrubland over *Triodia epactia, Indigofera monophylla* and *Triodia wiseana* mid hummock grassland/shrubland	R14060	273.36	0.48
ApTe	*Acacia pyrifolia* var. *pyrifolia, Acacia trachycarpa* and *Petalostylis labicheoides* tall-mid open shrubland over *Triodia epactia, *Cenchrus ciliaris* and **Aerva javanica* mid-low tussock grassland/hummock grassland/shrubland	R14056, R14058, R14074, R14080, R14111	1,101.31	1.93
ApTw	*Acacia pyrifolia* var. *pyrifolia, Acacia ancistrocarpa* and *Acacia inaequilatera* tall sparse shrubland over *Triodia wiseana* and *Triodia epactia* mid hummock grassland	R14014, R14016, R14025, R14027, R14028, R14031, R14041	4,204.61	7.37
As_1Cf	*Acacia sclerosperma* subsp. *sclerosperma* and *Carissa lanceolata* tall shrubland over *Chrysopogon fallax, Eragrostis xerophila* and **Cenchrus ciliaris* mid tussock grassland	R14001, R14002, R14003	25.53	0.05

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
As_3	*Acacia stellaticeps* and *Triodia schinzii* low shrubland/mid hummock grassland	R14022	122.33	0.21
AxSb	*Acacia xiphophylla* tall shrubland over *Streptoglossa bubakii, Stemodia kingii* and *Triodia wiseana* low open shrubland/hummock grassland	R14098, R14100	61.92	0.11
Cc_2AbBe	*Corymbia candida* mid woodland over *Acacia bivenosa* and *Acacia elachantha* tall open shrubland over *Bothriochloa ewartiana, Themeda triandra* and *Chrysopogon fallax* low sparse tussock grassland	R14116	17.69	0.03
Cc_2Eb	*Corymbia candida* low open woodland over *Eriachne benthamii, Triodia epactia* and *Chrysopogon fallax* mid tussock grassland/hummock grassland with *Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall scattered shrubs	R14067	12.76	0.02
$CdAa_5Te$	*Corymbia deserticola* subsp. *deserticola, Corymbia hamersleyana* and *Eucalyptus xerothermica* low open woodland over *Acacia atkinsiana* and *Grevillea wickhamii* tall open shrubland over *Triodia epactia* mid hummock grassland	R14076, R14113, R14132	2,667.85	4.68
$ChAa_1Ta$	*Corymbia hamersleyana* low open woodland over *Acacia acradenia, Acacia ancistrocarpa* and *Acacia inaequilatera* tall sparse shrubland over *Triodia angusta* and *Triodia epactia* low hummock grassland	R14065	156.86	0.27
$ChAa_5Te$	*Corymbia hamersleyana, Eucalyptus gamophylla and Eucalyptus xerothermica low open woodland over Acacia atkinsiana, Grevillea wickhamii and Acacia ancistrocarpa mid open-sparse shrubland over Triodia epactia and Eulalia aurea mid-low hummock grassland/tussock grassland*	R14133, R14136, R14137	1,828.65	3.21
ChAbTw	*Corymbia hamersleyana* and *Grevillea pyramidalis* subsp. *leucadendron* low open woodland or scattered trees over *Acacia bivenosa* and *Acacia arida* tall-mid sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia angusta* mid open tussock grassland	R14011, R14039, R14040	214.20	0.38
ChAeTt	*Corymbia hamersleyana* and *Eucalyptus xerothermica* low open woodland over *Acacia elachantha* and *Maytenus* sp. Mt Windell (S. van Leeuwen 846) mid sparse shrubland over *Themeda triandra*, *Eulalia aurea* and *Chrysopogon fallax* mid tussock grassland	R14121	111.09	0.19
ChAiCf	*Corymbia hamersleyana* low open woodland over *Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia* and *Eremophila longifolia* tall open shrubland over *Chrysopogon fallax, Triodia epactia* and *Themeda triandra* mid tussock grassland/hummock grassland	R14123	83.10	0.15
$ChAt_2Te$	*Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis* and *Acacia pyrifolia* var. *pyrifolia* tall-mid sparse shrubland over *Triodia epactia, Themeda triandra* and *Paraneurachne muelleri* mid hummock grassland/tussock grassland	R14126, R14143, R14148, R14149, R14152, R14157	570.52	1.00

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
EgAa$_5$Te	*Eucalyptus gamophylla* and *Corymbia hamersleyana* low open mallee shrubland/woodland over *Acacia atkinsiana, Acacia inaequilatera* and *Acacia trachycarpa (*dwarf variant) tall-mid open-sparse shrubland over *Triodia epactia, Paraneurachne muelleri* and *Triodia wiseana* mid-low hummock grassland/tussock grassland	R14122, R14124, R14125, R14128, R14139	2,663.71	4.67
ElAa$_3$Tm	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia deserticola* subsp. *deserticola* low open woodland over *Acacia ancistrocarpa* mid sparse shrubland over *Triodia* aff. *melvillei* and *Amphipogon sericeus* mid-low hummock grassland/tussock grassland	R14127, R14151	262.36	0.46
ElAs$_2$Te	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland or scattered trees over *Acacia* sp., *Acacia inaequilatera* and *Acacia tumida* subsp. *pilbarensis* tall sparse shrubland over *Triodia epactia* low hummock grassland	R14088, R14092, R14095	125.06	0.22
ElEgTw	*Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Eucalyptus gamophylla, Acacia pyrifolia* var. *pyrifolia* and *Acacia maitlandii* low open mallee shrubland/tall open shrubland over *Triodia wiseana* and *Waltheria virgata* low hummock grassland/shrubland	R14150	11.11	0.02
ElTe	*Eucalyptus leucophloia* subsp. *leucophloia* mid open woodland to scattered trees over *Triodia epactia, Triodia brizoides* and *Triodia wiseana* hummock grassland	R14101, R14102	612.24	1.07
ElTw(1)	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland over *Triodia wiseana* and *Eriachne mucronata* mid-low hummock grassland/tussock grassland with *Grevillea wickhamii* and *Hakea chordophylla* tall-mid scattered shrubs	R14114, R14118, R14119, R14120, R14153	2,766.68	4.85
ElTw(2)	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland over *Triodia wiseana* and *Triodia epactia* mid-low hummock grassland	R14093, R14144, R14146	948.73	1.66
EvApCc$_1$	*Eucalyptus victrix, Corymbia hamersleyana* and *Acacia coriacea* subsp. *pendens* mid-low open woodland over *Acacia pyrifolia* var. *pyrifolia* tall sparse shrubland over **Cenchrus ciliaris, Triodia angusta* and *Triodia epactia* low tussock grassland/hummock grassland	R14045	448.15	0.79
EvApTe	*Eucalyptus victrix* and *Corymbia hamersleyana* mid open woodland-scattered trees over *Acacia pyrifolia* var. *pyrifolia* and *Acacia tumida* var. *pilbarensis* tall shrubland-scattered shrubs over *Triodia epactia, Tephrosia rosea* var. Fortescue creeks (M.I.H Brooker 2186) and **Cenchrus ciliaris* mid-low open hummock grassland/shrubland/tussock grassland	R14081, R14082, R14109, R14112, R14117	541.99	0.95
EvAt$_1$Te	*Eucalyptus victrix* mid woodland-open woodland over *Acacia trachycarpa, Acacia ampliceps* and *Acacia pyrifolia* var. *pyrifolia* tall shrubland-sparse shrubland over *Triodia epactia* and **Cenchrus ciliaris* mid open hummock grassland/tussock grassland	R14015, R14026, R14068	396.58	0.70

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
EvCb	*Eucalyptus victrix* low open woodland over *Cyperus bifax* and *Eriachne benthamii* low sedgeland/tussock grassland with **Vachellia farnesiana* tall scattered shrubs	R14107	28.90	0.05
EvMgEb	*Eucalyptus victrix* and *Acacia citrinoviridis* mid woodland over *Melaleuca glomerata* and **Vachellia farnesiana* tall sparse shrubland over *Eriachne benthamii* and *Cyperus bifax* low open tussock grassland/sedgeland	R14108	37.00	0.06
EvMlCv	*Eucalyptus victrix, Eucalyptus camaldulensis* subsp. *refulgens* and *Acacia coriacea* subsp. *pendens* mid-low woodland over *Melaleuca linophylla, Melaleuca glomerata* and *Acacia trachycarpa* tall open shrubland over *Cyperus vaginatus, Triodia epactia* and **Cenchrus ciliaris* mid open sedgeland/hummock grassland/tussock grassland	R14059, R14061, R14073, R14075, R14089, R14094, R14103	632.39	1.10
Ex_1	*Eragrostis xerophila, Dichanthium sericeum* subsp. *humilius* and *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113) low tussock grassland/vineland	R14004, R14005, R14066, R14070	1,091.38	1.89
FbGpEm	*Ficus brachypoda* low open woodland over *Grevillea pyramidalis* subsp. *leucadendron* and *Tephrosia rosea* var. *clementii* mid sparse shrubland over *Eriachne mucronata, Triodia wiseana* and *Triodia epactia* mid open tussock grassland/hummock grassland	R14R1	2.48	0.004
FPg1 Mattiske	*Triodia epactia, Eragrostis xerophila* and *Eriachne benthamii* mid-low hummock grassland with tall *Acacia inaequilatera* and *Carissa lanceolata* scattered clumps of shrubs	(Mattiske Consulting Pty Ltd 2006)	82.69	0.14
HcTe	*Hakea chordophylla* and *Grevillea pyramidalis* subsp. *leucadendron* tall sparse shrubland over *Triodia epactia* and **Cenchrus ciliaris* mid hummock grassland/tussock grassland	R14044	357.14	0.62
MaMgCv	*Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *refulgens* mid open forest-open woodland over *Melaleuca glomerata, Acacia ampliceps* and *Acacia coriacea* subsp. pendens tall sparse shrubland-scattered shrubs over *Cyperus vaginatus* and *Stemodia grossa* mid open sedgeland/forbland	R14079, R14085	39.79	0.07
MaMlCi	*Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *refulgens* low open woodland over *Melaleuca linophylla* tall open shrubland over *Cyperus ixiocarpus* mid sparse sedgeland	R14033	271.08	0.47
Sb	*Streptoglossa bubakii, Sida fibulifera* and *Stemodia kingii* low open shrubland/herbland	R14097, R14099	31.81	0.06
Ta	*Triodia angusta* and *Triodia epactia* mid hummock grassland	R14013	231.73	0.40
Tb	*Triodia brizoides* and *Triodia epactia* mid-low hummock grassland with *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low scattered trees	R14106, R14142, R14156	981.68	1.72
Te(1)	*Triodia epactia* and *Triodia secunda* low hummock grassland	R14008	32.05	0.06

CODE	VEGETATION TYPE	QUADRATS	AREA (HA)	PROPORTION OF STUDY AREA (%)
Te(2)	*Triodia epactia* and *Triodia wiseana* low hummock grassland with *Corymbia hamersleyana* low scattered trees over *Acacia elachantha* tall scattered shrubs	R14140	162.96	0.28
Te(3)	*Triodia epactia, Sclerolaena hostilis* and *Triodia angusta* mid-low open hummock grassland/chenopod shrubland with occasional low *Acacia xiphophylla* scattered trees	R14046, R14047	57.57	0.10
Te(4)	*Triodia epactia, Triodia angusta* and *Triodia lanigera* mid hummock grassland with scattered low *Acacia xiphophylla* trees	R14053, R14055	352.55	0.61
Ts	*Triodia secunda, Triodia wiseana* and *Triodia epactia* mid hummock grassland	R14062	9.34	0.02
Tw(1)	*Triodia wiseana* and *Eragrostis xerophila* mid hummock grassland/tussock grassland	R14069	12.24	0.02
Tw(2)	*Triodia wiseana* and *Triodia epactia* low open hummock grass with *Corymbia hamersleyana* low scattered trees over *Acacia inaequilatera* mid scattered shrubs	R14134	317.26	0.55
Burnt	Recently burnt; not able to be mapped		136.77	0.24
Rock	Rock outcrop (not vegetated)		272.43	0.47
n/a	Not assessed; not accessible		18.23	0.03
Total			**57,055.44**	

The floristics dendrogram that was used to inform vegetation type groupings is included in **Appendix Nine**.

Table 7: Species codes used in vegetation type descriptions

CODE	FIRST LISTED SPECIES	CODE	FIRST LISTED SPECIES
Aa_1	*Acacia acradenia*	**Cb**	*Cyperus bifax*
Aa_2	*Acacia ampliceps*	**Ci**	*Cyperus ixiocarpus*
Aa_3	*Acacia ancistrocarpa*	**Cv**	*Cyperus vaginatus*
Aa_4	*Acacia arida*	**Eb**	*Eriachne benthamii*
Aa_5	*Acacia atkinsiana*	**Em**	*Eriachne mucronata*
Ab	*Acacia bivenosa*	**Eg**	*Eucalyptus gamophylla*
Ac_1	*Acacia citrinoviridis*	**El**	*Eucalyptus leucophloia* subsp. *leucophloia*
Ac_2	*Acacia coriacea* subsp. *pendens*	**Ev**	*Eucalyptus victrix*
Ae	*Acacia elachantha*	**Ex_1**	*Eragrostis xerophylla*
Ai	*Acacia inaequilatera*	**Ex_2**	*Eucalyptus xerothermica*
Am	*Acacia melleodora*	**Fb**	*Ficus brachypoda*
Ao	*Acacia orthocarpa*	**Gp**	*Grevillea pyramidalis* subsp. *leucadendron*
Ap	*Acacia pyrifolia* var. *pyrifolia*	**Ma**	*Melaleuca argentea*
As_1	*Acacia sclerosperma* subsp. *sclerosperma*	**Mg**	*Melaleuca glomerata*
As_2	*Acacia* sp.	**Ml**	*Melaleuca linophylla*
As_3	*Acacia stellaticeps*	**Sb**	*Streptoglossa bubakii*
At_1	*Acacia trachycarpa*	**Tm**	*Triodia* aff. *melvillei*
At_2	*Acacia tumida* var. *pilbarensis*	**Ta**	*Triodia angusta*
Ax	*Acacia xiphophylla*	**Tb**	*Triodia brizoides*
Cc_1	*Cenchrus ciliaris*	**Te**	*Triodia epactia*
Cc_2	*Corymbia candida*	**Tl**	*Triodia lanigera*
Cf	*Chrysopogon fallax*	**Ts**	*Triodia secunda*
Ch	*Corymbia hamersleyana*	**Tw**	*Triodia wiseana*

5.2.2 Vegetation Significance

5.2.2.1 Threatened Ecological Communities

None of the vegetation types recorded within the study area are considered likely to represent a TEC based on a comparison with current TEC listings for Western Australia (DPaW Species & Communities Branch 2014a). No TECs have been previously known to occur within the study area; the nearest known TEC is more than 20 km from the study area.

5.2.2.2 Priority Ecological Communities

Brockman PEC

No vegetation considered likely to represent the P1 'Brockman Iron cracking clay communities of the Hamersley Range' PEC was recorded during the field survey. This PEC was identified by the DPaW database search as occurring nearby, but not within the study area.

Wona PEC

Vegetation that may represent one of the four community types that form the P1-P3 'Four plant assemblages of the Wona Land System' PEC was recorded during the field survey. Little information is publicly available except the description '*P1 Cracking clays of the Chichester and Mungaroona Range. This grassless plain of*

stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa' (DPaW Species and Communities Branch 2014b). Two vegetation types were recorded on the Wona land system; one, **AxSb**, is unlikely to represent the above PEC subtype (or any of the other subtypes) as it has a significant perennial plant component, however vegetation type **Sb**, described as *Streptoglossa bubakii, Sida fibulifera* and *Stemodia kingii* low open shrubland/herbland, may be representative.

Additional survey following the wet season, and consultation with relevant DPaW authorities, will be required before accurate determination is possible. Vegetation type **Sb** occupied 31.81 ha, and was located to the north of Roebourne Wittenoom Road (**Map 4-7**). It does not correspond with previously mapped areas of the PEC; the previously mapped occurrence of the PEC that slightly overlaps the rail corridor is dominated by *Acacia xiphophylla* (vegetation type **AxSb**) and may be erroneously attributed to the PEC.

Horseflat PEC

Vegetation considered to represent the P3 'Horseflat Land System of the Roebourne Plains' PEC was recorded in the northern portion of the study area. According to the PEC description (DPaW Species and Communities Branch 2014b), Units 3, 5 and 7 described in Van Vreeswyk *et al.* (2004), constitute the PEC. These units, their descriptions and the Ecoscape and Mattiske Consulting (2006) vegetation types considered to represent them (based on a combination of landform and species) are shown in **Table 8**. Land system units that are not included in the PEC are unit 1 (stony rises and hills with *Triodia* spp.), unit 2 (calcrete plains with *Triodia wiseana*), unit 4 (non-gilgaied plains with *Acacia xiphophylla* and tussock and hummock grasses), unit 6 (dissected slopes with *Acacia xiphophylla* and tussock and hummock grasses) and unit 8 (channels and river terraces with fringing woodlands).

Vegetation type **Ex_1** is considered to represent the PEC subtype 3; vegetation types **Te(1)** and **Tw(1)** most likely represent uncommon variations of subtype 5, potentially with Mattiske (2006) vegetation unit **FPg1**. Vegetation type **Cc_2Eb**, in drainage depressions may represent subtype 7. Most, but not all, of these vegetation types occurred on the Horseflat land system with a small proportion associated with the Mallina land system.

Table 8: Horseflat land system units (Van Vreeswyk *et al*. 2004) and Ecoscape equivalent vegetation types

HORSEFLAT LAND SYSTEM UNIT	VAN VREESWYK *ET AL*. DESCRIPTION	ECOSCAPE VEGETATION TYPE	VEGETATION DESCRIPTION	EXTENT IN RAIL CORRIDOR (HA)
3	Mostly tussock grasslands dominated by *Eragrostis xerophila* (Roebourne Plains grass) (ARPG) but also other grasses such as *Chrysopogon fallax* (ribbon grass) and *Eriachne benthamii* (swamp grass) (APRG, APSG). Occasional patches of very scattered to scattered mid height shrublands of *Acacia xiphophylla* (snakewood) with tussock grasses (SSTS). (on gilgaied plains)	**Ex_1**	*Eragrostis xerophila, Dichanthium sericeum subsp. humilius* and *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113) low tussock grassland/vineland	1,091.38 (1,051.07 on the Horseflat land system)
5	Tussock grasslands with *Eragrostis xerophila, Eriachne benthamii, Chrysopogon fallax, Cenchrus ciliaris* (buffel grass) (APXG, ARPG); also tussock grasslands with shrub *Atriplex bunburyana* (silver saltbush) (PCGS). Occasionally *Triodia* spp. (spinifex) hummock grasslands. (on alluvial plains)	**Te(1), Tw(1)** **Potentially FPg1 (Mattiske 2006)**	*Triodia epactia* and *Triodia secunda* low hummock grassland, *Triodia wiseana* and *Eragrostis xerophila* mid hummock grassland/tussock grassland	32.05, 12.24 82.69 (22.13, 10.40, 77.99 on Horseflat land system respectively)
7	Dense tussock grasslands including *Eriachne benthamii, Chrysopogon fallax* with occasional eucalypt trees and shrubs such as *Acacia* (now *Vachellia*) *farnesiana* (mimosa bush) (APXG, APRG, DEGW). (associated with drainage depressions)	**Potentially Cc_2Eb**	*Corymbia candida* low open woodland over *Eriachne benthamii, Triodia epactia* and *Chrysopogon fallax* mid tussock grassland/hummock grassland with *Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall scattered shrubs	12.76
Total Extent (ha)				**1,2221.21**

Mattiske Consulting (2013a) considers its vegetation unit G8 (Open tussock grassland of *Aristida contorta, Eragrostis xerophila, Chrysopogon fallax*, (occasionally with *Triodia pungens*), *Eriachne helmsii* with mixed low shrubs and herbs, on redbrown cracking clay plains) to represent this PEC. This vegetation unit is similar to Ecoscape's **Ex_1** however no Mattiske equivalents were recorded for the other Ecoscape vegetation types considered to represent the PEC.

There is no overlap in survey areas that include this vegetation type between Ecoscape and Mattiske (2013a), however there is overlap between an earlier Mattiske (2006) survey area that contained similar vegetation. However, this was not identified as a PEC at that time, and this vegetation is considered 'well represented in either the Horseflat land system or the Pilbara region' (*ibid*.).

5.2.2.3 Groundwater Dependent Ecosystems

Vegetation types with the phreatophytic species *Eucalyptus camaldulensis* subsp. *refulgens* or *Melaleuca argentea* are considered to represent a GDE. Vegetation types are **EvMlCv**, **MaMgCv** and **MaMlCi** have these as either dominant or characteristic species, and are therefore considered as GDEs. Respectively these vegetation types occupied 632.39 ha (1.10% of the study area), 39.79 ha (0.07%) and 271.08 ha (0.47%).

Vegetation characterised by *Eucalyptus victrix* that is considered either a vadophyte or only weakly phreatophytic (see **Section 3.3.3**) also occurred in the study area. Vegetation types **EvApCc$_1$**, **EvApTe**, **EvAt$_1$Te**, **EvCb** and **EvMgEb,** characterised by *Eucalyptus victrix* but without the above species, may represent a GDE. Respectively these vegetation types occupied 448.15 ha (0.79% of the study area), 541.99 ha (0.95%), 396.58 ha (0.70%), 28.90 ha (0.05%) and 37.00 ha (0.06%).

5.2.2.4 Mulga Communities

There was no vegetation that had Mulga as a dominant or characteristic species, although Mulga (*Acacia aptaneura*) occurred sparsely within the study area. There was no SFDV.

5.2.2.5 'Ecosystems at Risk'

No vegetation was considered to represent an 'Ecosystem at Risk', except vegetation that is now considered to represent a PEC or GDE.

5.2.2.6 Other Significant Vegetation

Significant according to *Guidance Statement No. 51*

Vegetation having a restricted distribution can be considered significant according to *Guidance Statement No. 51* (EPA 2004).

Ecoscape (2010a; 2011a; 2012b; 2014b) considers vegetation type **ElAs$_3$Tm** that occupied 125.06 ha to have a restricted distribution within the central Hamersley Range.

Vegetation type **FbGpEm** was restricted to a quartz hill near the northern end of the rail corridor, occupying 2.48 ha; no landform nor similar vegetation was observed within the rail corridor nor in the close vicinity.

Vegetation type **AmEe** occupied a large Aeolian dune on the Gregory land system, near the northern end of the study area. No similar vegetation was recorded elsewhere, nor did the other areas of the same land system have the same landform (they were low undulating dunes). Vegetation type **AmEe** occupied 26.42 ha.

These vegetation types may be of significance according to *Guidance Statement No. 51*.

Although a number of vegetation types occupied only small extents, none were considered of restricted distribution, nor satisfied any other listed criteria, and are therefore not of significance according to *Guidance Statement No. 51* (EPA 2004).

Land System Representation

Van Vreeswyk *et al.* (2004) lists 102 land systems as occurring in the 181 674 km^2 in the Pilbara. Of these, 25 occupy less than 200 km^2. The Black land system occupies 165 km^2, the Gregory land system occupies 113 km^2 and the Sherlock land system occupies 192 km^2 within the Pilbara, and 4.79 km^2, 5.26 km^2 and 0.34 km^2 within the study area respectively. Vegetation confined, or largely confined, to these can also be considered of significance.

No vegetation types were confined to the Black or Sherlock land systems.

Vegetation types **AmEe** and **As$_3$** were largely confined to the Gregory land system; respectively these occupied 26.42 ha and 122.33 ha.

Pre-European Vegetation Representation

All pre-European vegetation associations within the rail corridor have more than 95% of their original extent remaining (**Table 2**).

Five pre-European vegetation associations currently occupy less than 1 000 km^2 within the Pilbara bioregion; 569 (occupying 593.38 km^2), 641 (183.28 km^2), 644 (270.69 km^2), 645 (846.58 km^2) and 649 (401.78 km^2). Vegetation confined, or largely confined to these, can also be considered of significance.

Pre-European vegetation association 569 has nine vegetation types associated with it; vegetation type **AiTe(3)** is wholly confined to it; vegetation types **AiTw(3)** and **MaMgCv** are largely confined to it.

Pre-European vegetation association 641 has 12 vegetation types associated with it; none are confined to it or largely confined to it.

Pre-European vegetation association 644 has 10 vegetation types associated with it; vegetation type **AiTe(1)** is largely confined to it.

Pre-European vegetation association 645 has four vegetation types associated with it; none are confined to it or largely confined to it.

Pre-European vegetation association 649 has 10 vegetation types associated with it; vegetation type **$ChAa_1Ta$** is wholly confined to it; vegetation types **AmEe** and **Ta** are largely confined to it.

Vegetation types **AiTe(1)**, **AiTe(3)**, **AiTw(3)**, **AmEe**, **$ChAa_1Ta$**, **MaMgCv** and **Ta** therefore have a degree of significance due to their association with poorly represented pre-European vegetation associations.

Vegetation Considered of Significance from Nearby

Available flora and vegetation survey reports from nearby areas were reviewed to identify vegetation considered of significance in these areas (**Section 3.3.7**). Similar vegetation considered significant in these, and also occurring in the rail corridor are:

- riparian vegetation characterised by *Eucalyptus victrix* or *Eucalyptus camaldulensis* (Ecoscape 2011a; 2012b; Mattiske Consulting Pty Ltd 2006); a number of vegetation types are characterised by these species
- vegetation restricted to high hilltops, characterised by *Eucalyptus kingsmillii* and *E. gamophylla*, in the FMG Central Pilbara Project Area (Ecoscape 2012b); the latter species characterises vegetation type **ElEgTw** that was only found on the highest hill within the rail corridor, however it is improbable that any railway construction will impact on this area.

Similar riparian vegetation types in the rail corridor are **$EvApCc_1$**, **EvApTe**, **$EvAt_1Te$**, **EvCb**, **EvMgEb**, **EvMlCv**, **MaMgCv** and **MaMlCi**. These are discussed above as GDEs in **Section 5.2.2.3**.

5.2.2.7 Floristic Analysis

The floristic analysis resulted in a dendrogram that, for many vegetation types, assisted with interpretation (**Appendix Nine**). Floristic relationships of each vegetation type are included in the vegetation type descriptions in **Appendix Eight**.

At 1.02 separation, the floristics dendrogram separated the quadrats and relevès (sites) into nine supergroups that broadly described the vegetation types in terms of their association with substrate and landform, and also, in many cases, IBRA subregion. These supergroups are described below.

Supergroup 1 consisted of nine sites; all occurred on the Horseflat land system towards the northern end or the rail corridor in the Roebourne IBRA subregion. Four vegetation types were interpreted from this supergroup, with the floristics agreeing with the field assessment. Three of these vegetation types are considered to represent subtypes of the P3 'Horseflat Land System of the Roebourne Plains' PEC.

Supergroup 2 consisted of six sites; all were associated with clay soils of the Wona land system and Fortescue River in the Chichester and Fortescue IBRA subregions. Four vegetation types were interpreted from this supergroup, including one that may represent the P1 'Cracking clays of the Chichester and Mungaroona Range' subtype of the 'Four plant assemblages of the Wona Land System' PEC.

Supergroup 3 consisted of five sites; all were associated with clay soils of the Horseflat, Satirist and Sherlock land systems in the northern portion of the rail corridor, in the Roebourne IBRA subregion. Three vegetation types were interpreted from this supergroup, including one that is considered to represent a subtype of the P3 'Horseflat Land System of the Roebourne Plains' PEC.

Supergroup 4 consisted of 27 sites; most were associated with low hills or areas with granite outcrops in the northern portion of the study area in the Roebourne IBRA subregion. Eleven vegetation types were interpreted from this supergroup, although some of the more broad vegetation types that could not be mapped as separate units also included sites from supergroup 6 or, less frequently, supergroup 5.

Supergroup 5 consisted of 16 sites; most were associated with basalt or granite derived soils, generally rocky areas, largely in the Chichester Range (Chichester IBRA subregion). Seven vegetation types were interpreted from this supergroup, and mostly confined to it.

Supergroup 6 consisted of 19 sites; all from the northern portion of the study area in the Roebourne IBRA subregion, largely on sandy soils. Five vegetation types, some of which also had representatives from supergroup 4, were interpreted for this vegetation type.

Supergroup 7 consisted of 31 sites, largely from the Hamersley IBRA subregion but some sites were located in the Fortescue and Chichester subregions. They were all associated with valleys (in the Hamersley and Fortescue subregions) or slopes and hills (in the Hamersley and Chichester subregions). Nine vegetation types were interpreted from this supergroup, most confined to it.

Supergroup 8 consisted of 29 sites; most were from the Hamersley IBRA subregion, and most were associated with alluvial soils of floodplains and less significant drainage lines. Thirteen vegetation types were interpreted from this supergroup; most were confined to it.

Supergroup 9 consisted of 14 sites; all were associated with the larger rivers and creeks of the study area through all IBRA subregions. Five vegetation types were interpreted from this supergroup; all were confined to it.

5.3 VEGETATION CONDITION

The vegetation condition of the quadrats and relevès and the overall study area is shown on **Map 7** and displayed in **Table 9**.

Most (90.64%) of the study area was assessed as being in Excellent condition.

Much of the study area was grazed by cattle, particularly the northern end (where the Horseflat land system grasslands were particularly heavily grazed) and towards the southern end. The central portion through the Chichester Range, which is largely Unallocated Crown Land, was less impacted by cattle or feral animal grazing and trampling. Vegetation associated with rocky soils, particularly upland areas, was less disturbed,

and at times no human-derived impacts were detected. Drainage lines were also heavily impacted by grazing, with the creek and river banks frequently covered with Buffel Grass (**Cenchrus ciliaris*) that is favoured for grazing, and the stream beds used to traverse between areas. There was also some localised impact around watering points (wells) however the scale of this impact was too small to be mapped.

Grazing impacts (trampling and soil disturbance) and weed invasion were the main reasons for assessing vegetation condition as lower than Excellent. There were few roads or tracks or other direct human impacts in the study area.

Table 9: Vegetation condition

VEGETATION CONDITION	EXTENT (ha)	EXTENT (%)
Excellent	51,717.74	90.64
Very Good	3,556.48	6.23
Good	972.52	1.70
Poor	427.03	0.75
Completely Degraded	0	0
Burnt	136.77	0.24
Rock	244.90	0.43

5.4 ADEQUACY OF SAMPLING

5.4.1 Species Accumulation Curve

A species accumulation curve (**Figure 3**) was generated to display adequacy of sampling: if the curve has reached (or nearly reached) an asymptote, it is considered likely that most species have been recorded from the study area.

The species accumulation curve for the study area suggests that additional survey would increase the number of species that may occur in the study area. However, as the line in **Figure 3** is close to asymptote, it is likely that most species (i.e. only approximately 10 additional species) occurring would have been recorded when taking opportunistic and targeted search observations. Additionally, as this survey was undertaken during the dry season, survey following rainfall would also increase the number of species recorded.

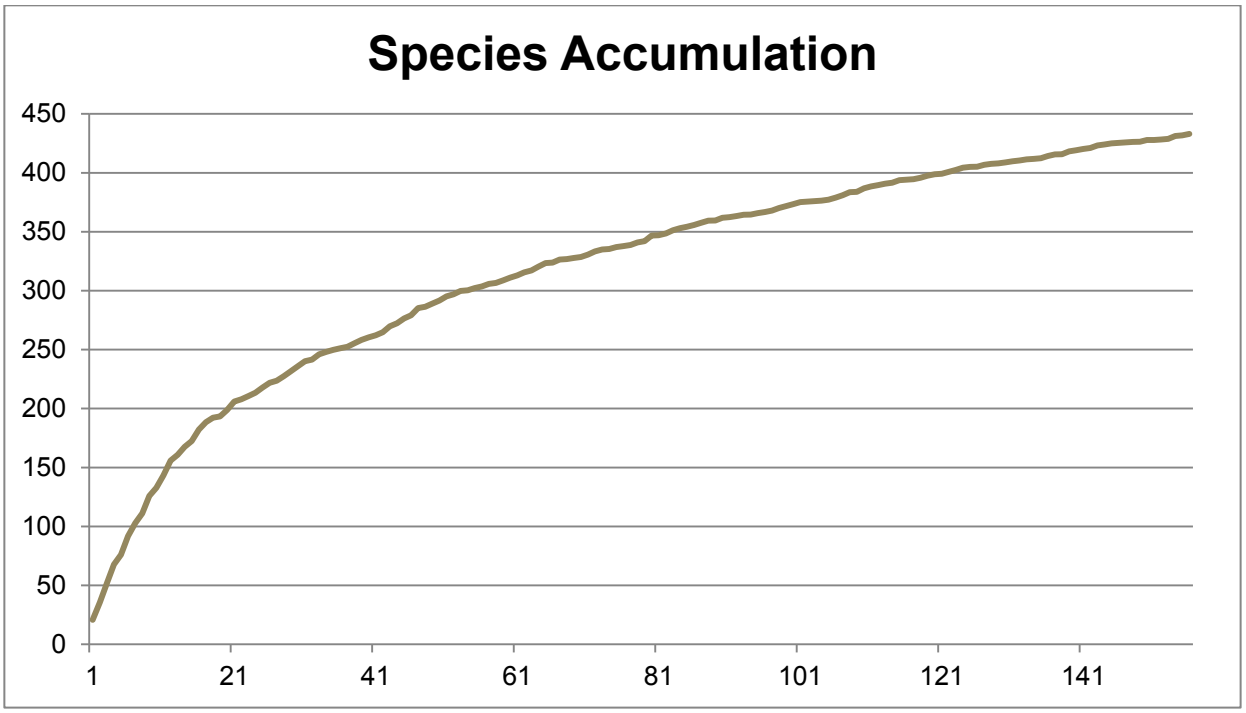

Figure 3: Species accumulation curve

5.4.2 Taxa Area Plot

Adequacy of sampling can also be illustrated by comparing the number of taxa recorded per unit area (km^2) from the study area (i.e. species richness) with the same data from nearby. **Figure 4** shows the taxa area plot for the study area and nearby areas. The references for this data are listed in **Table 10**.

The taxa area plot indicates that the species richness of the Rutila Rail Corridor is similar to, but slightly lower than, similar sized rail corridor survey areas, perhaps as a result of the survey being conducted during the dry season.

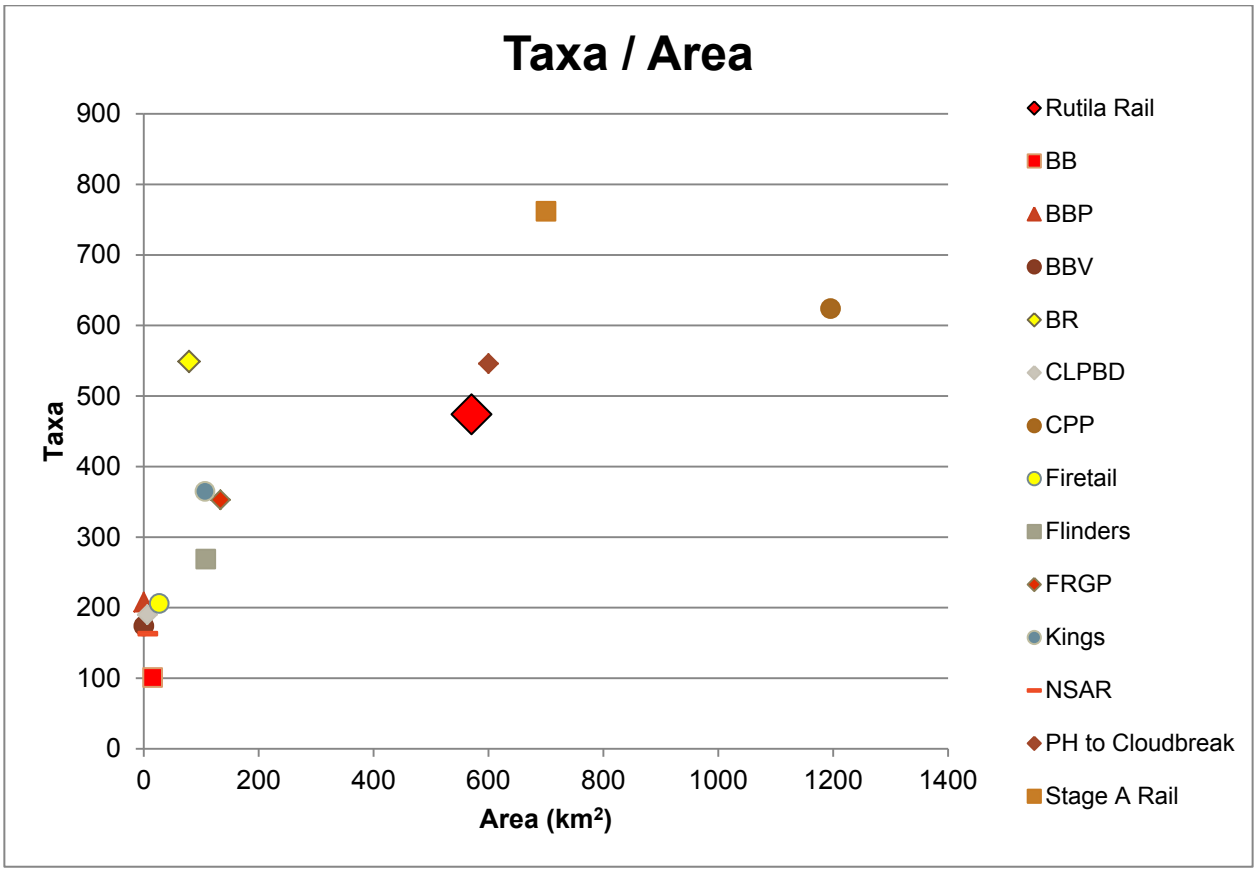

Figure 4: Taxa area plot

Table 10: Taxa numbers recorded for various Pilbara surveys

SURVEY	LEGEND ABBREVIATION	AREA (KM^2)	TAXA	REFERENCE
This survey	Rutila Rail	570.63	474	This report
Balla Balla export facilities	BB	Undefined	100	(Mattiske Consulting Pty Ltd 2013a)
Balla Balla Pipeline	BBP	Undefined	208	(Mattiske Consulting Pty Ltd 2008)
Balla Balla Vanadium (Mattiske)	BBV	Undefined	174	(Mattiske Consulting Pty Ltd 2006)
Brockman Rail	BR	79	549	(Ecologia Environment 2012a)
Cape Lambert Port B Development	CLPBD	6.02	190	(Biota Environmental Sciences Pty Ltd 2008)
Central Pilbara Project and regional survey area	CPP	1195.44	624	(Ecoscape 2012b)
Firetail	Firetail	26.7	206	(Ecoscape 2010a)
Flinders Blacksmith	Flinders	107.81	269	(Ecoscape 2011a)
Fortescue River Gas Pipeline	FRGP	133.38	353	(Mattiske Consulting Pty Ltd 2013b)
Kings	Kings	106.45	365	(ENV Australia Pty Ltd 2010)
North Star Access corridor	NSAR	7.04	163	(Ecologia Environment 2012b)
Port Hedland to Cloudbreak Rail, Borrow Pits & Infrastructure Area	PH to Cloudbreak	600	546	(Coffey Environments 2007)
Stage A Rail Corridor	Stage A Rail	700	762	(Biota Environmental Sciences Pty Ltd 2004)

5.4.3 Representation

Survey adequacy can also be assessed by representation of sample points recorded from within each vegetation type. The number of sample points from each vegetation type ranged from one (in 24 of the 58 vegetation types; 47%) to 19. For some of these vegetation types the low number of sample points was due to the small extent of the vegetation type, however in most cases it was due to lack of accessibility or that a vegetation type was not identified as being discrete until after the data had been analysed. Survey adequacy is therefore considered variable when using this metric.

The number of sample points recorded from each land system can also indicate survey adequacy (**Table 11**). In general, representation is in proportion to the extent of the land system. Except for the Hooley land system that was not accessible at the time of survey, all land systems are considered to be adequately represented.

Table 11: Land system representation

LAND SYSTEM	NO. SITES	EXTENT (HA)	LAND SYSTEM	NO. SITES	EXTENT (HA)
Black	2	478.89	Mallina	8	3303.05
Boolaloo	3	2037.30	McKay	5	1286.57
Boolgeeda	29	11651.33	Newman	10	3740.71
Calcrete	3	386.17	River	12	2951.97
Capricorn	5	467.21	Rocklea	12	6813.14
Coolibah	2	177.27	Ruth	10	4650.52
Granitic	7	1591.50	Satirist	3	471.18
Gregory	3	525.19	Sherlock	3	34.11
Hooley	0	14.57	Uaroo	9	10168.74
Horseflat	10	1420.13	Urandy	8	2514.20
Jurrawarrina	2	368.40	Wona	4	166.52
Macroy	6	1836.78			

5.5 BOTANICAL LIMITATIONS

5.5.1.1 Field Survey Timing

The single season field survey was conducted during July-August 2014 over two 11 day survey periods. The optimal (required) period for conducting Pilbara flora and vegetation surveys, as outlined in *Guidance Statement No. 51* (EPA 2004), is in the season following rain i.e. March-May. Whilst this survey did not comply with this optimal period, the survey occurred during a period when most conservation significant flora species were flowering (**Table 25**) and therefore identifiable.

Seasonal conditions during the surveys were considered by Ecoscape to be good (average) for the time of year (BoM 2014d; 2014e). According to the rainfall data shown in **Figure 5**, Roebourne (the closest long term BoM station to the northern end of the study area) experienced wetter than average December 2013 and May 2014 rainfall but below average for other months, and Wittenoom (the closest long-term BoM station to the southern end of the study area) experienced wetter than average December 203, January 2014 and June 2014, and below average for the other months.

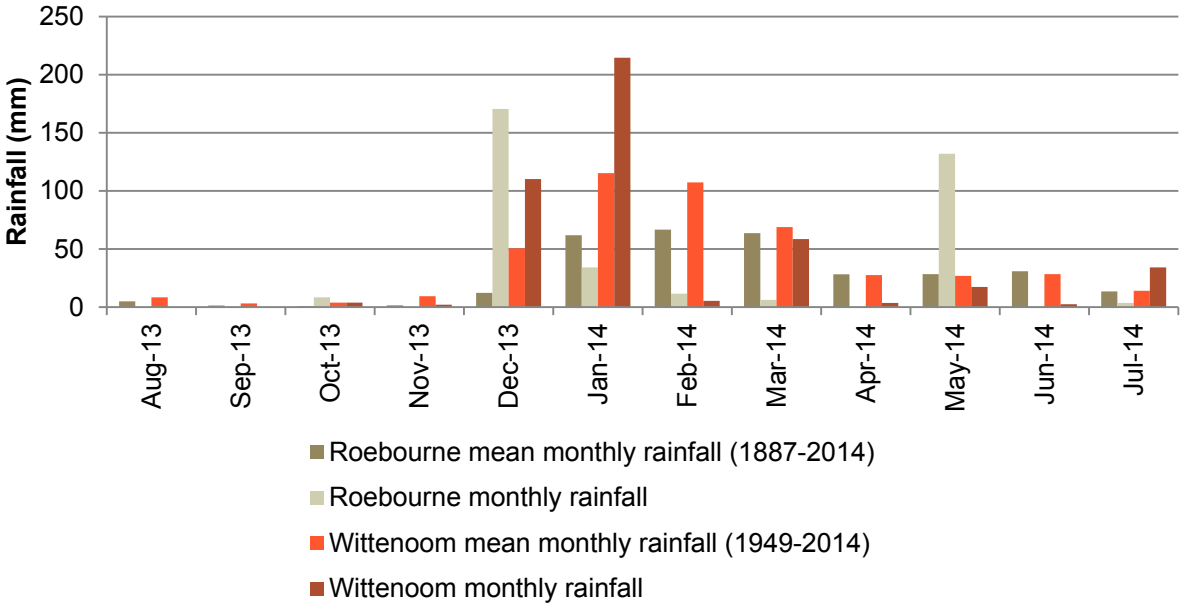

Figure 5: Rainfall data for Roebourne and Wittenoom (BoM 2014d; 2014e)

Figure 6 (BoM 2014f) indicates the rainfall of the study area was considered slightly below average for the six months prior to the field survey for the northern portion of the study area, and average for the southern portion. Due to the considerably above average rainfall recorded at Roebourne for May 2014 (132 mm, compared with the long term average of 28.4 mm (BoM 2014d)), there was no on-ground indication that the vegetation had been impacted by lower than average rainfall.

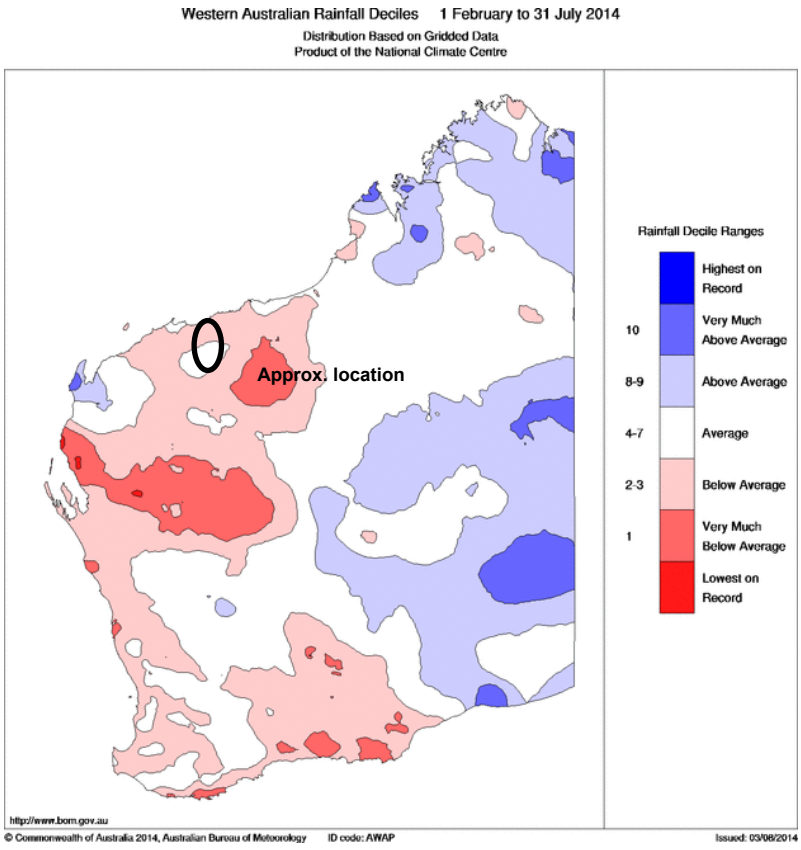

Figure 6: Western Australian rainfall deciles (BoM 2014f)

Table 12: Botanical limitations

POSSIBLE LIMITATIONS	CONSTRAINTS (YES/NO): SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No	The field team leaders conducting the field surveys have considerable experience conducting flora and vegetation surveys in the Pilbara. Stephen Kern has been conducting Pilbara botanical surveys since 2005 (10 years), Jared Nelson and Lyn Atkins since 2008 (seven years) and Richard Daniel since 2010 (four years).
Proportion of the flora identified	Negligible	474 flora taxa were recorded from the study area. Twenty four (5%) could not be identified to species level due to lack of reproductive material, however none were potentially of known conservation significance. The lack of reproductive material was most likely a result of the season of survey (July).
Proportion of the task achieved and further work that may need to be undertaken	Negligible (in main part of corridor) Moderate (in some areas largely away from the main corridor)	Almost all of the study area was accessible during the field surveys, with only some small sections, generally outside the main alignment (i.e. borrow pits etc), not readily accessible. There were negligible constraints in terms of the ability to determine vegetation types in these areas despite the lack of survey adequacy in these areas, and negligible constraints in terms of searches for conservation significant flora in these areas. Conservation significant vegetation is considered adequately surveyed in terms of representation but not in terms of season of survey. A second season of survey would target inaccessible areas and vegetation types with lower representation.
Timing/weather/season/cycle	Moderate-negligible (timing) Negligible/none (weather, season, cycle)	The field survey was conducted in July-August which is outside the optimal period for Pilbara botanical surveys as outlined in *Guidance Statement No. 51*. There were moderate constraints in this regard in some areas and some vegetation types that had a significant annual or ephemeral component (i.e. grasslands not dominated by *Triodia* spp.). However for most areas and vegetation types the constraint was considered to be negligible as most species were identifiable. There were negligible constraints in the ability to find and identify conservation significant flora as a majority were likely to be flowering at the time of survey or were otherwise identifiable. Weather conditions during the field surveys were ideal to conduct botanical surveys, with no constraints. Seasonal conditions were considered good for the time of year due to average rainfall in the southern portion of the study area, and out of season rainfall (in May) prior to the field survey in the northern portion of the study area. Constraint were considered to be none/negligible in this regard as the flora did not appear to be suffering from undue water stress.
Intensity of survey (e.g. In retrospect was the intensity adequate?)	Negligible	Most of the study area was accessible during the field survey. The sample point distribution was adequate to identify vegetation types and coverage adequate for conservation significant flora searches. As above, some outer areas outside the main alignment would benefit from additional survey, however overall the intensity of the survey is considered adequate.

POSSIBLE LIMITATIONS	CONSTRAINTS (YES/NO): SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Completeness (e.g. Was relevant area fully surveyed?)	Negligible	As above.
Resources (e.g. Degree of expertise available for plant identification)	No	There is adequate information available to identify significant vegetation and flora of the area. The senior taxonomist has considerable experience identifying Pilbara flora.
Remoteness and/or access problems	Negligible	Some portions of the study area were not directly accessible, however the access was adequate to describe the vegetation of the area and assess the likelihood of conservation significant flora occurring in them.
Availability of contextual (e.g. bioregional) information for the survey area	No	There is adequate contextual information in regard to the flora of the study area.

6.0 DISCUSSION

6.1 FLORA SIGNIFICANCE

A total of 474 vascular flora taxa were identified during the field survey, 5% of which could not be identified to species level. The relatively high proportion of taxa that could not be identified with certainty is most likely a result of the season of survey (July-August), when many plants did not have reproductive material.

The species accumulation curve, when taking into account opportunistic observations and plants collected during targeted searches for conservation significant flora, suggests that most species were likely to have been recorded during the field surveys. Despite this finding, it is likely that a survey conducted in the season following rain would result in additional ephemeral species being recorded, despite the seasonal conditions being considered as average (at least in the southern portion of the rail alignment). Heavily grazed areas, especially on the Horseflat land system in the north, are likely to have additional species present earlier in the season, before there are significant impacts of grazing and trampling.

Surveys have been conducted in nearby areas in the north, associated with the Balla Balla project (Astron Environmental Services 2005; Mattiske Consulting Pty Ltd 2006; 2008; 2013a), however only one report detailing these provides survey area extent. It is therefore not possible to compare species richness with Ecoscape's 2014 survey in a similar locality, however, review of these reports suggests that most species recorded were also recorded in 2014. Species richness is therefore likely to be similar between the areas.

A number of surveys have been undertaken in nearby areas at the southern end of the rail corridor (Coffey Environments 2010b; Ecoscape 2010a; 2010d; 2011a; 2012c; 2012d; 2012e; ENV Australia Pty Ltd 2010). The species richness of the Rutila rail corridor is considered similar to that recorded in the Flinders Blacksmith tenement, which overlaps with the southern end of the alignment (Ecoscape (Australia) Pty Ltd 2011a), but slightly less than for other linear surveys. Again, this is likely to be result of season of survey rather than lower species richness or inadequate survey.

There is no available comparative information available for the majority of the alignment, thus it is not possible to make an assessment in regard to species richness and adequacy of survey for most of the alignment.

It is Ecoscape's opinion that the significance of the flora within the rail corridor is comparable with the surrounding area.

6.1.1 Conservation Significant Flora

There were no flora taxa listed as TF under either the Commonwealth *EPBC Act 1999* or Western Australian *WC Act 1950* recorded from the study area.

Nine PF taxa were recorded from the study area:

- P1 taxa *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095), *Helichrysum oligochaetum*, *Heliotropium muticum*
- P2 taxon *Pentalepis trichodesmoides* subsp. *hispida*
- P3 taxa *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301), *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479), *Sida* sp. Barlee Range (S. van Leeuwen 1642)
- P4 taxa *Goodenia nuda, Rhynchosia bungarensis*

The potential impacts on each of these are discussed below. Whilst there is no statutory protection for PF, in general, for clearing applications in Western Australia, proponents are expected to provide evidence that removal of PF cannot be avoided and efforts have been made to minimise impacts on populations of these species. On occasion buffers of 20 m around P1 and P2 have been applied as a condition of vegetation clearing.

P1 *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095); one population of this taxon was recorded, in a disturbed area that is likely to be a result of lightning strike rather than human disturbance. Ecoscape has previously recorded this taxon in disturbed areas associated with tracks (Ecoscape 2013d) and considers it likely to be a disturbance opportunist. Therefore, whilst some individuals or populations may be removed as a result of developing the rail corridor, any disturbance is likely to result in an overall increase in the species population thus significant impacts are unlikely.

P1 *Helichrysum oligochaetum*; a single population of this species was recorded in the clay bed of the Fortescue River. Based on specimen records listed on *FloraBase* (WAH 2014) the habitat of this species is likely to be specific, however it is an annual herb and populations could fluctuate between years. Additionally, the taxon has a wide east to west distribution of close to 500 km (assessed using the *NatureMap* measuring tool; DPaW 2007-2014). Therefore long-term impacts of removing some individual plants are unlikely to be significant, although efforts to avoid known populations may be required.

P1 *Heliotropium muticum*; a number of populations of this species were recorded near the northern end of the rail corridor. Plant density was greatest in disturbed areas, following fire or associated with tracks. Ecoscape has also recorded this species during previous surveys close to Port Hedland (Ecoscape 2010b; 2011b; 2012j), with the same observation and therefore considers it most likely to be a disturbance opportunist. Therefore, whilst some individuals or populations may be removed as a result of developing the rail corridor, any disturbance is likely to result in an overall increase in the species population thus significant impacts are unlikely.

P2 *Pentalepis trichodesmoides* subsp. *hispida*; a single plant of this taxon was recorded from the study area. Ecoscape has previously recorded this taxon in nearby areas (Ecoscape 2014a; 2014b, both assessed in 2013) and considers it more common than its listing as P2 suggests. It is Ecoscape's opinion that the impact of removing a single plant (or small population if additional plants occur nearby) is unlikely to have a significant impact on the taxon as a whole.

P3 *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301); this taxon was recorded from the southern end of the alignment. Ecoscape has recorded this taxon during a number of surveys in the central and western Hamersley Range (Ecoscape 2011a; 2012c; 2012g; 2012k; 2013e; 2014a; 2014b) and considers it to be locally common, although, in the rail corridor, at the edge of its known range (DPaW 2007-2014). Therefore, removal of a small number of individuals is unlikely to have a significant impact on this taxon's population as a whole.

P3 *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) was recorded on the Wona land system on cracking clay soil. Whilst this is likely to be a new population, this poorly known taxon has a north to south and east to west range of close to 200 km (assessed using the *NatureMap* measuring tool; DPaW 2007-2014) thus impacts on the taxon's population are unlikely to be significant if development proceeds.

P3 *Sida* sp. Barlee Range (S. van Leeuwen 1642); one population of this taxon was recorded from a gorge near the southern end of the rail corridor. Whilst this population is at the northern edge of its known extent, the taxon as a whole has an east to west range of over 350 km (assessed using the *NatureMap* measuring tool; DPaW 2007-2014) thus impacts on the taxon's population are unlikely to be significant if development proceeds.

P4 *Goodenia nuda*; a number of individuals and populations of this species was recorded along the length of the alignment. Ecoscape has recorded this species from most of the surveys it has conducted in the Pilbara region, and considers it to be sparsely distributed but not uncommon. It has a wide extent (assessed using the *NatureMap* measuring tool; DPaW 2007-2014) and is unlikely to be under threat thus impacts on the species as a whole are unlikely to be significant if development proceeds.

P4 *Rhynchosia bungarensis*; this species has an east to west extent of over 500 km (assessed using the *NatureMap* measuring tool; DPaW 2007-2014), and therefore the impact of removing a small number of plants is unlikely to be significant in terms of the species' population as a whole.

Overall; two of the three P1 taxa recorded during the field survey are considered likely to be disturbance opportunists and developing the rail corridor is unlikely to have a negative impact on their population as a whole. The third species, *Helichrysum oligochaetum*, is also unlikely to be significantly impacted in the context of its population as a whole, however DPaW would be required to make a determination if additional surveys would be required before development, however, as the entire rail corridor width will not be developed, it is likely that the population can be avoided.

Significant impacts on the overall population of P2 taxon *Pentalepis trichodesmoides* subsp. *hispida* are also unlikely to be significant as only one individual plant was recorded.

6.1.2 Conservation Significant Flora Likelihood Assessment

As it is not possible to search all of the study area, there remains a possibility that some conservation significant flora may occur within the study area but were not located. The conservation significant flora likelihood assessment identified the following as 'possible' to occur in the study area, however the probability of their occurrence varies. Many are associated with pools or clay flats. Discussion in relation to extent below uses *NatureMap* and its measuring tool (DPaW 2007-2014).

P1 taxa:

- associated with pools, drainage lines and floodplains:
    - *Josephinia* sp. Marandoo (M.E. Trudgen 1554); a specimen identified as *Josephinia* ?sp. Marandoo (M.E. Trudgen 1554) on *NatureMap* is known from within 10 km of the rail alignment, indicating some doubt in relation to its identity. It is therefore not possible to determine the actual likelihood of this taxon occurring in the rail corridor.
    - *Nicotiana heterantha*; is known from 10-20 km from the rail corridor in the Fortescue River valley. It is possible that it occurs in the rail corridor
- associated with clay soils:
    - *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662); known from 20-50 km distance from the rail corridor but largely within the Hamersley Range to the south. Therefore, despite the possibility that it may occur, the probability of it occurring is likely to be low.
    - *Euphorbia inappendiculata* var. *queenslandica*; also known from 20-50 km distance from the rail corridor, and also to the south within the Hamersley Range. Therefore, despite the possibility that it may occur, the probability of it occurring within the rail corridor is likely to be low.
- associated with other habitat types:
    - *Sida* sp. Hamersley Range (K. Newbey 10692), associated with scree and skeletal soil, gorges and cliffs. This taxon is known from <10 km from the rail corridor. Whilst it is possible that it may occur within the rail corridor survey area, development of a rail corridor in the Hamersley Range portion of the study area is, for practical reasons, is unlikely to occur on areas associated with gorges and cliffs. Therefore, whilst the probability of this taxon occurring in the rail corridor survey area is moderate, the likelihood of it occurring in an impact area is low.

P2 taxa:

- associated with pools, drainage lines and floodplains:
    - *Cladium procerum*; known from 10-20 km distance from the rail corridor. It is possible that this species occurs in the study area.
    - *Oxalis* sp. Pilbara (M.E. Trudgen 12725); Ecoscape has collected this taxon from 50-100 km to the southwest of the rail corridor, although this record has not yet been verified by the WAH. The habitat of this taxon appears to be very specific (damp, sheltered areas in gorges), therefore the probability of this specific habitat occurring in the Hamersley Range within the rail corridor is low, and the probability of the taxon occurring is correspondingly low.
- associated with clay soils:
    - *Euphorbia australis* var. *glabra*; known from 20-50 km from the rail corridor in the Hamersley Range and Fortescue River Valley. It is possible that this taxon occurs in the study area, however, due to the difficulty of identifying this genus in the field almost all representatives are collected for later confirmation. Therefore the probability of it having been overlooked in the areas that have been adequately surveyed is low.
    - *Euphorbia inappendiculata* var. *inappendiculata*; known from 20-50 km from the rail corridor in the Hamersley Range and also occurs in other scattered areas. Whilst there remains a possibility of this taxon occurring in the study area, the probability is low as the known associated vegetation types occur only rarely, and not in the areas of known populations.
    - *Paspalidium retiglume*; known from <10 km from the study area on the edge of the Chichester Range, and Fortescue River valley. It is possible that this species occurs in the study area.
    - V*igna* sp. central (M.E. Trudgen 1626); known from 10-20 km from the rail corridor in the Hamersley Range. Although this taxa is associated with clay soils, this Hamersley Range record was collected by Ecoscape in 2011 in similar habitat to the southern end of the rail corridor and such it is possible that it may occur.
- associated with other habitat types:
    - *Spartothamnella puberula*; this taxon has recently been revised (published August 2014, but not yet appearing on *FloraBase* or *NatureMap*) and no longer occurs in Western Australia; it is now known as *Spartothamnella canescens* (Thiele & Shepherd 2014), and not of conservation significance.
    - *Trianthema* sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023); this taxon is known from 50-100 km from the rail corridor associated with sand and gibber plains on the edges of the Chichester Range and as such the probability of it occurring is low.

P3 taxa:

- associated with pools, drainage lines and floodplains:
    - *Eragrostis crateriformis*; known from 50-100 km from the rail corridor; there is a low probability that this species may occur
    - *Fimbristylis sieberiana*; known from 20 – 50 km from the rail corridor in the Hamersley Range; there is potential that this species may occur
    - *Gymnanthera cunninghamii*; known from 20 – 50 km from the rail corridor in the Hamersley and Chichester Ranges; there is potential that this species may occur
- associated with clay soils:
    - *Astrebla lappacea*; known from 10-20 km from the rail corridor; there is potential that this species may occur
    - *Eragrostis surreyana*; known from 20-50 km from the rail corridor; there is potential that this species may occur
    - *Glycine falcata*; known from 20-50 km from the rail corridor in the Hamersley Range; there is potential that this species may occur

- *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727); 20-50 km from the rail corridor in the Hamersley Range and Fortescue River valley; there is potential that this species may occur
- *Iotasperma sessilifolium*; although this species is known within 10 km of the rail corridor in the Hamersley Range, the specific habitat is not common therefore there is a low probability that this species may occur
- *Polymeria distigma*; although known from 20-50 km from the study area in the Hamersley Range, the specific habitat is not common therefore there is a low probability that this species may occur
- *Solanum albostellatum*; known from within 10 km of the rail corridor in the Hamersley Range and also from the Fortescue River floodplain; there is potential that this species may occur
- *Stackhousia clementii*; known from 10-20 km from the rail corridor in the Hamersley Range and Fortescue River floodplain; there is potential that this species may occur
- *Swainsona thompsoniana*; known from 10-20 km from the rail corridor in the Hamersley and Chichester Ranges; there is potential that this species may occur
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431); known from 20-50 km from the rail corridor; there is potential that this species may occur

- associated with other habitat types:
  - *Acacia daweana*; known from a variety of habitat types within 10 km of the rail corridor; there is potential that this species may occur
  - *Calotis latiuscula*; known from a variety of habitats 20-50 km from the study area; there is potential that this species may occur
  - *Geijera salicifolia*; known from rocky scree and gorges 50-100 km from the rail corridor; there is a very low probability that this species may occur as the specific habitat is uncommon in rail corridor
  - *Ptilotus subspinescens*; although known from 20-50 km from the study area, it only occurs in a very localised area and as such there is a low probability that this species may occur
  - *Rhagodia* sp. Hamersley (M. Trudgen 17794); known from 20-50 km from the study area however Ecoscape's experience with this taxa indicates there is only a low probability of occurrence
  - *Rostellularia adscendens* var. *latifolia*; known from within 10 km of the rail corridor; there is potential that this species may occur.

P4 taxa; none are considered as having potential to occur in the study area.

Other significant taxa; an unnamed *Josephinia* sp. was previously recorded from within 10 km of the rail corridor in the Flinders Blacksmith tenement (Ecoscape 2011a). The specific habitat is unlikely to occur within the rail corridor and as such there is only a low probability of occurrence.

Following the above assessment, 17 taxa have potential to occur in the study area but have not been recorded (**Table 13**). Most are associated with clay soils.

Table 13: Priority flora that have potential to occur in the rail corridor

PRIORITY	POOLS/RIPARIAN	CLAY SOILS	OTHER HABITATS
P1	*Nicotiana heterantha*		
P2	*Cladium procerum*	*Paspalidium retiglume*	
		Vigna sp. central (M.E. Trudgen 1626)	
P3	*Fimbristylis sieberiana*	*Astrebla lappacea*	*Acacia daweana*
	Gymnanthera cunninghamii	*Eragrostis surreyana*	*Calotis latiuscula*
		Glycine falcata	*Rostellularia adscendens* var. *latifolia*
		Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	
		Solanum albostellatum	
		Stackhousia clementii	
		Swainsona thompsoniana	
		Themeda sp. Hamersley Station (M.E. Trudgen 11431)	

6.1.3 Other Significant Flora

6.1.3.1 Range Extension, Range Edges and Outlier Populations

The flora taxa that are considered to represent a range extension, range edge or outlier population are listed in Table 4. Two of these are significant range extensions; *Gyrostemon tepperi* with a western range extension of over 200 km, and *Sida* sp. Rabbit Flat (B.J. Carter 626) with a western range extension of approximately 100 km. Both were recorded on the Gregory land system, which is composed of aeolian dunes, in the northern portion of the study area in the Roebourne IBRA subregion.

6.1.3.2 New (Undescribed) Species

A potentially new (undescribed species) *Acacia* species was recorded as a dominant species from the rail corridor, in the Chichester Range. As WAH's *Acacia* specialist is on extended leave, it has not been possible to confirm if the specimen is known or not. Further surveys, preferably collecting specimens with reproductive material would, in any case, most likely be required for clarification.

6.1.3.3 Significant According to Guidance Statement No. 51

Acacia trachycarpa (dwarf variant) is described as an uncommon form that appears to have several disjunct populations (*Wattles of the Pilbara* Maslin *et al*. 2010). It was recorded in the southern portion of the study area in a number of vegetation types, and may be considered significant according to *Guidance Statement No. 51* (EPA 2004). Whilst uncommon, there is a 1981 record of this form occurring approximately 30 km to the northwest of the study area (DPaW 2007-2014; WAH 2014). Whilst of interest, it is unlikely that this species is of conservation or any other significance.

No specimens of the unnamed *Josephinia* sp. (EPA 2012b) that was identified as significant during the desktop assessment were recorded.

6.1.3.4 Locally Significant

No other flora taxa were considered to be locally significant.

6.1.4 Introduced Flora

Sixteen introduced flora (weeds) were recorded in the study area, although for two of these (**Cucumis melo* subsp. *agrestis* and **Flaveria trinervia*) there is some doubt in regard to their alien status. None are Declared Pest plants listed under the *BAM Act 2007* for the relevant local government areas.

None of the introduced species recorded in the study area are included on any of the weed lists maintained by DoE and Weeds Australia (see **Section 3.2.7**).

According to the DEC (2011a) *Pilbara Region – Environmental Weed List*, **Acetosa vesicaria*, **Aerva javanica*, **Cenchrus ciliaris*, **C. setiger*, **Cynodon dactylon*, **Malvastrum americanum*, **Setaria verticillata* and **Vachellia farnesiana* have high ecological impact, defined as *causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure and function of ecosystems* (DEC 2011b). They also have rapid invasiveness and (except for **Acetosa vesicaria* and **Aerva javanica*) low feasibility of control; feasibility of control is related to the time required to achieve the desired goal and cost involved, and considers how widespread a weed is, the ease of finding infestations, the cost of controlling infestations, difficulty of limiting the weed's dispersal, willingness of landholders and governments to control the weed, and the commercial use of the plant *(ibid*.).

There are no requirements for control of any of these introduced species in the rail corridor area, however a management plan to restrict their spread during any future construction is potentially a requirement of environmental approvals.

6.2 VEGETATION SIGNIFICANCE

6.2.1 Vegetation Types

Fifty eight vegetation types were recorded within the study area. Twenty four of these had only quadrat or relevè recorded from them, largely as a result of lack of accessibility. Other reasons for lack of representation include the vegetation type not being recognised as a discrete vegetation type during the field survey and the vegetation type having a small extent. One vegetation type, previously identified by Mattiske Consulting (2006) had no quadrats recorded in it, however it was adequately described by Mattiske Consulting.

The significance of the vegetation types are discussed below.

6.2.2 Threatened Ecological Communities

There were no TECs recorded from within the study area. No TECs are likely to be impacted by any clearing or other proposed activities as the nearest TEC is more than 20 km from the study area, and downstream of any activities.

6.2.3 Priority Ecological Communities

The P3 'Horseflat Land System of the Roebourne Plains' PEC occurs in the northern portion of the rail corridor. This PEC occurs from near Cape Preston (west of Karratha), eastwards to Balla Balla; approximately 160 km apart.

The 'Horseflat Land System of the Roebourne Plains' PEC includes three subtypes (land system units) described in Van Vreeswyk *et al.* (2004). Land system unit 3 is represented by vegetation type **Ex_1** that occupies 1 091.38 ha in the rail corridor, on gilgaied plains. Land unit 5 may be represented by vegetation types **Te(1)**, **Tw(1)** and Mattiske **FPg1**, occupying a total of 126.98 ha; these vegetation types occur on alluvial plains. Land unit 7 may be represented by vegetation type **Cc_2Eb** occupying 12.76 ha in drainage

depressions. Locations of these vegetation types that may represent the different subtypes of the PEC are shown on **Map 5**. DPaW advice will be required to determine if the latter vegetation types are representative of the PEC however, the overall impact on the PEC by construction of a rail corridor is unlikely to be significant, given that the PEC occurs over such a wide area (160 km east to west). Since Ecoscape conducted the reconnaissance field survey, Rutila has already moved the proposed alignment in this portion of the corridor, and has reduced the potential impact on the PEC, including avoiding an area to the south of North West Coastal Highway.

The P1 'Cracking clays of the Chichester and Mungaroona Range' subtype of the 'Four plant assemblages of the Wona land system' PEC may be represented by vegetation type **Sb** that occupies 31.81 ha near the central portion of the rail corridor (see **Map 5**). Advice from the DPaW Species and Communities Branch and additional survey in the season following rain is likely to be required before the inclusion of this vegetation type in the PEC can be confirmed. Another area considered to represent the PEC, or at least occurring within the buffers of the area considered to represent the PEC (south of the Roebourne Wittenoom Rd) does not represent the PEC as it is a shrubland, not a grassland or herbland that define the four plant assemblages.

6.2.4 Groundwater Dependent Ecosystems

In the northern portion of the study area the proposed railway alignment crosses the Sherlock River and a major tributary, and occupies part of its floodplain. Through the Nunyerry Gap, in the Chichester Range, part of the alignment corresponds with Nunyerry Creek (itself a tributary of the Sherlock River). In the southern portion of the study area the proposed railway alignment crosses the Fortescue River and follows the course of its tributary, Weelumurra Creek. GDEs are associated with all major drainage lines, and are likely to be impacted by the proposed works.

The study area includes areas that are considered to represent Class 2 and Class 3 GDES.

GDEs characterised by *Eucalyptus camaldulensis* and/or *Melaleuca argentea*, including vegetation types **EvMlCv**, **MaMgCv** and **MaMlCv** that occupy 943.26 ha (1.65% of the study area), may represent Class 2 GDEs that are dependent on the surface expression of groundwater (i.e. vegetation associated with pools) or Class 3 GDEs that are dependent on the subsurface expression of groundwater (Eamus *et al*. 2006). These species generally co-occurred within the rail corridor but were not always associated with pools, although it was likely that the groundwater was close to the surface.

Class 3 GDEs include riparian vegetation; in this case Ecoscape considers riparian vegetation to include *Eucalyptus victrix* (as well as the above species). *Eucalyptus victrix* may be phreatophytic however this has not been determined absolutely and is likely to be dependent on local factors (see **Section 3.3.3**). Vegetation types that may be included as Class 3 GDEs include **EvApCc$_1$**, **EvApTe**, **EvAt$_1$Te**, **EvCb** and **EvMgEb** that occupy 1 512.9 ha (2.65% of the study area).

It will not be possible to determine impact extents on GDEs until a final rail corridor has been determined, however, given the requirement for a railway to be located on as flat land as possible, impacts are inevitable.

6.2.5 Mulga Communities

No vegetation types were considered to represent a Mulga Community.

There was no SFDV within the study area, and none identified from nearby that is likely to be impacted by the proposed works.

6.2.6 'Ecosystems at Risk'

No vegetation likely to represent an 'Ecosystem at Risk', except vegetation now considered to represent a PEC and GDEs, was recorded in the study area. These are discussed above.

6.2.7 Other Significant Vegetation

Vegetation having a restricted distribution can be significant according to *Guidance Statement No. 51* (EPA 2004).

Ecoscape has undertaken a number of flora and vegetation surveys in the Hamersley Range (Ecoscape 2010a; 2011a; 2012b; 2012i; 2013b; 2013e; 2014a; 2014b). Only four of these study areas (Ecoscape 2010a; 2011a; 2012b; 2014b) have recorded restricted areas of vegetation characterised by a species known as *Triodia* aff. *melvillei*. Ecoscape is therefore of the opinion that this vegetation type, known in this report as **ElAs$_3$Tm**, is of significance as it has a restricted distribution, being confined to the low undulating hills in the valleys of the central Hamersley Range. Vegetation type **ElAs$_3$Tm** occupied 125.06 ha in the rail corridor.

Vegetation type **FbGpEm**, occupying 2.48 ha in the rail corridor, was confined to a small quartz hill. No similar landform or vegetation type was recorded elsewhere in the study area, nor observed nearby. Therefore this vegetation type has a restricted distribution within the rail corridor and surrounds.

Vegetation type **AmEe**, occupying 26.42 ha in the rail corridor, was confined to a large aeolian dune, largely in the Gregory land system. No similar vegetation nor landform were recorded elsewhere; other representations of the Gregory land system were undulating dunes. Therefore this vegetation type has a restricted distribution within the rail corridor.

A number of other vegetation types in the rail corridor have restricted distributions (i.e. small extents or confined to a particular, restricted landform or geographic location), however none were considered of significance.

Vegetation types can have significance if they are confined to or largely confined to poorly represented land systems. Only one land system meets this criteria; Gregory. Vegetation types **AmEe** and **As$_3$** were largely confined to the Gregory land system and therefore are considered of significance.

Vegetation types can also have significance if they are confined to or largely confined to poorly represented pre-European vegetation associations. Vegetation types **AiTe(1)**, **AiTe(3)**, **AiTw(3)**, **AmEe**, **ChAa$_1$Ta**, **MaMgCv** and **Ta** are confined or largely confined to pre-European vegetation associations with low representation, however all pre-European vegetation associations have more than 95% of their pre-European extent remaining in the Pilbara.

6.2.8 Vegetation Similarity to Nearby Areas

Ecoscape is aware of a number of flora and vegetation reports associated with areas close to the far northern end of the rail corridor (Astron Environmental Services 2005; Mattiske Consulting Pty Ltd 2006; 2008; 2013a). In most cases (except vegetation type **FbGpEm**), the vegetation recorded during this survey is largely similar to vegetation recorded previously. Only riparian vegetation was considered of significance according to Mattiske Consulting (2006) and also recorded by Ecoscape during this survey. Riparian vegetation is considered of significance as it represents a GDE, and is discussed in **Section 6.2.4** above.

Ecoscape has conducted a number of surveys towards the southern end of the study area and is aware of other nearby surveys (see **Section 3.3.7**). In general, the vegetation of the rail corridor is considered similar to that recorded during these previous surveys. Vegetation associated with high hills (similar to vegetation

type **ElEgTw**) was considered of significance in a number of these areas (Ecoscape 2010a; 2012b; 2012g; 2014b). Therefore this vegetation type is likely to be of some significance, however it is unlikely to be impacted by any future development of the rail corridor due to its location on a high hill. Aside from GDE vegetation, and vegetation type **ElAs$_3$Tm** discussed above, no other vegetation similar to that recorded dring this survey was considered of significance.

Ecoscape is not aware of any previous flora and vegetation surveys conducted on the bulk of the rail corridor study area, largely from south of North West Coastal Highway to Weelamurra Creek, towards the south of the rail corridor. Vegetation that may be considered significant in this portion of the study area is discussed above, however, as a general statement, most of the vegetation appeared similar to large areas surrounding the rail corridor that were traversed in order to get to the corridor during the field survey.

6.2.9 Floristic Analysis

No regional floristic analysis was conducted.

Study area floristic analysis provided a reasonable correlation between vegetation types as observed during the field survey and floristic groups.

6.3 VEGETATION CONDITION

Most (90.64%) of the study area was assessed as being in Excellent condition. Those areas assessed in lesser condition were generally impacted by cattle grazing, and perhaps to some degree feral animal grazing, and weed invasion, largely Buffel Grass (**Cenchrus ciliaris*).

Impacts of grazing, particularly damage to the soil surface and weeds, were most common on the Horseflat land system and associated with drainage lines.

7.0 SUMMARY AND CONCLUSIONS

The vast majority of the rail corridor is not significant in terms of flora and vegetation. The significant aspects are:

- conservation significant flora, particularly P1 and P2 flora taxa;
    - P1 taxa *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095), *Helichrysum oligochaetum*, *Heliotropium muticum*
    - P2 taxon *Pentalepis trichodesmoides* subsp. *hispida*
- vegetation considered to represent, or potentially represent, two PECs;
    - P3 'Horseflat Land System of the Roebourne Plains' PEC
    - P1 'Cracking clays of the Chichester and Mungaroona Range' subtype of the 'Four plant assemblages of the Wona land system'.

A number of other vegetation types may be significant according to other attributes, including representing a GDE or significant due to its association with poorly represented land systems or pre-European vegetation associations, or be significant according to Guidance Statement No. 51 (generally of a restricted distribution).

7.1 RECOMMENDATIONS IN RELATION TO GUIDANCE STATEMENT NO. 51

Guidance Statement No. 51 (EPA 2004) states that a Level 2 survey requires:

1. one or more visit/s in the main flowering season and visit/s in other seasons
2. replication of plots in vegetation units, and greater coverage and displacement of the plots over the target area (relative to a Level 1 survey).

Ecoscape considers this survey has largely satisfied the second requirement, however the survey was conducted over only one season, not in the main flowering season. Therefore the first requirement of a Level 2 survey has not been met.

The EPA is anticipated to provide guidance if it considers that a second survey is required.

Ecoscape considers that the Rutila Rail flora and vegetation survey has:

- adequately described and mapped most vegetation units within the study area
- adequately identified significant vegetation types
- adequately described the perennial flora of the study area
- adequately searched the study area for conservation significant flora
- adequately assessed and mapped the vegetation condition of the study area
- discussed the flora and vegetation values of the study area.

Ecoscape considers that a second season of survey, conducted in the season following rain that is considered to represent the main flowering season, would:

- provide a larger flora inventory as many more annual and ephemeral plants are likely to be flowering (or, at least, have had a greater opportunity to have not yet been grazed)
- provide greater certainty in regard to the presence of conservation significant flora that flower earlier in the year
- provide an opportunity to target the few areas not considered adequately surveyed (generally off the main alignment but also including the Wona, Hooley and Gregory land systems within the main alignment)
- provide an opportunity to record additional data required for a determination in relation to possible PEC subtype on the Wona land system.

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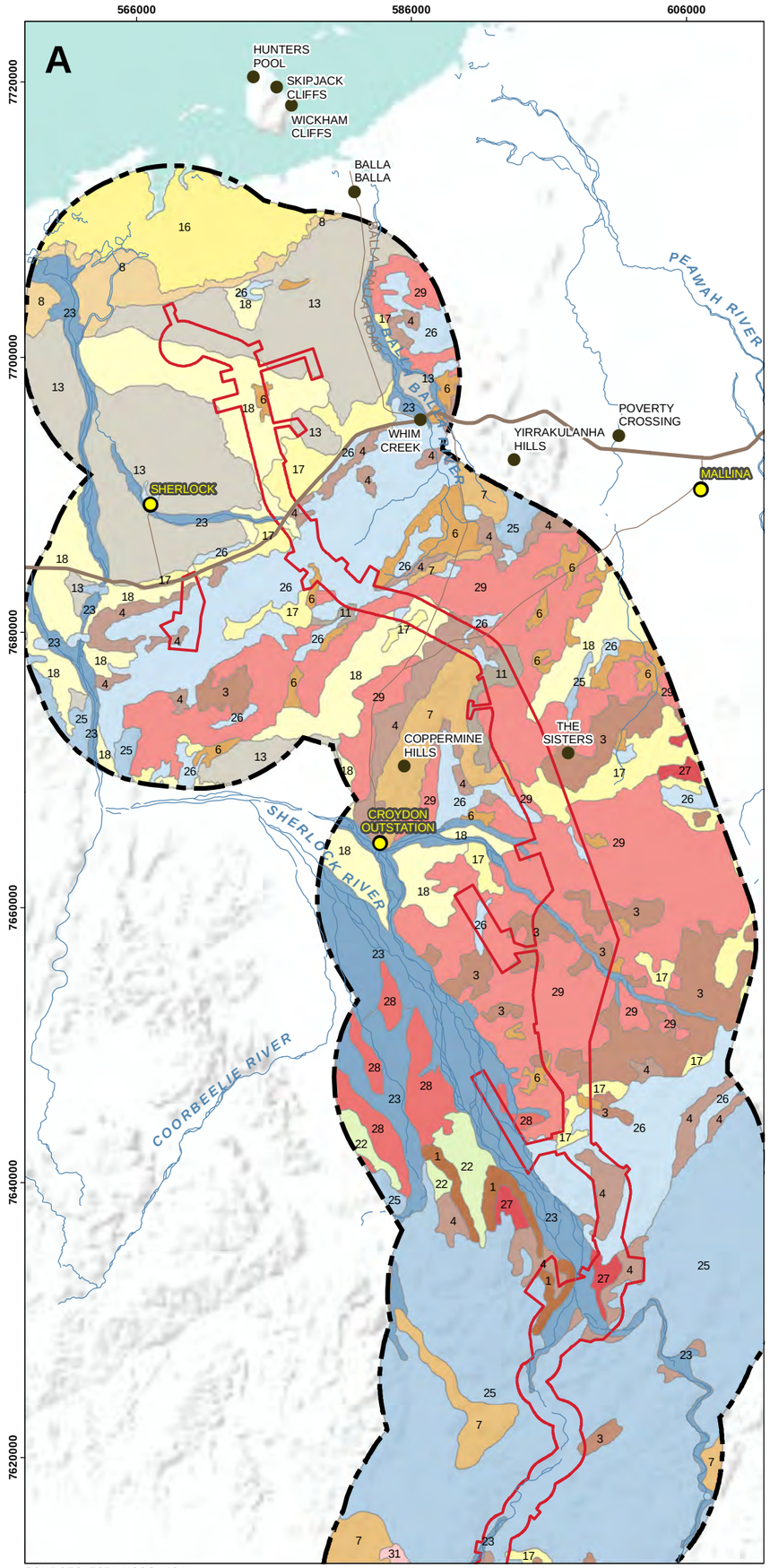
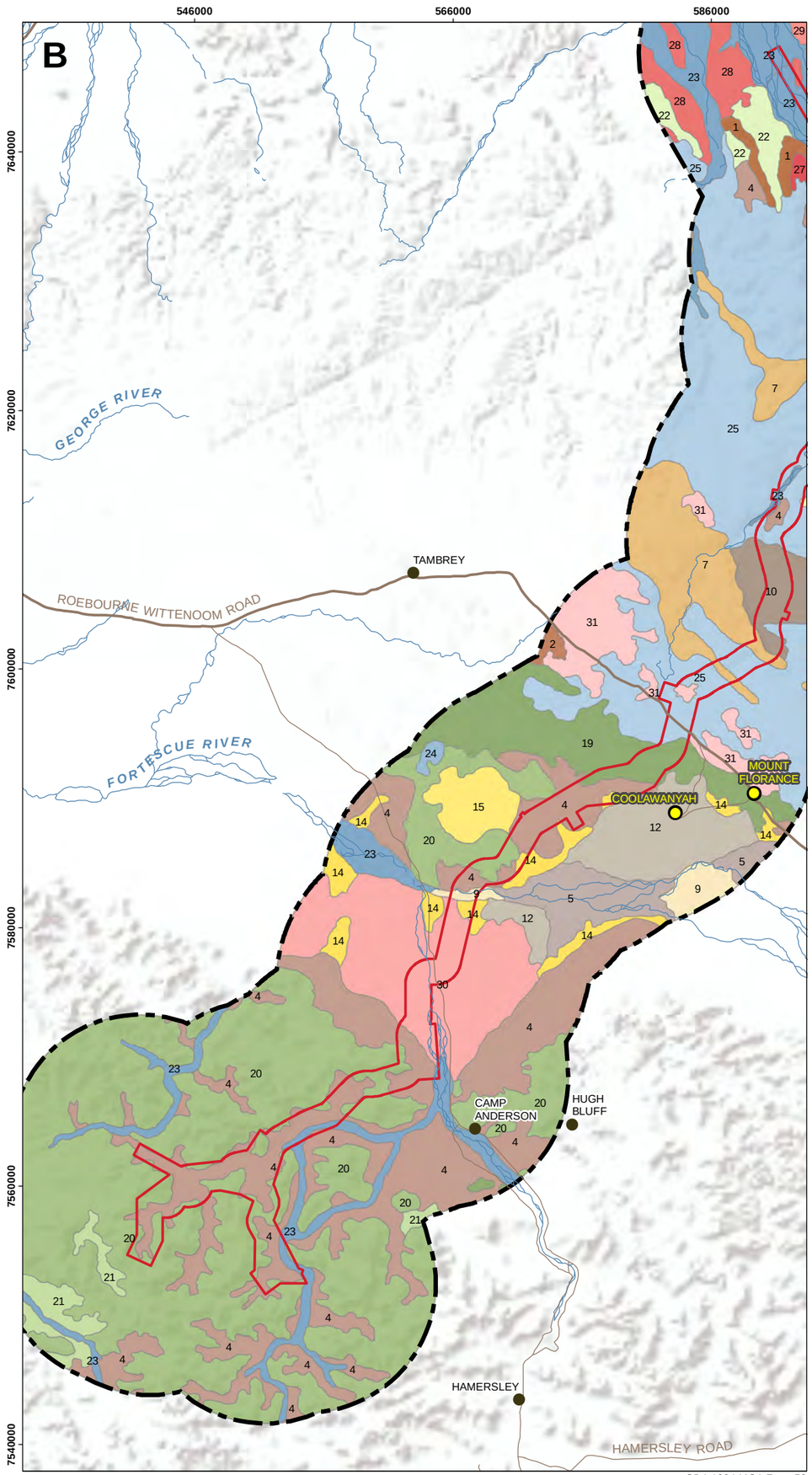
REPORT MAPS



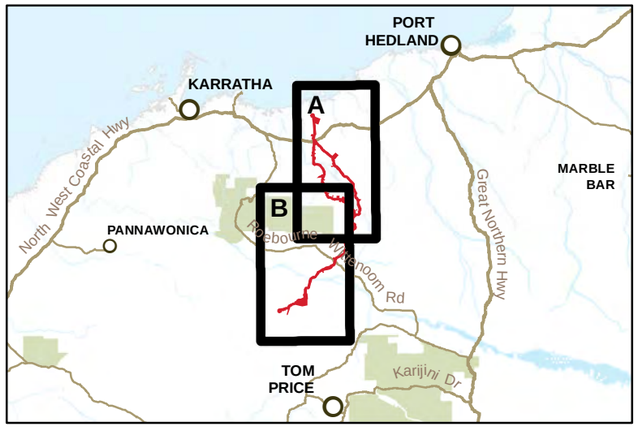


LEGEND

- Place Names
- Homesteads
- Principal Road
- Minor Road
- Drainage Lines
- Rutila Rail Corridor
- 10 km buffer

DAFWA Land Systems

1 Black System
2 Bonney System
3 Boolaloo System
4 Boolgeeda System
5 Brockman System
6 Calcrete System
7 Capricorn System
8 Cheerawarra System
9 Coolibah System
10 Granitic System
11 Gregory System
12 Hooley System
13 Horseflat System
14 Jurrawarrina System
15 Kumina System
16 Littoral System
17 Macroy System
18 Mallina System
19 McKay System
20 Newman System
21 Platform System
22 Pyramid System
23 River System
24 Robe System
25 Rocklea System
26 Ruth System
27 Satirist System
28 Sherlock System
29 Uaroo System
30 Urandy System
31 Wona System



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AUTHOR: JN
CHECKED: SB
DATE: OCT-14
PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

LAND SYSTEMS

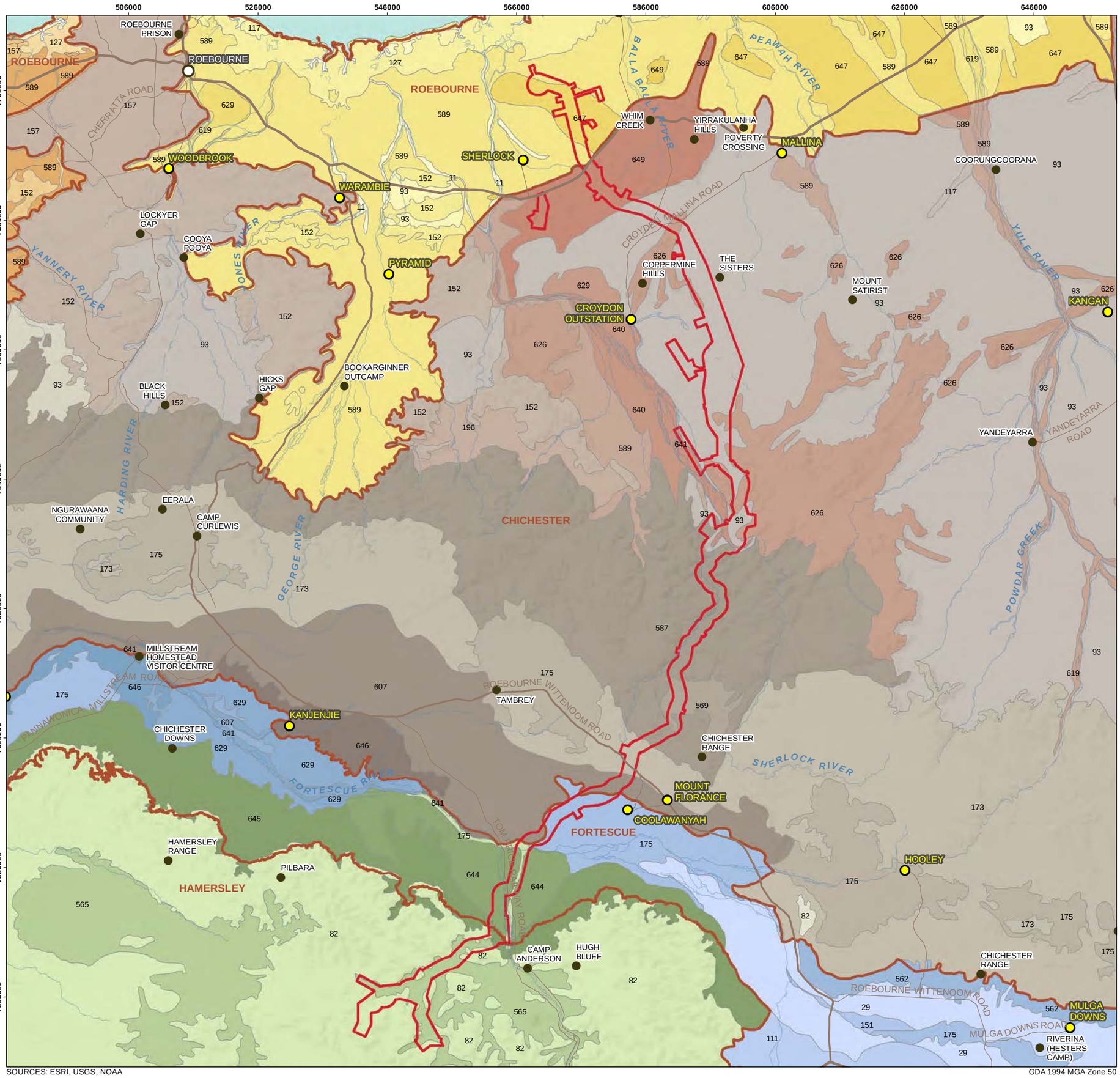
MAP 1

SCALE 1:400,000 @ A3

0 5 10 15 20 km

SOURCES: ESRI, USGS, NOAA

GDA 1994 MGA Zone 50



LEGEND

- Populated Places
- Homesteads
- Place Names
- Principal Road
- Secondary Road
- Minor Road
- Drainage Lines
- Rutila Rail Corridor
- IBRA Version7 Subregions

PreEuropean Vegetation Associations within Corridor

Abydos Plain - Chichester System

- 93: Hummock grasslands, shrub steppe; kanji over soft spinifex
- 626: Hummock grasslands, shrub-steppe; kanji over soft spinifex and *Triodia brizioides*
- 641: Medium woodland; coolabah & river gum
- 649: Sedgeland; Various sedges with very sparse snakewood

Abydos Plain System

- 589: Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex
- 647: Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex

Chichester System

- 173: Hummock grasslands, shrub steppe; kanji over soft spinifex and *Triodia wiseana* on basalt
- 569: Hummock grasslands, low tree steppe; bloodwood over soft spinifex and *Triodia wiseana*
- 587: Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrub-steppe; kanji over *Triodia pungens*
- 607: Hummock grasslands, low tree steppe; snappy gum and bloodwood over soft spinifex and *Triodia wiseana*

Hamersley System

- 82: Hummock grasslands, low tree steppe; snappy gum over *Triodia*
- 175: Short bunch grassland - savanna/grass plain (Pilbara)
- 565: Hummock grasslands, low tree steppe; bloodwood over soft spinifex
- 644: Hummock grasslands, open low tree steppe; mulga and snakewood over soft spinifex and *Triodia basedowii*
- 645: Hummock grasslands, shrub steppe; kanji and snakewood over soft spinifex and *Triodia wiseana*

Fortescue System

- 175: Short bunch grassland - savanna/grass plain (Pilbara)

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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

IBRA AND PRE-EURO VEGETATION

MAP 2

SCALE 1:580,000 @ A3

0 10 20 30 km

SOURCES: ESRI, USGS, NOAA

GDA 1994 MGA Zone 50

446000 466000 486000 506000 526000 546000 566000 586000 606000 626000 646000 666000

7720000 7700000 7680000 7660000 7640000 7620000 7600000 7580000 7560000 7540000 7520000

DAMPIER
POINT SAMSON
WICKHAM
COSSACK
KARRATHA
ROEBOURNE
MOUNT PRINSEP
KARRATHA
WOODBROOK
SHERLOCK
WARAMBIE
LOCKYER GAP
CHERRATTA
COOYA POOYA
PYRAMID
YANYARE RIVER
YANNERY RIVER
JONES RIVER
BLACK HILLS
HICKS GAP
BOOKARGINNER OUTCAMP
CROYDON OUTSTATION
NGURAWAANA COMMUNITY
EERALA
CAMP CURLEWIS
BALLA BALLA
PEAWAH RIVER
WHIM CREEK
POVERTY CROSSING
NORTH WEST COASTAL HIGHWAY
YIRRAKULANHA HILLS
MALLINA
CROYDON MALLINA ROAD
COPPERMINE HILLS
THE SISTERS
BABBACOORINGANNA
GREAT NORTHERN HIGHWAY
COORUNGCOORANA
YULE RIVER
MOUNT SATIRIST
KANGAN
WODGINA WEST
YANDEYARRA ROAD
YANDEYARRA
MILLSTREAM HOMESTEAD VISITOR CENTRE
MILLSTREAM OUTCAMP
PANNAWONICA MILLSTREAM ROAD
YALLALONG
KANJENJIE
CHICHESTER DOWNS
FORTESCUE RIVER
Invertebrate assemblages PEC
TAMBREY
ROEBOURNE WITTENOOM ROAD
CHICHESTER RANGE
SHERLOCK RIVER
MOUNT FLORANCE
COOLAWANYAH
YANDEYARRE OUTSTATION
MUNGAROONA RANGE
HAMERSLEY RANGE
PILBARA
ROBE RIVER
TOM PRICE RAILWAY ROAD
HOOLEY
HOOLEY ROAD
CHICHESTER RANGE
HUGH BLUFF
CAMP ANDERSON
CHICHESTER RANGE
HAMERSLEY RANGE
ROEBOURNE WITTENOOM ROAD
RIVERINA (HESTERS CAMP)
HAMERSLEY
MOUNT BROCKMAN
HAMERSLEY
NANUTARRA WITTENOOM ROAD
WITTENOOM
MUNJINA WITTENOOM ROAD
DRILLERS RIDGE
NAMMULDI RIDGE
BROCKMAN
ROSELLA SIDING
BANJIMA DRIVE
DALES GORGE LOOKOUT

SOURCES: ESRI, USGS, NOAA

GDA 1994 MGA Zone 50

LEGEND

- Populated Places
- Homesteads
- Place Names

DPaW Flora Databases

Conservation Status

- P1
- P2
- P3
- P4

- Principal Road
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Saline coastal flat
- Rutila Rail Corridor
- 40 km search buffer

DPaW Ecological Community Database

Threatened Ecological Communities

- Vulnerable: *Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)

Priority Ecological Communities

- Priority 1: Brockman Iron cracking clay communities of the Hamersley Range
- Priority 1: Four plant assemblages of the Wona Land System (previously 'Cracking clays of the Chichester and Mungaroona Range')
- Priority 3: Horseflat Land System of the Roebourne Plains
- Priority 4: Invertebrate assemblages (Errawallana Spring type) Coolawanya Station

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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

DPAW DATABASE SEARCH RESULTS

MAP 3

SCALE 1:750,000 @ A3

0 10 20 30 40 km

566000 571000 576000 581000 586000

7705000 7700000 7695000 7690000

LEGEND

- Quadrats/Detailed Releve
- Homesteads
- Principal Road
- Minor Road
- Track
- Drainage Lines
- Saline coastal flat
- Rutila Rail Corridor

Vegetation Type

- Aa_3Te
- Aa_4As_3
- ApTw
- As_1Cf
- Cc_2Eb
- $ChAa_1Ta$
- $EvAt_1Te$
- Ex_1
- FPg1
- FbGpEm
- Ta
- Te(1)
- Tw(1)
- Burnt

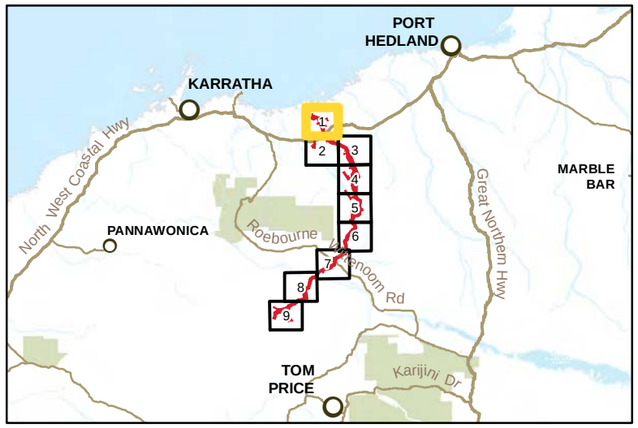
R14003 R14001 R14002 R14004 R14005 R14006 R14008 R14070 R14057 R14009 R14007 R14R1 R14069 R14068 R14010 R14066 R14067 R14012 R14013 R14015

SHERLOCK

BALLA BALLA RIVER

BALLA BALLA ROAD

NORTH WEST COASTAL HIGHWAY



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 1

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

566000 571000 576000 581000 586000

7685000 7680000 7675000 7670000

NORTH WEST COASTAL HIGHWAY

SHERLOCK RIVER

CROYDEN MALLINA ROAD

COPPERMINE HILLS

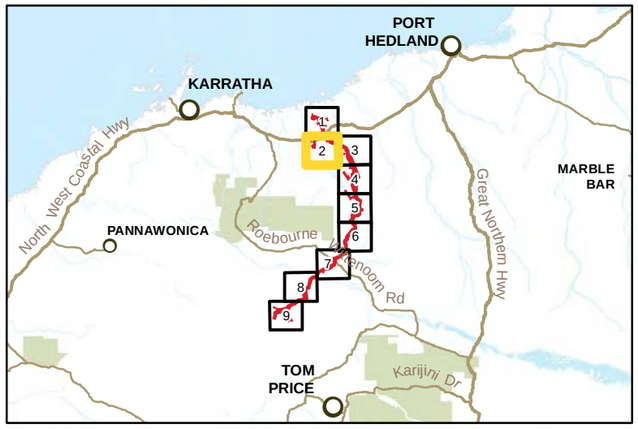
Ta
ApTw
ChAa$_1$Ta
Aa$_3$Tl
R14014
EvAt$_1$Te
ChAa$_1$Ta
Aa$_3$Tl
R14011
ChAa$_1$Ta
ChAbTw
EvAt$_1$Te
Aa$_3$Tl
Aa$_3$Tl
ChAa$_1$Ta
R14065
Aa$_3$Tl
ApTw
R14016
R14063
AmEe
R14017
AoTe
Aa$_3$Te
ChAa$_1$Ta
ApTw
R14027
ChAa$_1$Ta
Aa$_3$Te
R14028
EvApCc$_1$

LEGEND

- Quadrats/Detailed Releve
- Place Names
- Principal Road
- Minor Road
- Track
- Drainage Lines
- Rutila Rail Corridor

Vegetation Type

- Aa$_3$Te
- Aa$_3$Tl
- AmEe
- AoTe
- ApTw
- ChAa$_1$Ta
- ChAbTw
- EvApCc$_1$
- EvAt$_1$Te
- Ta



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 2

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

591000 596000 601000 606000

7685000 7680000 7675000 7670000

CROYDEN MALLINA ROAD

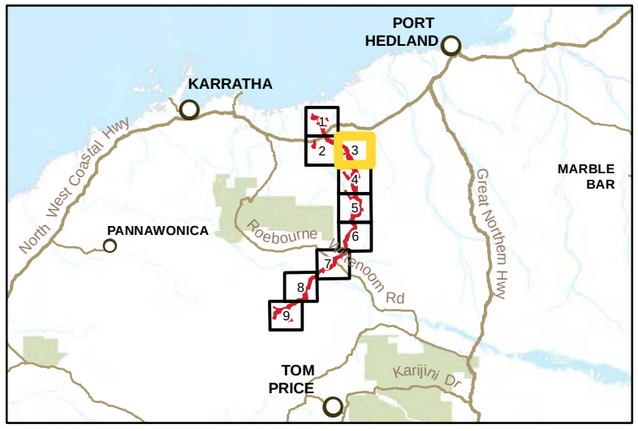
Aa_3Te R14018 R14019 R14020 AoTe R14060 AoTe Aa_3Tl R14021 As_3 R14022 R14023 THE SISTERS R14024 R14025 ApTw

LEGEND

- Quadrats/Detailed Releve
- Place Names
- Minor Road
- Track
- Drainage Lines
- Rutila Rail Corridor

Vegetation Type

- Aa_3Te
- Aa_3Tl
- AoTe
- ApTw
- As_3



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 3

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

591000 596000 601000 606000

7665000 7660000 7655000 7650000

Aa$_3$Tl
EvAt$_1$Te
Aa$_3$Tl
R14026
R14029
ApTw
Aa$_3$Tl
Aa$_3$Tl
Rock
R14071
EvAt$_1$Te
R14030
ApTw
R14031
MaMlCi
Aa$_3$Tl
R14032
Aa$_3$Tl/Ts
Rock
R14062
R14033
Aa$_3$Tl
Aa$_3$Te
Ts
R14034
Aa$_3$Tl
SHERLOCK RIVER
R14035
R14036
Rock
R14038
EvApCc$_1$
R14037
Aa$_3$Tl
MaMlCi
Te(3)
HcTe
EvApCc$_1$
R14040
HcTe
R14064
R14039
R14046
ChAbTw
Te(3)

IMAGERY SOURCE: CAD RESOURCES

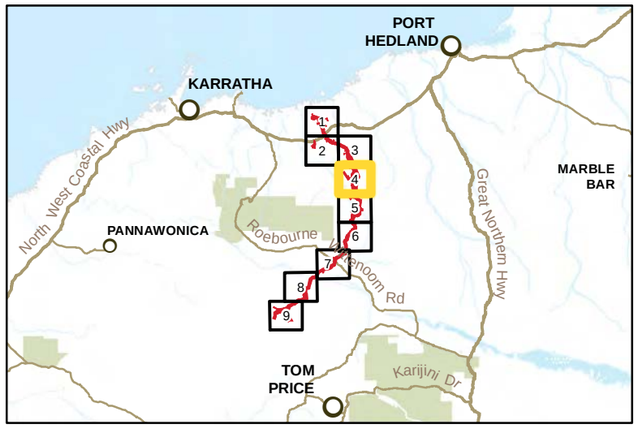
GDA 1994 MGA Zone 50

LEGEND

- Quadrats/Detailed Releve
- Track
- Drainage Lines
- Rutila Rail Corridor

Vegetation Type

- Aa$_3$Te
- Aa$_3$Tl
- Aa$_3$Tl/Ts
- ApTw
- ChAbTw
- EvApCc$_1$
- EvAt$_1$Te
- HcTe
- MaMlCi
- Te(3)
- Ts
- Rock



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 4

SCALE 1:75,000 @ A3

0 1 2 3 4 km

591000 596000 601000 606000

7645000 7640000 7635000 7630000 7625000

R14047 R14045 R14044 R14041 R14042 R14043 R14048 R14049 R14050 R14056 R14053 R14055 R14054 R14051 R14052 R14058 R14059 R14061 R14072

EvApCc$_1$ Te(3) HcTe EvMlCv Aa$_3$Tl ApTw ApTe Rock AiTe(1) MaMlCi Aa$_4$Tl EvAt$_1$Te Te(4) AiTw(2) Burnt ChAt$_2$Te

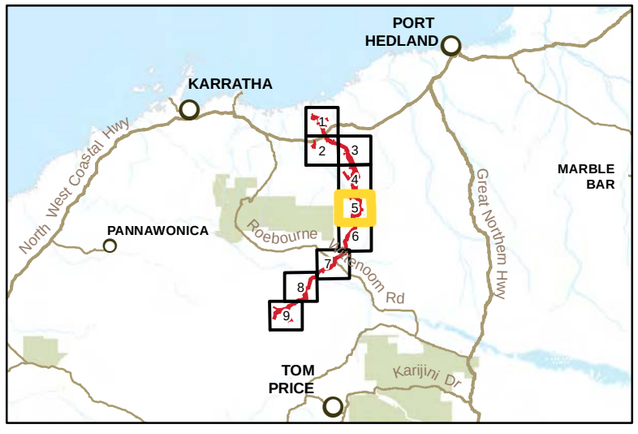
SHERLOCK RIVER

LEGEND

- Quadrats/Detailed Releve
- Track
- Drainage Lines
- Rutila Rail Corridor

Vegetation Type

- Aa$_3$Tl
- Aa$_4$Tl
- AiTe(1)
- AiTw(2)
- ApTe
- ApTw
- ChAbTw
- ChAt$_2$Te
- EvApCc$_1$
- EvAt$_1$Te
- EvMlCv
- HcTe
- MaMlCi
- Te(3)
- Te(4)
- Burnt
- Rock



IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

ecoscape

AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 5

SCALE 1:75,000 @ A3

0 1 2 3 4 km

591000 596000 601000 606000

7620000 7615000 7610000 7605000

ChAt$_2$Te AiTw(2) ApTw R14073 ChAt$_2$Te AiTw(2) R14131 ChAt$_2$Te EvApTe ApTw AiTw(2) R14074 ApTw EvApTe R14075 ApTw AiTw(2) AiTw(2) R14078 EvApTe R14077 R14079 ApTw ApTe MaMgCv EvApTe ApTe Tw(2) AiTw(2) R14080 EvMlCv Tw(2) EvApTe EvApTe R14082 EvApTe Tw(2) R14134 AiTw(2) R14083 R14084 AiTw(3) R14085 Tw(2) EvApTe MaMgCv AiTw(3) AiTe(3) R14135 R14087 EvMlCv AiTe(3) AiTw(3) ApTe EvApTe R14089 R14090 AiTw(3)

SHERLOCK RIVER

IMAGERY SOURCE: CAD RESOURCES

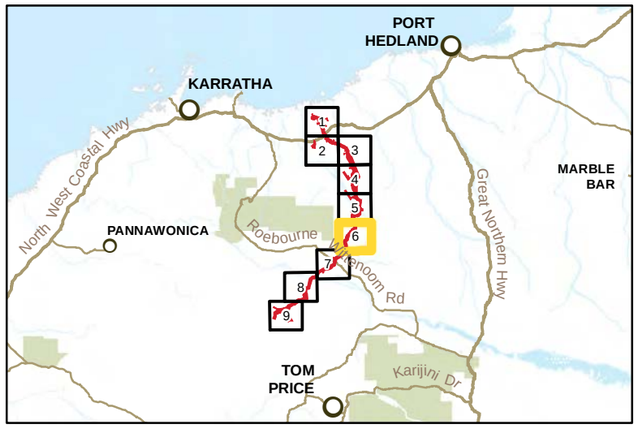
GDA 1994 MGA Zone 50

LEGEND

- Quadrats/Detailed Releve
- Track
- Drainage Lines
- Rutila Rail Corridor

Vegetation Type

- AiTe(3)
- AiTw(2)
- AiTw(3)
- ApTe
- ApTw
- ChAt$_2$Te
- EvApTe
- EvMlCv
- MaMgCv
- Tw(2)



ecoscape

AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 6

SCALE 1:75,000 @ A3

0 1 2 3 4 km

576000 581000 586000 591000

7600000 7595000 7590000 7585000

LEGEND

- Quadrats/Detailed Releve
- Homesteads
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Rutila Rail Corridor

Vegetation Type

- Ac_1ApTe
- Ac_1Te
- AiTw(1)
- AiTw(2)
- AiTw(3)
- AxSb
- $CdAa_5Te$
- $ChAa_5Te$
- $ChAt_2Te$
- $ElAs_2Te$
- ElTe
- EvApTe
- EvMlCv
- EvMvCv
- Sb
- Tb
- Te(2)
- unmapped

R14089 R14090 R14091 R14092 R14088 R14094 R14095 R14097 R14098 R14099 R14100 R14155 R14096 R14140 R14101 R14103 R14157 R14156 R14102 R14141 R14104 R14132 R14076 R14133 R14105

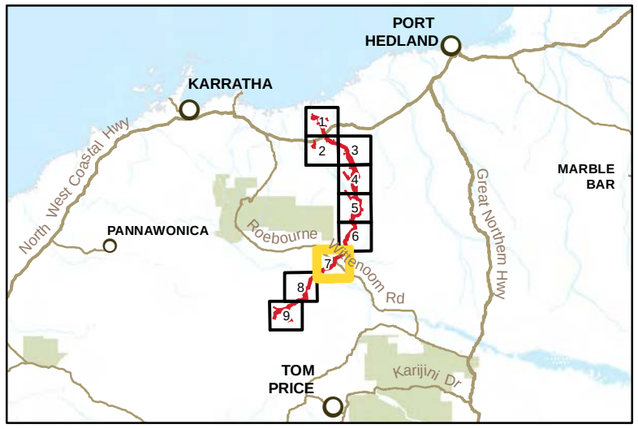
AiTw(3) AiTw(2) EvApTe $ElAs_2Te$ EvMlCv $ChAt_2Te$ AiTw(1) Sb AxSb Tb ElTe $ChAa_5Te$ $CdAa_5Te$ Ac_1Te Ac_1ApTe unmapped

ROEBOURNE WITTENOOM ROAD

FORTESCUE RIVER

MOUNT FLORANCE

COOLAWANYAH



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AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 7

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

551000 556000 561000 566000 571000

7585000 7580000 7575000 7570000

FORTESCUE RIVER

TOM PRICE RAILWAY ROAD

R14106 ChAa$_5$Te
R14142 Ac$_1$ApTe
R14103 AxSb
R14107 Tb EvCb
AxSb EvMgEb
Ac$_1$ApTe
R14086
R14109 Ac$_1$ApTe AiTe(2)
AiTe(2)
R14130
AiTe(2) R14145 AiTe(2)
R14110 EvApTe
Ac$_1$ApTe
ApTe
R14136 ChAa$_5$Te
R14112 ChAa$_5$Te ApTe
R14111
CdAa$_5$Te R14113
R14114 EvApTe
ElTw(1) ChAt$_2$Te ApTe
ChAt$_2$Te ChAa$_5$Te R14137
R14129
R14143

IMAGERY SOURCE: CAD RESOURCES

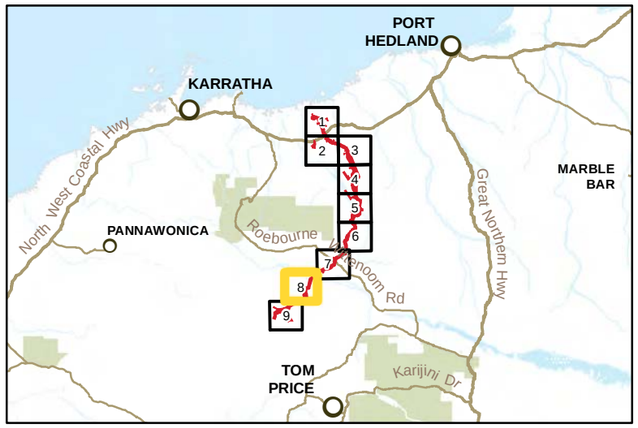
GDA 1994 MGA Zone 50

LEGEND

- Quadrats/Detailed Releve
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Rutila Rail Corridor

Vegetation Type

- Aa$_5$Tw
- Ac$_1$ApTe
- Ac$_1$Te
- AiTe(2)
- ApTe
- AxSb
- CdAa$_5$Te
- ChAa$_5$Te
- ChAt$_2$Te
- ElTw(1)
- EvApTe
- EvCb
- EvMgEb
- Tb



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

MAP 4 - 8

SCALE 1:75,000 @ A3

0 1 2 3 4 km

541000 546000 551000 556000 561000

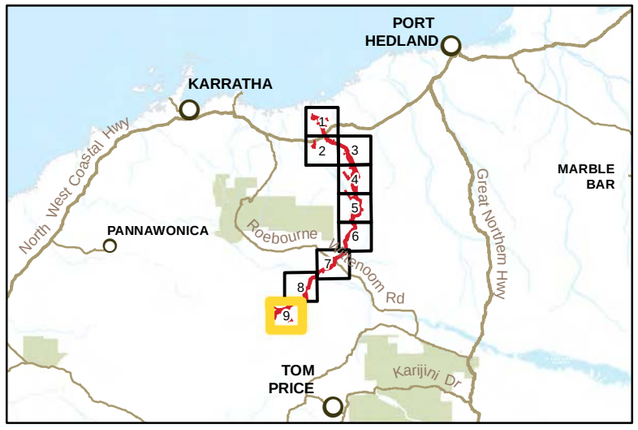
7565000 7560000 7555000 7550000

LEGEND

- Quadrats/Detailed Releve
- Track
- Rutila Rail Corridor

Vegetation Type

- Aa_5Tw
- Cc_2AbBe
- $CdAa_5Te$
- $ChAa_5Te$
- ChAeTt
- ChAiCf
- $ChAt_2Te$
- $EgAa_5Te$
- $ElAa_3Tm$
- ElEgTw
- ElTw(1)
- ElTw(2)
- EvApTe



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION TYPES

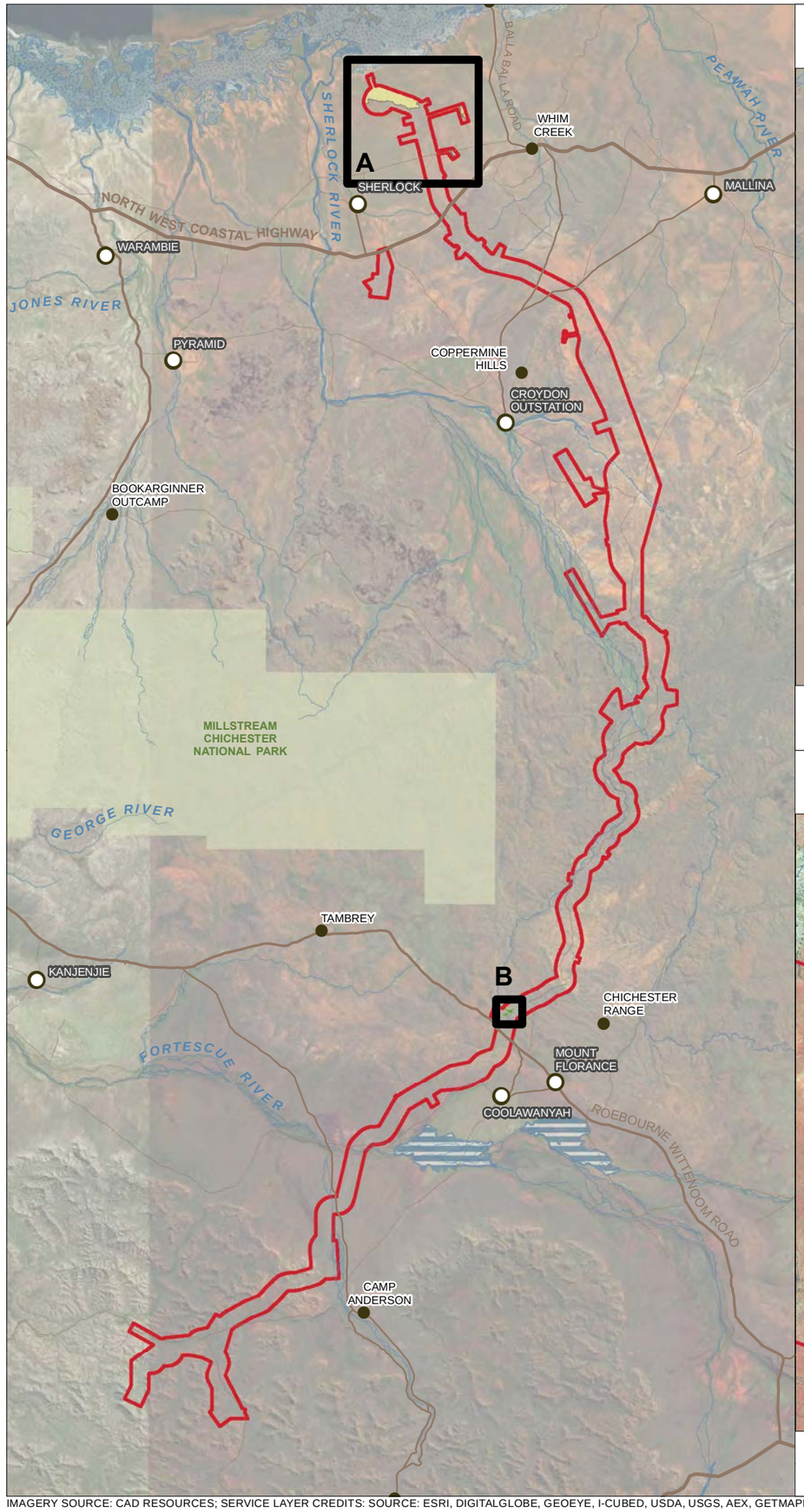
MAP 4 - 9

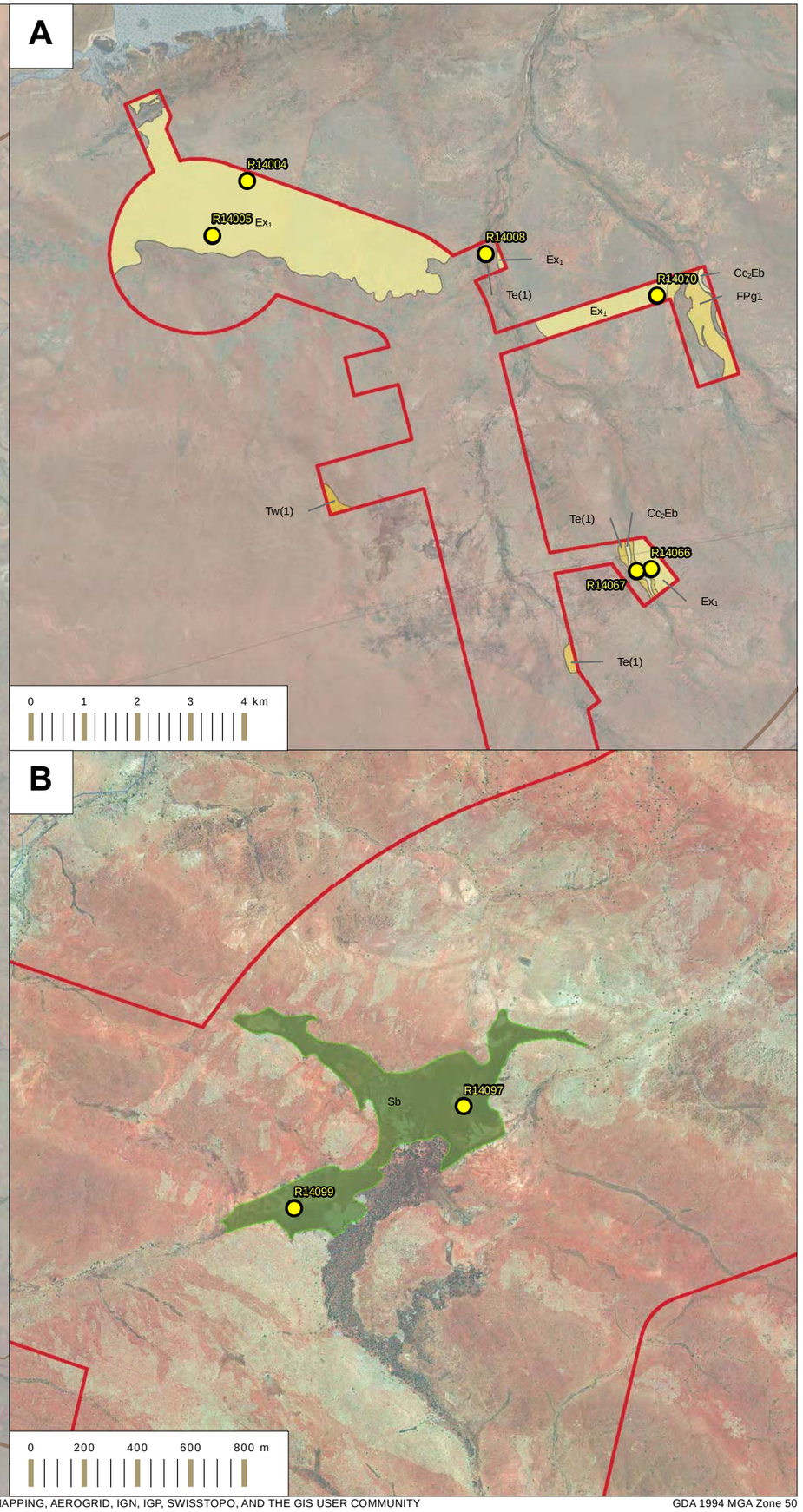
SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50





LEGEND

- Homesteads
- Place Names
- Quadrats/Detailed Releve
- Principal Road
- Secondary Road
- Minor Road
- Drainage Lines
- Rutila Rail Corridor
- Land subject to inundation
- Saline coastal flat
- Watercourse areas
- National Parks

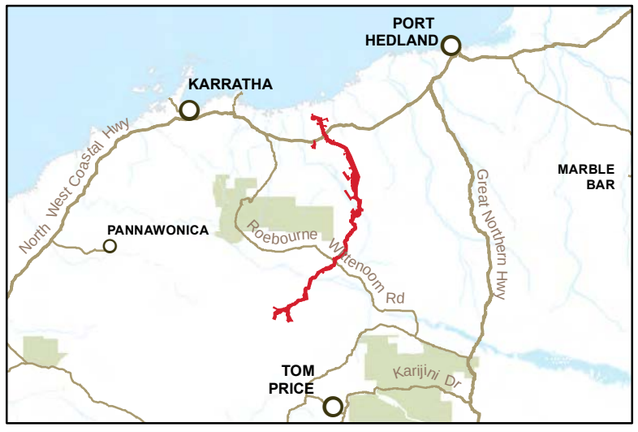
Potential Priority Ecological Communities

'Cracking clays of the Chichester and Mungaroona Range' P1

- Sb

'Horesflat Land System of the Roebourne Plains' P3

- Cc_2Eb
- Ex_1
- FPg1
- Te(1)
- Tw(1)



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

POTENTIAL PEC LOCATIONS

MAP 5

SCALE 1:600,000@ A3

0 10 20 30 km

IMAGERY SOURCE: CAD RESOURCES; SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

GDA 1994 MGA Zone 50

566000 571000 576000 581000 586000

7705000 7700000 7695000 7690000

BALLA BALLA RIVER

BALLA BALLA ROAD

NORTH WEST COASTAL HIGHWAY

SHERLOCK

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

- Homesteads
- Principal Road
- Minor Road
- Track
- Drainage Lines
- Saline coastal flat
- Rutila Rail Corridor

Flora Locations

Priority 1 Flora

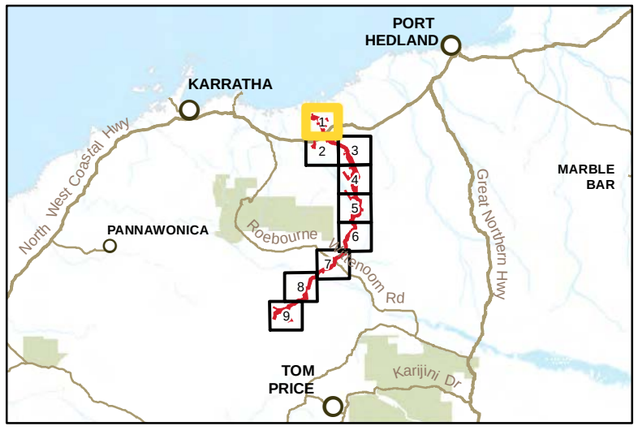
- H2 *Heliotropium muticum*

Priority 4 Flora

- G *Goodenia nuda*

Introduced Flora

- C1 *Cenchrus ciliaris*
- M1 *Malvastrum americanum*
- V *Vachellia farnesiana*



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 1

SCALE 1:75,000 @ A3

0 1 2 3 4 km

566000 571000 576000 581000 586000

7685000 7680000 7675000 7670000

NORTH WEST COASTAL HIGHWAY

SHERLOCK RIVER

CROYDEN MALLINA ROAD

COPPERMINE HILLS

S1 C1 M1 H2 C1 H2 G

LEGEND

- Place Names
- Principal Road
- Minor Road
- Track
- Drainage Lines
- Rutila Rail Corridor

Flora Locations

Priority 1 Flora

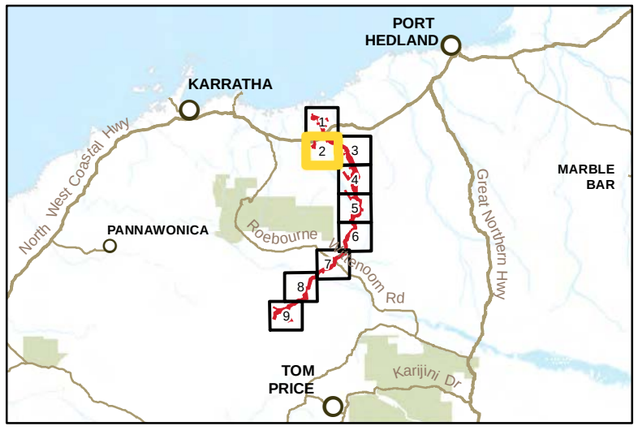
H2 *Heliotropium muticum*

Priority 4 Flora

G *Goodenia nuda*

Introduced Flora

C1 *Cenchrus ciliaris*



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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 2

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

591000 596000 601000 606000

7685000 7680000 7675000 7670000

CROYDEN MALLINA ROAD

THE SISTERS

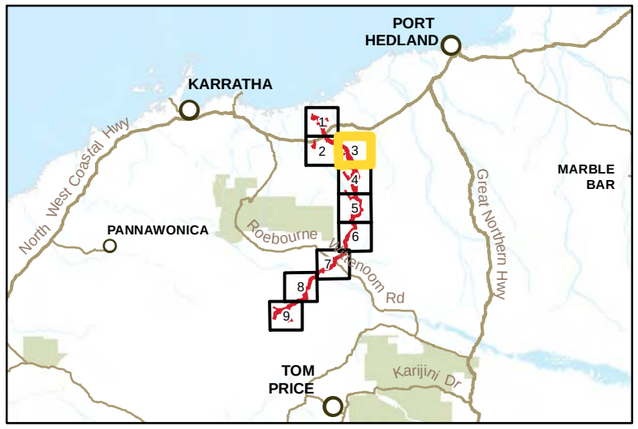
LEGEND

- Place Names
- Minor Road
- Track
- Drainage Lines
- Rutila Rail Corridor

Flora Locations

Priority 1 Flora

H2 *Heliotropium muticum*



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 3

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

591000
596000
601000
606000
7665000
7660000
7655000
7650000
C1
A2
A
C1
C1
A2
C1
SHERLOCK RIVER

LEGEND

Track
Drainage Lines
Rutila Rail Corridor

Flora Locations

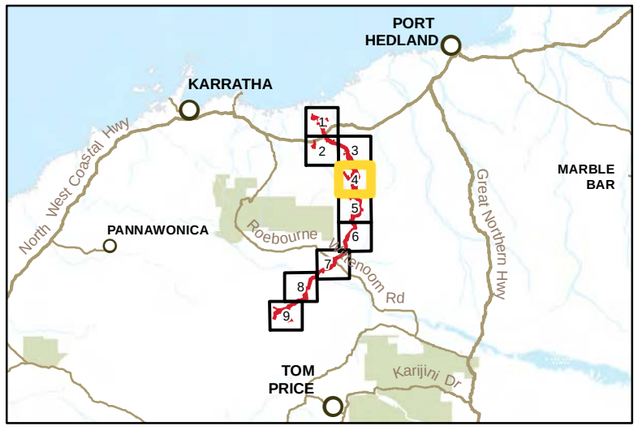
Priority 1 Flora

A *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)

Introduced Flora

A2 *Aerva javanica*

C1 *Cenchrus ciliaris*



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DATE: OCT-14
PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 4

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

591000 596000 601000 606000

7645000 7640000 7635000 7630000 7625000

C1
M2 V
A2 C1
SHERLOCK RIVER
M1
C1
C1
C1
A2 C1
M1
A3 C1
M1 P
C1 V

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

Track

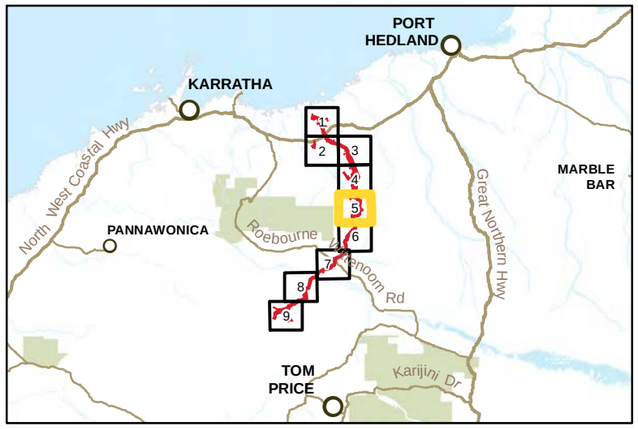
Drainage Lines

Rutila Rail Corridor

Introduced Flora

C1 *Cenchrus ciliaris*

M1 *Malvastrum americanum*



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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 5

SCALE 1:75,000 @ A3

0 1 2 3 4 km

591000 596000 601000 606000

7620000 7615000 7610000 7605000

A2 C1 C2 A3 S1 A2 A2 A2 A2 A2 C1 C4 M1 C1 G

SHERLOCK RIVER

LEGEND

Track
Drainage Lines
Rutila Rail Corridor

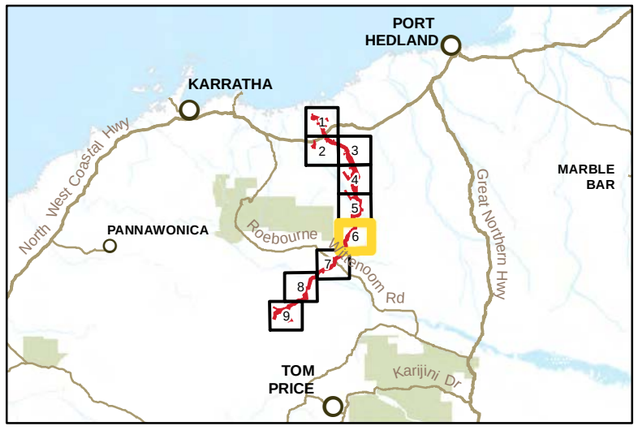
Flora Locations

Priority 4 Flora

G *Goodenia nuda*

Introduced Flora

A2 *Aerva javanica*
A3 *Argemone ochroleuca*
C1 *Cenchrus ciliaris*



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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 6

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

576000
581000
586000
591000
7600000
7595000
7590000
7585000

ROEBOURNE WITTENOOM ROAD
FORTESCUE RIVER
MOUNT FLORANCE
COOLAWANYAH

M1 P M1 V O V M1 V C3 O O V M1 V V M1 C1 M1 S1 V C1 C2 V B M1 S1 V G V B C3 M1

LEGEND

- Homesteads
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Rutila Rail Corridor

Flora Locations

Priority 2 Flora

- P *Pentalepis trichodesmoides* subsp. *hispida*

Priority 3 Flora

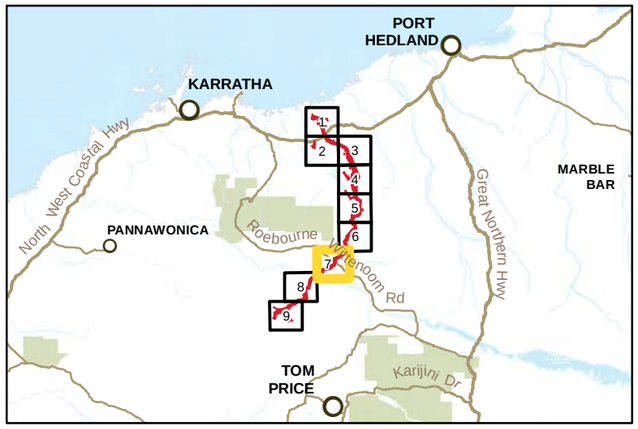
- O *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479)

Priority 4 Flora

- G *Goodenia nuda*

Introduced Flora

- M1 *Malvastrum americanum*
- V *Vachellia farnesiana*



IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

ecoscape

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PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 7

SCALE 1:75,000 @ A3

0 1 2 3 4 km

551000 556000 561000 566000 571000

7585000 7580000 7575000 7570000

FORTESCUE RIVER

TOM PRICE RAILWAY ROAD

H1 V H1 H1 V V

C1 C1 C1 C1 C1 C1

A1

G

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

- Minor Road
- Track
- Drainage Lines
- Land subject to inundation
- Rutila Rail Corridor

Flora Locations

Priority 1 Flora

H1 *Helichrysum oligochaetum*

Priority 4 Flora

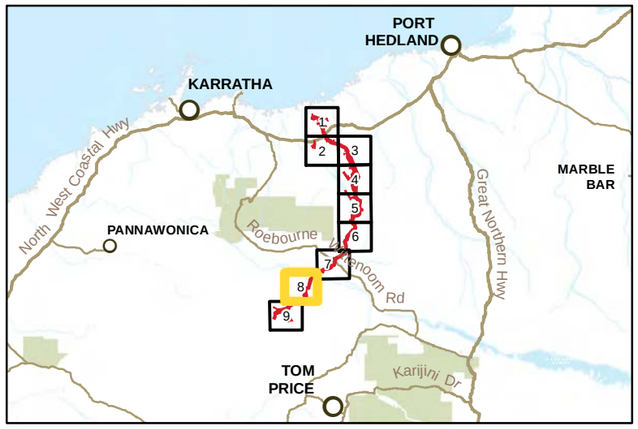
G *Goodenia nuda*

Introduced Flora

A1 *Acetosa vesicaria*

C1 *Cenchrus ciliaris*

V *Vachellia farnesiana*



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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 8

SCALE 1:75,000 @ A3

0 1 2 3 4 km

541000 546000 551000 556000 561000

7565000 7560000 7555000 7550000

LEGEND

Track

Rutila Rail Corridor

Flora Locations

Priority 3 Flora

S — *Sida* sp. Barlee Range (S. van Leeuwen 1642)

I — *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301)

Priority 4 Flora

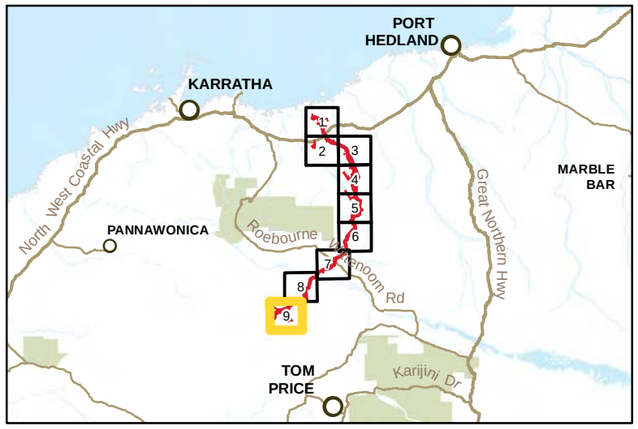
G — *Goodenia nuda*

R — *Rhynchosia bungarensis*

Introduced Flora

C1 — *Cenchrus ciliaris*

S2 — *Sigesbeckia orientalis*



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RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

CONSERVATION SIGNIFICANT AND INTRODUCED FLORA

MAP 6 - 9

SCALE 1:75,000 @ A3

0 1 2 3 4 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

566000 571000 576000 581000 586000 591000

7705000 7700000 7695000 7690000 7685000 7680000

R14003 R14001 R14002 R14004 R14005 R14006 R14008 R14070 R14057 R14009 R14007 R14R1 R14069 R14068 R14010 R14066 R14067 R14012 R14013 R14015 R14014 R14011 R14065 R14016 R14063 R14017 R14018 R14019 R14020 R14060 R14027 R14028

SHERLOCK

WHIM CREEK

SHERLOCK RIVER

BALLA BALLA ROAD

BALLA BALLA RIVER

NORTH WEST COASTAL HIGHWAY

CROYDEN MALINA ROAD

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

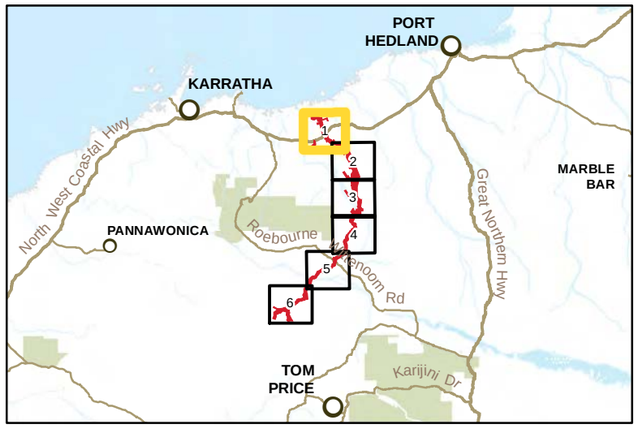
LEGEND

- Homesteads
- Place Names
- Principal Road
- Minor Road
- Track
- Drainage Lines
- Saline coastal flat

Quadrats/Detailed Releve
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded
- Rutila Rail Corridor

Mapping
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other
- Rock
- Burnt



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AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 1

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

586000 591000 596000 601000 606000 611000

7680000 7675000 7670000 7665000 7660000 7655000

R14016 R14063 R14017 R14018 R14019 R14020 R14060 R14021 R14022 R14023 R14024 R14025 R14026 R14029 R14071 R14030 R14031 R14032 R14062 R14033 R14034

CROYDON-MALLINA ROAD

COPPERMINE HILLS

THE SISTERS

CROYDON OUTSTATION

SHERLOCK RIVER

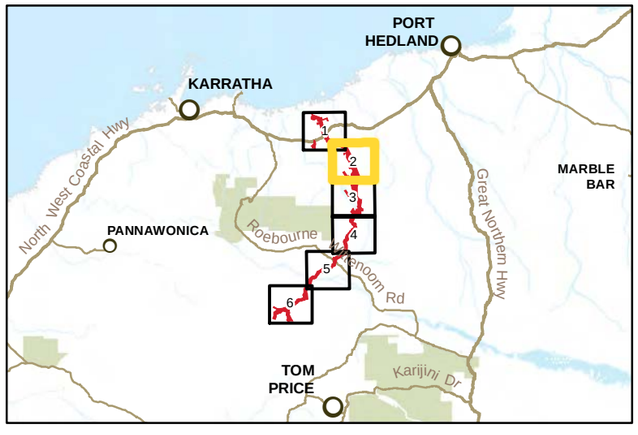
LEGEND

- Homesteads
- Place Names
- Minor Road
- Track
- Drainage Lines

Quadrats/Detailed Releve
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded
- Rutila Rail Corridor

Mapping
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other
- Rock
- Burnt



ecoscape

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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 2

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

586000 591000 596000 601000 606000 611000

7655000 7650000 7645000 7640000 7635000 7630000

R14035 R14036 R14038 R14037 R14040 R14064 R14039 R14046 R14047 R14045 R14041 R14042 R14044 R14043 R14048 R14049 R14050 R14056 R14053 R14055 R14051 R14052 R14054 R14058 R14059

SHERLOCK RIVER

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

Track

Drainage Lines

Quadrats/Detailed Releve

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded
- Rutila Rail Corridor

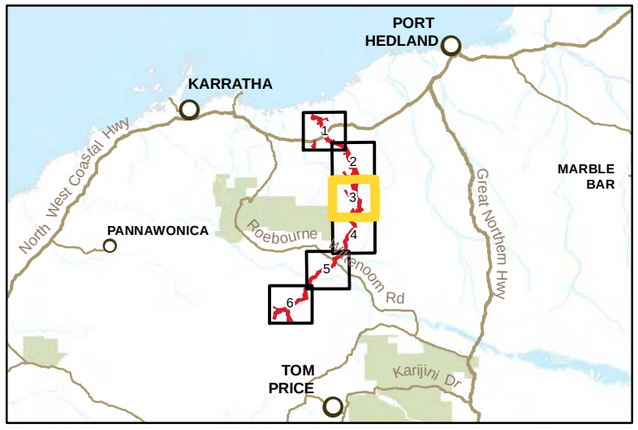
Mapping

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other

- Rock
- Burnt



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DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 3

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

586000 591000 596000 601000 606000 611000

7625000 7620000 7615000 7610000 7605000

R14061 R14072 R14073 R14131 R14074 R14075 R14078 R14077 R14079 R14080 R14082 R14134 R14083 R14084 R14085 R14135 R14087 R14090 R14089 R14091 R14092

SHERLOCK RIVER

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

Track

Drainage Lines

Quadrats/Detailed Releve

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Rutila Rail Corridor

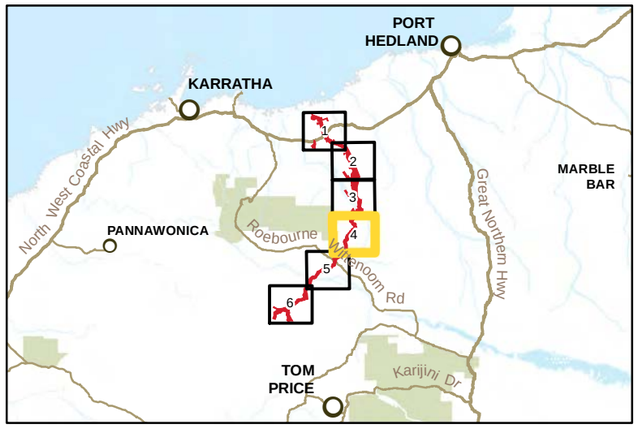
Mapping

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other

- Rock
- Burnt



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AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 4

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

566000 571000 576000 581000 586000 591000

7600000 7595000 7590000 7585000 7580000

R14091 R14092 R14088 R14094 R14095 R14097 R14155 R14099 R14098 R14100 R14096 R14140 R14101 R14103 R14157 R14156 R14102 R14141 R14104 R14132 R14076 R14133 R14105 R14106 R14142 R14108 R14107 R14086 R14109 R14130 R14145

ROEBOURNE WITTENOOM ROAD

MOUNT FLORANCE

COOLAWANYAH

FORTESCUE RIVER

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

- Homesteads
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Land subject to inundation

Quadrats/Detailed Releve

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded
- Rutila Rail Corridor

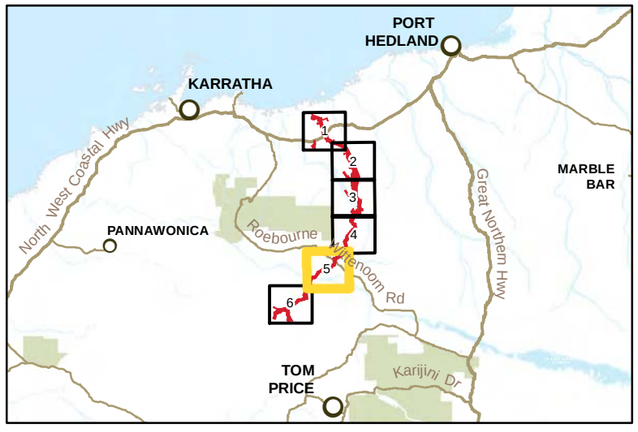
Mapping

Vegetation Condition Rating

- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other

- Rock
- Burnt



ecoscape

AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 5

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

541000 546000 551000 556000 561000 566000

7575000 7570000 7565000 7560000 7555000

R14130 R14145 R14110 R14136 R14112 R14111 R14113 R14114 R14137 R14143 R14129 R14115 R14117 R14148 R14133 R14116 R14118 R14146 R14123 R14121 R14124 R14125 R14144 R14139 R14119 R14122 R14150 R14126 R14120 R14151 R14153 R14128 R14152 R14093 R14127 R14081 R14149

TOM PRICE RAILWAY ROAD

CAMP ANDERSON

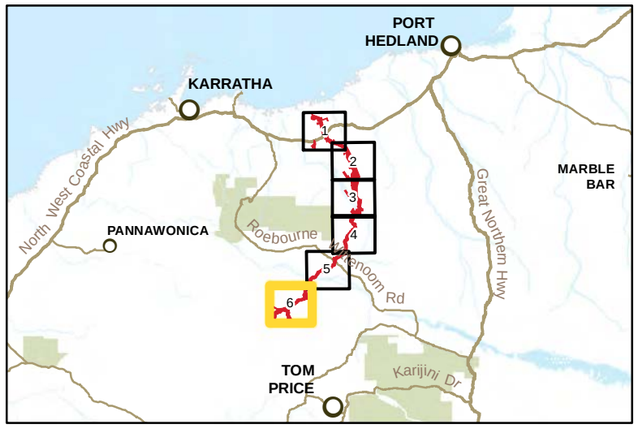
LEGEND

- Place Names
- Minor Road
- Track
- Drainage Lines

Quadrats/Detailed Releve
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded
- Rutila Rail Corridor

Mapping
Vegetation Condition Rating
- Excellent
- Very Good
- Good
- Poor
- Very Poor
- Degraded

Other
- Rock
- Burnt



ecoscape

AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

VEGETATION CONDITION

MAP 7 - 6

SCALE 1:100,000 @ A3

0 1 2 3 4 5 km

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

APPENDIX ONE: DEFINITIONS AND CRITERIA

Table 14: *EPBC Act 1999* categories for flora and fauna (Commonwealth of Australia 1999)

EPBC ACT CATEGORY	DEFINITION
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Table 15: Conservation codes for Western Australia flora and fauna (DPaW 2013)

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA AND FAUNA	
T	**Threatened species** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora). Species* which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Fauna and Flora are further recognised by the Department according to their level of threat using IUCN Red List criteria: **CR:** Critically Endangered – considered to be facing an extremely high risk of extinction in the wild. **EN:** Endangered – considered to be facing a very high risk of extinction in the wild. **VU:** Vulnerable – considered to be facing a high risk of extinction in the wild.
X	**Presumed extinct species** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora). Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	**Migratory birds protected under an international agreement** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice. Birds that are subject to an agreement between governments of Australia and Japan, China and The Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
S	**Other specially protected fauna** – Specially protected under the *Wildlife Conservation Act 1950*, listed under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.
Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation Dependent species are placed in Priority 5.	
P1	**Priority One: Poorly-known species** Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, rail reserves and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two: Poorly-known species** Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes
P3	**Priority Three: Poorly-known species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them
P4	**Priority Four: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five: Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.
*Species includes all taxa (plural of taxon-a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).	

Table 16: EPBC Act 1999 categories for TECs (DSEWPaC 2009)

EPBC Act CATEGORY	DEFINITION
Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	If, at that time, it is not critically endangered, and is facing a very high risk of extinction in the wild in the new future.
Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the medium-term future.

Table 17: DPaW definitions and criteria for TECs and PECs (DEC 2010)

CRITERIA	DEFINITION
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

CRITERIA	DEFINITION
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

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

Table 18: NVIS structural formation (terrestrial vegetation) (NHT 2003)

	COVER CHARACTERISTICS							
	Foliage cover *	70-100	30-70	10-30	<10	» 0 (scattered)	0-5 (clumped)	unknown
	Cover code	d	c	i	r	bi	bc	unknown
Growth Form	**Height Ranges (m)**	**Structural Formation Classes**						
tree, palm	<10,10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	tree, palm
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	tree mallee
shrub, cycad, grass-tree, tree-fern	<1,1-2,>2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrub, cycad, grass-tree, tree-fern
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrub
heath shrub	<1,1-2,>2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrub
chenopod shrub	<1,1-2,>2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrub
samphire shrub	<0.5,>0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrub
hummock grass	<2,>2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grass
tussock grass	<0.5,>0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grass
other grass	<0.5,>0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grass
sedge	<0.5,>0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedge
rush	<0.5,>0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rush
herb	<0.5,>0.5	closed herbland	herbland	open herbland	sparse herbland	isolated herbs	isolated clumps of herbs	herb
fern	<1,1-2,>2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	fern
bryophyte	<0.5	closed bryophyte-land	bryophyte-land	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophyte
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichen
vine	<10,10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vine

Table 19: NVIS height classes (NHT 2003)

HEIGHT		GROWTH FORM				
Height Class	**Height Range (m)**	**tree, vine (M & U), palm (single-stemmed)**	**shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)**	**tree mallee, mallee shrub**	**tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (G)**	**bryophyte, lichen, seagrass, aquatic**
8	>30	tall	NA	NA	NA	NA
7	10-30	mid	NA	tall	NA	NA
6	<10	low	NA	mid	NA	NA
5	<3	NA	NA	low	NA	NA
4	>2	NA	tall	NA	tall	NA
3	1-2	NA	mid	NA	tall	NA
2	0.5-1	NA	low	NA	mid	tall
1	<0.5	NA	low	NA	low	low

Source: (based on Walker & Hopkins 1990)

Table 20: Vegetation Condition Scale for the Eremaean and Northern Botanical Provinces (adapted from Keighery (1994), included in EPA & DEC (2012))

CONDITION RATING	DESCRIPTION
Excellent	Pristine or nearly so; no obvious signs of damage caused by activities of European man.
Very Good	Some relatively slight signs of damage caused by activities of European man. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds such as **Ursinia anthemoides* or **Briza* spp., or occasional vehicle tracks.
Good	More obvious signs of damage caused by activities of European man, including some obvious signs of impact on the vegetation structure such as that caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones such as **Ehrharta* spp.
Poor	Still retains basic vegetation structure or ability to regenerate to it after very obvious activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some aggressive ones such as **Ehrharta* spp.
Very Poor	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species including very aggressive species.
Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; ie areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

APPENDIX TWO: DESKTOP ASSESSMENT RESULTS

Table 21: Geological units in the study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996)

UNIT	DESCRIPTION
AaM	Millindinna Intrusion: undivided mafic and ultramafic rocks as layered sills; metamorphosed
AaO	Opaline Well Intrusion: fine- to coarse-grained, mafic intrusive rock; includes olivine gabbro and minor pyroxenite and dunite; minor extrusive mafic rock; metamorphosed
AaS	Sherlock Intrusion: fine- to coarse-grained mafic intrusive rock; includes gabbro, olivine gabbro, leucogabbro, and granophyric gabbro; metamorphosed
Abk	Komatiitic basalt, pyroxene spinifex textured, and olivine basalt; metamorphosed
ACc	CISTERN FORMATION: metamorphosed clastic and volcaniclastic rocks, fine- to coarse-grained wacke, siltstone, and volcanolithic sandstone; includes polymictic cobble conglomerate
ACf	MONS CUPRI VOLCANICS: metamorphosed felsic volcanic and volcaniclastic rocks; lavas and pyroclastic rock, with feldspar and quartz phenocrysts; dacite to rhyolite composition; locally spherulitic and
ACr	RUSHALL SLATE: metamorphosed well-laminated shale and siltstone; locally graphitic; minor sandstone; may be equivalent to lower part of MALLINA FORMATION
AD(b)	Basalt and high-Mg basalt; local ironstone, shale, and wacke
ADcq	Quartzite; medium- to coarse-grained; minor graded beds
ADcs	Poorly sorted sandstone and shale; minor graded beds
ADcsc	Conglomerate, pebbly sandstone, and coarse-grained lithic sandstone; metamorphosed
ADcsh	Laminated shale; locally includes minor beds of poorly sorted subarkose, siltstone, ferruginous siltstone, shale, and iron formation; metamorphosed
ADcstf	Poorly sorted subarkose; includes wacke; lesser interbeds of shale; rare graded beds; metamorphosed
ADcsw	Wacke; locally subarkosic; fine to coarse grained; well-developed graded units; minor pebble beds and shale; turbiditic; metamorphosed
ADm	MALLINA FORMATION: interbedded shale, siltstone, and medium-to fine-grained wacke; minor layers of chert; metamorphosed
Ae	LOUDEN VOLCANICS: undivided basalt and high-Mg basalt; interbedded clastic units and chert; metamorphosed
Afdp	Porphyritic dacite; metamorphosed
AFh	Sandstone, conglomerate, siltstone, shale, and felsic pyroclastic rocks
AFhst	Medium- to coarse-grained, poorly sorted sandstone and minor well-laminated siltstone
AFhy	Lyre Creek Member: felsic agglomerate and felsic pyroclastic rocks
AFjo	Woodiana Member: quartz-rich sandstone, chert, chert breccia, and mudstone; locally includes lithic volcaniclastic sandstone
AFjsl	Variegated, light-coloured mudstone and siltstone
AFjslg	Carbonaceous mudstone and siltstone, chert, and local dolomite beds
AFk	KYLENA FORMATION: massive or amygdaloidal basalt, basaltic andesite, and dacite; local komatiitic basalt and rhyolite
AFm	MADDINA FORMATION: massive, vesicular, and amygdaloidal basalt and basaltic andesite
AFr	MOUNT ROE BASALT: massive, vesicular, and glomeroporphyritic basalt
AFrs	Laminated shale, siltstone, and poorly sorted tuffaceous sandstone
AFt	TUMBIANA FORMATION: mafic to felsic volcaniclastic sandstone, pyroclastic rocks, and fine- to medium-grained clastic sedimentary rock; minor basalt, chert, dolomite, and limestone
AFtc	Meentheena Member: dark grey stromatolitic dolomite and limestone, carbonate-rich pyroclastic rocks, mudstone, and siltstone

UNIT	DESCRIPTION
Agja	JALLAGNOONINA GRANODIORITE: tonalite and granodiorite; metamorphosed
AGl	CLEAVERVILLE FORMATION: banded iron-formation, jaspilite, chert, siltstone, shale, and minor felsic volcaniclastic rock; metamorphosed
AGlfv	Felsic volcaniclastic rock, lithic volcaniclastic sandstone, and siltstone; metamorphosed
Agpe	PEAWAH GRANODIORITE: hornblende-biotite high-Mg diorite, granodiorite, and tonalite; metamorphosed
AgR	Granitoid gneiss and foliated granitoid rock
AgRg	BOOKINGARRA GRANITE: medium- to coarse-grained monzogranite to syenogranite; locally strongly foliated; metamorphosed
Agsa	SATIRIST GRANITE: metamorphosed biotite(-hornblende) granite
AgYel	ELLAWARRINA MONZOGRANITE: biotite-bearing monzogranite; metamorphosed
AgYfr	FLAT ROCKS TONALITE: biotite-bearing tonalite; strongly foliated; locally interleaved with abundant massive to weakly foliated, K-feldspar porphyritic monzogranite; metamorphosed
AgYmh	Hornblende-bearing monzogranite to granodiorite, undivided; metamorphosed
AHd	WITTENOOM FORAMTION: metamorphosed thin- to medium-bedded dolomite, dolomitic pelite, chert, and volcanic sandstone
AHm	MARRA MAMBA IRON FORMATION: chert, banded iron-formation, mudstone, and siltstone
AHs	MOUNT McRAE SHALE and MOUNT SYLVIA FORMATION: mudstone, siltstone, chert, banded iron-formation, and dolomite
Aog	Metagabbro, medium to coarse grained
Aoge	Melanogabbro; typically low-Ti tholeiitic; metamorphosed
Aombs	Fine- to medium-grained actinolite-chlorite(-serpentine-plagioclase) schist; boninitic composition
Apto	TOWERANNA PORPHYRY: metamorphosed porphyritic granodiorite; possibly equivalent to PEAWAH GRANODIORITE
At	MOUNT NEGRI VOLCANICS: metamorphosed variolitic and vesicular basalt; undivided
Auk	Serpentine-talc-tremolite rock after komatiite; pseudomorphed olivine spinifex textures
Aus	Serpentinized ultramafic rock
Czc	Colluvium - dissected consolidated clay, silt, sand, and gravel deposits; derived from adjacent rock outcrop
Czcb	Colluvium, dissected by present-day drainage, with gilgai surface in areas of expansive clay
Czcf	Ferruginous colluvium, derived from adjacent iron formation; includes hematite-rich conglomerate (canga) that contains iron ore
Czrk	Residual calcrete; massive, nodular, and cavernous limestone; mainly silicified
d	Dolerite dykes; interpreted from aeromagnetic data where dashed
PLHb	BROCKMAN IRON FORMATION: banded iron-formation, chert, and pelite
Qa	Alluvium - unconsolidated silt, sand, and gravel; in drainage channels and adjacent floodplains
Qaa	Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains
Qab	Alluvial sand, silt, and clay in floodplains, with gilgai surface in areas of expansive clay
Qao	Alluvial sand, silt, and clay in floodplains adjacent to main drainage channels
Qc	Colluvium - sand, silt, and gravel in outwash fans; scree and talus; proximal mass-wasting deposits; unconsolidated quartz and rock fragments in soil
Qhms	Coastal sand in beach deposits and dunes; chiefly marine sand reworked by wind, but includes some reworked alluvium near deltas; shelly sand contains Anadara granosa
Qs	Eolian sand - red-yellow, wind-blown sand; local ridges
Qw	Low-gradient sheetwash deposits - silt, sand, and pebbles on distal outwash fans; no defined drainage

UNIT	DESCRIPTION
Qwb	Sand, silt, and clay in distal outwash fans, with gilgai surface in areas of expansive clay
Qwc	Sheetwash sand, silt, and clay in distal outwash fans, with numerous claypans and minor clay-filled drainages
Qwf	Ferruginous sheetwash sand, silt, and clay in outwash fans, with clasts of iron formation
Qws	**Sand in distal outwash fans; no defined drainage**

Table 22: Descriptions of land types and systems within the study area (Van Vreeswyk *et al*. 2004)

UNIT	DESCRIPTION
Land type 1	**Hills and ranges with spinifex grasslands**
Black land system	Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits.
Boolaloo land system	Granite hills, domes, tor fields and sandy plains supporting spinifex grasslands with scattered shrubs.
Capricorn land system	Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs.
Granitic land system	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.
McKay land system	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.
Newman land system	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands
Rocklea land system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands
Ruth land system	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands.
Land type 8	**Stony plains with spinifex grasslands**
Boolgeeda land system	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
Macroy land system	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands.
Satirist land system	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands.
Land type 9	**Stony gilgai plains with tussock grasslands and spinifex grasslands**
Wona land system	Basalt upland gilgai plains supporting Roebourne Plains grass and Mitchell grass tussock grasslands, minor hard spinifex grasslands or annual grasslands/herbfields.
Land type 11	**Sandplains with spinifex grasslands**
Gregory land system	Linear dunes and restricted sandplains supporting shrubby hard spinifex (and occasionally soft spinifex) grasslands.
Uaroo land system	Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs.
Land type 12	**Wash plains on hardpan with groved mulga shrublands (sometimes spinifex understory)**
Jurrawarrina land system	Hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses.
Land type 13	**Alluvial plains with soft spinifex grasslands**
Mallina land system	Sandy surfaced alluvial plains supporting soft spinifex grasslands and minor hard spinifex and tussock grasslands.
Urandy land system	Stony plains, alluvial plains and drainage lines supporting shrubby soft spinifex grasslands.
Land type 14	**Alluvial plains with tussock grasslands or grassy shrublands**
Horseflat land system	Gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands.
Land type 15	**Alluvial plains with snakewood shrublands**

UNIT	DESCRIPTION
Hooley land system	Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands.
Sherlock land system	Stony alluvial plains supporting snakewood shrublands with patchy tussock grasses and spinifex grasslands
Land type 17	**River plains with grassy woodlands and shrublands, and tussock grasslands**
Coolibah land system	Flood plains with weakly gilgaied clay soils supporting coolibah woodlands with tussock grass understorey.
River land system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.
Land type 18	**Calcrete drainage plains with shrublands or spinifex grasslands**
Calcrete land system	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands.

APPENDIX THREE: DATABASE SEARCH RESULTS

Table 23: Combined flora database search results

Database searches: 1 = DPaW, 2 = *NatureMap* (**Figure 7**), 3 = *PMST*, 4 = Ecoscape records

SPECIES	DATABASE	*EPBC ACT* STATUS	DPAW STATUS
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	4	-	P1
Acacia bromilowiana	1	-	P4
Acacia daweana	1,2	-	P3
Acacia leeuweniana	1	-	P1
Acacia subtiliformis	1	-	P3
Adiantum capillus-veneris	1	-	P2
Astrebla lappacea	1,2,4	-	P3
Bothriochloa decipiens var. *cloncurrensis*	1	-	P1
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	1	-	P1
Calotis latiuscula	1	-	P3
Calotis squamigera	1	-	P1
Cladium procerum	1,2	-	P2
Dampiera anonyma	1,2,4	-	P3
Dampiera metallorum	1	-	P3
Eragrostis crateriformis	1	-	P3
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	1	-	P1
Eragrostis surreyana	1	-	P3
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	1	-	P2
Eremophila magnifica subsp. *magnifica*	1,2,4	-	P4
Eremophila magnifica subsp. *velutina*	1,2,4	-	P3
Eremophila sp. Hamersley Range (K. Walker KW 136)	1	-	P1
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	1	-	P1
Eremophila sp. West Angelas (S. van Leeuwen 4068)	1	-	P1
Eremophila spongiocarpa	1	-	P1
Eucalyptus lucens	1	-	P1
Euphorbia australis var. *glabra*	1	-	P2
Euphorbia inappendiculata var. *inappendiculata*	1	-	P2
Euphorbia inappendiculata var. *queenslandica*	1	-	P1
Fimbristylis sieberiana	1	-	P3
Geijera salicifolia	1	-	P3
Glycine falcata	1,4		P3
Goodenia nuda	1,2,4	-	P4
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	1	-	P3
Gymnanthera cunninghamii	1	-	P3

SPECIES	DATABASE	*EPBC ACT* STATUS	DPAW STATUS
Helichrysum oligochaetum	1,2	-	P1
Heliotropium muticum	1,2,4	-	P1
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	1	-	P2
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	1	-	P1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	1,2,4	-	P3
Indigofera sp. Gilesii (M.E. Trudgen 15869)	1	-	P3
Iotasperma sessilifolium	1,2,4	-	P3
Ipomoea racemigera	1	-	P2
Josephinia sp. Marandoo (M.E. Trudgen 1554)	2	-	P1
Lepidium catapycnon	1,3	Vulnerable	T
Livistona alfredii	1	-	P4
Nicotiana heterantha	1,2	-	P1
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	1,2,4	-	P3
Olearia mucronata	1	-	P3
Owenia acidula	1	-	P3
Oxalis sp. Pilbara (M.E. Trudgen 12725)	1	-	P2
Paspalidium retiglume	1,2,4	-	P2
Pentalepis trichodesmoides subsp. *hispida*	1	-	P2
Pilbara trudgenii	1	-	P2
Pleurocarpaea gracilis	1	-	P3
Polymeria distigma	1	-	P3
Ptilotus subspinescens	1	-	P3
Rhagodia sp. Hamersley (M. Trudgen 17794)	1,4	-	P3
Rhynchosia bungarensis	1,2,4	-	P4
Rostellularia adscendens var. *latifolia*	1,2,4	-	P3
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	1	-	P2
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	1	-	P1
Sida sp. Barlee Range (S. van Leeuwen 1642)	1,2,4	-	P3
Sida sp. Hamersley Range (K. Newbey 10692)	1,2,4	-	P1
Solanum albostellatum	1,4	-	P3
Solanum kentrocaule	1	-	P3
Spartothamnella puberula	1	-	P2
Sporobolus pulchellus	1	-	P1
Stackhousia clementii	1	-	P3
Swainsona thompsoniana	1,2	-	P3
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1,2,4	-	P1
Tetratheca fordiana	1	-	P1
Teucrium pilbaranum	1	-	P1
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	1,4	-	P3
Thryptomene wittweri	1	Vulnerable	T

SPECIES	DATABASE	*EPBC ACT* STATUS	DPAW STATUS
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	1	-	P2
Triodia sp. Karijini (S. van Leeuwen 4111)	1	-	P1
Triodia sp. Mt Ella (M.E. Trudgen 12739)	1	-	P3
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	1	-	P3
Vigna sp. central (M.E. Trudgen 1626)	1,2,4	-	P2
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	4	-	P3
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	1	-	P1

Barbula ehrenbergii (P1), identified by the DPaW database search, was removed from the list as it is not a vascular plant and surveys for mosses are not within the scope of the project.

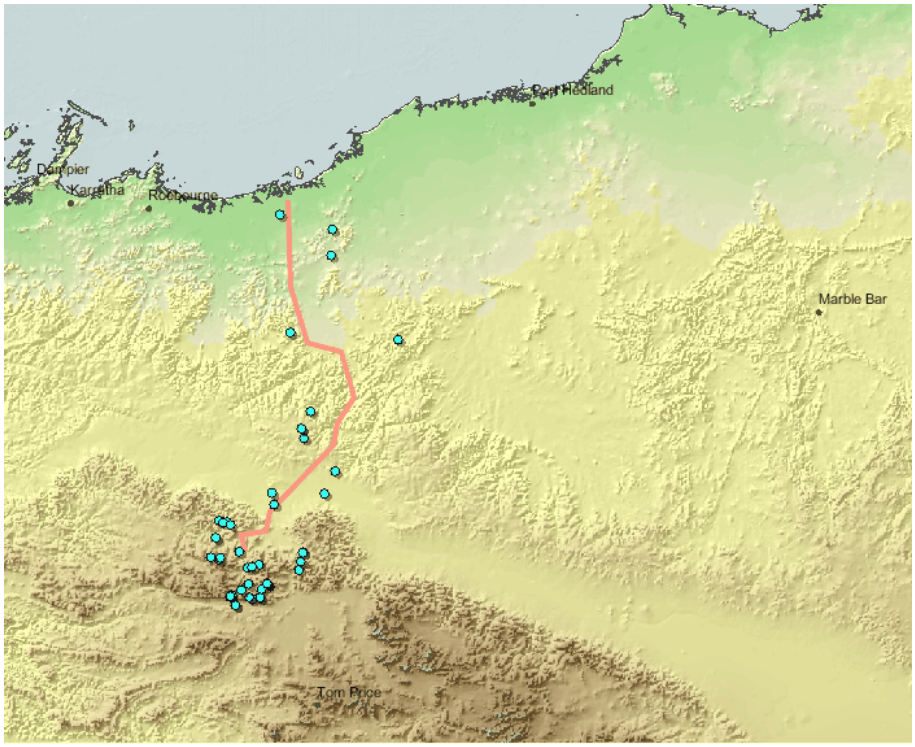


Figure 7: *NatureMap* (DPaW 2007-2014) search area

Table 24: Conservation significant flora details

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
		T			
Lepidium catapycnon	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag, white flowers	Oct	Skeletal	Hillsides	*Triodia wiseana* hummock grassland. With *Acacia bivenosa, A. inaequilatera, A. pruinocarpa, A. pyrifolia, Triodia* sp. Shovelanna Hill
Thryptomene wittweri	Spreading or rounded shrub, 0.5–1.5(–2.1) m high	Apr/Jul/Aug	Skeletal red stony soils	Breakaways, stony creek beds	*Eucalyptus kingsmillii*
		P1			
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Erect shrub to 3 m, yellow or orange flowers	Jun-Nov	Orange brown sandy loam, red sand, clay	Sandplain, dunes, floodplain	Grassland, shrubland, *Acacia* shrubland
Acacia leeuweniana	Narrow, obconic tree, to 14 m high, bark minni ritchi	Apr-May	Granitic sandy loam	Granite outcrop high in landscape	*Acacia retivenea, A. tumida, Terminalia canescens*
Bothriochloa decipiens var. *cloncurrensis*	Perennial grass to 1.4 m high	May	Loam, clay	Damp depression, clay pan	*Eucalyptus camaldulensis*, Mulga
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Annual herb to 40 cm, purple/blue/white/pink flowers	Mar-Sep	Clay	Flats	Mulga, grassland
Calotis squamigera	Procumbent annual, herb, to 0.21 m high	Jul	Pebbly loam	Plain	*Acacia xiphophylla*, Mulga
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Tussock-forming perennial, grass-like or herb, to 0.3 m high	Sep	Red-brown skeletal soils, ironstone	Steep slopes, summits	*Eucalyptus kingsmillii*
Eremophila sp. Hamersley Range (K. Walker KW 136)	Shrub to 2 m tall, rounded crowded canopy, Flowers white-cream-yellow-pink-purple	Aug-Sep	Ironstone	Hill crest, cliff top , gorge top	Mulga
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Shrub to 1 m high, rounded	-	Ironstone	High hill	*Eucalyptus leucophloia, Corymbia hamersleyana*, Mulga
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Spindly shrub to 3 m high	Sep	Banded ironstone	High in landscape, hill summit, scree	*Eucalyptus gamophylla, E. kingsmillii*, Mulga
Eremophila spongiocarpa	Compact, succulent-leaved shrub, to 1 m high	May/Sep	Alluvium	Weakly saline alluvial plain on margins of marsh	*Tecticornia* spp., Mulga, *Frankenia* sp.
Eucalyptus lucens	Mallee, to 4.5 m high, bark smooth, white, sometimes slightly powdery; leaves glossy green	Jan-Apr	Ironstone	Rocky slopes and mountain tops, high in the landscape	*Eucalyptus kingsmillii*
Euphorbia inappendiculata var. *queenslandica*	Herb to 2 cm high	May-Jun	Cracking clay	Clay plain, depression	*Eriachne benthamii, Themeda* sp. Hamersley Station, grassland
Helichrysum oligochaetum	Annual herb to 25 cm, yellow flowers	Aug-Nov	Red clay	Alluvial plains, drainage lines	*Eucalyptus camaldulensis, E. victrix*
Heliotropium muticum	Ascending to spreading perennial herb to 0.3 m, white flowers	May-Nov	Sand, clayey sand, granite	Sandplain, floodplain	*Acacia* shrubland, *Acacia stellaticeps, Triodia*
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Shrub to 2.5 m high, purple flowers	Jul-Sep	Ironstone	Gorges, crevices, gullies	*Corymbia ferriticola*
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Erect shrub or herb, to 30 cm, pink flowers	Aug	Alluvial	Drainage lines, plains	Mulga, *Acacia* spp.

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Nicotiana heterantha	Annual or short-lived perennial herb to 0.5 m. White-cream flowers	Mar-Sep	Black clay, alluvial sand, sandy clay	Seasonally wet flats, floodplain, creeklines	*Tecticornia, Eucalyptus victrix*
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Open shrub to 1.2 m high	Aug	Cracking clay	Creek bed	-
Sida sp. Hamersley Range (K. Newbey 10692)	Open shrub to 2 m, yellow flower. Discolorous leaves with white margins	Apr-Oct	Scree, skeletal soil	Gorge, cliff	*Acacia pruinocarpa, Corymbia ferriticola, Eucalyptus gamophylla, E. leucophloia,*
Sporobolus pulchellus	Ephemeral grass to 0.4 m high	Feb-Nov	Sand, sandstone, sandy ironstone	Rocky hills	-
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Erect or sprawling shrub, maroon-red-purple or pink flowers	Mar-Oct	Sand, sandy loam	Coastal dunes, plains	*Acacia coriacea, Triodia epactia, Spinifex longifolius, Acacia stellaticeps, *Cenchrus ciliaris*
Tetratheca fordiana	Dwarf shrub, 0.3–0.4 m high	Jul	Ironstone	Cliff, crest, ridge	*Eucalyptus kingsmillii, Triodia wiseana*
Teucrium pilbaranum	Rounded shrub, to 0.4 m high, white flowers	May-Sep	Clay, calcrete	Crab hole plain in a river floodplain, margin of calcrete table	*Chrysopogon fallax, Eucalyptus victrix*, *Eriachne benthamii*
Triodia sp. Karijini (S. van Leeuwen 4111)	Hummock grass to 1 m high	May-Sep	Ironstone, banded ironstone	Hilltops, upper slopes, high hills	*Eucalyptus kingsmillii, Eucalyptus leucophloia, Corymbia hamersleyana*
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Tall daisy to 1 m , open canopy, in late flower and dehiscing fruit, cream/white flowers	May/Sep	Clay loam	Plain	*Acacia* thicket over mixed grassland. *Acacia aneura, Eucalyptus ?xerothermica, Themeda ?triandra.*
P2					
Adiantum capillus-veneris	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-	-	Moist, sheltered sites in gorges and on cliff walls	-
Cladium procerum	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov	Alluvium	Perennial pools, coastal swamps, gorges	*Cyperus, Typha*, date palms
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Low shrub 0.5 m tall with red or pinky flowers with long exerted stamens	May-Jul	Stony	Slopes, flats, drainage lines	Mulga, *Corymbia hamersleyana*
Euphorbia australis var. *glabra*	Annual herb	-	Alluvium, cracking clay	Flats, drainage lines	*Eucalyptus victrix*, grassland
Euphorbia inappendiculata var. *inappendiculata*	Prostrate annual herb to 5 cm	May-Aug	Clay, cracking clay	Floodplain, plain, high in landscape	*Aristida* and *Astrebla* grasslands, *Acacia xiphophylla*
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Spindly upright shrub to 3 m tall, purple flower	May-Aug	Stony soil, Brockman Iron Formation	Hill summits, high in landscape	*Eucalyptus kingsmillii, E, leucophloia* & *E. gamophylla* over *Acacia aneura, A. rhodophloia* over *Scaevola acacioides, Eremophila latrobei* over *Triodia wiseana*
Ipomoea racemigera	Creeping annual herb, climber, white flowers	Apr	Basalt, ?alluvium	Valley	Grassland
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Small herb to 10 cm tall. Leaves green above, purple below; yellow flowers	May/Sep	Red-brown pebbly/rocky loam amongst boulders	Drainage lines, gullies	Mulga, *Triodia* grassland, *Eucalyptus leucophloia*

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Paspalidium retiglume	Annual grass to 0.5 m high	Apr-May	Clay, cracking clay	Plain	Grassland, *Neptunia*
Pentalepis trichodesmoides subsp. *hispida*	Spreading shrub to 1.3 m high x 2 m wide, yellow flowers	Apr-Dec	Basalt, loam, stony clay sand, alluvium	Screes, drainage lines, hills	*Triodia*
Pilbara trudgenii	Gnarled, aromatic shrub, to 1 m high	Sep	Ironstone, skeletal soil	Hill summits, steep slopes, screes, cliff faces	*Corymbia ferriticola*, Mulga, *Eucalyptus kingsmillii, Astrotricha hamptonii*
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Shrub, to 1 m high	Jul-Aug.	Skeletal, brown gritty soil over basalt	Summits of hills, steep hills	*Eucalyptus kingsmillii* and *Eucalyptus* aff. *hamersleyana* over *Acacia hamersleyensis* over *Ptilotus rotundifolius* over *Triodia* sp. (SVL 2476).
Spartothamnella puberula	Shrub, 0.35–1.5 m high, blue-white flowers	Sep-Nov	Rocky loam, sandy or skeletal soils, clay	Hills, gorges	*Eucalyptus leucophloia, Corymbia ferriticola*
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Low succulent herb with pink-white flowers	Mar-Jul	Sand, gibber plain	Plain	*Triodia longiceps, T. pungens*
Vigna sp. central (M.E. Trudgen 1626)	Prostrate creeper 50 cm high x 50 cm wide	Jan-Oct	Clay, alluvium	Valleys	*Triodia epactia*, Mulga, *Corymbia hamersleyana*
P3					
Acacia daweana	Spreading shrub, 0.3–1.5(–2) m high	Jul-Sep	Stony red loam, colluvium	Low rocky rises, along drainage lines, scree	*Eucalyptus gamophylla, Corymbia deserticola, C. hamersleyana*
Acacia subtiliformis	Spindly, slender, erect shrub, to 3.5 m high	Jun	Calcrete	On rocky calcrete plateau	*Eucalyptus leucophloia, Triodia wiseana, T. basedowii*
Astrebla lappacea	Tufted perennial, grass, 0.1–0.5 m high	Apr	Clay	Plain	*Acacia xiphophylla*, grassland
Calotis latiuscula	Erect herb, to 0.5 m high	Jun-Oct	Sand, loam, clay, calcrete	Rocky hillsides, floodplains, rocky creeks or river beds	*Themeda triandra*, Mulga
Dampiera anonyma	Multistemmed perennial, herb, to 0.5(-1) m high, purple flowers	Jun-Sep	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite	Hill summits, upper slopes	*Eucalyptus leucophloia, E. kingsmillii, Acacia hamersleyensis*
Dampiera metallorum	Rounded, multistemmed perennial, herb, to 0.5 m high	Apr-Oct	Skeletal red-brown gravely soils over banded ironstone	Steep slopes and summits	*Eucalyptus gamophylla, E. kingsmillii, E. leucophloia*
Eragrostis crateriformis	Annual, grass-like or herb, 0.17–0.42 m high	Jan-Jul	Clayey loam or clay	Creek banks, depressions	Grassland, *Acacia* spp, *Triodia* spp., Buffel grass
Eragrostis surreyana	Tufted annual herb 5-8 (-13) cm high	May-Sep	Red-brown clay	Drainage line	*Eucalyptus victrix, E. camaldulensis, Melaleuca*
Eremophila magnifica subsp. *velutina*	Shrub, 0.5–1.5 m high, purple flowers	Aug-Sep	Skeletal soils over ironstone	Summits, hills, rocky areas on slopes	*Eucalyptus leucophloia*
Fimbristylis sieberiana	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25–0.6 m high	May-Jun	Mud, skeletal soil pockets	Pool edges, sandstone cliffs	*Cyperus, Eleocharis, Cladium*

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Geijera salicifolia	Tree, 1.5–6 m high	Sep	Skeletal soils, stony soils	Massive rock scree, gorges	*Eucalyptus leucophloia, E. xerothermica*
Glycine falcata	Mat-forming perennial, herb, to 0.2 m high. Fl. blue, purple	May-Jul	Black clayey sand	Floodplains. Along drainage depressions in crabhole plains on river	*Eriachne* grassland,
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect annual or biennial, herb, to 0.2 m high, yellow flowers	Feb-Sep	Red-brown clay soil, calcrete	Low undulating plain, swampy plains	*Melaleuca eleuterostachya*, *Acacia bivenosa* over *Triodia wiseana, Triodia angusta*
Gymnanthera cunninghamii	Erect shrub 1-2 m high, cream-yellow-green flowers	Jan-Dec	Sand, clay loam	River bed, floodplain	*Eucalyptus victrix, E. camaldulensis*, near Mangroves
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Erect shrub to 2.3 m high, red-pink flowers	Jul-Oct	Alluvium	Creeks and gorges	*Corymbia hamersleyana, Eucalyptus xerothermica, E. victrix*
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Shrub, to 1.5 m high, dull pink flowers	May/Aug	Pebbly loam amongst boulders & outcrops, Brockman Iron Formation	Hills	*Eucalyptus gamophylla, E. leucophloia, Corymbia ferriticola*
Iotasperma sessilifolium	Erect herb. Fl. pink.	May-Sep	Cracking clay, black loam.	Edges of waterholes, plains, drainage line	Herbland, grassland
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05–0.1 m high	Mar	Cracking clay, basalt	Gently undulating plain with large surface rocks, flat crabholed plain	*Astrebla, Eriachne* and *Themeda* grasslands
Olearia mucronata	Densely branched, unpleasantly aromatic shrub, 0.6–1 m high. Fl. white, yellow	Aug-Jan	Ironstone	Cliffs, hills, upper slopes	*Eucalyptus leucophloia, Astrotricha hamptonii,* Mulga
Owenia acidula	Small tree to 8 m high, pendulous branches	Apr-Sep	-	Creek	-
Pleurocarpaea gracilis	Rounded shrub, to 0.4 m high	Oct	Skeletal, brown gritty soil over ironstone	Hill summit	*Eucalyptus leucophloia* and *E. gamophylla* over *Senna pruinosa, Acacia bivenosa, A. maitlandii* and *A. pyrifolia* over *A. marramamba* over *Triodia* sp.
Polymeria distigma	Prostrate herb, pink flowers	Apr-Jul	Sandy soil, clay	Coastal plain, floodplain	*Astrebla pectinata*
Ptilotus subspinescens	Compact shrub, to 0.8 m high. Fl. pink	Sep–Oct	Ironstone, basalt, quartz	Gentle rocky slopes, screes and the bases of screes	*Triodia angusta, T. longiceps, T. wiseana, Eucalyptus leucophloia*, Mulga
Rhagodia sp. Hamersley (M. Trudgen 17794)	Erect shrub	Apr-Nov	Sandy loam, alluvium	Floodplain / lower slopes	Mulga, *Eucalyptus leucophloia, E. xerothermica*
Rostellularia adscendens var. *latifolia*	Herb or shrub, 0.1–0.3 m high, purple flowers	Apr-May	Ironstone, calcrete	Near creeks, rocky hills	*Eucalyptus victrix, Corymbia ferriticola*, Mulga, *E. xerothermica, E. kingsmillii*
Sida sp. Barlee Range (S. van Leeuwen 1642)	Spreading shrub, to 0.5 m high	Aug	Skeletal red soils pockets	Steep slope, drainage lines, gullies	*Eucalyptus leucophloia, Acacia citrinoviridis, A. pruinocarpa, Corymbia ferriticola*
Solanum albostellatum	Sub-shrub to 40 cm, mauve flowers	Mar-May	Cracking clay	Plain, floodplain	Grassland

SPECIES NAME	DESCRIPTION	FL. PERIOD	SOIL	LANDFORM/HABITAT	ASSOCIATED VEGETATION
Solanum kentrocaule	Shrub to 1.5 m high, extremely prickly. Purple flowers	Jul-Oct	Ironstone, basalt	Hills, occasionally creeks	*Eucalyptus leucophloia, E. kingsmillii*
Stackhousia clementii	Herb or shrub to 45 cm high, yellow-brown flowers	Apr-Oct	Clay	Floodplain	Grassland (*Themeda* sp. Hamersley Station), *Eucalyptus victrix*
Swainsona thompsoniana	Prostrate annual, herb, to 0.1 m high	Mar	Clay	Flat crabholed plain	Open *Eremophila maculata* shrubland over moderately dense herbs, tussock grassland of *Astrebla pectinata*
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	Aug	Red clay	Clay pan, grass plain	*Polymeria* sp. Hamersley (M.E. Trudgen 11353) herbland with *Chrysopogon fallax, Astrebla pectinata, Aristida latifolia* very open tussock grassland
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Perennial, grass-like or herb, 0.4 m high	May-Aug	Light orange-brown, pebbly loam	Amongst rocks & outcrops, gully slopes, scree	*Eucalyptus leucophloia*, Mulga
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Perennial hummock grass to 0.6 m high	Feb-Oct	Ironstone, pisolite (Robe land system)	Rocky hills and mesas	*Eucalyptus leucophloia, Triodia wiseana*
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Annual climbing herb, yellow flowers	Mar-Jun	Skeletal	Rock piles, scree	*Triodia epactia, T. angusta, Terminalia supranitifolia, Brachychiton acuminatus, Acacia inaequifolia*
P4					
Acacia bromilowiana	Tree or shrub, to 12 m high	Jul-Aug	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt	Rocky hills, breakaways, scree slopes, gorges, creek beds	*Eucalyptus leucophloia, Corymbia hamersleyana*
Eremophila magnifica subsp. *magnifica*	Shrub, 0.5-1.5 m high	Aug-Nov	Skeletal soils over ironstone.	Rocky screes	*Eucalyptus leucophloia, Corymbia hamersleyana*
Goodenia nuda	Erect to ascending herb, to 0.5 m high Fl. yellow	Apr-Aug	Red--brown clay loam, ironstone	Mostly low lying areas (floodplains, outwash areas), occasionally hills	*Acacia tumida* tall shrubland with mixed grass understorey including *Triodia epactia*
Livistona alfredii	Palm to 10 m high	Jun-Sep	-	Edges of permanent pools, with flowing water	*Eucalyptus camaldulensis*
Rhynchosia bungarensis	Compact, prostrate shrub, to 0.5 m high	Mar-Nov	Pebbly, coarse sand	Banks of flow line	*Corymbia hamersleyana, Eucalyptus camaldulensis, Triodia wiseana, E. victrix*
Significant According to *Guidance Statement No. 51*					
Unnamed *Josephinia* sp.	Annual? low rounded hairy shrub 40-50 cm high, pink flowers	May	Rocky outcrops	Hills, gorges	*Acacia monticola, Triodia wiseana, Corymbia hamersleyana, Eucalyptus leucophloia*

Table 25: Conservation significant flora flowering times

Boxed cells indicate the months the field surveys were conducted during.

SPECIES NAME	Description	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
TF														
Lepidium catapycnon	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag, white flowers	Oct												
Thryptomene wittweri	Spreading or rounded shrub, 0.5–1.5(–2.1) m high	Apr/Jul/Aug												
P1														
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Erect shrub to 3 m, yellow or orange flowers	Jun-Nov												
Acacia leeuweniana	Narrow, obconic tree, to 14 m high, bark minni ritchi	Apr-May												
Bothriochloa decipiens var. *cloncurrensis*	Perennial grass to 1.4 m high	May												
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Annual herb to 40 cm, purple/blue/white/pink flowers	Mar-Sep												
Calotis squamigera	Procumbent annual, herb, to 0.21 m high	Jul												
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Tussock-forming perennial, grass-like or herb, to 0.3 m high	Sep												
Eremophila sp. Hamersley Range (K. Walker KW 136)	Shrub to 2 m tall, rounded crowded canopy, Flowers white-cream-yellow-pink-purple	Aug-Sep												
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Shrub to 1 m high, rounded	-												
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Spindly shrub to 3 m high	Sep												
Eremophila spongiocarpa	Compact, succulent-leaved shrub, to 1 m high	May/Sep												
Eucalyptus lucens	Mallee, to 4.5 m high, bark smooth, white, sometimes slightly powdery; leaves glossy green	Jan-Apr												
Euphorbia inappendiculata var. *queenslandica*	Prostrate annual herb to 5 cm	May-Aug												
Helichrysum oligochaetum	Annual herb to 25 cm, yellow flowers	Aug-Nov												
Heliotropium muticum	Ascending to spreading perennial herb to 0.3 m, white flowers	May-Nov												
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Shrub to 2.5 m high, purple flowers	Jul-Sep												
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Erect shrub or herb, to 30 cm, pink flowers	Aug												
Nicotiana heterantha	Annual or short-lived perennial herb to 0.5 m. White-cream flowers	Mar-Sep												

SPECIES NAME	Description	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Open shrub to 1.2 m high	Aug								■				
Sida sp. Hamersley Range (K. Newbey 10692)	Open shrub to 2 m, yellow flower. Discolorous leaves with white margins	Apr-Oct				■	■	■	■	■	■	■		
Sporobolus pulchellus	Ephemeral grass to 0.4 m high	Feb-Nov		■	■	■	■	■	■	■	■	■	■	
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Erect or sprawling shrub, maroon-red-purple or pink flowers	Mar-Oct			■	■	■	■	■	■	■	■		
Tetratheca fordiana	Dwarf shrub, 0.3–0.4 m high	Jul							■					
Teucrium pilbaranum	Rounded shrub, to 0.4 m high, white flowers	May-Sep					■	■	■	■	■			
Triodia sp. Karijini (S. van Leeuwen 4111)	Hummock grass to 1 m high	May-Sep					■	■	■	■	■			
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Tall daisy to 1 m , open canopy, in late flower and dehiscing fruit, cream/white flowers	May/Sep					■	■	■	■	■			
P2														
Adiantum capillus-veneris	Rhizomatous, perennial, herb (fern), 0.1-0.2 m high	-												
Cladium procerum	Densely tufted perennial, grass-like or herb (sedge), 2 m high	Nov											■	
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Low shrub 0.5 m tall with red or pinky flowers with long exerted stamens	May-Jul					■	■	■					
Euphorbia australis var. *glabra*	Annual herb	-												
Euphorbia inappendiculata var. *inappendiculata*	Herb to 2 cm high	May-Jun					■	■						
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Spindly upright shrub to 3 m tall	May-Aug					■	■	■	■				
Ipomoea racemigera	Creeping annual herb, climber, white flowers	Apr				■								
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Small herb to 10 cm tall. Leaves green above, purple below; yellow flowers	May/Sep					■				■			
Paspalidium retiglume	Annual grass to 0.5 m high	Apr-May				■	■							
Pentalepis trichodesmoides subsp. *hispida*	Spreading shrub to 1.3 m high x 2 m wide, yellow flowers	Apr-Dec				■	■	■	■	■	■	■	■	■
Pilbara trudgenii	Gnarled, aromatic shrub, to 1 m high	Sep									■			
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Shrub, to 1 m high	Jul-Aug.							■	■				
Spartothamnella puberula	Shrub, 0.35–1.5 m high, blue-white flowers	Sep-Nov									■	■	■	
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Low succulent herb with pink-white flowers	Mar-Jul			■	■	■	■	■					
Vigna sp. central (M.E. Trudgen 1626)	Prostrate creeper 50 cm high x 50 cm wide	Jan-Oct	■	■	■	■	■	■	■	■	■	■		
P3														

SPECIES NAME	Description	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Acacia daweana	Spreading shrub, 0.3–1.5(–2) m high	Jul-Sep												
Acacia subtiliformis	Spindly, slender, erect shrub, to 3.5 m high	Jun												
Astrebla lappacea	Tufted perennial, grass, 0.1–0.5 m high	Apr												
Calotis latiuscula	Erect herb, to 0.5 m high	Jun-Oct												
Dampiera anonyma	Multistemmed perennial, herb, to 0.5(-1) m high, purple flowers	Jun-Sep												
Dampiera metallorum	Rounded, multistemmed perennial, herb, to 0.5 m high	Apr-Oct												
Eragrostis crateriformis	Annual, grass-like or herb, 0.17–0.42 m high	Jan-Jul												
Eragrostis surreyana	Tufted annual herb 5-8 (-13) cm high	May-Sep												
Eremophila magnifica subsp. *velutina*	Shrub, 0.5–1.5 m high, purple flowers	Aug-Sep												
Fimbristylis sieberiana	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), 0.25–0.6 m high	May-Jun												
Geijera salicifolia	Tree, 1.5–6 m high	Sep												
Glycine falcata	Mat-forming perennial, herb, to 0.2 m high. Fl. blue, purple	May-Jul												
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect annual or biennial, herb, to 0.2 m high, yellow flowers	Feb-Sep												
Gymnanthera cunninghamii	Erect shrub 1-2 m high, cream-yellow-green flowers	Jan-Dec												
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Erect shrub to 2.3 m high, red-pink flowers	Jul-Oct												
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Shrub, to 1.5 m high, dull pink flowers	May/Aug												
Iotasperma sessilifolium	Erect herb. Fl. pink.	May-Sep												
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05–0.1 m high	Mar												
Olearia mucronata	Densely branched, unpleasantly aromatic shrub, 0.6–1 m high. Fl. white, yellow	Aug-Jan												
Owenia acidula	Small tree to 8 m high, pendulous branches	Apr-Sep												
Pleurocarpaea gracilis	Rounded shrub, to 0.4 m high	Oct												
Polymeria distigma	Prostrate herb, pink flowers	Apr-Jul												
Ptilotus subspinescens	Compact shrub, to 0.8 m high. Fl. pink	Sep–Oct												
Rhagodia sp. Hamersley (M. Trudgen 17794)	Erect shrub	Apr-Nov												
Rostellularia adscendens var. *latifolia*	Herb or shrub, 0.1–0.3 m high, purple flowers	Apr-May												
Sida sp. Barlee Range (S. van Leeuwen 1642)	Spreading shrub, to 0.5 m high	Aug												
Solanum albostellatum	Sub-shrub to 40 cm, mauve flowers	Mar-May												

SPECIES NAME	Description	FL. PERIOD	J	F	M	A	M	J	J	A	S	O	N	D
Solanum kentrocaule	Shrub to 1.5 m high, extremely prickly. Purple flowers	Jul-Oct												
Stackhousia clementii	Herb or shrub to 45 cm high, yellow-brown flowers	Apr-Oct												
Swainsona thompsoniana	Prostrate annual, herb, to 0.1 m high	Mar												
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high	Aug												
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Perennial, grass-like or herb, 0.4 m high	May-Aug												
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Perennial hummock grass to 0.6 m high	Feb-Oct												
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Annual climbing herb, yellow flowers	Mar-Jun												
P4														
Acacia bromilowiana	Tree or shrub, to 12 m high	Jul-Aug												
Eremophila magnifica subsp. *magnifica*	Shrub, 0.5-1.5 m high	Aug-Nov												
Goodenia nuda	Erect to ascending herb, to 0.5 m high Fl. yellow	Apr-Aug												
Livistona alfredii	Palm to 10 m high	Jun-Sep												
Rhynchosia bungarensis	Compact, prostrate shrub, to 0.5 m high	Mar-Nov												
Significant according to *Guidance Statement No. 51*														
Unnamed *Josephinia* sp.	Annual? low rounded hairy shrub 40-50 cm high, pink flowers	May												

APPENDIX FOUR: FLORISTIC QUADRAT DATA

R14001

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 568592 **mE** 7703639 **mN** **Lat.** -20.7657 **Long.** 117.6590

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 10 % cover ; 2 cm in depth

Bare ground 20 % cover **Weeds** <2 % cover

Vegetation M+ ^*Acacia sclerosperma* subsp. *sclerosperma*,*Carissa lanceolata*\^shrub\4\c;G ^*Chrysopogon fallax*,^*Eragrostis xerophila*\^tussock grass\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age <5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia sclerosperma subsp. *sclerosperma*		2	40
Carissa lanceolata		1.3	5
Chrysopogon fallax		1	40
Eragrostis xerophila		0.2	10
Streptoglossa bubakii		0.3	1
Gomphrena affinis subsp. *pilbarensis*		0.2	<1
Rhynchosia minima		Creeper	<1
Eremophila longifolia		1	<1

Rutila

Dichanthium sericeum subsp. *humilius*	0.3	<1
Acacia pyrifolia var. *pyrifolia*	0.7	<1
Goodenia forrestii	0.4	<1
Solanum lasiophyllum	0.4	<1
Senna artemisioides subsp. *oligophylla*	0.8	<1
Ptilotus obovatus	0.8	<1
Phyllanthus maderaspatensis	0.05	<1
* *Malvastrum americanum*	0.2	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	Prostrate	<1
Sporobolus australasicus	0.1	<1
Sida fibulifera	0.15	<1
Tephrosia virens	0.25	<1
Portulaca oleracea	0.05	<1
* *Vachellia farnesiana*	0.3	<1
Crotalaria medicaginea var. *neglecta*	0.25	<1
Corchorus walcottii	0.3	<1
Aristida contorta	0.2	<1
Triumfetta clementii	0.3	<1
Evolvulus alsinoides var. *decumbens*	0.1	<1
Cucumis maderaspatanus	Climber	<1
Eriachne benthamii	0.4	1
Pterocaulon sphacelatum	0.3	<1
Cleome viscosa	0.2	<1
* *Cenchrus ciliaris*	0.2	<1

R14002

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 568270 **mE** 7703482 **mN** **Lat.** -20.7672 **Long.** 117.6559

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 10 % cover ; 2 cm in depth

Bare ground 10 % cover **Weeds** <2 % cover

Vegetation M+ ^*Acacia sclerosperma* subsp. *sclerosperma*,^*Carissa lanceolata*\^shrub\4\c;G ^*Chrysopogon fallax*,^*Eragrostis xerophila*\^tussock grass\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age <5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia sclerosperma subsp. *sclerosperma*		1.9	40
Chrysopogon fallax		0.6	35
Eragrostis xerophila		0.2	2
Polymeria ambigua		0.1	<1
Chrysocephalum gilesii		0.15	<1
Sporobolus australasicus		0.1	<1
Dichanthium sericeum subsp. *humilius*		0.1	<1
Euphorbia australis var. *subtomentosa*		Prostrate	<1

Rutila

Rhynchosia minima	Creeper	<1
Aristida contorta	0.2	<1
Goodenia forrestii	0.15	<1
Sida fibulifera	0.2	<1
Senna artemisioides subsp. *oligophylla*	1	<1
Tephrosia virens	0.25	<1
Pterocaulon sphacelatum	0.3	<1
Corchorus walcottii	0.25	<1
Ptilotus obovatus	0.5	<1
Carissa lanceolata	2	5
* *Malvastrum americanum*	0.4	<1
Abutilon lepidum	0.4	<1
Enchylaena tomentosa var. *tomentosa*	1.5	<1
Evolvulus alsinoides var. *decumbens*	0.1	<1
Tephrosia supina	0.3	<1
Ptilotus macrocephalus	0.35	<1
Polymeria ambigua	0.2	<1
Carissa lanceolata	0.7	5
Acacia pyrifolia var. *pyrifolia*	0.9	
Cleome viscosa	0.25	<1
Abutilon lepidum	0.8	<1
Solanum lasiophyllum	0.45	<1
Euphorbia coghlanii	0.15	<1
Crotalaria medicaginea var. *neglecta*	0.15	<1
Portulaca oleracea	0.1	<1
Eremophila longifolia	0.8	<1
Hakea chordophylla	1	<1
Scaevola spinescens	0.6	<1

R14003

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 568109 **mE** 7703561 **mN** **Lat.** -20.7665 **Long.** 117.6543

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 10 % cover ; 2 cm in depth

Bare ground 20 % cover **Weeds** <2 % cover

Vegetation M+ ^*Acacia sclerosperma* subsp. *sclerosperma*,^*Carissa lanceolata*\^shrub\4\c;G ^*Chrysopogon fallax*,^*Eragrostis xerophila*,*Cenchrus ciliaris*\^tussock grass\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age <5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia sclerosperma subsp. *sclerosperma*		2	40
Carissa lanceolata		2.1	10
Chrysopogon fallax		0.6	40
Eragrostis xerophila		0.2	10
* *Cenchrus ciliaris*		0.3	5
Rhynchosia minima		Creeper	<1
Scaevola spinescens		1.2	<1
Corchorus walcottii		0.2	<1

		Rutila
* *Malvastrum americanum*	0.2	<1
Solanum lasiophyllum	0.2	<1
Evolvulus alsinoides var. *decumbens*	0.15	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.2	<1
Eremophila longifolia	0.4	<1
Dichanthium sericeum subsp. *humilius*	0.3	<1
Sida fibulifera	0.2	<1
Senna artemisioides subsp. *oligophylla*	0.7	<1
Euphorbia tannensis subsp. *eremophila*	0.15	<1

R14004

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 570279 **mE** 7702233 **mN** **Lat.** -20.7784 **Long.** 117.6752

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 30 % cover **Weeds** <1 % cover

Vegetation G+ ^*Eragrostis xerophila*,^*Dichanthium sericeum* subsp. *humilius*\^tussock grass\1\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age <5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eragrostis xerophila		0.3	70
Dichanthium sericeum subsp. *humilius*		0.2	<2
Sida fibulifera		0.2	<1
Corchorus tridens		0.1	<1
Rhynchosia minima		Creeper	<1
Phyllanthus maderaspatensis		0.1	<1
Euphorbia coghlanii		0.1	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.15	<1
Desmodium campylocaulon		0.15	<1

Rutila

	Goodenia pascua	0.2	<1
	Aristida contorta	0.15	<1
*	*Cenchrus ciliaris*	0.15	<1
	Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	Creeper	<1

R14005

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 569625 **mE** 7701209 **mN** **Lat.** -20.7876 **Long.** 117.6690

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 30 % cover **Weeds** 0 % cover

Vegetation G+ ^*Eragrostis xerophila*,^*Dichanthium sericeum* subsp. *humilius*\^tussock grass\1\c

Veg. Condition Very Good

Disturbance Grazing, trampling

Fire Age <5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eragrostis xerophila		0.2	70
Dichanthium sericeum subsp. *humilius*		0.1	<2
Euphorbia coghlanii		0.1	<1
Fimbristylis sp.		0.15	<1
Rhynchosia minima		Creeper	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.15	<1
Desmodium muelleri		0.15	<1
Sida fibulifera		0.15	<1
Phyllanthus maderaspatensis		0.15	<1

Rutila

Goodenia pascua	Semi Prostrate	<1

R14006

Staff RD **Date** 15/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 569561 **mE** 7700764 **mN** **Lat.** -20.7917 **Long.** 117.6684

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 25 % cover **Weeds** <1 % cover

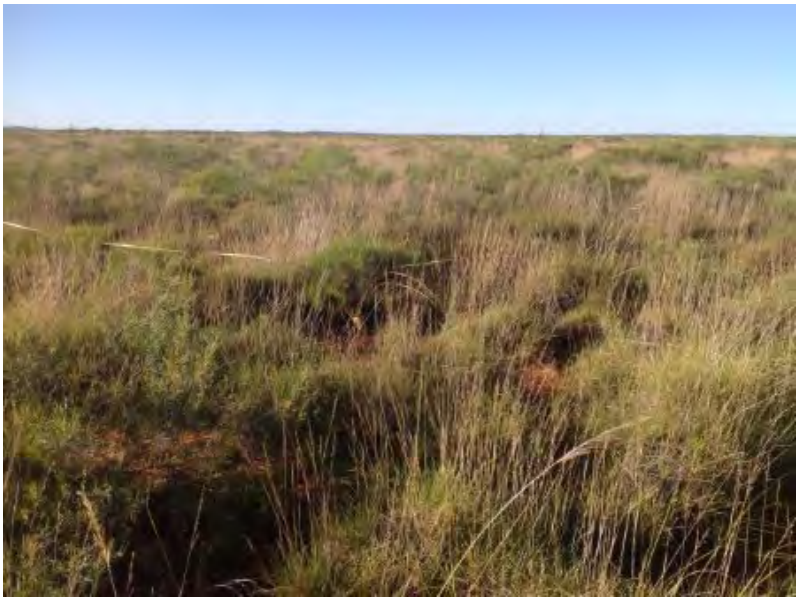
Vegetation M ^*Acacia arida*\^shrub\3\i;G+ ^*Triodia epactia*,^*Chrysopogon fallax*\^hummock grass,tussock grass\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age <5

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia arida		1	20
Triodia epactia		1	60
Chrysopogon fallax		1	5
Cyperaceae sp.		0.1	<1
Indigofera monophylla		0.2	<1
Goodenia muelleriana		0.15	<1
Goodenia forrestii		0.1	<1
Rhynchosia minima		Creeper	<1

		Rutila
Polymeria ambigua	0.2	<1
Eragrostis xerophila	0.15	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	Prostrate	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	<1
Sida clementii	0.8	<1
Evolvulus alsinoides var. *villosicalyx*	0.05	<1
Acacia pyrifolia var. *pyrifolia*	0.8	<1
Triumfetta clementii	0.4	<1
Hybanthus aurantiacus	0.2	<1
Goodenia microptera	0.1	<1
Ptilotus helipteroides	0.2	<1
Sida arsiniata	0.8	<1
* *Vachellia farnesiana*	0.3	<1

R14007

Staff LA/AF **Date** 7/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 575331 **mE** 7699462 **mN** **Lat.** -20.8032 **Long.** 117.7239

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Sandy brown loam

Rock Type Mixed alluvial

Loose Rock 0 % cover ; 2-6 mm in size **Litter** 5 % cover ; 1 cm in depth

Bare ground 40 % cover **Weeds** <1 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia arida*\^shrub\3\r;G+ ^^*Acacia stellaticeps*,*Triodia epactia*,*Bonamia erecta*\^shrub,hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	1
Acacia arida		1.5	7
Acacia stellaticeps		.6	30
Triodia epactia		.5	30
Bonamia erecta		.3	5
Polymeria ambigua		.2	<1
Acacia inaequilatera		1.3	<1
Indigofera monophylla		1.1	<1

Rutila

Ptilotus astrolasius		.5	<1
Cassytha capillaris		Climber	<1
Corchorus tectus		.5	<1
* *Cenchrus ciliaris*		.5	<1
Hybanthus aurantiacus		.4	<1
Paraneurachne muelleri		.3	<1
Evolvulus alsinoides var. *villosicalyx*		.2	<1
Sporobolus actinocladus		.3	<1
Hakea lorea subsp. *lorea*		1.7	<1
Mollugo molluginea		.2	<1
Scaevola spinescens		.5	<1
Goodenia forrestii		.4	<1
Euphorbia australis var. *subtomentosa*		.1	<1
Aristida holathera var. *holathera*		.2	<1
Chrysopogon fallax		.4	<1
Rhynchosia minima		Climber	<1
Scaevola amblyanthera var. *centralis*		.3	<1
Swainsona formosa		.2	<1
Boerhavia coccinea		Prostrate	<1
Paraneurachne muelleri		.3	<1
Acacia trachycarpa		1.6	<1
Goodenia nuda	P 4	.2	<1
Waltheria indica		.1	<1
Euphorbia tannensis subsp. *eremophila*		.3	<1
Eriachne obtusa		.3	<1
Acacia colei var. *colei*		1.9	<1
Sida clementii		1	<1
Solanum lasiophyllum		.3	<1
Goodenia microptera		.2	<1
Eragrostis ?eriopoda		.4	<1

R14008

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 574765 **mE** 7700864 **mN** **Lat.** -20.7906 **Long.** 117.7184

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Mixed alluvial

Loose Rock 0 % cover ; 200 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 65 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia epactia*,^*Triodia secunda*\^hummock grass\1\c

Veg. Condition Very Good

Disturbance Cattle grazing

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		.5	35
Sclerolaena hostilis		.4	<1
Acacia stellaticeps		.6	<1
Fimbristylis microcarya		.4	<1
Sclerolaena hostilis		.3	<1
Threlkeldia diffusa		.3	<1
Trianthema triquetra		Prostrate	<1
Neptunia dimorphantha		.2	<1
Bonamia erecta		.3	<1

Rutila

Heliotropium muticum	P 1	.2	<1
Indigofera linifolia		.2	<1
Triodia secunda		.3	2
Ipomoea coptica		.1	<1
Ptilotus murrayi		Prostrate	<1
Portulaca oleracea		.1	<1
Cassytha capillaris		Climber	<1

R14009

Staff RD **Date** 14/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 573204 **mE** 7699451 **mN** **Lat.** -20.8034 **Long.** 117.7034

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown sandy clay? loam

Rock Type ? & quartz

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

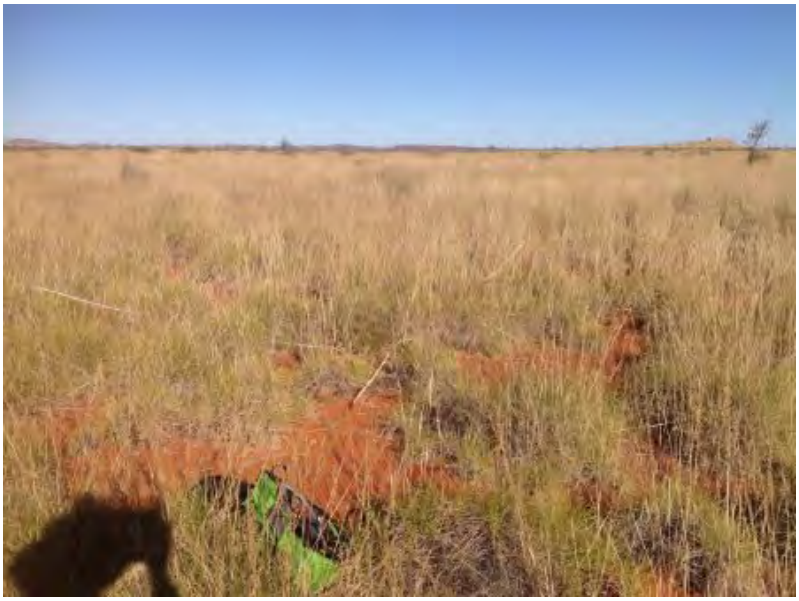
Vegetation M ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*\^shrub\3\r;G+ ^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age <5

Notes



Species	WA Cons.	Height (m)	Cover (%)
Cyperaceae sp.		0.05	<1
Corchorus walcottii		0.3	<1
Hybanthus aurantiacus		0.2	<1
Evolvulus alsinoides var. *villosicalyx*		0.15	<1
Ptilotus astrolasius		0.3	<1
Goodenia microptera		0.3	<1
Senna glutinosa subsp. *glutinosa*		1.4	<1
Acacia bivenosa		0.5	<1

		Rutila
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.15	<1
Hakea chordophylla	1.2	<1
Indigofera monophylla	0.4	<1
Bonamia erecta	0.2	<1
Mollugo molluginea	0.1	<1
Sida arsiniata	0.2	<1
Ptilotus helipteroides	0.15	<1
Eriachne pulchella subsp. *dominii*	0.05	<1
Acacia inaequilatera	2	2
Acacia ancistrocarpa	1	<2
Triodia wiseana	0.7	55
Cleome uncifera subsp. *uncifera*	0.3	<1

R14010

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 575151 **mE** 7696287 **mN** **Lat.** -20.8319 **Long.** 117.7223

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Quartz and calcrete

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia synchronicia*,^*Acacia bivenosa*\^shrub\3\bi;G+ ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eriachne benthamii		.3	<1
Eragrostis xerophila		.3	<1
Acacia synchronicia		1.4	1
Acacia bivenosa		1.3	1
Triodia epactia		.5	20
Triodia wiseana		.5	3
Ptilotus murrayi		.1	<1
Trianthema triquetra		.1	<1

		Rutila
Sporobolus australasicus	.2	<1
Indigofera linifolia	.1	<1
Portulaca oleracea	.1	<1
Brachyachne convergens	.1	<1
Sida fibulifera	.2	<1
Fimbristylis microcarya	.3	<1
Corchorus tectus		<1
Euphorbia sp.	.5	<1
Acacia pyrifolia var. *pyrifolia*	1.1	<1
Ptilotus astrolasius	.6	<1
Solanum lasiophyllum	.3	<1
Triodia epactia	.5	20

R14011

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 578739 **mE** 7684869 **mN** **Lat.** -20.9349 **Long.** 117.7573

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Calcrete

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Grevillea pyramidalis* subsp. *leucadendron*\^tree\6\r;G ^*Triodia angusta*,^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia angusta		.5	15
Triodia wiseana		.4	5
Corymbia hamersleyana		6	2
Grevillea pyramidalis subsp. *leucadendron*		5	1
Acacia bivenosa		.3	<1
Pluchea ferdinandi-muelleri		.4	<1
Corchorus tectus		.6	<1
Cassytha capillaris		Climber	<1

Rutila

Ptilotus calostachyus		.4	<1
Hybanthus aurantiacus		.3	<1
Acacia ampliceps		.5	<1
Ptilotus astrolasius		.3	<1
Acacia stellaticeps		1.3	<1
Mollugo molluginea		.2	<1
Senna notabilis		.2	<1
Tephrosia clementii		.1	<1
Euphorbia australis var. *subtomentosa*		.1	<1
Euphorbia coghlanii		.3	<1
Bonamia erecta		.4	<1
Cucumis maderaspatanus		Climber	<1
Acacia pyrifolia var. *pyrifolia*		.3	<1
Chrysopogon fallax		.3	<1
Ptilotus axillaris		Prostrate	<1
Eriachne mucronata			<1
Scaevola amblyanthera var. *centralis*		.4	<1
Heliotropium muticum	P 1	.3	<1
Boerhavia coccinea		.3	<1
Carissa lanceolata		.2	<1

R14012

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 576418 **mE** 7691344 **mN** **Lat.** -20.8765 **Long.** 117.7347

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown clayey loam

Rock Type mixed

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation M ^*Grevillea pyramidalis* subsp. *leucadendron*\^shrub\4\bi;G+ ^*Triodia epactia*,^*Bonamia erecta*\^hummock grass\1\i

Veg. Condition Very Good

Disturbance Grazing by cattle

Fire Age 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		.4	<1
Triodia epactia		.5	20
Grevillea pyramidalis subsp. *leucadendron*		3	1
Bonamia erecta		.3	2
Corchorus tectus		.7	<1
Ptilotus astrolasius		.7	<1
Mollugo molluginea		.2	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		.5	<1

Rutila

Hybanthus aurantiacus		.2	<1
Acacia pyrifolia var. *pyrifolia*		1.2	<1
Goodenia microptera		.2	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.2	<1
Heliotropium muticum	P 1	.2	<1
Aristida contorta		.2	<1
Hakea chordophylla		.5	<1
Euphorbia australis var. *subtomentosa*		.1	<1
Acacia ancistrocarpa		1.2	<1

R14013

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 577684 **mE** 7688183 **mN** **Lat.** -20.9050 **Long.** 117.7470

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

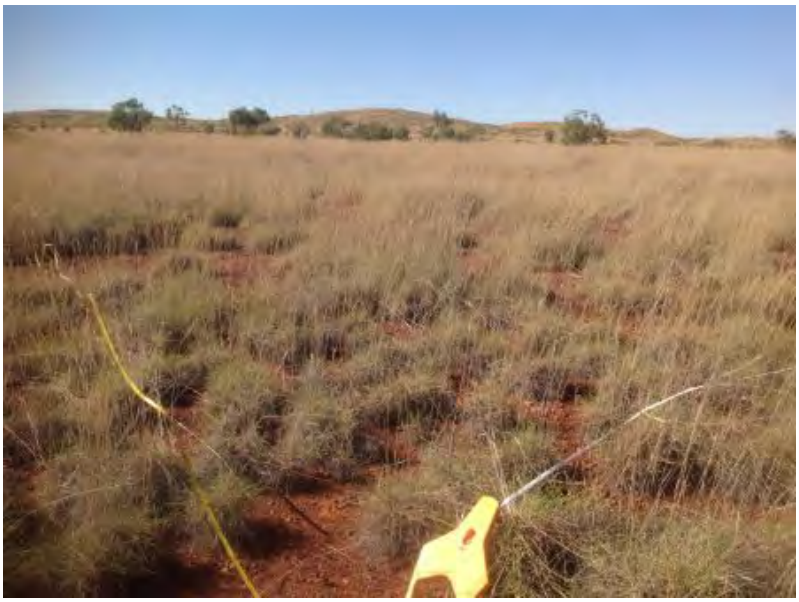
Vegetation G+ ^*Triodia angusta*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >10

Notes



Species	WA Cons.	Height (m)	Cover (%)
Triodia angusta		.6	25
Triodia epactia		.5	10
Acacia bivenosa		1.5	<1
Sida clementii		1.3	<1
Acacia pyrifolia var. *pyrifolia*		1	<1
Sporobolus australasicus		.2	<1
Trianthema triquetra		.1	<1
Corchorus tectus		.5	<1
Triodia wiseana		.3	<1

Rutila

Euphorbia coghlanii	.3	<1
Triodia wiseana	0.5	<1

R14014

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 578678 **mE** 7685993 **mN** **Lat.** -20.9248 **Long.** 117.7566

Habitat Upper-Slope

Aspect NW **Slope** Gentle

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		.6	25
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		.1	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.1	<1
Boerhavia coccinea		.3	<1
Bulbostylis barbata		.1	<1
Corchorus laniflorus		.3	<1
Acacia pyrifolia var. *pyrifolia*		.6	<1
Corchorus tectus		.5	<1
Senna notabilis		.4	<1

Rutila

Indigofera monophylla	.4	<1
Acacia inaequilatera	1.4	<1
Mollugo molluginea	.2	<1
Pterocaulon sphacelatum	.2	<1

R14015

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila Rail

MGA Zone 50 577860 **mE** 7687440 **mN** **Lat.** -20.9117 **Long.** 117.7487

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Mixed river sand and red brown loam

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 5 % cover

Vegetation U+ ^*Eucalyptus victrix*\^tree\7\i;M ^*Acacia ampliceps*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^^*Triodia epactia*,*Triodia angusta*,*Cenchrus ciliaris*\^hummock grass,tussock grass\2\i

Veg. Condition Good

Disturbance Heavy grazing by cattle, invasion by weeds

Fire Age >10

Notes Quadrat follows line of drainage

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		.5	5
Triodia angusta		.5	2
Eucalyptus victrix		12	20
Acacia ampliceps		3	2
Acacia pyrifolia var. *pyrifolia*		2	2
* *Cenchrus ciliaris*		.3	2
Cyperus vaginatus		.7	<1
Corchorus tectus		.3	<1

Rutila

Tephrosia clementii	.3	<1
Rhynchosia minima	Climber	<1
Stemodia grossa	.3	<1
Crotalaria cunninghamii	1.3	<1
Euphorbia sp.		<1
Indigofera trita	.2	<1
Sesbania cannabina	.3	<1
Sporobolus australasicus	.1	<1
* *Setaria verticillata*	.2	<1
Acacia trachycarpa	1.4	<1
Bonamia erecta	.2	<1
Hybanthus aurantiacus	.3	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.4	<1
Pimelea ammocharis	.4	<1
Streptoglossa sp.	.2	<1
Cassytha capillaris	Climber	<1
Bothriochloa ewartiana	.6	<1
Eragrostis cumingii	.1	<1
Crotalaria medicaginea var. *neglecta*	.2	<1
Themeda triandra	.7	<1
Pterocaulon sphacelatum	.2	<1
Pluchea rubelliflora	Prostrate	<1
Acacia acradenia	1.4	<1
Jasminum didymum subsp. *lineare*	Climber	<1
Melaleuca linophylla	2	<1
Hybanthus aurantiacus	.3	<1
* *Malvastrum americanum*	.4	<1
Corchorus incanus subsp. *incanus*	.3	<1
Triumfetta clementii	.1	<1
Cucumis maderaspatanus	Climber	<1
Senna notabilis	.1	<1
Senna notabilis	.1	<1
Stemodia grossa	.3	<1
Indigofera linifolia	.2	<1
Scaevola amblyanthera var. *centralis*	.5	<1
Carissa lanceolata	1.5	<1
Polymeria ambigua	Prostrate	<1
Evolvulus alsinoides var. *villosicalyx*	.2	<1
Corymbia hamersleyana	1.2	<1
Acacia bivenosa	1.2	<1
Acacia ancistrocarpa	1.4	<1
Phyllanthus maderaspatensis	.2	<1
Bonamia linearis	Climber	<1
Sida clementii	.2	<1
Crotalaria cunninghamii		<1
Chrysopogon fallax	.5	<1
Cynanchum floribundum	Climber	<1
Triumfetta ramosa	.4	<1

Rutila

Aristida holathera var. *holathera*	.2	<1
Triumfetta appendiculata	.6	<1
Sida rohlenae subsp. *rohlenae*	.8	<1

R14016

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 582133 **mE** 7682372 **mN** **Lat.** -20.9573 **Long.** 117.7900

Habitat Lower-Slope

Aspect N **Slope** Very Gentle

Soil Type Brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia arida*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^^*Triodia epactia*,*Triodia wiseana*, *Boerhavia gardneri*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance None

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		0.5	25
Triodia wiseana		.4	5
Acacia arida		2	2
Acacia pyrifolia var. *pyrifolia*		2	1
Boerhavia gardneri		.3	2
Indigofera monophylla		.3	<1
Grevillea pyramidalis subsp. *leucadendron*		1.3	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		.1	<1

Rutila

Corchorus tectus	.4	<1
Mollugo molluginea	.2	<1
Hybanthus aurantiacus	.3	<1
Cassytha capillaris	Climber	<1
Ptilotus calostachyus	.5	<1
Euphorbia schultzii	.3	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.1	<1
Ptilotus astrolasius	.5	<1

R14017

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 582841 **mE** 7681565 **mN** **Lat.** -20.9646 **Long.** 117.7969

Habitat Lower-Slope

Aspect SE **Slope** Very Gentle

Soil Type Red brown sand

Rock Type Granite

Loose Rock 0 % cover ; 2-6 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia inaequilatera*\^shrub\4\r;G ^^*Triodia lanigera*,*Triodia epactia*,*Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601)\^hummock grass,shrub\1\i

Veg. Condition Excellent

Disturbance Recent fire, grazing and cattle tracks

Fire Age 2-3

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia lanigera		.3	15
Triodia epactia		.3	2
Acacia inaequilatera		2.3	3
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		.2	2
Mollugo molluginea		.2	<1
Cleome uncifera subsp. *uncifera*		.2	<1
Bonamia erecta		.3	1
Indigofera monophylla		.4	<1

Rutila

Goodenia microptera		.3	<1
Corchorus tectus		.4	<1
Heliotropium muticum	P 1	.2	<1
Eriachne aristidea		.1	<1
Senna notabilis		.1	<1
Aristida holathera var. *holathera*		.3	<1
Acacia stellaticeps		.2	<1
Hibiscus leptocladus		.2	<1
Bonamia linearis		.1	<1
Ptilotus astrolasius		.3	<1
Senna artemisioides subsp. *oligophylla*		.7	<1
Acacia arida		.2	<1
Euphorbia australis var. *subtomentosa*		.1	<1
Hakea chordophylla		.7	<1
Acacia ancistrocarpa		.3	<1
Grevillea pyramidalis subsp. *leucadendron*		.4	<1
Isotropis atropurpurea		.3	<1

R14018

Staff RD **Date** 14/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 586585 **mE** 7681043 **mN** **Lat.** -20.9691 **Long.** 117.8329

Habitat Lower-Slope

Aspect N **Slope** Gentle

Soil Type Red brown sandy loam

Rock Type ? & quartz

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*\^shrub\4\bi;G+ ^*Triodia epactia*,^*Triodia lanigera*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age <2

Notes

Species	WA Cons.	Height (m)	Cover (%)
Ptilotus calostachyus		1.2	<1
Indigofera monophylla		0.3	<1
Cyperaceae sp.		0.05	<1
Polymeria ambigua		Prostrate	<1
Cassytha capillaris		Creeper	<1
Acacia inaequilatera		2.7	2
Acacia ancistrocarpa		1.5	2
Triodia epactia		0.5	40

Rutila

Triodia lanigera	0.6	10

R14019

Staff RD **Date** 13/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 587700 **mE** 7681016 **mN** **Lat.** -20.9693 **Long.** 117.8437

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown sandy loam

Rock Type ? & quartz

Loose Rock 10-20 % cover ; 20-60 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation M ^^*Acacia ancistrocarpa*,*Acacia bivenosa*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\\;G ^*Triodia epactia*\^hummock grass\\

Veg. Condition Excellent

Disturbance Minimal

Fire Age >2

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia ancistrocarpa		3	10
Acacia bivenosa		1.8	10
Acacia pyrifolia var. *pyrifolia*		1.5	2
Triodia epactia		0.6	45
Grevillea wickhamii subsp. *hispidula*		1.8	<1
Hakea chordophylla		1.8	<1
Acacia stellaticeps		1.4	<1
Indigofera monophylla		0.3	<1

R14020

Staff RD **Date** 13/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 589242 **mE** 7679879 **mN** **Lat.** -20.9795 **Long.** 117.8585

Habitat Flat

Aspect S **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

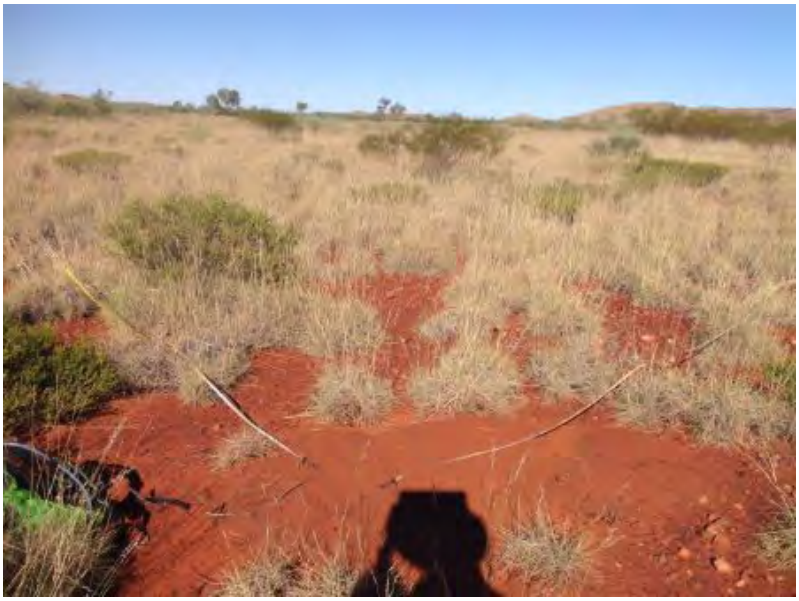
Vegetation M ^*Acacia ancistrocarpa*,^*Acacia acradenia*\^shrub\4\r;G+ ^*Triodia lanigera*,^*Acacia stellaticeps*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age >2

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia ancistrocarpa		2.5	10
Acacia acradenia		2.5	2
Triodia lanigera		0.7	40
Acacia stellaticeps		0.3	10
Ptilotus calostachyus		0.7	<1
Acacia bivenosa		1.7	<1
Trianthema glossostigmum		0.05	<1
Goodenia stobbsiana		0.2	<1

		Rutila
Hakea chordophylla	1.3	<1
Senna glutinosa subsp. *pruinosa*	1	<1
Grevillea wickhamii subsp. *hispidula*	0.8	<1

R14021

Staff RD **Date** 13/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 592708 **mE** 7678077 **mN** **Lat.** -20.9956 **Long.** 117.8920

Habitat Flat

Aspect SE **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?

Loose Rock <2 % cover ; 2-6 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia ancistrocarpa*\^shrub\3\r;G+ ^*Triodia lanigera*,*Polymeria ambigua*,*Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601)\^hummock grass,shrub\1\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age <2

Notes Heard RBEs in creekline

Species	WA Cons.	Height (m)	Cover (%)
Acacia ancistrocarpa		0.6	10
Triodia lanigera		0.4	15
Polymeria ambigua		0.3	5
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		0.3	2
Triodia epactia		0.6	<1
Eragrostis eriopoda		0.4	<1
Aristida holathera var. *holathera*		0.3	<1
Mollugo molluginea		0.1	<1

			Rutila
Corchorus laniflorus		0.15	<1
Bonamia erecta		0.4	<1
Solanum diversiflorum		0.3	<1
Heliotropium muticum	P 1	0.2	<1
Acacia stellaticeps		0.3	<1
Acacia inaequilatera		2	<1
Goodenia microptera		0.2	<1
Goodenia stobbsiana		0.2	<1
Cullen martinii		1.2	<1
Cleome uncifera subsp. *uncifera*		0.3	<1
Grevillea wickhamii subsp. *hispidula*		1	<1
Ptilotus astrolasius		0.3	<1

R14022

Staff RD **Date** 13/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 591700 **mE** 7676848 **mN** **Lat.** -21.0068 **Long.** 117.8824

Habitat Lower-Slope

Aspect S **Slope** Gentle

Soil Type Red brown sandy loam

Rock Type ?

Loose Rock <2 % cover ; **Litter** 2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

Vegetation G+ ^*Acacia stellaticeps*,^*Triodia schinzii*\^shrub,hummock grass\2\d

Veg. Condition Excellent

Disturbance Grazing

Fire Age <2

Notes RBEs in creekline

Species	WA Cons.	Height (m)	Cover (%)
Acacia stellaticeps		0.6	30
Triodia schinzii		1.5	25
Dampiera candicans		0.7	<1
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)		0.2	<1
Senna notabilis		0.1	<1
Eragrostis eriopoda		0.2	<1
Aristida holathera var. *holathera*		0.25	<1
Acacia melleodora		1.4	<1
Dodonaea coriacea		1.2	<1

		Rutila
Keraudrenia velutina subsp. *elliptica*	0.3	<1
Indigofera monophylla	0.3	<1
Triumfetta sp.	0.4	1
Bonamia linearis	Prostrate	<1
Sida arenicola	1	<1
Ptilotus arthrolasius	0.2	<1
Goodenia armitiana	0.25	<1
Paraneurachne muelleri	0.2	<1
Gyrostemon tepperi	1	<1
Acacia tumida var. *pilbarensis*	0.8	<1
Ptilotus polystachyus	0.2	<1
Acacia ancistrocarpa	0.5	<1
Hakea chordophylla	1.4	<1

R14023

Staff RD **Date** 11/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 594086 **mE** 7674238 **mN** **Lat.** -21.0302 **Long.** 117.9054

Habitat Flat

Aspect NW **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ?Ironstone & quartz

Loose Rock 50-90 % cover ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*,*Acacia acradenia*\^shrub\4\i;G+ ^*Triodia wiseana*, *Triodia lanigera*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age 1-5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	2
Acacia ancistrocarpa		2	8
Acacia acradenia		2	2
Triodia wiseana		1.2	40
Cassytha capillaris		Creeper	<1
Acacia bivenosa		1.3	<1
Acacia pyrifolia var. *pyrifolia*		1.3	<1
Corchorus tectus		1.3	<1

Rutila

Acacia melleodora	2	<1
Eriachne pulchella subsp. *dominii*	0.05	<1
Acacia tumida var. *pilbarensis*	2.5	<1
Mollugo molluginea	0.15	<1
Triodia lanigera	1	5
Senna artemisioides subsp. *oligophylla*	1.2	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	0.3	<1
Ptilotus astrolasius	0.3	<1
Euphorbia sp.	0.2	<1
Ptilotus calostachyus	0.4	<1
Triodia lanigera	1.2	5
Swainsona formosa	0.1	<1

R14024

Staff RD **Date** 11/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 594402 **mE** 7670353 **mN** **Lat.** -21.0653 **Long.** 117.9087

Habitat Flat

Aspect S **Slope** Very Gentle

Soil Type Red brown loamy sand

Rock Type ?Ironstone & quartz

Loose Rock 2-10 % cover ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 75 % cover **Weeds** 0 % cover

Vegetation U ^*Acacia inaequilatera*\^tree\5\bi;M ^*Acacia pyrifolia* var. *pyrifolia*,^*Acacia ancistrocarpa*\^shrub\3\;G+ ^*Triodia lanigera*,^*Triodia epactia*,*Corchorus tectus*\^hummock grass, shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age 1-5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		2	<2
Acacia pyrifolia var. *pyrifolia*		0.5	2
Acacia ancistrocarpa		0.4	2
Triodia lanigera		0.5	15
Triodia epactia		0.5	10
Corchorus tectus		0.5	<2
Heliotropium muticum	P 1	0.1	<1

Rutila

Polymeria ambigua	Creeper	<1
Goodenia microptera	0.2	<1
Eragrostis ?eriopoda	0.3	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.2	<1
Mollugo molluginea	0.15	<1
Ptilotus calostachyus	0.4	<1
Senna notabilis	0.1	<1
Ptilotus astrolasius	0.3	<1
Indigofera monophylla	0.4	<1
Solanum diversiflorum	0.3	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1
Aristida contorta	0.2	<1
Ptilotus axillaris	Prostrate	<1
Aristida holathera var. *holathera*	0.3	<1
Grevillea pyramidalis subsp. *leucadendron*	2.5	<1
Senna artemisioides subsp. *oligophylla*	1	<1

R14025

Staff RD **Date** 11/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 594811 **mE** 7668272 **mN** **Lat.** -21.0841 **Long.** 117.9128

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loamy sand

Rock Type ?Ironstone & quartz

Loose Rock 10-20 % cover ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*\^shrub\4\r;G+ ^*Triodia epactia*,^*Corchorus tectus*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	<2
Acacia ancistrocarpa		3	<2
Triodia epactia		1	25
Corchorus tectus		0.8	<2
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.1	<1
Indigofera colutea		0.15	<1
Aristida contorta		0.2	<1
Aristida holathera var. *holathera*		0.3	<1

		Rutila
Duperreya commixta	0.1	<1
Grevillea pyramidalis subsp. *leucadendron*	1.5	<1
Eragrostis ?*eriopoda*	0.4	<1
Poaceae sp.	0.7	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.05	<1

R14026

Staff RD **Date** 11/07/2014 **Season** P

Revisit

Type Q 12.5 m x 200 m

Location Rutila Rail

MGA Zone 50 594270 **mE** 7664170 **mN** **Lat.** -21.1212 **Long.** 117.9078

Habitat River

Aspect W **Slope** Moderate

Soil Type Red brown sand

Rock Type ?Ironstone /river stone

Loose Rock <2 % cover ; 2-6 mm in size **Litter** 15 % cover ; 5 cm in depth

Bare ground 55 % cover **Weeds** 25 % cover

Vegetation U ^*Eucalyptus victrix*\^tree\7\r;M ^*Acacia trachycarpa*,^*Acacia ampliceps*\^shrub\4\c;G+ ^*Triodia epactia*,^*Cenchrus ciliaris*\^hummock grass,tussock grass\2\c

Veg. Condition Poor

Disturbance Grazing

Fire Age >5

Notes heard RBEs (rainbow bee eater).

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		10	2
Acacia trachycarpa		2	30
Triodia epactia		0.8	25
* *Cenchrus ciliaris*		0.6	25
Eragrostis cumingii		0.1	<1
Fimbristylis microcarya		0.2	<1
Cassytha capillaris		Low Creeper	<1
Acacia colei var. *colei*		3	1

Rutila

Corchorus incanus subsp. *incanus*	0.3	1-2
* *Aerva javanica*	0.4	<1
Cajanus cinereus	0.25	<1
Pluchea rubelliflora	0.2	<1
Hibiscus austrinus var. *austrinus*	0.25	<1
Cyperus vaginatus	0.9	<1
Cynanchum floribundum	Sprawling	<1
Cullen leucanthum	0.8	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	0.8	<1
Corchorus incanus subsp. *incanus*	1	<1
Cleome viscosa	0.05	<1
Waltheria indica	0.2	<1
Euphorbia australis var. *subtomentosa*	0.1	<1
Calandrinia quadrivalvis	Prostrate	<1
Hibiscus leptocladus	0.4	<1
Adriana tomentosa var. *tomentosa*	2	<1
Pluchea ferdinandi-muelleri	0.7	<1
Acacia ampliceps	3	2
Crotalaria cunninghamii	0.4	<1
Acacia stellaticeps	0.6	<1
Hybanthus aurantiacus	0.3	<1
Stemodia grossa	0.4	<1
Euphorbia coghlanii	0.2	<1
Rhynchosia minima	0.15	<1
Polymeria ambigua		<1

R14027

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 569754 **mE** 7681513 **mN** **Lat.** -20.9656 **Long.** 117.6710

Habitat Lower-Slope

Aspect NW **Slope** Gentle

Soil Type Red Brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

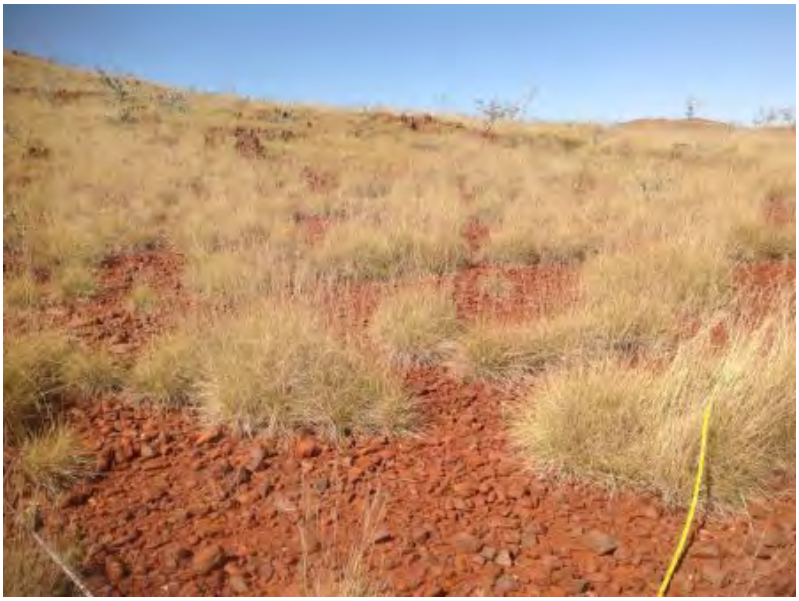
Vegetation M+ ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Fire within last three years

Fire Age 3 years

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia pyrifolia var. *pyrifolia*		2.5	3
Triodia epactia		.4	25
Corchorus laniflorus		.7	<1
Ptilotus calostachyus		.5	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.1	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		.1	<1
Tribulus suberosus		.4	<1
Acacia ancistrocarpa		.8	<1

		Rutila
Stemodia grossa	.4	<1
Euphorbia australis var. *subtomentosa*	.1	<1
Mollugo molluginea	.1	<1
Senna notabilis	.1	<1
Triumfetta clementii	.2	<1
Solanum diversiflorum	.3	<1
Fimbristylis dichotoma	.1	<1
Euphorbia schultzii	.3	<1
Boerhavia coccinea	.4	<1
Indigofera monophylla	.5	<1
Triodia wiseana	.5	2
Cymbopogon ambiguus	.5	<1

R14028

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 569462 **mE** 7679446 **mN** **Lat.** -20.9843 **Long.** 117.6683

Habitat Mid-Slope

Aspect N **Slope** Gentle

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

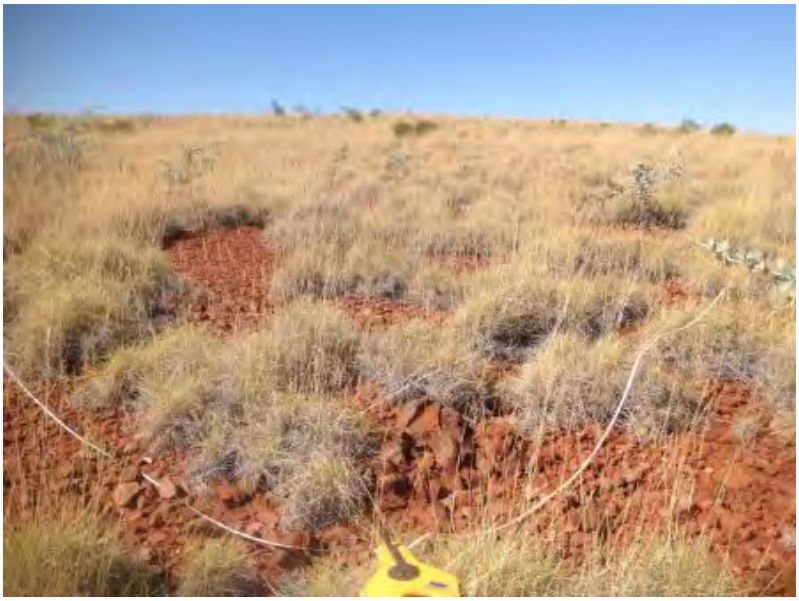
Vegetation M ^*Acacia pyrifolia* var. *pyrifolia*,^*Acacia ancistrocarpa*\^shrub\4\r;G+ ^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia pyrifolia var. *pyrifolia*		2	1
Acacia ancistrocarpa		2.5	1
Triodia wiseana		.6	30
Ptilotus nobilis subsp. *nobilis*		.2	<1
Mollugo molluginea		.2	<1
Bulbostylis barbata		.1	<1
Cassytha capillaris		Climber	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		.1	<1

Rutila

Triumfetta clementii	.2	<1
Corchorus laniflorus	.6	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.1	<1
Triodia epactia	.3	<1

R14029

Staff LA/AF **Date** 10/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596391 **mE** 7663902 **mN** **Lat.** -21.1235 **Long.** 117.9282

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Granite

Loose Rock 0 % cover ; 2-6 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia pyrifolia* var. *pyrifolia*,^*Acacia inaequilatera*\^shrub\4\r;G+ ^*Triodia epactia*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle tracks

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		0.6	20
Acacia pyrifolia var. *pyrifolia*		2.5	2
Acacia inaequilatera		3	1
Swainsona formosa		.5	<1
Solanum lasiophyllum		.3	<1
Pimelea ammocharis		1.2	<1
Cucumis maderaspatanus		Climber	<1
Sporobolus actinocladus		.2	<1

Rutila

Sporobolus australasicus			<1
Euphorbia sp.		.2	<1
Euphorbia australis var. *subtomentosa*		.1	<1
Stemodia grossa		.5	<1
Corchorus tectus		.6	<1
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P 1	.4	<1
Cassytha capillaris		Climber	<1
Ptilotus astrolasius		.4	<1
Acacia ancistrocarpa		.5	<1
Hakea chordophylla		1.3	<1
Aristida holathera var. *holathera*		.2	<1
Cleome viscosa		.5	<1
Eragrostis eriopoda		.3	<1
Gossypium australe		.6	<1

R14030

Staff LA/AF **Date** 10/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 599188 **mE** 7659719 **mN** **Lat.** -21.1611 **Long.** 117.9554

Habitat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Granite

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation M+ ^^*Grevillea pyramidalis* subsp. *leucadendron*,*Acacia pyrifolia* var. *pyrifolia*,*Acacia tumida* var. *pilbarensis*\^shrub\4\r;G ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		.6	10
Triodia wiseana		.6	15
Grevillea pyramidalis subsp. *leucadendron*		4	2
Acacia pyrifolia var. *pyrifolia*		2	2
Acacia tumida var. *pilbarensis*		3	1
Corchorus tectus		.5	<1
Bonamia erecta		.2	<1
Acacia ancistrocarpa		1.5	<1

Rutila

Aristida contorta	.2	<1
Indigofera colutea	.1	<1
Mollugo molluginea	.1	<1
Fimbristylis dichotoma	.1	<1
Zornia muelleriana	.1	<1
Eragrostis cumingii	.1	<1
Pluchea tetranthera	.3	<1

R14031

Staff LA/AF **Date** 10/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 590894 **mE** 7658550 **mN** **Lat.** -21.1721 **Long.** 117.8756

Habitat Upper-Slope

Aspect SE **Slope** Gentle

Soil Type Red brown loam

Rock Type Granite

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 10 % cover ; 1 cm in depth

Bare ground 40 % cover **Weeds** 0 % cover

Vegetation M+ ^^*Grevillea wickhamii*,*Acacia ancistrocarpa*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Grevillea wickhamii		2	3
Acacia ancistrocarpa		2.3	2
Acacia pyrifolia var. *pyrifolia*		1.5	1
Triodia epactia		.6	40
Fimbristylis dichotoma		.2	<1
Corchorus laniflorus		.7	<1
Evolvulus alsinoides var. *villosicalyx*		.1	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.2	<1

		Rutila
Cymbopogon ambiguus	1	<1
Cucumis maderaspatanus	Climber	<1
Hibiscus sturtii var. *campylochlamys*	.6	<1
Crotalaria novae-hollandiae subsp. *novae-hollandiae*		<1
Trachymene sp.	.05	<1
Indigofera monophylla	.6	1
Acacia tumida var. *pilbarensis*	4	<1
Isotropis atropurpurea	.4	<1
Crotalaria medicaginea var. *neglecta*	.2	<1
Acacia maitlandii	2.1	<1
Mollugo molluginea	.1	<1

R14032

Staff LA/AF **Date** 9/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 592657 **mE** 7657465 **mN** **Lat.** -21.1819 **Long.** 117.8926

Habitat Flat

Aspect E **Slope** Very Gentle

Soil Type Sandy brown loam

Rock Type Quartz and granite

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*\^shrub\4\r;G ^*Triodia lanigera*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia ancistrocarpa		2.5	6
Triodia lanigera		.6	20
Triodia epactia		.5	<1
Acacia inaequilatera		2	5
Indigofera monophylla		.6	<1
Corchorus tectus			<1
Indigofera monophylla		.4	<1
Ptilotus astrolasius		.4	<1

		Rutila
Grevillea pyramidalis subsp. *leucadendron*	1.3	<1
Grevillea wickhamii	2	<1
Acacia pyrifolia var. *pyrifolia*	1.2	<1
Hybanthus aurantiacus	.4	<1

R14033

Staff LA/AF **Date** 10/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598518 **mE** 7657084 **mN** **Lat.** -21.1850 **Long.** 117.9491

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type River sand

Rock Type Mixed alluvial mostly quartz based

Loose Rock 2-10 % cover ; 2-6 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 95 % cover **Weeds** <1 % cover

Vegetation U+ ^*Melaleuca argentea*,^*Eucalyptus camaldulensis* subsp. *refulgens*\^tree\6\r;M ^*Melaleuca linophylla*\^shrub\4\r;G ^*Cyperus ixiocarpus*\^sedge\2\r

Veg. Condition Excellent

Disturbance Cattle tracks

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Melaleuca argentea		4	3
Melaleuca linophylla		2	2
Cyperus ixiocarpus		0.6	1.5
Eucalyptus camaldulensis subsp. *refulgens*		5	2
Vigna lanceolata var. *lanceolata*		Climber	<1
Euphorbia sp.		.1	<1
Stemodia grossa		.4	<1
Cleome viscosa		.5	<1

Rutila

Phyllanthus maderaspatensis	.2	<1
* *Cenchrus ciliaris*	.3	<1
Goodenia lamprosperma		<1
Cymbopogon procerus	.4	<1
Eragrostis cumingii	.1	<1
Senna notabilis	.4	<1
Indigofera linifolia	Prostrate	<1
Eulalia aurea	.7	<1
Sesbania cannabina	1.1	<1
Acacia pyrifolia var. *pyrifolia*	.2	<1
Cynanchum floribundum	Climber	<1
Triodia epactia	.4	<1
Eragrostis speciosa		<1
Acacia ampliceps	2	<1
Fimbristylis elegans	.1	<1
Ipomoea coptica	Climber	<1
Striga curviflora	.2	<1
Corchorus incanus subsp. *incanus*	.3	<1
Sporobolus australasicus	.2	<1
Calandrinia quadrivalvis	.1	<1
Portulaca pilosa	.1	<1
Pluchea rubelliflora	.1	<1
Crotalaria cunninghamii	.9	<1

R14034

Staff RD **Date** 9/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598559 **mE** 7655767 **mN** **Lat.** -21.1969 **Long.** 117.9496

Habitat Flat

Aspect NW **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Granite?

Loose Rock ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 45 % cover **Weeds** 0 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\r;G+ ^^*Triodia wiseana*,*Acacia stellaticeps*,*Triodia epactia*\^hummock grass,shrub\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age >5

Notes Camels, RBEs in creekline.

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	5
Triodia wiseana		0.8	30
Acacia stellaticeps		0.5	15
Triodia epactia		0.6	10
Acacia bivenosa		0.5	<1
Hybanthus aurantiacus		0.2	<1
Sporobolus actinocladus		0.3	<1
Acacia ancistrocarpa x stellaticeps		1.4	<1

		Rutila
Scaevola browniana	0.2	<1
Corchorus laniflorus	0.5	<1
Pluchea ferdinandi-muelleri	0.8	1
Pluchea dentex	0.2	<1
Goodenia microptera	0.2	<1
Senna notabilis	0.15	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.05	<1
Schizachyrium fragile	0.05	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1
Ptilotus astrolasius	0.3	<1
Acacia trachycarpa	0.35	<1
Aristida contorta	0.15	<1

R14035

Staff RD **Date** 9/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596145 **mE** 7652666 **mN** **Lat.** -21.2250 **Long.** 117.9265

Habitat Flat

Aspect NW **Slope** Very Gentle

Soil Type Red brown loam

Rock Type ?Ironstone

Loose Rock ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 35 % cover **Weeds** 0 % cover

Vegetation U ^*Corymbia deserticola* subsp. *deserticola*\^tree\6\bi;M ^*Acacia ancistrocarpa*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\3\i;G+ ^*Triodia lanigera*\^hummock grass\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age >5

Notes heavy grazing..

Species	WA Cons.	Height (m)	Cover (%)
Corymbia deserticola subsp. *deserticola*		6	<2
Acacia ancistrocarpa		1.7	20
Acacia pyrifolia var. *pyrifolia*		0.5	<2
Triodia lanigera		0.8	60
Bonamia erecta		0.2	1
Acacia ancistrocarpa		1.6	<1
Ptilotus astrolasius		0.3	<1

R14036

Staff RD **Date** 9/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598125 **mE** 7650532 **mN** **Lat.** -21.2442 **Long.** 117.9457

Habitat Flat

Aspect W **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?Ironstone

Loose Rock ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 25 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*,^*Acacia ancistrocarpa*\^shrub\4\r;G+ ^*Triodia lanigera*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	8
Acacia ancistrocarpa		2	2
Triodia lanigera		0.7	70
Gossypium australe		0.4	<1
Ptilotus astrolasius		0.25	<1
Indigofera monophylla		0.2	<1
Acacia pyrifolia var. *pyrifolia*		1	<1
Bonamia erecta		0.3	1

		Rutila
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.5	<1
Triumfetta sp.	0.6	<1

R14037

Staff RD **Date** 9/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 595818 **mE** 7648337 **mN** **Lat.** -21.2642 **Long.** 117.9236

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?Ironstone/quartz

Loose Rock 20-50 % cover ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 40 % cover **Weeds** 0 % cover

Vegetation U ^*Acacia inaequilatera*\^tree\6\r;M ^*Acacia ancistrocarpa*\^shrub\3\i;G+ ^*Triodia epactia*,^*Triodia lanigera*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		6	5
Acacia ancistrocarpa		2	15
Triodia epactia		0.8	30
Triodia lanigera		0.8	30
Corchorus laniflorus		0.5	1
Triumfetta sp.		0.4	<1
Aristida contorta		0.2	<1
Ptilotus astrolasius		0.4	<1

		Rutila
Senna artemisioides subsp. *oligophylla*	0.5	<1
Duperreya commixta	0.1	<1
Goodenia forrestii	0.25	<1
Sida clementii	0.5	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1

R14038

Staff RD **Date** 9/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596822 **mE** 7648612 **mN** **Lat.** -21.2616 **Long.** 117.9332

Habitat Flat

Aspect S **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type Quartz

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 40 % cover **Weeds** 0 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia inaequilatera*\^shrub\4\r;G+ ^*Triodia epactia*, *Indigofera monophylla*\^hummock grass,shrub\2\c

Veg. Condition Very Good

Disturbance Grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	2
Acacia inaequilatera		3	4
Triodia epactia		0.7	50
Indigofera monophylla		0.5	10
Corchorus laniflorus		0.5	1
Ptilotus astrolasius		0.3	<1
Acacia ancistrocarpa		1	<1
Acacia pyrifolia var. *pyrifolia*		0.6	<1

		Rutila
Aristida contorta	0.2	<1
Hybanthus aurantiacus	0.1	<1
Clerodendrum floribundum var. *angustifolium*	0.6	<1
Senna glutinosa subsp. *glutinosa*	0.5	<1
Senna glutinosa subsp. x *luerssenii*	1	<1
Acacia trachycarpa	1.5	<1

R14039

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598290 **mE** 7645988 **mN** **Lat.** -21.2852 **Long.** 117.9475

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Light brown loam

Rock Type Calcrete and Granite

Loose Rock 10-20 % cover ; **Litter** 3 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia arida*,^*Acacia bivenosa*\^shrub\4\r;G ^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia arida		2.3	5
Corymbia hamersleyana		8	1
Acacia bivenosa		1.5	2
Triodia wiseana		.6	15
Acacia pyrifolia var. *pyrifolia*		1.5	<1
Enneapogon caerulescens		.1	<1
Rhynchosia minima		Prostrate	<1
Corchorus tectus		.6	<1

Rutila

Triodia epactia	.5	1
Rhynchosia minima	.3	<1
Triumfetta clementii	.5	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.2	<1
Cassytha capillaris	Climber	<1
Pluchea ferdinandi-muelleri	1.2	<1
Gossypium australe	1.2	<1
Codonocarpus cotinifolius	3	<1
Acacia ancistrocarpa	.8	<1
Bonamia erecta	.2	<1
Boerhavia coccinea	Prostrate	<1
Euphorbia australis var. *subtomentosa*	Prostrate	<1
Acacia arida	2.3	5

R14040

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598575 **mE** 7646631 **mN** **Lat.** -21.2794 **Long.** 117.9502

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Granite and calcrete mixed

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 75 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia arida*\^shrub\3\r;G ^*Triodia epactia*,*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Some weeds

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	1
Acacia arida		2	5
Triodia epactia		.6	10
Triodia wiseana		.6	5
Corchorus tectus		.5	<1
Enneapogon caerulescens		.1	<1
Aristida holathera var. *holathera*		.1	<1
Cleome uncifera subsp. *uncifera*		.2	<1

Rutila

Acacia pyrifolia var. *pyrifolia*	1.4	<1
Ptilotus calostachyus	.4	<1
* *Aerva javanica*	.5	<1
Ptilotus astrolasius	.4	<1
Grevillea pyramidalis subsp. *leucadendron*	1	<1
Bonamia linearis	Climber	<1
Gossypium australe	.8	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.1	<1
Sida clementii	.7	<1
Grevillea wickhamii	1.5	<1
Bonamia erecta	.3	<1
Acacia bivenosa	1.1	<1
Hakea lorea subsp. *lorea*	2	<1
Eragrostis eriopoda	.3	<1

R14041

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598194 **mE** 7644192 **mN** **Lat.** -21.3015 **Long.** 117.9467

Habitat Mid-Slope

Aspect NW **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Granite

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		.6	20
Acacia pyrifolia var. *pyrifolia*		1.2	<1
Indigofera monophylla		.3	<1
Mollugo molluginea		.2	<1
Ptilotus calostachyus		.6	<1
Senna glutinosa subsp. x *luerssenii*		1.5	<1
Triodia epactia		.3	<1
Eriachne ciliata		.1	<1
Hakea chordophylla		2	<1

		Rutila
Goodenia stobbsiana	.6	<1
Corchorus tectus	.3	<1
Bonamia sp. (HD94-6)	.1	<1
Ptilotus astrolasius	.4	<1
Bonamia erecta	.1	<1

R14042

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 597206 **mE** 7643204 **mN** **Lat.** -21.3105 **Long.** 117.9372

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia stellaticeps*\^shrub\3\i;G ^*Triodia lanigera*\^hummock grass\2\r

Veg. Condition Excellent

Disturbance Cattle tracks

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia lanigera		.6	10
Acacia stellaticeps		1.2	20
Codonocarpus cotinifolius		1.2	<1
Acacia sphaerostachya		2	<1
Ptilotus astrolasius		.3	<1
Ptilotus calostachyus		.4	<1

R14043

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 598042 **mE** 7642882 **mN** **Lat.** -21.3133 **Long.** 117.9453

Habitat Lower-Slope

Aspect SE **Slope** Very Gentle

Soil Type brown loam

Rock Type Basalt

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** 5 % cover ; 2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia inaequilatera*,^*Acacia acradenia*\^shrub\4\r;G ^*Triodia epactia*,*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	3
Acacia acradenia		1.7	1
Triodia epactia		.6	35
Acacia ancistrocarpa		1.5	<1
Triodia wiseana		.5	15
Corchorus tectus		.3	<1
Acacia bivenosa		2.2	<1
Pluchea ferdinandi-muelleri		1.1	<1

Rutila

Stemodia grossa	.5	<1
Bonamia erecta	.2	<1
Swainsona stenodonta	.5	<1
Goodenia stobbsiana	.1	<1
Cynanchum floribundum	Creeper	<1
Cajanus cinereus	.6	<1

R14044

Staff LA/AF **Date** 9/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 593763 **mE** 7642673 **mN** **Lat.** -21.3154 **Long.** 117.9041

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 2-6 mm in size **Litter** 2 % cover ; <1 cm in depth

Bare ground 40 % cover **Weeds** 15 % cover

Vegetation M ^*Hakea chordophylla*,^*Grevillea pyramidalis* subsp. *leucadendron*\^shrub\4\r;G+ ^*Triodia epactia*,^*Cenchrus ciliaris*\^hummock grass,tussock grass\2\c

Veg. Condition Good

Disturbance Grazing

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Hakea chordophylla		4	2
Grevillea pyramidalis subsp. *leucadendron*		2	1
Triodia epactia		.5	20
* *Cenchrus ciliaris*		.5	15
Eragrostis eriopoda		.3	<1
Acacia trachycarpa		.4	<1
Cullen leucanthum		.4	<1
Indigofera colutea		.1	<1

Rutila

Indigofera linnaei	.1	<1
Cullen leucochaites	.7	<1
Aristida holathera var. *holathera*	.4	<1
Pluchea tetranthera	.5	<1
Corchorus tectus	1.1	<1
* *Aerva javanica*	.6	<1
Cleome viscosa	.1	<1

R14045

Staff LA/AF **Date** 9/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 593674 **mE** 7643881 **mN** **Lat.** -21.3045 **Long.** 117.9031

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type None

Loose Rock 0 % cover ; **Litter** 25 % cover ; 1 cm in depth

Bare ground 20 % cover **Weeds** 40 % cover

Vegetation U+ ^*Eucalyptus victrix*,^*Corymbia hamersleyana*,*Acacia coriacea* subsp. *pendens*\^tree\7\i;M ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^^*Cenchrus ciliaris*,*Triodia angusta*,*Triodia epactia*\^tussock grass,hummock grass\1\c

Veg. Condition Poor

Disturbance Heavy weed infestation. Heavily grazed

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		15	5
Corymbia hamersleyana		8	10
Acacia coriacea subsp. *pendens*		5	5
Acacia pyrifolia var. *pyrifolia*		3	2
* *Cenchrus ciliaris*		.2	30
Triodia angusta		.4	1
Triodia epactia		.4	1

Rutila

* *Vachellia farnesiana*	3	<1
Senna notabilis	.5	<1
Senna artemisioides subsp. *oligophylla*	1	<1
Goodenia forrestii	.1	<1
Cullen leucanthum	.5	<1
Acacia trachycarpa	1.6	<1
Cyperus vaginatus	.4	<1
* *Melochia pyramidata*	.2	<1
Hibiscus austrinus var. *austrinus*	.6	<1
Euphorbia coghlanii	.2	<1
Rhynchosia minima	Prostrate	<1

R14046

Staff LA/AF **Date** 9/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 592581 **mE** 7645633 **mN** **Lat.** -21.2888 **Long.** 117.8925

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** <1 % cover

Vegetation U ^*Acacia xiphophylla*\^tree\6\bi;G+ ^*Triodia epactia*,^*Sclerolaena hostilis*\^hummock grass, chenopod shrub\2\i

Veg. Condition Good

Disturbance Cattle grazing, some weeds

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia xiphophylla		4	1
Sclerolaena hostilis		.5	1
* *Cenchrus ciliaris*		.4	<1
Trianthema triquetra		.1	<1
Ptilotus murrayi		.1	<1
Eragrostis dielsii		.1	<1
Sporobolus australasicus		.1	<1
Threlkeldia diffusa		.3	<1

		Rutila
Sclerolaena densiflora	.1	<1
Dactyloctenium radulans	.1	<1
Triodia angusta	.5	<1
Abutilon lepidum	.2	<1
Triodia epactia	0.6	15

R14047

Staff LA/AF **Date** 9/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 592670 **mE** 7645226 **mN** **Lat.** -21.2924 **Long.** 117.8934

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** <1 % cover

Vegetation G+ ^^*Triodia angusta*,*Sclerolaena hostilis*,*Triodia epactia*\^hummock grass,chenopod shrub\2\i

Veg. Condition Very Good

Disturbance Cattle tracks, some weeds

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia angusta		.6	15
Sclerolaena hostilis		0.4	2
Gomphrena affinis subsp. *pilbarensis*		.2	<1
Sclerolaena densiflora		.1	<1
Threlkeldia diffusa		.2	<1
Xerochloa barbata		.1	<1
Triodia epactia		.6	10
Ptilotus murrayi		.1	<1
Dactyloctenium radulans		.1	<1

Rutila

Trianthema triquetra	.1	<1
Portulaca oleracea	.1	<1
* *Cenchrus ciliaris*	.4	<1
Eragrostis dielsii	.1	<1

R14048

Staff RD **Date** 10/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 599754 **mE** 7640444 **mN** **Lat.** -21.3353 **Long.** 117.9620

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loamy sand

Rock Type ?Ironstone

Loose Rock 0 % cover ; **Litter** 2 % cover ; <2 cm in depth

Bare ground 40 % cover **Weeds** 0 % cover

Vegetation U ^*Acacia inaequilatera*\^tree\6\r;M ^*Acacia ancistrocarpa*\^shrub\4\r;G+ ^*Triodia lanigera*,^*Acacia stellaticeps*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age >2

Notes Scattered sparsely C. hamersleyana.

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		5	2
Acacia ancistrocarpa		3	2
Triodia lanigera		0.6	55
Acacia stellaticeps		0.5	2
Acacia sphaerostachya		1.2	<1
Acacia acradenia		2	<1
Hakea chordophylla		2	<1
Triodia epactia		0.6	1

		Rutila
Goodenia microptera	0.3	<1
Duperreya commixta	Low Creeper	<1
Stemodia grossa	0.3	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	0.2	<1
Cassytha capillaris	Low Creeper	<1

R14049

Staff RD **Date** 10/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 600257 **mE** 7637531 **mN** **Lat.** -21.3615 **Long.** 117.9670

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?Ironstone

Loose Rock <2 % cover ; 2-6 mm in size **Litter** 2 % cover ; 2 cm in depth

Bare ground 60 % cover **Weeds** <1 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia ancistrocarpa*\^shrub\3\r;G+ ^^*Triodia lanigera*, *Acacia stellaticeps*,*Triodia epactia*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age 1-5 yrs

Notes heard RBEs near creekline.

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	2
Acacia ancistrocarpa		1.5	5
Triodia lanigera		1	10
Acacia stellaticeps		0.5	10
Triodia epactia		1	5
Acacia tumida var. *pilbarensis*		2	<1
Sida arenicola		1.2	1
Ptilotus astrolasius		0.3	1

Rutila

* *Malvastrum americanum*	0.4	<1
Duperreya commixta	Low Creeper	<1
Waltheria indica	0.3	<1
Euphorbia australis var. *subtomentosa*	0.1	<1
Eriachne sp.	0.2	<1
Acacia trachycarpa x *tumida*	2	<1
Malvaceae sp.	0.2	<1
Paraneurachne muelleri	0.3	<1
Indigofera monophylla	0.4	<1
Hakea chordophylla	1.5	<1
Sida clementii	0.4	<1
Pluchea ferdinandi-muelleri	0.3	<1
Acacia pyrifolia var. *pyrifolia*	0.3	<1
Acacia inaequilatera	1.2	<1
Acacia trachycarpa	1	<1
Corchorus laniflorus	1	<1

R14050

Staff RD **Date** 16/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 600412 **mE** 7634408 **mN** **Lat.** -21.3897 **Long.** 117.9687

Habitat Mid-Slope

Aspect E **Slope** Moderate

Soil Type Red brown sandy loam

Rock Type ?Ironstone

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*\^shrub\4\bi;G+ ^*Triodia epactia*,*Triodia lanigera*,*Acacia spondylophylla*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		2.2	<2
Triodia epactia		0.5	25
Triodia lanigera		0.5	15
Acacia spondylophylla		0.6	10
Ptilotus calostachyus		0.6	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.05	<1
Grevillea pyramidalis subsp. *leucadendron*		1.5	<1
Corymbia hamersleyana		3	<1

		Rutila
Indigofera monophylla	0.3	<1
Senna glutinosa subsp. *glutinosa*	1.3	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	Prostrate	<1
Grevillea wickhamii	0.5	<1
Acacia ancistrocarpa	1.5	<1
Mollugo molluginea	0.5	<1
Goodenia stobbsiana	0.4	<1
Tribulus suberosus	0.8	<1
Corchorus laniflorus	0.6	<1
Eriachne ciliata	0.1	<1
Ptilotus astrolasius	0.3	<1

R14051

Staff RD **Date** 12/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596399 **mE** 7631383 **mN** **Lat.** -21.4173 **Long.** 117.9301

Habitat Lower-Slope

Aspect E **Slope** Gentle

Soil Type Red brown loamy sand

Rock Type Basalt

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

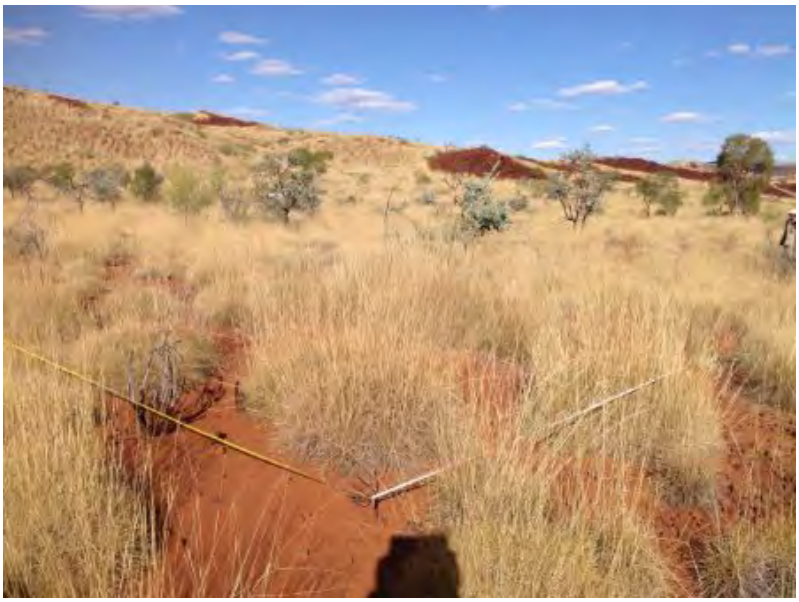
Vegetation U ^*Acacia inaequilatera*\^tree\5\r;M ^*Acacia acradenia*\^shrub\3\r;G+ ^*Triodia wiseana*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age 1-5

Notes Corymbia hamersleyana is very scattered in the Black system.



Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		2	2
Acacia acradenia		1.5	2
Triodia wiseana		1.1	20
Triodia epactia		1.1	10
Corchorus laniflorus		0.4	<1
Boerhavia coccinea		Prostrate	<1
Grevillea pyramidalis subsp. *leucadendron*		1.3	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		Prostrate	<1

Rutila

Acacia pyrifolia var. *pyrifolia*	1.5	<1

R14052

Staff RD **Date** 12/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596728 **mE** 7631333 **mN** **Lat.** -21.4177 **Long.** 117.9333

Habitat Crest

Aspect S **Slope** Moderate

Soil Type Red brown loam sany

Rock Type basalt

Loose Rock 50-90 % cover ; 2-6 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*\^shrub\4\;G+ ^*Triodia wiseana*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		0.5	30
Acacia inaequilatera		2.5	<2
Boerhavia coccinea		Prostrate	<1
Corchorus laniflorus		0.4	<1
Hakea chordophylla		1	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		Prostrate	<1

R14053

Staff LA/AF **Date** 12/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 600350 **mE** 7633407 **mN** **Lat.** -21.3988 **Long.** 117.9681

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loam

Rock Type Mixed alluvial

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** 2 % cover ; 3 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U ^*Acacia xiphophylla*\^tree\6\bi;G+ ^*Triodia angusta*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle tracks

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia angusta		.5	20
Triodia epactia		.5	15
Acacia xiphophylla		5	1
* *Cenchrus ciliaris*		.5	<1
Pluchea rubelliflora		.1	<1
Bulbostylis barbata		.1	<1
Ptilotus murrayi		.2	<1
Trianthema triquetra		.1	<1
Corchorus tectus		1.2	<1

Rutila

Eragrostis dielsii	.1	<1
Eragrostis cumingii	.2	<1
Pterocaulon sphacelatum	.4	<1
Dactyloctenium radulans	.2	<1
Marsilea hirsuta	.1	<1
Sporobolus australasicus	.2	<1

R14054

Staff LA/AF **Date** 16/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 600965 **mE** 7631001 **mN** **Lat.** -21.4205 **Long.** 117.9742

Habitat Lower-Slope

Aspect SE **Slope** Gentle

Soil Type Brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 65 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia arida*\^shrub\3\i;G ^^*Triodia lanigera*,*Acacia spondylophylla*,*Triodia epactia*\^hummock grass,shrub\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia arida		1.4	20
Triodia lanigera		.6	20
Acacia spondylophylla		.5	5
Triodia epactia		.6	2
Mollugo molluginea		.2	<1
Goodenia cusackiana		.2	<1
Acacia ancistrocarpa		.7	<1
Goodenia stobbsiana		.2	<1

R14055

Staff LA/AF **Date** 12/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 599874 **mE** 7632567 **mN** **Lat.** -21.4064 **Long.** 117.9636

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown sandy loam

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** <1 % cover

Vegetation G+ ^^*Triodia epactia*,*Triodia angusta*,*Triodia lanigera*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle tracks

Fire Age >10

Notes

?

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		.6	15
Triodia angusta		.5	5
Boerhavia coccinea		Prostrate	<1
Ptilotus murrayi		.1	<1
Eragrostis dielsii		.1	<1
Trianthema triquetra		.1	<1
Pterocaulon sphacelatum		.3	<1
Cleome viscosa		.3	<1
* *Cenchrus ciliaris*			<1

Rutila

Cleome oxalidea	.1	<1
Lepidium pholidogynum	.1	<1
Sclerolaena costata	.1	<1
Bulbostylis barbata	.1	<1
Dactyloctenium radulans	.2	<1
Mollugo molluginea	.2	<1
Triodia lanigera	.5	2

R14056

Staff LA/AF **Date** 12/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 599825 **mE** 7633690 **mN** **Lat.** -21.3963 **Long.** 117.9630

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown sandy loam

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 65 % cover **Weeds** <1 % cover

Vegetation M ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\3\r;G+ ^*Triodia epactia*,^*Cenchrus ciliaris*\^hummock grass,tussock grass\2\i

Veg. Condition Very Good

Disturbance Cattle tracks , some weeds

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		0.5	30
Acacia pyrifolia var. *pyrifolia*		2	2
Acacia trachycarpa		1.6	<1
* *Cenchrus ciliaris*		.3	2
Cullen leucanthum		1.8	<1
Gossypium australe		1.3	<1
Cleome uncifera subsp. *uncifera*		.2	<1
Bonamia linearis		Climber	<1

		Rutila
Indigofera colutea	.1	<1
Tephrosia rosea var. *clementii*	.6	<1
Euphorbia australis var. *subtomentosa*	.1	<1
Goodenia forrestii	.2	<1
Corchorus incanus subsp. *incanus*	.6	<1
Corymbia hamersleyana	4	<1

R14057

Staff RD **Date** 17/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 572780 **mE** 7699502 **mN** **Lat.** -20.8029 **Long.** 117.6994

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy clay loam

Rock Type ? & quartz

Loose Rock 2-10 % cover ; 20-60 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 25 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia arida*\^shrub\4\i;G+ ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age <5

Notes overall Excellent condition, however there is one Vachellia farnesiana plant.

Species	WA Cons.	Height (m)	Cover (%)
Acacia arida		1.5	15
Triodia epactia		0.8	55
Indigofera monophylla			1
Rhynchosia minima		Creeper	<1
Bonamia erecta		0.5	<1
Sida arsiniata		0.8	<1
Mollugo molluginea		0.15	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.3	<1
Corchorus walcottii		0.2	<1

Rutila

Gossypium australe	0.25	<1
Evolvulus alsinoides var. *villosicalyx*	Creeper	<1
Acacia pyrifolia var. *pyrifolia*	0.2	<1
Cyperaceae sp.	0.1	<1
Sclerolaena costata	0.15	<1
Eragrostis xerophila	0.2	<1
Paspalidium clementii	0.3	<1
Hybanthus aurantiacus	0.2	<1
Acacia ancistrocarpa	1.5	<1
* *Vachellia farnesiana*	1.5	<1
Boerhavia repleta	Prostrate	<1
Aristida contorta	0.2	<1

R14058

Staff RD **Date** 12/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 596948 **mE** 7630016 **mN** **Lat.** -21.4296 **Long.** 117.9355

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown loamy sand

Rock Type ?Ironstone

Loose Rock 0 % cover ; 6-20 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 50 % cover **Weeds** 50 % cover

Vegetation U ^*Acacia trachycarpa*,*Petalostylis labicheoides*\^tree\6\r;M ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\bi;G+ ^^*Triodia epactia*,*Cenchrus ciliaris*,*Aerva javanica*\^hummock grass, tussock grass,shrub\2\c

Veg. Condition Poor

Disturbance Grazing, weedy

Fire Age 1-5

Notes **** replace Anagallis arvensis with Aerva javanica****

Species	WA Cons.	Height (m)	Cover (%)
Acacia trachycarpa		4	5
Petalostylis labicheoides		3	2
Acacia pyrifolia var. *pyrifolia*		2	<2
Triodia epactia		1	30
* *Cenchrus ciliaris*		0.1	20
* *Aerva javanica*		0.9	2
* *Malvastrum americanum*		0.25	<1

		Rutila
Polymeria ambigua		<1
Cleome viscosa	0.4	<1
Boerhavia repleta	Creeper	<1
Tephrosia rosea var. *clementii*	0.4	<1
Sida clementii	0.6	<1
Indigofera monophylla	0.15	<1
Cullen leucanthum	0.25	<1

R14059

Staff RD **Date** 16/07/2014 **Season** P

Revisit

Type Q 12.5 m x 200 m

Location Rutila Rail

MGA Zone 50 600218 **mE** 7629377 **mN** **Lat.** -21.4352 **Long.** 117.9671

Habitat River

Aspect W **Slope** Steep

Soil Type Grey sand

Rock Type Riverstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 50+ % cover ; 5 cm in depth

Bare ground 65 % cover **Weeds** 5 % cover

Vegetation U+ ^^*Eucalyptus victrix*,*Melaleuca argentea*,*Eucalyptus camaldulensis* subsp. *refulgens*\^tree\7\c; M ^^*Acacia coriacea* subsp. *pendens*,*Atalaya hemiglauca*,*Melaleuca glomerata*\^shrub\4\;G ^*Cyperus vaginatus*,^*Triodia epactia*,*Cenchrus ciliaris*\^sedge,hummock grass,tussock grass\2\r

Veg. Condition Good

Disturbance Grazing

Fire Age >5

Notes Heard RBEs

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		15	25
Melaleuca argentea		15	10
Cyperus vaginatus		1.3	2
Triodia epactia		0.6	10
Atalaya hemiglauca		1.7	2
Acacia coriacea subsp. *pendens*		5	5
Atalaya hemiglauca		2	2

Rutila

Melaleuca glomerata	4	2
Flueggea virosa subsp. *melanthesoides*	2	<1
Cymbopogon sp.	0.5	<1
Cullen leucanthum	0.2	<1
Hybanthus aurantiacus	0.15	<1
* *Cenchrus ciliaris*	0.2	<1
* *Malvastrum americanum*	0.2	<1
Acacia pyrifolia var. *pyrifolia*	3	<1
Acacia trachycarpa	3	<1
Euphorbia sp.	0.2	<1
Streptoglossa sp.	0.1	<1
Pluchea rubelliflora	0.5	<1
Cleome viscosa	0.3	<1
* *Cenchrus ciliaris*	0.5	2
Rhynchosia minima	Creeper	<1
Triodia angusta	0.6	<1
Grevillea pyramidalis subsp. *leucadendron*	1.5	<1
Crotalaria medicaginea var. *neglecta*	0.4	<1
Cucumis maderaspatanus	Climber	<1
* *Argemone ochroleuca*	0.03	<1
Amaranthus undulatus	0.3	<1
* *Passiflora foetida* var. *hispida*	0.1	<1
Cullen leucanthum	0.8	<1
Eucalyptus camaldulensis subsp. *refulgens*	15	10

R14060

Staff RD **Date** 13/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 590132 **mE** 7678623 **mN** **Lat.** -20.9908 **Long.** 117.8672

Habitat Mid-Slope

Aspect W **Slope** Moderate

Soil Type Red brown sandy loam

Rock Type ?

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia orthocarpa*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\i;G+ ^^*Triodia epactia*,*Indigofera monophylla*,*Triodia wiseana*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Minimal

Fire Age 1-5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia orthocarpa		2.5	10
Triodia epactia		1	30
Indigofera monophylla		0.4	<1
Corchorus laniflorus		0.9	<1
Aristida holathera var. *holathera*		0.3	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		Prostrate	<1
Tribulus suberosus		0.8	<1
Indigofera monophylla		0.4	2

		Rutila
Triodia wiseana	0.8	10
Senna glutinosa subsp. *pruinosa*	1.4	<1
Ptilotus calostachyus	0.6	<1
Acacia ancistrocarpa	1	<1
Goodenia stobbsiana	0.25	<1
Sida arenicola	0.5	<1
Mollugo molluginea	0.1	<1
Grevillea wickhamii subsp. *hispidula*	0.5	<1
Ptilotus astrolasius	0.2	<1
Acacia pyrifolia var. *pyrifolia*	2	2

R14061

Staff RD **Date** 12/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 595419 **mE** 7627748 **mN** **Lat.** -21.4502 **Long.** 117.9209

Habitat River

Aspect W **Slope** Moderate

Soil Type Brown sand

Rock Type Riverstone

Loose Rock 50-90 % cover ; 2-6 mm in size **Litter** 10 % cover ; 5 cm in depth

Bare ground 80 % cover **Weeds** <2 % cover

Vegetation U ^*Eucalyptus victrix*\^tree\7\i;M+ ^*Melaleuca glomerata*,^*Acacia coriacea* subsp. *pendens*\^tree\6\c;G ^*Triodia epactia*,^*Cyperus vaginatus*\^hummock grass,sedge\2\i

Veg. Condition Good

Disturbance Grazing

Fire Age >5

Notes Heard RBEs

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		15	20
Melaleuca glomerata		4	20
Acacia coriacea subsp. *pendens*		3	15
Triodia epactia		1	5
Cyperus vaginatus		1	3
Pluchea rubelliflora		0.05	<1
Stemodia grossa		0.2	<1
Acacia trachycarpa		2	1

Rutila

Flueggea virosa subsp. *melanthesoides*	2.5	<1
Euphorbia tannensis subsp. *eremophila*	0.5	<1
Cleome viscosa	0.2	<1
* *Vachellia farnesiana*	1	<1
Acacia pyrifolia var. *pyrifolia*	1	<1
Melaleuca argentea	4	<1
Cullen leucanthum	0.5	<1
Hybanthus aurantiacus	0.2	<1
Poaceae sp.	0.2	<1
Bothriochloa ewartiana	0.8	1
Triodia angusta	1	<1
* *Cenchrus ciliaris*	0.3	<1
Hybanthus aurantiacus	0.2	<1
Jasminum didymum subsp. *lineare*	1.5 Climber	<1
Euphorbia sp.	0.4	<1
Rhynchosia minima	Low Creeper	<1
Polycarpaea longiflora	0.3	<1
Eriachne tenuiculmis	0.4	<1

R14062

Staff RD **Date** 14/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 593861 **mE** 7657072 **mN** **Lat.** -21.1853 **Long.** 117.9042

Habitat Flat

Aspect N/A **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type ?

Loose Rock <2 % cover ; 2-6 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia secunda*,*Triodia wiseana*,*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age >2

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia secunda		0.4	30
Triodia wiseana		0.7	10
Triodia epactia		0.7	5
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		0.6	<1
Acacia stellaticeps		0.5	1
Acacia ancistrocarpa		2	<1
Acacia pyrifolia var. *pyrifolia*		1	<1
Acacia bivenosa		1.3	<1
Acacia inaequilatera		3	<1

Rutila

Cyperaceae sp.	0.5	<1
Pluchea ferdinandi-muelleri x *tetranthera*	0.6	<1
Sporobolus actinocladus	0.2	<1
Cleome uncifera subsp. *uncifera*	0.3	<1
Ptilotus astrolasius	0.2	<1
Indigofera monophylla	0.3	<1
Corchorus laniflorus	0.2	<1

R14063

Staff LA/AF **Date** 13/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 581926 **mE** 7681944 **mN** **Lat.** -20.9612 **Long.** 117.7881

Habitat Upper-Slope

Aspect NW **Slope** Moderate

Soil Type Red brown sand

Rock Type Aeolian sand

Loose Rock 0 % cover ; **Litter** 20 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia melleodora*\^shrub\4\i;G ^*Eragrostis eriopoda*,^*Aristida holathera* var. *holathera*\^tussock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia melleodora		4	15
Eragrostis eriopoda		.3	10
Aristida holathera var. *holathera*		.2	10
Ptilotus polystachyus		.4	<1
Sida sp. Rabbit Flat (B.J. Carter 626)		Prostrate	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*		1	<1
Poaceae sp.		.1	<1
Triumfetta ramosa		.4	<1

Rutila

Bonamia erecta	.2	<1
Triodia epactia	.4	<1
Heliotropium transforme	.6	<1
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)	.3	<1
Dodonaea coriacea	.4	<1
Senna notabilis	.1	<1
Triodia lanigera	.3	<1
Paraneurachne muelleri	.4	<1
Ptilotus astrolasius	.4	<1
Hibiscus sturtii var. *platychlamys*	.4	<1

R14064

Staff LA/AF **Date** 11/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 597418 **mE** 7645889 **mN** **Lat.** -21.2862 **Long.** 117.9391

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loam

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M+ ^*Acacia ancistrocarpa*\^shrub\3\r;G ^*Triodia lanigera*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Some cattle tracks

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia lanigera		.6	20
Corymbia hamersleyana		8	1
Acacia ancistrocarpa		1.5	5
Ptilotus astrolasius		.3	<1
Corchorus tectus		.6	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		.1	<1
Scaevola browniana		.3	<1
Bonamia linearis		Climber	<1

Rutila

Gossypium australe	.2	<1
Acacia pyrifolia var. *pyrifolia*	1.2	<1
Cleome uncifera subsp. *uncifera*	.2	<1
Senna glutinosa subsp. x *luerssenii*	.4	<1

R14065

Staff LA/AF **Date** 14/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 581052 **mE** 7682935 **mN** **Lat.** -20.9523 **Long.** 117.7796

Habitat Open Depression

Aspect N **Slope** Very Gentle

Soil Type Brown clayey loam

Rock Type Quartz and Calcrete

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 5 % cover ; 1 cm in depth

Bare ground 50 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\r;M ^^*Acacia acradenia*,*Acacia ancistrocarpa*,*Acacia inaequilatera*\^shrub\4\r;G ^*Triodia angusta*,^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance Cattle

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	4
Acacia acradenia		3	3
Acacia ancistrocarpa		3	3
Acacia inaequilatera		2	2
Corchorus tectus		.6	<1
Sida clementii		.6	<1
Acacia bivenosa		1.6	<1
Acacia colei var. *colei*		1.8	<1

Rutila

Boerhavia coccinea	.2	<1
Phyllanthus maderaspatensis	.3	<1
Hybanthus aurantiacus	.2	<1
* *Cenchrus ciliaris*	.3	<1
Triumfetta clementii	.3	<1
Hibiscus sturtii var. *campylochlamys*	.3	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	.1	<1
Rhynchosia minima	Climber	<1
Senna glutinosa subsp. *glutinosa x oligophylla*	1,5	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.5	<1
Acacia arida	.7	<1
Cajanus cinereus	1.3	<1
Cassytha capillaris	Climber	<1
Grevillea pyramidalis subsp. *leucadendron*	.5	<1
Sida rohlenae subsp. *rohlenae*	.3	<1
Chrysopogon fallax	.5	<1
Ptilotus astrolasius	.3	<1
Scaevola amblyanthera var. *centralis*	.4	<1
Triodia wiseana	.4	<1
Ptilotus calostachyus	.5	<1
Cynanchum floribundum	Climber	<1
Cymbopogon sp.	.4	<1
Triodia angusta	.3	25
Triodia epactia	.5	15

R14066

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 577867 **mE** 7694947 **mN** **Lat.** -20.8439 **Long.** 117.7484

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clay with gilgies

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 30 % cover **Weeds** <1 % cover

Vegetation G+ ^*Eragrostis xerophila*\^tussock grass\1\d

Veg. Condition Very Good

Disturbance Heavy grazing

Fire Age

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eragrostis xerophila		.3	70
Rhynchosia minima		Climber	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.2	<1
Triodia epactia		.5	<1
Sida fibulifera		.2	<1
Bulbostylis turbinata		.1	<1
Dichanthium sericeum subsp. *humilius*		.1	<1
Phyllanthus maderaspatensis		.2	<1
Desmodium muelleri		.1	<1

		Rutila
Calotis plumulifera	.1	<1
Hibiscus verdcourtii	.1	<1
* *Vachellia farnesiana*	.1	<1
Iseilema vaginiflorum	.1	<1

R14067

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type Q 40 m x 62 m

Location Rutila Rail

MGA Zone 50 577596 **mE** 7694905 **mN** **Lat.** -20.8443 **Long.** 117.7458

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 5 % cover ; 2 cm in depth

Bare ground 60 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia candida*\^tree\6\r;M ^*Acacia inaequilatera*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\bi;G ^^*Eriachne benthamii*,*Triodia epactia*,*Chrysopogon fallax*\^tussock grass, hummock grass\2\c

Veg. Condition Good

Disturbance Heavy grazing by cattle

Fire Age

Notes Quadrat shaped to follow drainage

Species	WA Cons.	Height (m)	Cover (%)
Corymbia candida		6	5
Eriachne benthamii		.3	20
Acacia inaequilatera		2.5	1
Acacia pyrifolia var. *pyrifolia*		2	1
Triodia epactia		.6	10
Chrysopogon fallax		.6	2
Neptunia dimorphantha		.1	<1

Rutila

Boerhavia coccinea	.2	<1
Rhynchosia minima	Climber	<1
Indigofera linifolia	.1	<1
Polymeria ambigua	.2	<1
Mimulus gracilis	.1	<1
Evolvulus alsinoides var. *villosicalyx*	.1	<1
Triumfetta clementii	.4	<1
Alternanthera nana	.2	<1
Goodenia forrestii	.2	<1
Corchorus tectus	1.2	<1
Eragrostis xerophila	.2	<1
Dichanthium sericeum subsp. *humilius*	.2	<1
Acacia synchronicia	1.5	<1
Corchorus walcottii	.3	<1
Triodia wiseana	.4	<1
Desmodium muelleri	.1	<1
Carissa lanceolata	2	<1
* *Vachellia farnesiana*	1.6	<1
Solanum lasiophyllum	.1	<1
Indigofera trita	.2	<1
* *Cenchrus ciliaris*	.2	<1
Euphorbia australis var. *subtomentosa*	.1	<1
Solanum diversiflorum	.2	<1
Pterocaulon sphacelatum	.2	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.2	<1
Phyllanthus maderaspatensis	.2	<1
Calotis plumulifera	.1	<1
Sida fibulifera	.2	<1
Acacia bivenosa	1.3	<1
* *Malvastrum americanum*	.2	<1

R14068

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila Rail

MGA Zone 50 574734 **mE** 7696378 **mN** **Lat.** -20.8311 **Long.** 117.7183

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type River sand

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 2 % cover ; 3 cm in depth

Bare ground 80 % cover **Weeds** 2 % cover

Vegetation U+ ^*Eucalyptus victrix*\^tree\7\r;M ^*Acacia trachycarpa*,^*Acacia coriacea* subsp. *pendens*\^shrub\4\r;G ^*Triodia epactia*,^*Cenchrus ciliaris*\^hummock grass,tussock grass\2\i

Veg. Condition Very Good

Disturbance Grazing by cattle. Some weeds

Fire Age

Notes In drainage shaped to follow creek

Species	WA Cons.	Height (m)	Cover (%)
Triodia epactia		.4	15
Eucalyptus victrix		10	5
Acacia trachycarpa		3	8
Acacia coriacea subsp. *pendens*		4	2
* *Cenchrus ciliaris*		.3	2
Cyperus vaginatus		.4	<1
Senna notabilis		.2	<1
Rhynchosia minima		Climber	<1

Rutila

Crotalaria cunninghamii	1.3	<1
Cynanchum floribundum	Climber	<1
Amaranthus undulatus	.3	<1
Cleome viscosa	.3	<1
Dysphania kalpari	.1	<1
* *Malvastrum americanum*	.2	<1
Dysphania rhadinostachya subsp. *rhadinostachya*	.3	<1
Sesbania cannabina	1.3	<1
Heliotropium crispatum	.3	<1
Euphorbia coghlanii	.2	<1
Indigofera linifolia	.3	<1
Phyllanthus maderaspatensis	.2	<1
Eragrostis cumingii	.2	<1
Stemodia grossa	.5	<1
Sporobolus australasicus	.1	<1
Acacia stellaticeps	.6	<1
Pluchea rubelliflora	.4	<1
Bothriochloa ewartiana	.6	<1
Chrysopogon fallax	.7	<1
Triodia angusta	.5	<1
Eriachne obtusa	.2	<1
Goodenia lamprosperma	.3	<1
Acacia pyrifolia var. *pyrifolia*	.6	<1
Triumfetta ramosa	.6	<1
Stemodia grossa	.6	<1
Triumfetta appendiculata	.3	<1
Hybanthus aurantiacus	.2	<1
Acacia ancistrocarpa x trachycarpa	2.3	<1
Acacia colei var. *colei*	1.5	<1
Eriachne benthamii	.3	<1
Alysicarpus muelleri	.2	<1
Acacia bivenosa	1.3	<1
Corchorus tectus	1.2	<1
Indigofera monophylla	.3	<1
Synaptantha tillaeacea var. *tillaeacea*	.1	<1
Polymeria ambigua	.1	<1
Acacia ampliceps	1.2	<1
Ipomoea muelleri	Prostrate	<1
Crotalaria medicaginea var. *neglecta*	.1	<1
Fimbristylis microcarya	.4	<1
Bulbostylis barbata	.1	<1
Pterocaulon sphacelatum	.1	<1
Boerhavia coccinea	.2	<1
Crotalaria ramosissima	.2	<1
Eriachne aristidea	.2	<1
Aristida holathera var. *holathera*	.2	<1
Desmodium filiforme	.1	<1
Evolvulus alsinoides var. *villosicalyx*	.1	<1

R14069

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 571780 **mE** 7696342 **mN** **Lat.** -20.8315 **Long.** 117.6899

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock 0 % cover ; 2-6 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia wiseana*,^*Eragrostis xerophila*\^hummock grass,tussock grass\2\c

Veg. Condition Excellent

Disturbance Grazing by cattle

Fire Age

Notes

?

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		.6	45
Eragrostis xerophila		.3	2
Indigofera trita		.2	<1
Indigofera linifolia		.3	<1
Solanum lasiophyllum		.4	<1
Crotalaria medicaginea var. *neglecta*		.2	<1
Polymeria ambigua		Prostrate	<1
Fimbristylis microcarya		.3	<1
Aristida contorta		.2	<1

Rutila

Boerhavia coccinea	.2	<1
Gomphrena canescens	.3	<1
Aristida holathera var. *holathera*	.3	<1
Goodenia forrestii	.2	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.3	<1
Sida fibulifera	Prostrate	<1
Corchorus walcottii	.3	<1
Triumfetta clementii	.3	<1
Boerhavia sp.	Prostrate	<1

R14070

Staff LA/AF **Date** 17/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 577980 **mE** 7700083 **mN** **Lat.** -20.7975 **Long.** 117.7493

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clay loam with gilgais

Rock Type Mixed alluvial

Loose Rock <2 % cover ; **Litter** 2 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation G+ ^*Eragrostis xerophila*,^*Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113)\^tussock grass, vine\1\c

Veg. Condition Very Good

Disturbance Heavy grazing by cattle

Fire Age

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eragrostis xerophila		.4	35
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		.2	1
Sorghum timorense		.4	<1
Rhynchosia minima		Prostrate	<1
Dichanthium sericeum subsp. *humilius*		.4	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.2	<1
Indigofera trita		.2	<1
Sida fibulifera		.3	<1

Rutila

Goodenia pascua	.3	<1
Euphorbia coghlanii	.2	<1
Crotalaria medicaginea var. *neglecta*	.2	<1
Triodia epactia	.5	<1
Operculina aequisepala	.1	<1

R14071

Staff RD **Date** 14/07/2014 **Season** P

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 595887 **mE** 7660449 **mN** **Lat.** -21.1547 **Long.** 117.9236

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown sandy loam

Rock Type ? & quartz

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** <2 % cover ; <2 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation M ^*Acacia ancistrocarpa*\^shrub\3\r;G+ ^*Triodia lanigera*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing

Fire Age >2

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corchorus laniflorus		0.8	<1
Ptilotus astrolasius		0.4	<1
Cleome uncifera subsp. *uncifera*		0.2	<1
Pluchea tetranthera		0.2	<1
Pluchea ferdinandi-muelleri		0.5	<1
Cassytha capillaris		Creeper	<1
Duperreya commixta		Creeper	<1
Acacia inaequilatera		1	<1
Acacia ancistrocarpa		1.6	5

Rutila

Triodia lanigera	1	30
Acacia colei var. *colei*	2	<1
Isotropis atropurpurea	0.6	<1
Hakea chordophylla	1.3	<1
Acacia synchronicia	0.5	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.4	<1
Dampiera candicans	0.4	<1
Acacia stellaticeps	0.4	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	Creeper	<1

R14072

Staff SK/AF **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 595686 **mE** 7624319 **mN** **Lat.** -21.4811 **Long.** 117.9236

Habitat Mid-Slope

Aspect NW **Slope** Moderate

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground **Weeds** 0 % cover

Vegetation M ^*Acacia inaequilatera*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G+ ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		2.5	2
Triodia epactia		.5	40
Acacia pyrifolia var. *pyrifolia*		1.5	1
Triodia wiseana		.5	20
Senna artemisioides subsp. *oligophylla*		1	
Indigofera monophylla		.4	<1
Boerhavia coccinea		.3	<1

R14073

Staff SK/AF **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 597080 **mE** 7622967 **mN** **Lat.** -21.4933 **Long.** 117.9372

Habitat River

Aspect N/A **Slope** N/A

Soil Type Light brown sand

Rock Type Basalt

Loose Rock 50-90 % cover ; **Litter** 10 % cover ; 0-50cm cm in depth

Bare ground 70 % cover **Weeds** <2 % cover

Vegetation U ^*Eucalyptus victrix*\^tree\6\bi;M+ ^^*Melaleuca linophylla*,*Acacia coriacea* subsp. *pendens*, *Melaleuca glomerata*\^shrub\4\c;G ^^*Eulalia aurea*,*Cyperus vaginatus*,*Cenchrus ciliaris*\^tussock grass,sedge\2\

Veg. Condition Very Good

Disturbance Cattle

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		7	1
Melaleuca linophylla		3	30
Acacia coriacea subsp. *pendens*		4	10
Melaleuca glomerata		3	10
Eulalia aurea		.6	10
Cyperus vaginatus		.5	5
Acacia trachycarpa		1.5	<1

Rutila

Sesbania cannabina	.4	<1
Stemodia grossa	.1	<1
Flueggea virosa subsp. *melanthesoides*	.6	<1
Phyllanthus maderaspatensis	.4	<1
* *Cenchrus ciliaris*	.4	<1
* *Cenchrus ciliaris*	.5	2
Cajanus cinereus	.6	<1
Cleome viscosa	.4	<1
Pluchea rubelliflora	.3	<1
Acacia pyrifolia var. *pyrifolia*	1.5	<1
Ipomoea muelleri	.2	<1
Euphorbia australis var. *hispidula*	Prostrate	<1
Acacia ampliceps	.2	<1
Triodia epactia	.3	<1
* *Cenchrus setiger*	.3	<1
* *Setaria verticillata*	.3	<1
Nicotiana occidentalis subsp. *occidentalis*	.2	<1
Rostellularia adscendens var. *clementii*	.4	<1
Senna venusta	.4	<1
Corchorus tectus		<1
Jasminum didymum subsp. *lineare*	Climber	<1
Euphorbia coghlanii	.2	<1
Eragrostis tenellula	.3	<1
Amaranthus undulatus	.3	<1
Senna notabilis	.3	<1
Cucumis maderaspatanus	.6	<1

R14074

Staff SK/AF **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 597195 **mE** 7619567 **mN** **Lat.** -21.5240 **Long.** 117.9385

Habitat Lower-Slope

Aspect E **Slope** Gentle

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 60-200 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** <1 % cover

Vegetation M ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\bi;G+ ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Some weeds

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia pyrifolia var. *pyrifolia*		2.5	1
Triodia epactia		.6	20
Triodia wiseana		.6	15
Boerhavia coccinea		.4	<1
Indigofera monophylla		.3	<1
Mollugo molluginea		.1	<1
Grevillea pyramidalis subsp. *leucadendron*		1.2	<1
Corymbia hamersleyana		2	<1

			Rutila
	Corchorus tectus		<1
	Bonamia sp. Dampier (A.A. Mitchell PRP 217)	.1	<1
	Senna notabilis	.4	<1
*	*Aerva javanica*	.6	<1
	Eriachne mucronata	.2	<1
	Cassytha capillaris	Climber	<1
	Goodenia stobbsiana	.1	<1

R14075

Staff JKN **Date** 29/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location

MGA Zone 50 594934 **mE** 7618357 **mN** **Lat.** -21.5350 **Long.** 117.9167

Habitat Creek

Aspect N **Slope** Very Gentle

Soil Type Brown loamy sand

Rock Type Basalt

Loose Rock 2-10 % cover ; 600 mm in size **Litter** 4 % cover ; 1 - 2 cm cm in depth

Bare ground 60 % cover **Weeds** 4 % cover

Vegetation U+ ^*Eucalyptus camaldulensis* subsp. *refulgens*,*Eucalyptus victrix*\^tree\7\r;M ^*Melaleuca linophylla*,^*Melaleuca glomerata*,*Acacia trachycarpa*\^shrub\3\r;G ^^*Triodia epactia*,*Cyperus vaginatus*,*Cynodon dactylon*\^hummock grass,sedge,other grass\2\i

Veg. Condition Very Good

Disturbance Cattle, weeds

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*		14	8
Melaleuca linophylla		1.8	4
Melaleuca glomerata		1.8	3
Cyperus vaginatus		0.8	4
* *Cynodon dactylon*		0.05	2
Euphorbia australis var. *subtomentosa*		0.05	<1
Euphorbia australis var. *subtomentosa*			<1

Rutila

Acacia coriacea subsp. *pendens*	3	<1
Cullen leucanthum	0.05	<1
Pluchea rubelliflora		<1
Stemodia grossa	0.3	<1
Ammannia baccifera	0.1	<1
Senna notabilis	0.4	<1
Cleome viscosa	0.3	<1
Sida rohlenae subsp. *rohlenae*	0.3	<1
Crotalaria medicaginea var. *neglecta*	0.15	<1
Boerhavia sp.	0.05	<1
Acacia trachycarpa	2	2
Polymeria ambigua	0.05	<1
* *Malvastrum americanum*	0.15	<1
Eragrostis tenellula	0.1	<1
Sesbania cannabina	0.3	<1
* *Cenchrus ciliaris*	0.1	<1
Cajanus cinereus		<1
Rhynchosia minima	Climber	<1
Eucalyptus victrix	8	1
Gossypium australe	0.4	<1
Acacia pyrifolia var. *pyrifolia*	0.4	<1
Indigofera monophylla	0.1	<1
Phyllanthus maderaspatensis	0.2	<1
Flueggea virosa subsp. *melanthesoides*	2	<1
Cymbopogon procerus	0.7	<1
Eulalia aurea	0.6	<1
Gossypium robinsonii	2	<1
Indigofera colutea		<1
Acacia ampliceps	0.4	<1
Ipomoea muelleri	Climber	<1
Euphorbia coghlanii	0.2	<1
Triodia epactia	0.6	4
Eriachne tenuiculmis	0.3	<1

R14076

Staff JKN **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolawanyah - Boolgeeda land system

MGA Zone 50 573285 **mE** 7588942 **mN** **Lat.** -21.8018 **Long.** 117.7090

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 6-20 mm in size **Litter** 5 % cover ; <1 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia deserticola* subsp. *deserticola*\^tree\6\r;M+ ^*Acacia atkinsiana*,*Grevillea wickhamii* subsp. *hispidula*,*Acacia trachycarpa* (dwarf variant)\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia deserticola subsp. *deserticola*		5	2
Acacia atkinsiana		4.5	25
Grevillea wickhamii subsp. *hispidula*		4	2
Triodia epactia		0.4	45
Acacia trachycarpa (dwarf variant)		1.6	2
Acacia tenuissima		2.2	1
Dodonaea coriacea		1.8	<1

Rutila

Acacia tumida var. *pilbarensis*	4	1
Aristida holathera var. *holathera*	0.3	<1
Indigofera monophylla	0.5	<1
Scaevola parvifolia subsp. *pilbarae*	0.2	<1
Ptilotus calostachyus	0.4	<1
Goodenia stobbsiana	0.3	<1
Acacia ancistrocarpa	2.2	<1
Keraudrenia nephrosperma	0.4	<1

R14077

Staff JKN **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 594254 **mE** 7615428 **mN** **Lat.** -21.5615 **Long.** 117.9103

Habitat Crest

Aspect N **Slope** Gentle

Soil Type Red brown light clay

Rock Type Basalt

Loose Rock 50-90 % cover ; 60-200 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 45 % cover **Weeds** Nil % cover

Vegetation G+ ^*Triodia wiseana*,*Triodia brizoides*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance No obvious signs

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia wiseana		0.4	40
Triodia brizoides		0.3	2
Pterocaulon sphaeranthoides		0.2	<1
Corymbia hamersleyana		4	<1
Tinospora smilacina		Climber	<1
Indigofera monophylla		0.6	<1
Cullen leucochaites		2.3	<1
Cajanus cinereus		1.3	<1
Swainsona stenodonta		1.5	<1

Rutila

Acacia pyrifolia var. *pyrifolia*	0.6	<1

R14078

Staff JKN **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 592911 **mE** 7615908 **mN** **Lat.** -21.5573 **Long.** 117.8973

Habitat Mid-Slope

Aspect SE **Slope** Moderate

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** Nil % cover

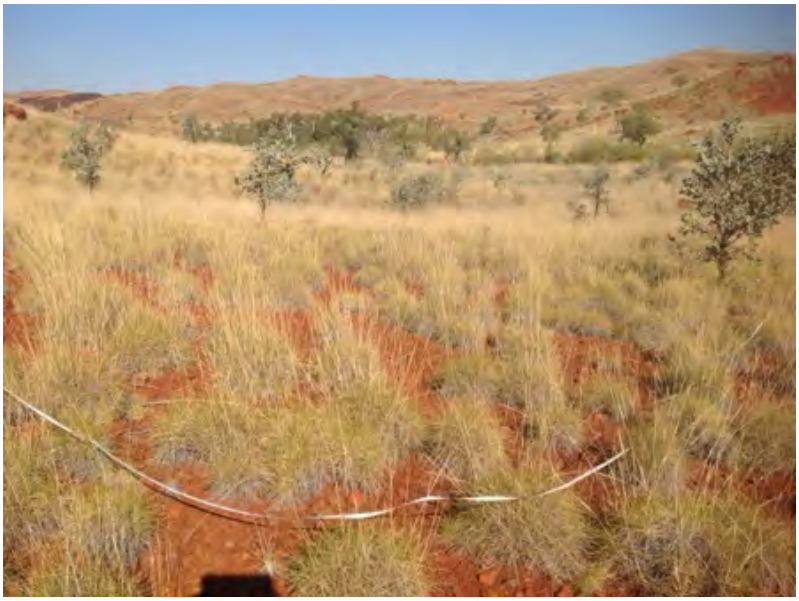
Vegetation M ^*Acacia inaequilatera*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G+ ^*Triodia wiseana*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance Minimal

Fire Age >5 years

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	1
Triodia wiseana		0.4	25
Indigofera monophylla		0.2	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1
Corchorus tectus		0.4	<1
Boerhavia coccinea		0.15	<1
Solanum lasiophyllum		0.4	<1
Mollugo molluginea		0.15	<1

		Rutila
Corymbia hamersleyana	5	<1
Triodia epactia	0.4	<1
Acacia pyrifolia var. *pyrifolia*	4	1
Grevillea pyramidalis subsp. *leucadendron*	0.4	<1
Hakea lorea subsp. *lorea*	4	<1
Senna glutinosa subsp. *glutinosa*	1.8	<1
Goodenia stobbsiana	0.3	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.05	<1
Tribulus platypterus	0.5	<1

R14079

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Nunyerry River

MGA Zone 50 592065 **mE** 7614611 **mN** **Lat.** -21.5690 **Long.** 117.8892

Habitat River

Aspect N/A **Slope** N/A

Soil Type Coarse brown sand

Rock Type Some granite outcropping

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 5 % cover ; 3 cm cm in depth

Bare ground 85 % cover **Weeds** <1 % cover

Vegetation U+ ^*Melaleuca argentea*\^tree\7\c;M ^*Acacia coriacea* subsp. *pendens*,*Acacia trachycarpa*, *Melaleuca glomerata*\^shrub\4\r;G ^*Cyperus vaginatus*,^*Stemodia grossa*,*Cymbopogon procerus*\^sedge,forb,tussock grass\2\r

Veg. Condition Excellent

Disturbance Minor cattle

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Melaleuca argentea		16	40
Acacia coriacea subsp. *pendens*		5	2
Cyperus vaginatus		0.8	5
Stemodia grossa		0.3	1
Triodia epactia		0.4	<1
Ipomoea muelleri		0.05	<1
Cajanus cinereus		0.6	<1

Rutila

Cymbopogon procerus	0.6	1
Acacia trachycarpa	3	2
Acacia pyrifolia var. *pyrifolia*	2	<1
Triumfetta propinqua	0.5	<1
Ammannia baccifera	0.1	<1
Hybanthus aurantiacus	0.3	<1
Phyllanthus maderaspatensis	0.3	<1
Sida rohlenae subsp. *rohlenae*	0.3	<1
Euphorbia schultzii	0.2	<1
Cleome viscosa	0.05	<1
Polycarpaea longiflora	0.2	<1
Boerhavia coccinea	0.3	<1
Grevillea pyramidalis subsp. *leucadendron*	2.2	<1
Terminalia canescens	2.5	<1
Tribulus platypterus	0.4	<1
Eriachne tenuiculmis	0.3	<1
Petalostylis labicheoides	2	<1
Flueggea virosa subsp. *melanthesoides*	2	<1
Senna notabilis	0.3	<1
Melaleuca glomerata	2.1	1
Melaleuca linophylla	1.5	<1
Acacia ampliceps	2	<1
Crotalaria medicaginea var. *neglecta*	0.3	<1
Trachymene oleracea subsp. *oleracea*	0.2	<1
Euphorbia coghlanii	0.3	<1
Eucalyptus victrix	5	<1
Eucalyptus camaldulensis subsp. *refulgens*	4	<1
Trichodesma zeylanicum var. *zeylanicum*	0.2	<1
Sesbania cannabina	2	<1
Pluchea rubelliflora	0.3	<1
Nicotiana occidentalis subsp. *occidentalis*	0.1	<1
Stylidium fluminense	0.15	<1
Eleocharis geniculata	0.1	<1
Polymeria ambigua	0.15	<1
Enneapogon lindleyanus	0.4	<1
Corchorus tectus	0.5	<1
Eulalia aurea	0.5	<1

R14080

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 591293 **mE** 7613638 **mN** **Lat.** -21.5779 **Long.** 117.8818

Habitat Flat

Aspect W **Slope** Very Gentle

Soil Type Brown clay loam

Rock Type N/a

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 5 % cover ; 1 - 2 cm cm in depth

Bare ground 40 % cover **Weeds** Nil % cover

Vegetation M+ ^^*Acacia pyrifolia* var. *pyrifolia*,*Acacia trachycarpa*,*Grevillea pyramidalis* subsp. *leucadendron*\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Very Good

Disturbance Minor cattle

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia pyrifolia var. *pyrifolia*		3	5
Acacia trachycarpa		4	5
Grevillea pyramidalis subsp. *leucadendron*		3.5	2
Triodia epactia		0.4	50
Indigofera monophylla		0.5	<1
Petalostylis labicheoides		2.2	<1
Euphorbia australis var. *subtomentosa*		0.1	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1

		Rutila
Mollugo molluginea	0.2	<1
Gossypium australe	1.5	<1
Triumfetta clementii	0.3	<1
Corchorus tectus	0.2	<1

R14081

Staff SK/AF **Date** 4/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila Rail

MGA Zone 50 552786 **mE** 7555824 **mN** **Lat.** -22.1017 **Long.** 117.5117

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Mixed alluvial

Loose Rock >90% cover ; 20-60 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** <1% cover

Vegetation U ^*Eucalyptus victrix*\^tree\6\bi;M ^^*Grevillea wickhamii*,*Acacia tumida* var. *pilbarensis*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\bi;G+ ^^*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186),*Heliotropium cunninghamii*,*Triodia epactia*\^shrub,hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle grazing, some weeds

Fire Age >5

Notes Area immediately adjacent to the east has recently been burnt

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		8	1
Grevillea wickhamii		3	1
Acacia tumida var. *pilbarensis*		3	<1
Acacia pyrifolia var. *pyrifolia*		3	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		.7	8
Heliotropium cunninghamii		.2	5
Triodia epactia		.6	2

Rutila

Boerhavia coccinea	.2	<1
Aristida contorta	.3	<1
* *Cenchrus ciliaris*	.5	<1
Eriachne pulchella subsp. *dominii*	.2	<1
Stemodia grossa	.5	<1
Cleome viscosa	.5	<1
Indigofera monophylla	.5	<1
Pterocaulon sphacelatum	.5	<1
Senna artemisioides subsp. *oligophylla*	.5	<1
Hybanthus aurantiacus	.5	<1
Ptilotus astrolasius	.4	<1
Goodenia lamprosperma	.4	<1
Polycarpaea longiflora	.3	<1
Cucumis maderaspatanus	.3	<1
Phyllanthus maderaspatensis	.4	<1
Waltheria indica	.6	<1
Enneapogon lindleyanus	.5	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)	.5	<1
Gomphrena cunninghamii	.2	<1
Trichodesma zeylanicum var. *zeylanicum*	.1	<1
Cymbopogon procerus	.4	<1
Corchorus lasiocarpus subsp. *parvus*	.8	<1
Digitaria brownii	.4	<1
Corchorus crozophorifolius	.6	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	1	<1
Euphorbia australis var. *subtomentosa*	.1	<1

R14082

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Chichester

MGA Zone 50 591305 **mE** 7612392 **mN** **Lat.** -21.5891 **Long.** 117.8820

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Light brown sand

Rock Type Granite

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 - 2 cm cm in depth

Bare ground 70 % cover **Weeds** Nil % cover

Vegetation U ^*Eucalyptus victrix*\^tree\6\r;M+ ^*Acacia trachycarpa*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\c;G ^*Triodia epactia*,*Cymbopogon procerus*\^hummock grass,tussock grass\1\i

Veg. Condition Excellent

Disturbance Cattle

Fire Age >5 years

Notes Linear transect 12.5 m either side of central line down creek bed

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		8	2
Acacia trachycarpa		5	25
Acacia pyrifolia var. *pyrifolia*		4	5
Triodia epactia		0.5	15
Cymbopogon procerus		0.4	2
Cajanus cinereus		1.5	<1
Phyllanthus maderaspatensis		0.2	<1
Senna notabilis		0.4	<1

Rutila

Sida rohlenae subsp. *rohlenae*	0.4	<1
Triumfetta propinqua	0.2	<1
Cucumis maderaspatanus	Climber	<1
Bonamia erecta	0.3	<1
Hybanthus aurantiacus	0.1	<1
Euphorbia australis var. *subtomentosa*	0.1	<1
Corymbia hamersleyana	7	<1
Cyperus vaginatus	0.5	<1
Cleome viscosa	0.3	<1
Polymeria ambigua	0.1	<1
Boerhavia sp.	0.05	<1
Solanum phlomoides	0.1	<1
Nicotiana occidentalis subsp. *occidentalis*	0.05	<1
Crotalaria medicaginea var. *neglecta*	0.4	<1
Pterocaulon sphaeranthoides	0.1	<1
Solanum horridum	0.1	<1
Euphorbia coghlanii	0.3	<1
Gossypium australe	0.6	<1
Trichodesma zeylanicum var. *zeylanicum*	0.2	<1
Corchorus tectus	0.4	<1
Paspalidium clementii	0.05	<1
Cassytha capillaris	Climber	<1
Goodenia forrestii	0.2	<1
Euphorbia sp.	0.3	<1
Mollugo molluginea	0.1	<1
Grevillea pyramidalis subsp. *leucadendron*	4	<1

R14083

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 590218 **mE** 7610287 **mN** **Lat.** -21.6082 **Long.** 117.8716

Habitat Lower-Slope

Aspect NW **Slope** Moderate

Soil Type Red brown loam

Rock Type Basalt, some granite

Loose Rock >90% cover ; **Litter** <1 % cover ; <1 cm in depth

Bare ground 75% cover **Weeds** Nil% cover

Vegetation M ^*Acacia inaequilatera*\^shrub\4\bi;G+ ^*Triodia wiseana*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	1
Triodia wiseana		0.4	25
Boerhavia coccinea		0.3	<1
Indigofera monophylla		0.3	<1
Corchorus tectus		0.5	<1
Ptilotus astrolasius		0.5	<1
Senna glutinosa subsp. *pruinosa*		1.6	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1
Tribulus platypterus		0.5	<1

		Rutila
Trichodesma zeylanicum var. *zeylanicum*	0.7	<1
Cullen leucochaites	3	<1
Tephrosia sp. Fortescue (A.A. Mitchell 606)	1.5	<1

R14084

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 590883 **mE** 7609388 **mN** **Lat.** -21.6163 **Long.** 117.8781

Habitat Crest

Aspect SE **Slope** Gentle

Soil Type Brown loam

Rock Type Granite

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^^*Grevillea pyramidalis* subsp. *leucadendron*,*Acacia trudgeniana*,*Acacia inaequilatera*\^shrub\4\bi;G ^*Triodia wiseana*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		4	1
Grevillea pyramidalis subsp. *leucadendron*		2.2	1
Acacia trudgeniana		1.7	1
Triodia wiseana		.6	25
Triodia epactia		.6	15
Eriachne pulchella subsp. *dominii*		.1	<1
Swainsona stenodonta		1	<1

Rutila

Goodenia stobbsiana	.1	<1
Cullen leucochaites	.6	<1
Acacia inaequilatera	1.5	<1
Cassytha capillaris	Climber	<1
Indigofera monophylla	.4	<1

R14085

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 589647 **mE** 7609091 **mN** **Lat.** -21.6190 **Long.** 117.8662

Habitat River

Aspect N/A **Slope** N/A

Soil Type Brown sandy clay

Rock Type Granitic

Loose Rock 2-10 % cover ; 20-60 mm in size **Litter** 15 % cover ; 2 cm in depth

Bare ground 70 % cover **Weeds** <1 % cover

Vegetation U+ ^*Melaleuca argentea*,^*Eucalyptus camaldulensis* subsp. *refulgens*\^tree\7\c;M ^*Melaleuca glomerata*,^*Acacia ampliceps*\^shrub\4\bi;G ^*Cyperus vaginatus*\^sedge\2\i

Veg. Condition Excellent

Disturbance Grazing by cattle

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Melaleuca argentea		15	40
Eucalyptus camaldulensis subsp. *refulgens*		20	5
Melaleuca glomerata		2	1
Acacia ampliceps		2	1
Cyperus vaginatus		.7	25
Stemodia grossa		.2	<1
Lobelia arnhemiaca			<1
Eleocharis geniculata		.1	<1

Rutila

Typha domingensis	1.5	<1
Sesbania cannabina	.4	<1
Pluchea rubelliflora	.2	<1
Acacia coriacea subsp. *pendens*	2	<1
Myriophyllum verrucosum	Aquatic	<1
Cajanus cinereus	.4	<1
Melaleuca bracteata	1.6	<1
* *Cenchrus ciliaris*	.1	<1
Gossypium robinsonii	2	<1

R14086

Staff SK/AF **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 567106 **mE** 7580724 **mN** **Lat.** -21.8763 **Long.** 117.6495

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loam

Rock Type Mixed alluvial

Loose Rock 2-10 % cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

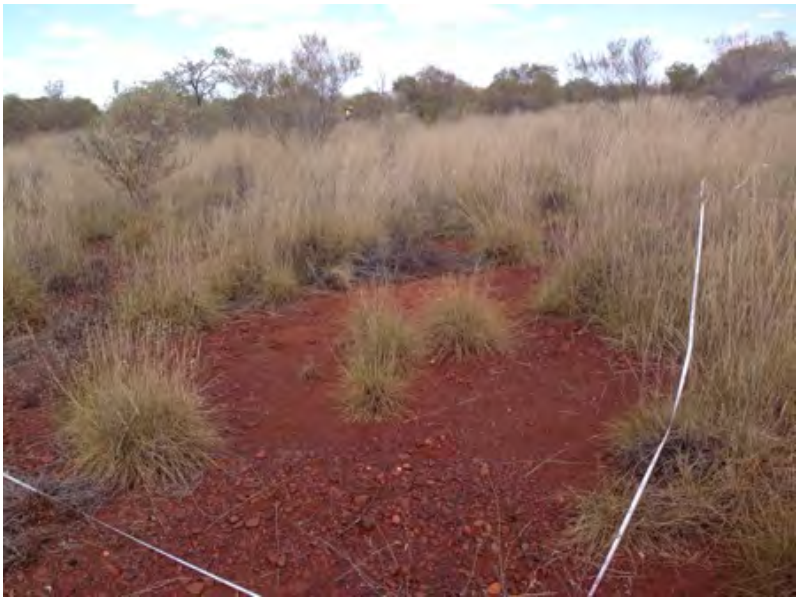
Vegetation M+ ^^*Acacia citrinoviridis*,*Acacia pruinocarpa*,*Acacia inaequilatera*\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Grazing by cattle

Fire Age >5

Notes



Species	WA Cons.	Height (m)	Cover (%)
Acacia citrinoviridis		4	10
Acacia pruinocarpa		3	1
Acacia inaequilatera		4	1
Triodia epactia		.6	40
Stemodia grossa		.6	<1
Cucumis maderaspatanus		1	<1
Hakea lorea subsp. *lorea*		2	<1
Acacia pyrifolia var. *pyrifolia*		2	<1

Rutila

Grevillea wickhamii	2	<1
Acacia ancistrocarpa	1.8	1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.5	<1
Eulalia aurea	.8	<1
Chrysopogon fallax	.6	<1
Aristida latifolia	.7	<1
Indigofera monophylla	.8	<1
Corchorus tectus	.8	<1
Pterocaulon sphacelatum	.5	<1
Acacia tetragonophylla	1.2	<1
Rhynchosia minima	Climber	<1
Gossypium australe	.5	<1
Senna glutinosa subsp. *glutinosa*	2	<1

R14087

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 591137 **mE** 7606597 **mN** **Lat.** -21.6415 **Long.** 117.8807

Habitat Low Undulating Hills

Aspect N **Slope** Very Gentle

Soil Type Brown loam

Rock Type Granite

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia inaequilatera*,^*Grevillea pyramidalis* subsp. *leucadendron*\^shrub\4\bi;G ^*Triodia wiseana*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		4	1
Grevillea pyramidalis subsp. *leucadendron*		2	1
Acacia inaequilatera		2	1
Triodia wiseana		.6	25
Triodia epactia		.6	5
Swainsona stenodonta		1	<1
Eriachne pulchella subsp. *dominii*		.1	<1
Fimbristylis dichotoma		.2	<1

Rutila

Senna glutinosa subsp. *glutinosa*	1.4	<1
Aristida holathera var. *holathera*	.2	<1
Mollugo molluginea	.2	<1

R14088

Staff JKN **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 590260 **mE** 7601140 **mN** **Lat.** -21.6908 **Long.** 117.8725

Habitat Crest

Aspect W **Slope** Gentle

Soil Type Red brown clay loam

Rock Type Granite

Loose Rock 20-50 % cover ; 60-200 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 35 % cover **Weeds** Nil % cover

Vegetation U ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\bi;M+ ^*Acacia tumida* var. *pilbarensis*, ^*Acacia* sp.\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance

Fire Age 3 - 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	1
Acacia tumida var. *pilbarensis*		4.5	4
Acacia sp.		3	2
Triodia epactia		0.4	60
Grevillea wickhamii		2	<1
Petalostylis labicheoides		2	<1
Eriachne mucronata		0.3	<1
Dampiera candicans		0.5	<1

Rutila

Solanum horridum	0.26	<1
Goodenia stobbsiana	0.4	<1

R14089

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila rail

MGA Zone 50 591267 **mE** 7604120 **mN** **Lat.** -21.6639 **Long.** 117.8821

Habitat Creek

Aspect N **Slope** Very Gentle

Soil Type Brown sand

Rock Type Granite

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 15 % cover ; 0-20cm cm in depth

Bare ground 85 % cover **Weeds** 0 % cover

Vegetation U+ ^^*Eucalyptus camaldulensis* subsp. *refulgens*,*Eucalyptus victrix*,*Acacia coriacea* subsp. *pendens*\^tree\7\i;M ^^*Melaleuca glomerata*,*Melaleuca linophylla*,*Acacia trachycarpa*\^shrub\4\i;G ^^*Cyperus vaginatus*,*Triodia epactia*,*Eriachne tenuiculmis*\^sedge,hummock grass,other grass\2\i

Veg. Condition Excellent

Disturbance Cattle

Fire Age >10 years

Notes Nearby are some large permanent waterholes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*		15	15
Eucalyptus victrix		10	5
Acacia coriacea subsp. *pendens*		10	5
Melaleuca glomerata		4	10
Melaleuca linophylla		3	5
Cyperus vaginatus		1	5
Acacia pyrifolia var. *pyrifolia*		1.5	<1

Rutila

Acacia trachycarpa	3	5
Cajanus cinereus	1	<1
Triodia epactia	.5	4
Senna notabilis	.5	<1
Cymbopogon procerus	1.5	<1
Stemodia grossa	1	<1
Eriachne tenuiculmis	.5	3
Phyllanthus maderaspatensis		<1
Jasminum didymum subsp. *lineare*	1	<1
Gossypium robinsonii	2	<1
Pluchea rubelliflora	.3	<1
Pluchea dentex	.2	<1
Senna venusta	1	<1
Sesbania cannabina	1	<1
Cleome viscosa	.5	<1
Ammannia baccifera	.5	<1
Atalaya hemiglauca	3	<1
Ehretia saligna var. *saligna*	3	<1
Euphorbia biconvexa	.5	<1
Euphorbia schultzii	.4	<1
Sida rohlenae subsp. *rohlenae*	.4	<1
Crotalaria medicaginea var. *neglecta*	.3	<1
Gossypium australe	.6	<1
Tinospora smilacina	.5	<1
Ipomoea muelleri	.2	<1

R14090

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 590222 **mE** 7604148 **mN** **Lat.** -21.6636 **Long.** 117.8720

Habitat Mid slope of moderate undulating hills

Aspect N **Slope** Moderate

Soil Type Red brown sandy loam

Rock Type Granite

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 4 % cover ; 0-5 cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

Vegetation U+ ^*Acacia* sp.\^tree\6\bi;M ^^*Grevillea pyramidalis* subsp. *leucadendron*,*Acacia inaequilatera*\^shrub\4\r;G ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia sp.		3	1
Acacia sp.		3	1
Acacia inaequilatera		2	1
Grevillea pyramidalis subsp. *leucadendron*		3	1
Triodia epactia		.5	25
Triodia wiseana		.5	5
Mollugo molluginea		.2	<1
Fimbristylis dichotoma		.1	<1

		Rutila
Grevillea wickhamii	2.5	<1
Goodenia stobbsiana	.5	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	.2	<1
Dampiera candicans	.5	<1
Eriachne mucronata	.4	<1
Tephrosia virens	1	<1
Indigofera monophylla	.5	<1
Solanum phlomoides	.3	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1

R14091

Staff SK/AF **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 590445 **mE** 7602477 **mN** **Lat.** -21.6787 **Long.** 117.8742

Habitat Low undulating hills

Aspect SW **Slope** Very Gentle

Soil Type Brown loam

Rock Type Granite

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^^*Acacia* sp.,*Acacia inaequilatera*,*Grevillea wickhamii*\^shrub\4\r;G ^*Triodia* aff. *melvillei*,^*Triodia epactia*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	1
Acacia sp.		3	2
Acacia inaequilatera		2.5	1
Grevillea wickhamii		2.1	1
Triodia aff. *melvillei*		.6	20
Triodia epactia		.6	10
Acacia maitlandii		1.5	<1
Senna glutinosa subsp. *glutinosa*		1.5	<1

Rutila

Goodenia stobbsiana	.4	<1
Acacia trachycarpa	1.5	<1
Fimbristylis dichotoma	.1	<1
Eriachne pulchella subsp. *dominii*	.1	<1
Indigofera monophylla	.5	<1
Triodia wiseana	.5	<1
Pluchea tetranthera	.2	<1
Solanum phlomoides	.3	<1
Mollugo molluginea	.1	<1

R14092

Staff JKN **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 589430 **mE** 7601340 **mN** **Lat.** -21.6891 **Long.** 117.8645

Habitat Upper-Slope

Aspect SE **Slope** Moderate

Soil Type Brown loam

Rock Type Mixed

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M+ ^*Acacia* sp.,^*Acacia inaequilatera*\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		5.5	1
Acacia sp.		2.2	2
Triodia epactia		0.4	45
Acacia inaequilatera		4	1
Senna glutinosa subsp. *pruinosa*		1.7	<1
Indigofera monophylla		0.5	<1
Grevillea wickhamii subsp. *hispidula*		2.2	<1
Senna glutinosa subsp. *glutinosa*		1.6	<1

		Rutila
Cheilanthes brownii	0.05	<1
Gossypium australe	0.5	<1
Cymbopogon ambiguus	0.4	<1
Eriachne mucronata	0.25	<1
Cullen leucochaites	2.1	<1
Hakea lorea subsp. *lorea*	0.4	<1
Triodia wiseana	0.4	<1

R14093

Staff SK/AF **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 551004 **mE** 7557038 **mN** **Lat.** -22.0908 **Long.** 117.4944

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^*Acacia ancistrocarpa*\^shrub\4\r;G ^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Minor cattle evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	3
Acacia ancistrocarpa		3	2
Triodia wiseana		.6	35
Triodia epactia		.5	1
Hakea chordophylla		1	<1
Acacia adoxa var. *adoxa*		.5	<1
Senna glutinosa subsp. *glutinosa*		1.5	<1
Senna glutinosa subsp. *pruinosa*		1.5	<1

Rutila

Acacia maitlandii	2	<1
Acacia elachantha	2	<1
Eucalyptus gamophylla	2	<1
Jasminum didymum subsp. *lineare*	Climber	<1
Senna symonii	1	<1

R14094

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Chichester

MGA Zone 50 586837 **mE** 7599812 **mN** **Lat.** -21.7030 **Long.** 117.8395

Habitat River

Aspect N/A **Slope** N/A

Soil Type Brown sand

Rock Type

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** 10 % cover ; 1 - 2 cm in depth

Bare ground 25 % cover **Weeds** <1 % cover

Vegetation U+ ^*Eucalyptus camaldulensis* subsp. *refulgens*,^*Eucalyptus victrix*\^tree\7\i;M ^^*Acacia coriacea* subsp. *pendens*,*Acacia tumida* var. *pilbarensis*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\i;G ^*Cymbopogon procerus*,^*Cyperus vaginatus*,*Triodia epactia*\^tussock grass,sedge,hummock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus camaldulensis subsp. *refulgens*		18	20
Eucalyptus victrix		16	10
Acacia coriacea subsp. *pendens*		4	10
Acacia tumida var. *pilbarensis*		3.5	5
Acacia pyrifolia var. *pyrifolia*		3	5
Cymbopogon procerus		0.6	20

		Rutila
Cyperus vaginatus	0.6	10
Trichodesma zeylanicum var. *zeylanicum*	0.5	<1
Stemodia grossa	0.3	<1
Senna notabilis	0.1	<1
Gossypium australe	1.5	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1
Acacia monticola	2	<1
Grevillea pyramidalis subsp. *leucadendron*	2	<1
Flueggea virosa subsp. *melanthesoides*	2.2	<1
Sida rohlenae subsp. *rohlenae*	0.4	<1
Hybanthus aurantiacus	0.5	<1
Phyllanthus maderaspatensis	0.2	<1
Brachychiton acuminatus	1.5	<1
Santalum lanceolatum	1	<1
Hakea lorea subsp. *lorea*	2	<1
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	1.5	<1
Ammannia baccifera	0.3	<1
Sesbania cannabina	1.2	<1
Phyllanthus reticulatus	2	<1
Lobelia arnhemiaca	0.1	<1
Corchorus tectus	0.5	<1
Acacia trachycarpa	1.8	<1
Solanum diversiflorum	0.4	<1
Cajanus cinereus	0.6	<1
Corymbia hamersleyana	6	<1
Tinospora smilacina	Climber	<1
Clerodendrum floribundum var. *angustifolium*	0.5	<1
Ehretia saligna var. *saligna*		<1
Enneapogon lindleyanus	0.5	<1
Triodia epactia	0.5	2
Rhynchosia minima		<1
Triumfetta clementii	0.5	<1
Crotalaria medicaginea var. *neglecta*	0.4	<1
Jasminum didymum subsp. *lineare*	1	<1
Acacia bivenosa	1.5	<1
* *Malvastrum americanum*	0.3	<1
Gossypium robinsonii	2	<1
Indigofera colutea	0.3	<1
Senna artemisioides subsp. *oligophylla*	1.6	<1
Eulalia aurea	0.5	<1
Indigofera monophylla	0.4	<1
Solanum phlomoides		<1
Euphorbia australis var. *subtomentosa*	0.1	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.4	<1
Eremophila longifolia	1.5	<1

Rutila

R14095

Staff JKN **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 587431 **mE** 7599275 **mN** **Lat.** -21.7078 **Long.** 117.8453

Habitat Upper-Slope

Aspect SW **Slope** Moderate

Soil Type Brown clay loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 60 % cover **Weeds** Nil % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^*Acacia* sp.\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	2
Acacia sp.		2.3	6
Triodia epactia		0.4	40
Ptilotus calostachyus		0.6	<1
Goodenia stobbsiana		0.3	<1
Eriachne mucronata		0.4	<1
Grevillea wickhamii subsp. *hispidula*		2.2	<1
Corymbia hamersleyana		7	<1

		Rutila
Dampiera candicans	0.5	<1
Senna glutinosa subsp. *glutinosa*	1.3	<1
Dodonaea coriacea	1.6	<1
Mollugo molluginea	0.05	<1
Senna glutinosa subsp. *pruinosa*	1.8	<1
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	1.6	<1

R14096

Staff SK/AF **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583503 **mE** 7596997 **mN** **Lat.** -21.7286 **Long.** 117.8074

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Basalt

Loose Rock 20-50 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 65 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia inaequilatera*\^shrub\4\r;G ^*Triodia wiseana*,^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		3	3
Triodia wiseana		.6	20
Triodia epactia		.5	20
Acacia elachantha		1.5	<1
Evolvulus alsinoides var. *villosicalyx*		.1	<1
Gossypium australe		1.5	<1
Cucumis maderaspatanus		.2	<1
Pterocaulon sphacelatum		.4	<1
Eriachne pulchella subsp. *dominii*		.1	<1

Rutila

Boerhavia coccinea	.3	<1
Indigofera monophylla	.5	<1
Senna glutinosa subsp. x *luerssenii*	1.5	<1
Swainsona formosa	.3	<1
Cassytha capillaris	Climber	<1
Grevillea pyramidalis subsp. *leucadendron*	1	<1
Acacia monticola	.8	<1
Ptilotus calostachyus	.7	<1
Clerodendrum floribundum var. *angustifolium*	2	<1
Goodenia stobbsiana	.2	<1
Senna glutinosa subsp. *pruinosa*	1.5	<1
Solanum phlomoides	.5	<1
Ptilotus fusiformis	.2	<1
Acacia ancistrocarpa	.5	<1
Triumfetta maconochieana	.5	<1
Polygala glaucifolia	.1	<1
Trichodesma zeylanicum var. *zeylanicum*	1.5	<1

R14097

Staff SK/AF **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 584269 **mE** 7598390 **mN** **Lat.** -21.7160 **Long.** 117.8148

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 85 % cover **Weeds** <1 % cover

Vegetation G+ ^^*Streptoglossa bubakii*,*Neptunia dimorphantha*,*Sida fibulifera*\^shrub\1\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Streptoglossa bubakii		.3	10
Neptunia dimorphantha		.2	5
Sida fibulifera		.2	5
Brachyachne convergens		.3	<1
Senna artemisioides subsp. *oligophylla*		.2	<1
Aristida latifolia		.3	2
Boerhavia sp.		.1	<1
Abutilon malvifolium		.2	<1
Sida spinosa		.2	<1

Rutila

Crotalaria dissitiflora subsp. *benthamiana*	.1	<1
Cullen cinereum	.1	<1
Stemodia kingii	.2	<1
Panicum laevinode	.1	<1
* *Malvastrum americanum*	.2	<1
Ipomoea lonchophylla	.1	<1
Rhynchosia minima	Prostrate	<1
Ptilotus carinatus	.2	<1
Ptilotus gomphrenoides	.2	<1
Dichanthium sericeum subsp. *humilius*	.1	<1
Phyllanthus maderaspatensis	.1	<1
Ptilotus nobilis subsp. *nobilis*	.2	<1

R14098

Staff SK/AF **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 584001 **mE** 7598114 **mN** **Lat.** -21.7185 **Long.** 117.8122

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Basalt

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** <1 % cover

Vegetation M+ ^*Acacia xiphophylla*\^shrub\4\i;G ^^*Streptoglossa bubakii*,*Stemodia kingii*,*Sida fibulifera*\^shrub\1\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia xiphophylla		4	15
Streptoglossa bubakii		.2	10
Stemodia kingii		.3	5
Sida fibulifera		.3	2
Hibiscus brachysiphonius		Prostrate	<1
Abutilon malvifolium		.2	<1
Phyllanthus maderaspatensis		.2	<1
Ptilotus gomphrenoides		.1	<1

		Rutila
Crotalaria dissitiflora subsp. *benthamiana*	.1	<1
Senna hamersleyensis	.4	<1
Ptilotus carinatus	.1	<1
Boerhavia repleta	.3	<1
Rhynchosia minima	Prostrate	<1
Sida spinosa	.2	<1
Portulaca oleracea	.1	<1
Lotus sp.	.3	<1
Jasminum didymum subsp. *lineare*	.6	<1
* *Malvastrum americanum*	.4	<1

R14099

Staff SK/AF **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583632 **mE** 7598007 **mN** **Lat.** -21.7194 **Long.** 117.8086

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Basalt

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** <1 % cover

Vegetation G+ ^^*Streptoglossa bubakii*,*Sida fibulifera*,*Stemodia kingii*\^shrub\1\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Streptoglossa bubakii		.3	15
Sida fibulifera		.3	5
Stemodia kingii		.4	2
Senna hamersleyensis		.3	<1
Neptunia dimorphantha		.1	<1
Phyllanthus maderaspatensis		.2	<1
Sida spinosa		.2	<1
Lotus sp.		.2	<1
Brachyachne convergens		.3	2

Rutila

Rostellularia adscendens var. *clementii*	.1	<1
Aristida latifolia	.5	1
Rhynchosia minima	Prostrate	<1
Boerhavia paludosa	.3	<1
Senna ?glaucifolia	.4	<1
Panicum laevinode	.5	<1
* *Cucumis melo* subsp. *agrestis*	.1	<1
Hibiscus brachysiphonius	Prostrate	<1

R14100

Staff SK/AF **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583799 **mE** 7597818 **mN** **Lat.** -21.7211 **Long.** 117.8102

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 95 % cover **Weeds** 0 % cover

Vegetation M+ ^*Acacia xiphophylla*\^shrub\4\c;G ^^*Triodia wiseana*,*Triodia epactia*,*Sporobolus actinocladus*\^hummock grass,tussock grass\1\bi

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia xiphophylla		3	40
Triodia wiseana		.4	1
Triodia epactia		.4	<1
Sporobolus actinocladus		.4	<1
Senna hamersleyensis		.4	<1
Sida fibulifera		.2	<1
Senna glutinosa subsp. x *luerssenii*		.2	<1
Ptilotus nobilis subsp. *nobilis*		.1	<1

Rutila

Salsola australis	.2	<1
Neptunia dimorphantha	.2	<1

R14101

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583053 **mE** 7594084 **mN** **Lat.** -21.7549 **Long.** 117.8032

Habitat Upper-Slope

Aspect SW **Slope** Very Gentle

Soil Type Brown loam

Rock Type Chert

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^*Acacia* sp.\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*			
Acacia sp.		3	5
Triodia epactia		.6	40
Goodenia stobbsiana		.3	<1
Ptilotus calostachyus		1	<1
Acacia tenuissima		1.5	<1
Eriachne mucronata		.3	<1
Dodonaea coriacea		.6	<1

		Rutila
Triodia brizoides	.6	<1
Grevillea wickhamii	1.7	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1

R14102

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 580542 **mE** 7591732 **mN** **Lat.** -21.7763 **Long.** 117.7791

Habitat Low Undulating Hills

Aspect N **Slope** Very Gentle

Soil Type Brown loam

Rock Type Chert

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\bi;M ^*Acacia bivenosa*,^*Acacia atkinsiana*\^shrub\4\i;G ^^*Triodia wiseana*,*Triodia epactia*,*Triodia brizoides*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	1
Acacia bivenosa		2.5	10
Acacia atkinsiana		2	2
Triodia wiseana		.6	30
Triodia epactia		.6	5
Triodia brizoides		.6	2
Ptilotus nobilis subsp. *nobilis*		.1	<1
Senna symonii		1.5	<1

Rutila

Bonamia sp. Dampier (A.A. Mitchell PRP 217)	.1	<1
Indigofera monophylla	.3	<1
Amphipogon sericeus	.3	<1
Eriachne pulchella subsp. *dominii*	.1	<1
Trianthema glossostigmum	.1	<1
Mollugo molluginea	.2	<1
Ptilotus astrolasius	.1	<1

R14103

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila Rail

MGA Zone 50 582058 **mE** 7593638 **mN** **Lat.** -21.7590 **Long.** 117.7936

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type River sand

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 5 % cover ; 2 cm in depth

Bare ground 70 % cover **Weeds** 3 % cover

Vegetation U+ ^*Eucalyptus victrix*,^*Eucalyptus camaldulensis* subsp. *refulgens*\^tree\7\i;M ^^*Melaleuca linophylla*,*Acacia coriacea* subsp. *pendens*,*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\i;G ^^*Triodia epactia*,*Cenchrus ciliaris*\^hummock grass,tussock grass\2\i

Veg. Condition Very Good

Disturbance Some weeds, grazing by cattle

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		12	20
Eucalyptus camaldulensis subsp. *refulgens*		15	5
Melaleuca linophylla		4	5
Acacia coriacea subsp. *pendens*		6	2
Acacia pyrifolia var. *pyrifolia*		3	2
Cyperus vaginatus		.6	8
Triodia epactia		.6	8

Rutila

* *Cenchrus ciliaris*	.3	3
Amaranthus undulatus	.3	<1
Alternanthera nana	.2	<1
Acacia sclerosperma subsp. *sclerosperma*	2	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	.4	<1
* *Vachellia farnesiana*	2	<1
Phyllanthus maderaspatensis	.1	<1
Sporobolus australasicus	.2	<1
Eragrostis tenellula	.2	<1
Cyperus blakeanus	.2	<1
Sesbania cannabina	.3	<1
Acacia trachycarpa	2	<1
Flueggea virosa subsp. *melanthesoides*	1.5	<1
Goodenia lamprosperma	.3	<1
Acacia ancistrocarpa	1.2	<1
Marsilea sp.	.1	<1
Cassytha capillaris	Climber	<1
Rostellularia adscendens var. *clementii*	.1	<1
Eragrostis cumingii	.1	<1
Euphorbia coghlanii	.1	<1
Hybanthus aurantiacus	.2	<1
Ipomoea muelleri	.1	<1
Triumfetta chaetocarpa	.3	<1
Rhynchosia minima	Climber	<1
Melaleuca glomerata	3	1
Gossypium australe	1	<1
Enteropogon ramosus	1	<1
* *Cenchrus setiger*	.3	<1
Bothriochloa ewartiana	.6	<1
Waltheria indica	.4	<1
Carissa lanceolata	1.5	<1
Synaptantha tillaeacea var. *tillaeacea*	.1	<1
Basilicum polystachyon	.1	<1
Cymbopogon procerus	.3	<1

R14104

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 578297 **mE** 7590080 **mN** **Lat.** -21.7913 **Long.** 117.7574

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Mixed alluvial

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** 10 % cover ; 2 cm in depth

Bare ground 25 % cover **Weeds** <1 % cover

Vegetation U+ ^*Acacia citrinoviridis*,^*Corymbia hamersleyana*\^tree\6\i;M ^^*Acacia trachycarpa*,*Acacia atkinsiana*,*Acacia ancistrocarpa*\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle tracks, some weeds

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia citrinoviridis		6	8
Corymbia hamersleyana		8	3
Acacia trachycarpa		3	10
Acacia atkinsiana		2	2
Triodia epactia		.7	65
* *Vachellia farnesiana*		3	<1
Stemodia grossa		.5	<1
Duperreya commixta		1	<1

Rutila

Sida sp. verrucose glands (F.H. Mollemans 2423)		.3	<1
Corchorus tectus		1.2	<1
Indigofera monophylla		.7	<1
Hakea lorea subsp. *lorea*		2	<1
Senna glutinosa subsp. *glutinosa*		2	<1
Bonamia erecta		.4	<1
Acacia ancistrocarpa		2	2
Cassytha capillaris		Climber	<1
Aristida inaequiglumis		.7	<1
Goodenia nuda	P 4	.2	<1
Eulalia aurea		.6	<1
Pterocaulon sphacelatum		.3	<1
Rhynchosia minima		Climber	<1
Abutilon otocarpum		.3	<1
Cucumis maderaspatanus		Climber	<1

R14105

Staff JKN **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolawanyah - Jurrawarrina land system

MGA Zone 50 571592 **mE** 7585478 **mN** **Lat.** -21.8332 **Long.** 117.6928

Habitat Floodplain

Aspect N/A **Slope** N/A

Soil Type Brown light clay

Rock Type N/a

Loose Rock <2 % cover ; 2-6 mm in size **Litter** 80 % cover ; 1 - 2 cm cm in depth

Bare ground <1 % cover **Weeds** 2 % cover

Vegetation U+ ^*Acacia citrinoviridis*,*Corymbia hamersleyana*\^tree\6\i;G ^^*Triodia epactia*,*Chrysopogon fallax*, *Urochloa* sp.\^hummock grass,tussock grass\1\c

Veg. Condition Good

Disturbance Weeds

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia citrinoviridis		8	25
Corymbia hamersleyana		8	4
Triodia epactia		0.5	20
Chrysopogon fallax		0.6	15
Urochloa sp.		0.3	15
* *Malvastrum americanum*		0.5	2
Evolvulus alsinoides var. *villosicalyx*		0.2	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.1	<1

		Rutila
Alternanthera nana	0.2	<1
Pterocaulon sphacelatum	0.3	<1
Abutilon lepidum	0.6	<1
Rhynchosia minima	Climber	<1
Gomphrena affinis subsp. *pilbarensis*		<1
Sida spinosa	0.3	<1
Senna artemisioides subsp. *helmsii*	0.5	<1
* *Bidens bipinnata*	0.3	<1
Ptilotus nobilis subsp. *nobilis*	0.3	<1
Alysicarpus muelleri		<1
Gossypium australe	0.4	<1
Cleome viscosa	0.6	<1
Duperreya commixta	Climber	<1
Astrebla pectinata	0.4	<1
Senna artemisioides subsp. *oligophylla*	1.5	<1
Cheilanthes sieberi subsp. *sieberi*	0.1	<1
Themeda triandra	1.5	<1
Eulalia aurea	0.5	<1
Digitaria brownii	0.5	<1
Corchorus lasiocarpus subsp. *parvus*	1	<1
Goodenia heterochila	0.3	<1
Rostellularia adscendens var. *clementii*	0.1	<1
Acacia pyrifolia var. *pyrifolia*	2	<1
Abutilon otocarpum	0.3	<1
Eragrostis cumingii	0.05	<1
Polymeria ambigua		<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	2	<1
Stemodia grossa	0.3	<1
Santalum lanceolatum	1.6	<1
Rhyncharrhena linearis	Climber	<1
Hakea lorea subsp. *lorea*	2.4	<1
* *Cucumis melo* subsp. *agrestis*	0.05	<1
Digitaria ctenantha	0.3	<1
Acacia aneura	2.5	<1
Perotis rara	0.05	<1
Eremophila longifolia	0.3	<1
Tephrosia remotiflora	0.15	<1
Acacia ancistrocarpa	0.6	<1
Phyllanthus maderaspatensis	0.3	<1
Indigofera monophylla	0.5	<1

R14106

Staff JKN **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolawanyah - Newman land system

MGA Zone 50 568959 **mE** 7583899 **mN** **Lat.** -21.8475 **Long.** 117.6674

Habitat Crest of low hill

Aspect S **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** Nil % cover

Vegetation M ^*Acacia atkinsiana*,^*Grevillea wickhamii* subsp. *hispidula*\^shrub\3\bi;G+ ^*Triodia brizoides*, *Triodia epactia*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia atkinsiana		2	0.5
Grevillea wickhamii subsp. *hispidula*		2	0.5
Triodia brizoides		0.3	10
Triodia epactia		0.4	5
Hakea chordophylla		2	<1
Acacia adoxa var. *adoxa*		1	<1
Goodenia stobbsiana		0.4	<1
Ptilotus calostachyus		0.4	<1

		Rutila
Keraudrenia nephrosperma	0.4	<1
Trianthema glossostigmum		<1
Indigofera monophylla	0.1	<1
Corchorus tectus	0.3	<1

R14107

Staff SK/AF **Date** 2/08/2014 **Season**

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 567869 **mE** 7582862 **mN** **Lat.** -21.8570 **Long.** 117.6569

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 30 % cover ; 1 cm in depth

Bare ground 25 % cover **Weeds** 1 % cover

Vegetation U+ ^*Eucalyptus victrix*\^tree\6\r;M ^*Vachellia farnesiana*\^shrub\4\bi;G ^*Cyperus bifax*,^*Eriachne benthamii*\^sedge,tussock grass\1\c

Veg. Condition Very Good

Disturbance Weedy, heavy grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		6	2
* *Vachellia farnesiana*		2.5	1
Cyperus bifax		.3	70
Stemodia kingii		.2	<1
Alternanthera denticulata		.3	<1
Eriachne benthamii		.3	5
Neptunia dimorphantha		.1	<1
Rostellularia adscendens var. *clementii*		.1	<1

		Rutila
Panicum decompositum		<1
Phyllanthus maderaspatensis	.1	<1
Ptilotus gomphrenoides	.3	<1
Dichanthium sericeum subsp. *humilius*	.4	<1
Rhagodia eremaea	.4	<1
Euphorbia drummondii	Prostrate	<1
Cullen cinereum	.3	<1
Basilicum polystachyon	.2	<1

R14108

Staff SK/AF **Date** 2/08/2014 **Season**

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 565905 **mE** 7582753 **mN** **Lat.** -21.8580 **Long.** 117.6378

Habitat River

Aspect N/A **Slope** N/A

Soil Type Brown cracking clay

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 3 % cover ; 1 cm in depth

Bare ground 75 % cover **Weeds** <1 % cover

Vegetation U+ ^*Eucalyptus victrix*,^*Acacia citrinoviridis*\^tree\7\i;M ^*Melaleuca glomerata*,^*Vachellia farnesiana*\^shrub\4\r;G ^*Eriachne benthamii*,^*Cyperus bifax*\^tussock grass\1\i

Veg. Condition Very Good

Disturbance Heavy cattle grazing, some weeds

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		12	10
Acacia citrinoviridis		12	8
Melaleuca glomerata		4	5
* *Vachellia farnesiana*		3	1
Eriachne benthamii		.3	10
Cyperus bifax		.4	5
Ptilotus gomphrenoides		.1	<1
Cullen cinereum		.2	<1

Rutila

Eragrostis tenellula	.4	<1
Phyllanthus maderaspatensis	.2	<1
Sida spinosa	.1	<1
Eragrostis cumingii	.1	<1
Basilicum polystachyon	.3	<1
Rostellularia adscendens var. *clementii*	.1	<1
Stemodia kingii	.3	<1
Pimelea holroydii	.2	<1

R14109

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 565522 **mE** 7579988 **mN** **Lat.** -21.8830 **Long.** 117.6342

Habitat Outwash Plain

Aspect **Slope**

Soil Type Brown loam

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** <1 % cover

Vegetation U+ ^*Eucalyptus victrix*,^*Corymbia hamersleyana*\^tree\7\r;M ^^*Acacia pyrifolia* var. *pyrifolia*, *Acacia citrinoviridis*,*Atalaya hemiglauca*\^shrub\4\r;G ^^*Triodia epactia*,*Eriachne tenuiculmis*, *Corchorus lasiocarpus* subsp. *parvus*\^hummock grass,tussock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Cattle grazing, some weeds

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		12	5
Corymbia hamersleyana		8	1
Acacia pyrifolia var. *pyrifolia*		3	2
Acacia citrinoviridis		3	1
Atalaya hemiglauca		3	<1
Triodia epactia		.6	25
Eriachne tenuiculmis		.5	5

Rutila

Corchorus lasiocarpus subsp. *parvus*	.5	2
Bulbostylis barbata	.1	<1
Dysphania rhadinostachya subsp. *rhadinostachya*	.1	<1
Senna artemisioides subsp. *oligophylla*	1.5	<1
Waltheria indica	.4	<1
Euphorbia tannensis subsp. *eremophila*	.2	<1
Corchorus crozophorifolius	1	<1
Nicotiana occidentalis subsp. *occidentalis*	.1	<1
Pentalepis trichodesmoides subsp. *trichodesmoides*	1.2	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	.8	<1
Grevillea wickhamii subsp. *hispidula*	.4	<1
Indigofera monophylla	.5	<1
* *Cenchrus ciliaris*	.5	<1
Hybanthus aurantiacus	.2	<1
Eriachne pulchella subsp. *dominii*	.1	<1
Evolvulus alsinoides var. *villosicalyx*	.1	<1
Boerhavia coccinea	.3	<1
Goodenia forrestii	.2	<1
Cleome viscosa	.5	<1
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	1.5	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	.1	<1
Heliotropium cunninghamii	.1	<1
Phyllanthus maderaspatensis	.3	<1
Triumfetta chaetocarpa	.6	<1
Euphorbia australis var. *subtomentosa*	.2	<1
Salsola australis	.3	<1
Trichodesma zeylanicum var. *zeylanicum*	.5	<1

R14110

Staff JKN **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolwanyah - Urandy land system

MGA Zone 50 563848 **mE** 7575893 **mN** **Lat.** -21.9201 **Long.** 117.6182

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown clay

Rock Type Ironstone

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 55 % cover **Weeds** <1 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia inaequilatera*\^shrub\3\bi;G+ ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Very Good

Disturbance Cattle

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	1
Acacia inaequilatera		2	1
Triodia epactia		0.	40
Chrysopogon fallax		0.4	<1
Aristida contorta		0.2	<1
* *Cenchrus ciliaris*		0.4	<1
Tribulus macrocarpus		0.1	<1
Salsola australis		0.15	<1

Rutila

Corchorus tectus	0.2	<1
Digitaria brownii	0.3	<1
Ptilotus nobilis subsp. *nobilis*	0.2	<1
Senna artemisioides subsp. *oligophylla*	0.1	<1
Gomphrena affinis subsp. *pilbarensis*	0.05	<1
Eriachne pulchella subsp. *dominii*	0.05	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	0.2	<1
Heliotropium cunninghamii	0.3	<1
Mollugo molluginea	0.1	<1
Hakea chordophylla	1.2	<1
Hibiscus sturtii var. *campylochlamys*	0.3	<1
Eulalia aurea	0.4	<1
Rhynchosia minima	Climber	<1
Pterocaulon sphacelatum	0.4	<1
Clerodendrum floribundum var. *angustifolium*	1.6	<1
Acacia dictyophleba	2.1	<1
Cullen leucochaites	2	<1
Cucumis maderaspatanus	Climber	<1
Acacia citrinoviridis	1.7	<1
Aristida holathera var. *holathera*	0.3	<1
Acacia ancistrocarpa	1.5	<1
Stemodia grossa	0.3	<1
Trichodesma zeylanicum var. *zeylanicum*	0.4	<1
Goodenia forrestii	0.3	<1
Crotalaria medicaginea var. *neglecta*	0.2	<1
Indigofera colutea	0.2	<1
Boerhavia coccinea	0.2	<1
Abutilon otocarpum	0.1	<1
Goodenia microptera	0.2	<1
Euphorbia biconvexa		<1
Hibiscus sturtii var. *grandiflorus*	0.2	<1

R14111

Staff JKN **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolwanyah - east of rail

MGA Zone 50 564127 **mE** 7571335 **mN** **Lat.** -21.9612 **Long.** 117.6211

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 40 % cover **Weeds** <1 % cover

Vegetation M+ ^*Acacia pyrifolia* var. *pyrifolia*,^*Grevillea wickhamii* subsp. *hispidula*\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia pyrifolia var. *pyrifolia*		3	6
Grevillea wickhamii subsp. *hispidula*		3	4
Triodia epactia		0.5	60
Indigofera monophylla		0.4	<1
Corchorus tectus		0.6	<1
Pentalepis trichodesmoides subsp. *trichodesmoides*		0.5	<1
* *Cenchrus ciliaris*		0.4	<1
Crotalaria medicaginea var. *neglecta*		0.4	<1

Rutila

Gossypium australe	0.4	<1
Solanum lasiophyllum	0.5	<1
Atalaya hemiglauca	2.3	<1
Eriachne tenuiculmis	0.2	<1
Eragrostis eriopoda	0.15	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.05	<1
Hakea chordophylla	1.7	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.2	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.15	<1

R14112

Staff JKN **Date** 2/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location

MGA Zone 50 562888 **mE** 7572686 **mN** **Lat.** -21.9491 **Long.** 117.6090

Habitat River

Aspect N/A **Slope** N/A

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 6-20 mm in size **Litter** 25 % cover ; 1 - 2 cm cm in depth

Bare ground 50 % cover **Weeds** 25 % cover

Vegetation U+ ^*Eucalyptus victrix*,*Atalaya hemiglauca*\^tree\7\i;M ^*Acacia tumida* var. *pilbarensis*\^shrub\\;G ^*Cenchrus ciliaris*,^*Triodia epactia*\^tussock grass,hummock grass\1\i

Veg. Condition Good

Disturbance Weeds, cattle

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		12	15
Atalaya hemiglauca		10	1
Triodia epactia		0.4	10
* *Cenchrus ciliaris*		0.3	20
Indigofera monophylla		0.3	<1
Acacia tumida var. *pilbarensis*		2	0.5
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		0.3	<1
Acacia citrinoviridis		8	<1

Rutila

Rhynchosia minima	Climber	<1
Solanum diversiflorum	0.1	<1
Themeda triandra	0.5	<1
Corchorus crozophorifolius	1.3	<1
Corymbia hamersleyana	6	<1
Eulalia aurea	0.7	<1
Heliotropium cunninghamii	0.3	<1
Gossypium robinsonii	1.6	<1
Paraneurachne muelleri	0.4	<1
Acacia bivenosa	1.5	<1
Melaleuca glomerata	1.6	<1
Cleome viscosa	0.3	<1
Waltheria indica	0.2	<1
Phyllanthus erwinii	0.1	<1
Euphorbia biconvexa	0.2	<1
Acacia pyrifolia var. *pyrifolia*	0.2	<1
Acacia ancistrocarpa	0.6	<1
Phyllanthus maderaspatensis	0.1	<1
Eriachne pulchella subsp. *dominii*	0.1	<1
* *Acetosa vesicaria*	0.1	<1
Euphorbia australis var. *subtomentosa*	0.05	<1
Eriachne tenuiculmis	0.3	<1
Ipomoea muelleri	0.05	<1
Solanum ashbyae	1	<1
Adriana tomentosa var. *tomentosa*	1.5	<1

R14113

Staff JKN **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolawanyah east of rail

MGA Zone 50 562695 **mE** 7569697 **mN** **Lat.** -21.9761 **Long.** 117.6073

Habitat Mid-Slope

Aspect SE **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 80 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M+ ^*Acacia atkinsiana*\^shrub\4\c;G ^*Triodia epactia*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	1
Acacia atkinsiana		4	35
Triodia epactia		0.4	20
Grevillea wickhamii subsp. *hispidula*		5	<1
Ptilotus calostachyus		0.8	<1
Amphipogon sericeus		0.15	<1
Cassytha capillaris		Climber	<1
Lysiana casuarinae		Parasite	<1

		Rutila
Goodenia stobbsiana	0.3	<1
Eulalia aurea	0.3	<1
Keraudrenia nephrosperma	0.6	<1
Senna glutinosa subsp. x *luerssenii*	1.7	<1
Hakea chordophylla	0.4	<1
Senna glutinosa subsp. *glutinosa*	1.6	<1
Trianthema glossostigmum	0.05	<1
Dodonaea coriacea	0.3	<1
Acacia tumida var. *pilbarensis*	2.2	<1
Aristida holathera var. *holathera*	0.5	<1
Acacia pyrifolia var. *pyrifolia*	2	<1
Corchorus tectus	0.3	<1
Duperreya commixta	Climber	<1

R14114

Staff JKN **Date** 2/08/2014 **Season** E

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 561781 **mE** 7568877 **mN** **Lat.** -21.9835 **Long.** 117.5985

Habitat Lower-Slope

Aspect S **Slope** Steep

Soil Type Brown sandy loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 65% cover **Weeds** Nil% cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;G ^*Triodia wiseana*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	2
Triodia wiseana		0.4	30
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		0.4	<1
Acacia bivenosa		0.4	<1
Senna glutinosa subsp. *glutinosa*		1.6	<1
Acacia ancistrocarpa		0.5	<1
Indigofera monophylla		0.4	<1
Ptilotus astrolasius		0.4	<1
Grevillea wickhamii subsp. *hispidula*		0.4	<1

		Rutila
Gossypium australe	0.5	<1
Acacia pruinocarpa	0.6	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	0.3	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		<1
Eulalia aurea	0.5	<1
Hakea chordophylla	0.4	<1
Goodenia cusackiana	0.2	<1
Ptilotus calostachyus		<1
Clerodendrum floribundum var. *angustifolium*	2.2	<1
Eriachne mucronata	0.15	<1

R14115

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 556744 **mE** 7565288 **mN** **Lat.** -22.0161 **Long.** 117.5498

Habitat Lower-Slope

Aspect SE **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 90 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M+ ^*Acacia ancistrocarpa,Acacia atkinsiana*\^shrub\3\r;G ^*Triodia wiseana,Ptilotus calostachyus*\^hummock grass,shrub\1\i

Veg. Condition Excellent

Disturbance

Fire Age

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	1
Acacia ancistrocarpa		1.8	3
Triodia wiseana		0.4	10
Ptilotus calostachyus		0.5	1
Grevillea wickhamii subsp. *hispidula*		2	<1
Ptilotus astrolasius		0.3	<1
Mollugo molluginea		0.15	<1
Sida arenicola		0.7	<1

		Rutila
Aristida holathera var. *holathera*	0.1	<1
Fimbristylis simulans	0.05	<1
Goodenia stobbsiana	0.3	<1
Amphipogon sericeus	0.2	<1
Acacia atkinsiana	2	1
Corchorus tectus	1.6	<1
Ptilotus nobilis subsp. *nobilis*	0.05	<1
Goodenia microptera	0.15	<1
Keraudrenia nephrosperma	0.4	<1
Dampiera candicans	0.4	<1
Acacia trachycarpa (dwarf variant)	1	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1
Rhyncharrhena linearis	Climber	<1
Hakea lorea subsp. *lorea*	0.1	<1

R14116

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 553479 **mE** 7563326 **mN** **Lat.** -22.0339 **Long.** 117.5182

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Brown loamy clay

Rock Type N/a

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 70 % cover ; 2 - 3 cm cm in depth

Bare ground 25 % cover **Weeds** 2 % cover

Vegetation U+ ^*Corymbia candida*\^tree\7\i;M ^*Acacia bivenosa*,^*Acacia elachantha*\^shrub\4\i;G ^^*Bothriochloa ewartiana*,*Themeda triandra*,*Chrysopogon fallax*\^tussock grass\1\r

Veg. Condition Good

Disturbance Fire, cattle, weeds

Fire Age 1 year

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia candida		17	25
Acacia bivenosa		3.5	5
Rhynchosia minima		Climber	<1
Solanum diversiflorum		0.1	<1
Acacia dictyophleba		0.3	<1
* *Cynodon dactylon*		0.05	<1
Chrysopogon fallax		0.3	2
Themeda triandra		0.5	2

Rutila

Corchorus tridens		0.05	<1
* *Malvastrum americanum*		0.2	<1
Evolvulus alsinoides var. *villosicalyx*		0.1	<1
Indigofera linnaei		0.05	<1
Senna notabilis		0.1	<1
Setaria surgens		0.1	<1
Glycine canescens		Climber	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)			<1
Indigofera linifolia		0.1	<1
* *Cynodon dactylon*		0.05	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		0.05	<1
Gossypium australe		0.5	<1
Gossypium robinsonii		0.3	<1
* *Flaveria trinervia*		0.5	<1
Euphorbia sp.		0.3	<1
Phyllanthus maderaspatensis		0.05	<1
Goodenia nuda	P 4	0.1	<1
Alternanthera nana		0.05	<1
Stemodia grossa		0.1	<1
Swainsona kingii		0.05	<1
Eragrostis cumingii		0.1	<1
Acacia elachantha		3.5	5
Sporobolus australasicus		0.1	<1
Eragrostis dielsii		0.1	<1
Triodia epactia		0.4	<1
Eulalia aurea		0.4	<1
* *Setaria verticillata*		0.4	<1
Pterocaulon sphacelatum		0.5	<1
* *Vachellia farnesiana*		2.2	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.1	<1
Pluchea dentex		0.3	<1
Eriachne aristidea		0.3	<1
Hakea lorea subsp. *lorea*		0.2	<1
Bothriochloa ewartiana		0.05	3
Acacia pyrifolia var. *pyrifolia*		0.4	<1
* *Sonchus oleraceus*		0.1	<1
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)		Climber	<1
Euphorbia australis var. *subtomentosa*		0.05	<1
Cyperus vaginatus		0.5	<1
Polymeria ambigua		0.05	<1
* *Cenchrus ciliaris*		0.1	<1
Eucalyptus xerothermica		7	<1
Corchorus tectus		0.2	<1
Acacia trachycarpa (dwarf variant)		1	<1

R14117

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location

MGA Zone 50 555682 **mE** 7564621 **mN** **Lat.** -22.0222 **Long.** 117.5395

Habitat River

Aspect N/A **Slope** N/A

Soil Type Red brown sandy loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** 4 % cover ; 1 - 2 cm in depth

Bare ground 65 % cover **Weeds** <1% cover

Vegetation U+ ^*Eucalyptus victrix*\^tree\7\r;G ^^*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186), *Eulalia aurea*,*Stemodia grossa*\^shrub,tussock grass\2\c

Veg. Condition Very Good

Disturbance Cattle

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus victrix		16	10
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		0.7	20
Eulalia aurea		0.7	15
Stemodia grossa		0.6	8
Cucumis maderaspatanus		Climber	<1
Sesbania cannabina		2.4	<1
Phyllanthus maderaspatensis		0.3	<1
Triodia epactia		0.5	2

Rutila

Themeda triandra		0.6	2
Acacia pyrifolia var. *pyrifolia*		2.3	<1
Acacia bivenosa		1.7	<1
Gossypium robinsonii		3	<1
Crotalaria medicaginea var. *neglecta*		0.4	<1
Polycarpaea longiflora		0.15	<1
Eriachne tenuiculmis		0.4	2
Cleome viscosa		0.3	<1
Pluchea dentex		0.3	<1
Corchorus crozophorifolius		0.6	<1
Boerhavia coccinea		0.1	<1
Paraneurachne muelleri		0.4	<1
Euphorbia sp		0.3	<1
Indigofera monophylla		0.4	<1
Acacia tumida var. *pilbarensis*		1.5	<1
Hybanthus aurantiacus		0.5	<1
Rhynchosia minima		0.05	<1
Cyperus vaginatus		0.6	<1
* *Cenchrus ciliaris*		0.4	<1
Heliotropium cunninghamii		0.2	<1
Eucalyptus camaldulensis subsp. *refulgens*		14	<1
Alternanthera nana		0.2	<1
Grevillea wickhamii subsp. *hispidula*		2.2	<1
Pterocaulon sphacelatum		0.4	<1
Ipomoea muelleri		Climber	<1
Isotropis atropurpurea		0.4	<1
Waltheria indica		0.4	<1
Gossypium australe		0.4	<1
Grevillea pyramidalis subsp. *leucadendron*		0.4	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)		1.5	<1
Ptilotus astrolasius		0.3	<1
Corchorus tectus		0.4	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.1	<1
Enneapogon lindleyanus		0.5	<1
Indigofera linnaei		0.2	<1
Polymeria ambigua		0.05	<1
Melhania oblongifolia		0.3	<1
Chrysopogon fallax		0.5	<1
Ptilotus calostachyus		0.4	<1
Mollugo molluginea		0.1	<1
Goodenia nuda	P 4	0.2	<1
Goodenia forrestii		0.2	<1
Goodenia lamprosperma		0.2	<1
Acacia dictyophleba		0.3	<1
Ptilotus nobilis subsp. *nobilis*		0.2	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1

R14118

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 551141 **mE** 7563141 **mN** **Lat.** -22.0357 **Long.** 117.4956

Habitat Crest

Aspect S **Slope** Moderate

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

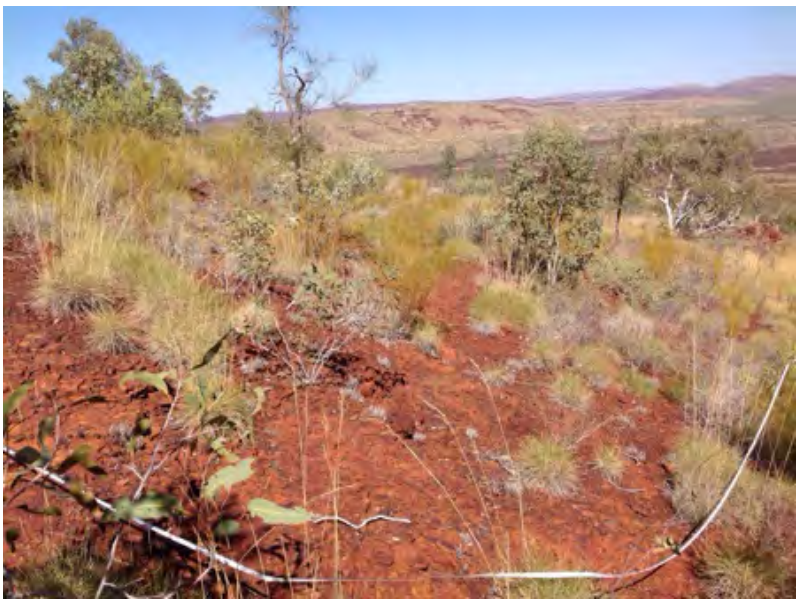
Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*,^*Corymbia hamersleyana*\^tree\6\r;M ^^*Mirbelia viminalis*,*Acacia acradenia*,*Grevillea wickhamii*\^shrub\4\i;G ^^*Triodia wiseana*,*Eriachne mucronata*,*Dampiera candicans*\^hummock grass,tussock grass,shrub\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes



Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	5
Corymbia hamersleyana		6	2
Mirbelia viminalis		2.5	8
Acacia acradenia		2	2
Grevillea wickhamii		2	2
Triodia wiseana		.6	20
Eriachne mucronata		.4	3

		Rutila
Dampiera candicans	.6	2
Indigofera monophylla	.3	<1
Hakea chordophylla	4	<1
Cymbopogon ambiguus	.5	<1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	.2	<1
Waltheria virgata	1	2
Acacia pyrifolia var. *pyrifolia*	2	<1
Ptilotus calostachyus	.7	<1
Acacia pruinocarpa	1.5	<1
Dodonaea coriacea	.5	<1
Goodenia stobbsiana	.3	<1
Paraneurachne muelleri	.4	<1
Ptilotus incanus	.3	<1
Triumfetta maconochieana	.2	<1
Cheilanthes sieberi subsp. *sieberi*	.2	<1
Ptilotus nobilis subsp. *nobilis*	.1	<1
Ptilotus astrolasius	.4	<1
Acacia tumida var. *pilbarensis*	.8	<1
Gompholobium oreophilum	.4	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	.5	<1
Acacia orthocarpa	2	<1
Senna glutinosa subsp. *glutinosa*	2	<1
Cassytha capillaris	Climber	<1
Eulalia aurea	.5	<1
Jasminum didymum subsp. *lineare*	Climber	<1
Aristida holathera var. *holathera*	.3	<1
Solanum diversiflorum	.4	<1
Acacia adoxa var. *adoxa*	.5	<1

R14119

Staff SK/AF **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 549608 **mE** 7560842 **mN** **Lat.** -22.0565 **Long.** 117.4808

Habitat Upper-Slope

Aspect NE **Slope** Gentle

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^*Acacia maitlandii*,^*Senna glutinosa* subsp. *glutinosa*\^shrub\3\bi;G ^*Triodia wiseana*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	5
Acacia maitlandii		1.5	<1
Senna glutinosa subsp. *glutinosa*		1.5	<1
Triodia wiseana		.4	25
Senna glutinosa subsp. *pruinosa*		1	<1
Gossypium australe		1.5	<1
Hakea lorea subsp. *lorea*		1	<1
Acacia monticola		1	<1

Rutila

Cassytha capillaris	Climber	<1
Acacia monticola x tumida var. *pilbarensis*	1	<1
Eriachne mucronata	.3	<1
Ptilotus astrolasius	.2	<1
Acacia tenuissima	1.3	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	.6	<1
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	.5	<1
Goodenia stobbsiana	.3	<1
Ptilotus calostachyus	.2	<1
Aristida holathera var. *holathera*	.2	<1
Acacia dictyophleba	.5	<1

R14120

Staff SK/AF **Date** 5/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 543456 **mE** 7559301 **mN** **Lat.** -22.0706 **Long.** 117.4212

Habitat Crest

Aspect SW **Slope** Gentle

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^*Acacia dictyophleba*,^*Hakea chordophylla*\^shrub\4\bi;G ^*Triodia wiseana*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance No evidence

Fire Age >10

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	8
Acacia dictyophleba		3	1
Hakea chordophylla		2.5	<1
Triodia wiseana		.6	30
Corymbia hamersleyana		1	<1
Goodenia cusackiana		.3	<1
Tripogon loliiformis		.1	<1
Eriachne mucronata		.3	<1

Rutila

Cassytha capillaris	Climber	<1
Triodia aff. *melvillei*	.4	<1
Eriachne ciliata	.1	<1

R14121

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 549980 **mE** 7561746 **mN** **Lat.** -22.0483 **Long.** 117.4844

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 10 % cover ; 0-5 cm in depth

Bare ground 35 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Eucalyptus xerothermica*\^tree\6\r;M ^*Acacia elachantha*, ^*Maytenus* sp. Mt Windell (S. van Leeuwen 846)\^shrub\3\r;G ^^*Themeda triandra*,*Eulalia aurea*, *Chrysopogon fallax*\^tussock grass\2\c

Veg. Condition Excellent

Disturbance Minor grazing

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus xerothermica		6	1
Acacia elachantha		2	2
Maytenus sp. Mt Windell (S. van Leeuwen 846)		1.8	2
Themeda triandra		1	20
Eulalia aurea		.6	20
Chrysopogon fallax		.6	5
Duperreya commixta		1	<1

Rutila

Jasminum didymum subsp. *lineare*		1	<1
Pterocaulon sphacelatum		.5	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		.3	<1
Triodia epactia		.4	4
Rhynchosia minima		.3	<1
Evolvulus alsinoides var. *villosicalyx*		.3	<1
Crotalaria medicaginea var. *neglecta*		.4	<1
Bonamia erecta		.3	<1
* *Malvastrum americanum*		.4	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*		1	<1
Indigofera colutea		.2	<1
Aristida inaequiglumis		1	<1
Tephrosia supina		.4	<1
Bothriochloa ewartiana		1	<1
Evolvulus alsinoides var. *decumbens*		.3	<1
Indigofera linifolia		.3	<1
Indigofera linnaei		.2	<1
Eremophila longifolia		.6	<1
Gossypium australe		1	<1
Goodenia nuda	P 4	.4	<1
Paraneurachne muelleri		.4	<1
Senna artemisioides subsp. *oligophylla*		1.5	<1
Aristida holathera var. *holathera*		.4	<1
Eragrostis eriopoda			<1
Ptilotus astrolasius		.4	<1
Corchorus tectus		1	<1
Corymbia hamersleyana		6	3

R14122

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 550748 **mE** 7560583 **mN** **Lat.** -22.0588 **Long.** 117.4918

Habitat Valley floor

Aspect E **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 3 % cover ; 0-2 cm in depth

Bare ground 65 % cover **Weeds** 0 % cover

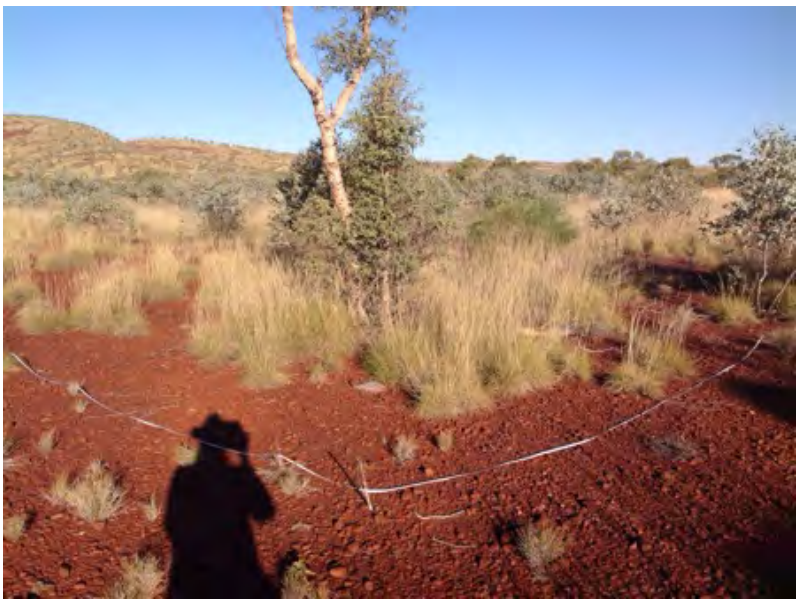
Vegetation U ^*Corymbia deserticola* subsp. *deserticola*,^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\bi; M+ ^*Eucalyptus gamophylla*,^*Acacia atkinsiana*\^shrub\4\i;G ^*Triodia epactia*,^*Amphipogon sericeus*\^hummock grass,tussock grass\2\i

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes



Species	WA Cons.	Height (m)	Cover (%)
Bonamia erecta		.3	<1
Amphipogon sericeus		.3	2
Corymbia deserticola subsp. *deserticola*		6	1
Eucalyptus gamophylla		3	8
Acacia atkinsiana		2	1
Triodia epactia		.6	25
Amphipogon sericeus		.4	2

		Rutila
Hakea lorea subsp. *lorea*	1.6	<1
Ptilotus calostachyus	.6	<1
Ptilotus astrolasius	.4	<1
Scaevola parvifolia subsp. *pilbarae*	.4	<1
Acacia adoxa var. *adoxa*	.8	<1
Goodenia stobbsiana	.2	<1
Acacia trachycarpa (dwarf variant)	1.5	<1
Paraneurachne muelleri	.4	<1
Rhyncharrhena linearis	.8	<1
Eucalyptus leucophloia subsp. *leucophloia*	5	1
Grevillea wickhamii	2	<1
Senna artemisioides subsp. *oligophylla*	1.3	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1
Senna glutinosa subsp. *pruinosa*	.5	<1
Eulalia aurea	.5	<1
Isotropis atropurpurea	.5	<1

R14123

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 541947 **mE** 7562655 **mN** **Lat.** -22.0403 **Long.** 117.4065

Habitat Flat

Aspect N **Slope** Very Gentle

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 2 cm in depth

Bare ground 40 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia inaequilatera*,^*Acacia pyrifolia* var. *pyrifolia*, *Eremophila longifolia*\^shrub\4\r;G ^^*Chrysopogon fallax*,*Triodia epactia*,*Themeda triandra*\^tussock grass,hummock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	4
Acacia inaequilatera		4	4
Acacia pyrifolia var. *pyrifolia*		3	2
Triodia epactia		0.6	15
Gossypium australe		1.5	<1
Chrysopogon fallax		0.5	25
Enneapogon polyphyllus		0.15	2

Rutila

Indigofera monophylla		0.3	<1
Boerhavia coccinea		0.1	<1
Pterocaulon sphacelatum		0.4	<1
* *Malvastrum americanum*		0.3	<1
Cucumis maderaspatanus		Climber	<1
Indigofera colutea		0.1	<1
Alternanthera nana		0.3	<1
Aristida latifolia		0.5	<1
Digitaria brownii		0.4	<1
Evolvulus alsinoides var. *villosicalyx*		0.3	<1
Eulalia aurea		0.4	2
Senna artemisioides subsp. *oligophylla*		1.8	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.3	<1
Enneapogon lindleyanus		0.4	<1
Grevillea pyramidalis subsp. *leucadendron*		0.4	<1
Hakea lorea subsp. *lorea*		2	<1
Aristida holathera var. *holathera*		0.4	<1
Senna glutinosa subsp. *glutinosa*		1.3	<1
Clerodendrum floribundum var. *angustifolium*		0.3	<1
Melhania oblongifolia		0.1	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)		0.6	<1
Eriachne mucronata		0.2	<1
Corchorus tectus		1.6	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*		0.3	<1
Cymbopogon ambiguus		0.4	<1
Eremophila longifolia		1.6	2
Hibiscus sturtii var. *platychlamys*		0.4	<1
Euphorbia tannensis subsp. *eremophila*		0.3	<1
Ptilotus obovatus		0.3	<1
Jasminum didymum subsp. *lineare*		0.4	<1
Sida echinocarpa		0.4	<1
Themeda triandra		0.4	10
Senna glutinosa subsp. *glutinosa*		1.7	<1
Mollugo molluginea		0.1	<1
Goodenia forrestii		0.4	<1
Eragrostis eriopoda		0.4	<1
Acacia trachycarpa (dwarf variant)		1.5	<1
Swainsona formosa		0.3	<1
Heliotropium cunninghamii		0.4	<1
Ptilotus astrolasius		0.4	<1
Goodenia nuda	P 4	0.15	<1
Paraneurachne muelleri		0.4	<1
Euphorbia australis var. *subtomentosa*		0.05	<1
Hibiscus sturtii var. *campylochlamys*		0.5	<1
Cleome viscosa		0.1	<1
Euphorbia sp.		0.3	<1
Aristida contorta		0.3	1
Crotalaria medicaginea var. *neglecta*		0.3	<1

Rutila

Acacia elachantha	2	<1
Rhynchosia minima	Climber	<1
Ptilotus nobilis subsp. *nobilis*	0.3	<1
Acacia dictyophleba	2	<1
* *Cenchrus ciliaris*	0.1	<1

Rutila

R14124

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 544178 **mE** 7561301 **mN** **Lat.** -22.0525 **Long.** 117.4282

Habitat Flat

Aspect N **Slope** Very Gentle

Soil Type Red brown sandy loam

Rock Type Ironstone

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 - 2 cm in depth

Bare ground 45 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Eucalyptus gamophylla*\^tree,mallee shrub\6\i;M ^*Acacia trachycarpa* (dwarf variant),^*Acacia inaequilatera*\^shrub\3\r;G ^*Triodia epactia*,*Paraneurachne muelleri*\^hummock grass,tussock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	6
Eucalyptus gamophylla		6	4
Acacia trachycarpa (dwarf variant)		1.6	4
Triodia epactia		0.6	30
Paraneurachne muelleri		0.4	20
Acacia elachantha		2.1	<1
Bonamia erecta		0.2	<1

Rutila

Eulalia aurea	0.4	<1
Rhynchosia minima	Climber	<1
Chrysopogon fallax	0.5	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.8	<1
Senna glutinosa subsp. *glutinosa*	1.7	<1
Indigofera colutea	0.05	<1
Acacia inaequilatera	2	2
Digitaria brownii	0.3	<1
Indigofera monophylla	0.3	<1
Crotalaria medicaginea var. *neglecta*	0.1	<1
Ptilotus astrolasius	0.3	<1
Gossypium australe	0.4	<1
Jasminum didymum subsp. *lineare*		<1
Heliotropium cunninghamii	0.2	<1
Evolvulus alsinoides var. *villosicalyx*	0.2	<1
Alternanthera nana	0.1	<1
Cymbopogon ambiguus	0.5	<1
Aristida holathera var. *holathera*	0,3	<1
Eragrostis eriopoda	0.3	<1
Mollugo molluginea	0.05	<1
Senna artemisioides subsp. *oligophylla*	2	<1
Alysicarpus muelleri	0.2	<1
Hibiscus sturtii var. *campylochlamys*	0.3	<1
Ptilotus nobilis subsp. *nobilis*	0.3	<1
Goodenia microptera	0.2	<1
Eremophila longifolia	1.8	<1
Corchorus tectus	0.4	<1
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.4	<1
Acacia tenuissima	2	<1
Duperreya commixta	Climber	<1
Hakea lorea subsp. *lorea*	1.5	<1
Keraudrenia nephrosperma	0.5	<1
Scaevola parvifolia subsp. *pilbarae*	0.1	<1
Acacia dictyophleba	2	<1
Cleome viscosa	0.3	<1

R14125

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 545262 **mE** 7560933 **mN** **Lat.** -22.0558 **Long.** 117.4387

Habitat Flat

Aspect N **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 2-10 % cover ; 6-20 mm in size **Litter** 2 % cover ; 2 cm in depth

Bare ground 75 % cover **Weeds** Nil % cover

Vegetation U+ ^*Eucalyptus gamophylla*\^mallee shrub\6\i;M ^*Acacia trachycarpa* (dwarf variant),*Acacia dictyophleba*\^shrub\3\r;G ^*Triodia epactia*,^*Paraneurachne muelleri*,*Eragrostis eriopoda*\^hummock grass,tussock grass\2\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus gamophylla		5	15
Acacia trachycarpa (dwarf variant)		1.6	3
Acacia dictyophleba		2	1
Triodia epactia		0.6	20
Paraneurachne muelleri		0.5	2
Bonamia erecta		0.3	1
Chrysopogon fallax		0.5	<1

Rutila

Eulalia aurea	0.5	<1
Rhynchosia minima	Climber	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.5	<1
Crotalaria medicaginea var. *neglecta*	0.3	<1
Cymbopogon ambiguus	0.4	<1
Aristida holathera var. *holathera*	0.2	<1
Eragrostis eriopoda	0.2	1
Corymbia hamersleyana	7	<1
Acacia pyrifolia var. *pyrifolia*	2	<1
Acacia elachantha	2.2	<1
Indigofera colutea	0.1	<1
Indigofera monophylla	0.1	<1
Acacia inaequilatera	1.6	<1
Ptilotus astrolasius	0.3	<1
Tephrosia sp. Fortescue (A.A. Mitchell 606)	0.5	<1
Gossypium australe	2	<1
Eriachne mucronata	0.3	<1
Acacia ancistrocarpa	1.4	<1
Eriachne aristidea	0.1	<1
Corchorus tectus	0.4	<1
Goodenia microptera	0.3	<1
Evolvulus alsinoides var. *villosicalyx*	0.1	<1
Heliotropium cunninghamii	0.15	<1
Ptilotus nobilis subsp. *nobilis*	0.15	<1
Tribulus hirsutus	0.05	<1
Hibiscus sturtii var. *campylochlamys*	0.3	<1
Digitaria brownii	0.3	<1
Hakea lorea subsp. *lorea*	0.4	<1
Senna glutinosa subsp. *glutinosa*	1.4	<1
Aristida contorta	0.1	<1

R14126

Staff JKN **Date** 5/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location

MGA Zone 50 544892 **mE** 7559681 **mN** **Lat.** -22.0671 **Long.** 117.4351

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 85% cover **Weeds** <1% cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia tumida* var. *pilbarensis*\^shrub\4\bi;G+ ^^*Triodia epactia*,*Cymbopogon procerus*,*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) \^hummock grass,tussock grass,shrub\2\i

Veg. Condition Excellent

Disturbance Minor weeds

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	2
Acacia tumida var. *pilbarensis*		2.1	1
Triodia epactia		0.5	10
Cymbopogon procerus		0.7	10
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		0.4	5
Themeda triandra		0.6	2
Eulalia aurea		0.6	<1

Rutila

* *Cenchrus ciliaris*	0.5	<1
Polycarpaea longiflora	0.15	<1
Eriachne tenuiculmis	0.5	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	2.1	<1
Gossypium australe	2	<1
Cucumis maderaspatanus	Climber	<1
Acacia pyrifolia var. *pyrifolia*	2.3	<1
Aristida contorta	0.2	<1
Trichodesma zeylanicum var. *zeylanicum*	1.6	<1
Heliotropium cunninghamii	0.2	<1
Corchorus tectus	0.5	<1
Digitaria brownii	0.3	<1
Ptilotus nobilis subsp. *nobilis*	0.1	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.6	<1
Bonamia erecta	0.3	<1
Alternanthera nana	0.2	<1
Rhynchosia minima	Climber	<1
Acacia dictyophleba	2	<1
Jasminum didymum subsp. *lineare*	1	<1
Enneapogon lindleyanus	0.4	<1
Indigofera monophylla	0.2	<1
Hybanthus aurantiacus	0.4	<1
Polymeria ambigua	Prostrate	<1
Paraneurachne muelleri	0.3	<1
Goodenia microptera	0.2	<1
Chrysopogon fallax	0.5	<1
Euphorbia boophthona	0.1	<1
Evolvulus alsinoides var. *villosicalyx*	0.2	<1
Boerhavia coccinea	0.05	<1
Abutilon otocarpum	0.5	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.05	<1
Hibiscus sturtii var. *campylochlamys*	0.5	<1
Senna glutinosa subsp. *glutinosa*	0.4	<1
Euphorbia sp.	0.3	<1
Aristida holathera var. *holathera*	0.4	<1
Crotalaria medicaginea var. *neglecta*	0.1	<1
Waltheria indica	0.3	<1
Cassytha capillaris	Creeper	<1
Sida echinocarpa	1	<1
Enneapogon robustissimus	0.4	<1
Cleome viscosa	0.15	<1
Digitaria ctenantha	0.5	<1
Gomphrena cunninghamii	0.05	<1
Amaranthus undulatus		<1
Phyllanthus maderaspatensis	0.3	<1
Ptilotus astrolasius	0.2	<1
Swainsona formosa	0.15	<1
Euphorbia australis var. *subtomentosa*	0.1	<1

		Rutila
Goodenia forrestii	0.15	<1

R14127

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Black jack

MGA Zone 50 542378 **mE** 7556737 **mN** **Lat.** -22.0938 **Long.** 117.4108

Habitat Crest of low hill

Aspect W **Slope** Gentle

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 75% cover **Weeds** Nil% cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*,^*Corymbia deserticola* subsp. *deserticola*\^tree\6\r;G ^*Triodia* aff. *melvillei*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		9	2
Corymbia deserticola subsp. *deserticola*		6	2
Triodia aff. *melvillei*		0.4	25
Grevillea wickhamii subsp. *hispidula*		2.2	<1
Triodia wiseana		0.3	<1
Goodenia stobbsiana		0.3	<1
Acacia maitlandii		2	<1
Cleome viscosa		0.15	<1

		Rutila
Senna glutinosa subsp. *glutinosa*	1.5	<1
Acacia hilliana		<1
Ptilotus astrolasius	0.15	<1
Ptilotus calostachyus	0.3	<1
Keraudrenia nephrosperma	0.4	<1
Corymbia hamersleyana	2.1	<1
Acacia adoxa var. *adoxa*	0.2	<1
Hibiscus sturtii var. *campylochlamys*	0.15	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.05	<1
Senna glutinosa subsp. *pruinosa*	0.5	<1
Hakea chordophylla	4.5	<1
Themeda triandra	0.4	<1
Jasminum didymum subsp. *lineare*	1.4	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	0.3	<1
Corchorus tectus	0.7	<1

R14128

Staff SK/AF **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 551384 **mE** 7559044 **mN** **Lat.** -22.0727 **Long.** 117.4981

Habitat Flat

Aspect W **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 0-2 cm in depth

Bare ground 55 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus gamophylla*,^*Corymbia hamersleyana*\^mallee shrub,tree\6\i;M ^*Acacia atkinsiana*\^shrub\4\r;G ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Minor grazing

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus gamophylla		4	10
Corymbia hamersleyana		5	1
Acacia atkinsiana		3	8
Triodia epactia		.7	35
Triodia wiseana		.7	10
Acacia ancistrocarpa		2.5	<1
Bonamia erecta		.3	<1
Senna artemisioides subsp. *oligophylla*		1	<1

Rutila

Senna artemisioides subsp. *oligophylla* x *helmsii*	1.2	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1
Indigofera monophylla	.5	<1
Paraneurachne muelleri	.4	<1
Grevillea wickhamii	1.5	<1
Jasminum didymum subsp. *lineare*	1.5	<1
Aristida holathera var. *holathera*	.4	<1
Rhynchosia minima	.2	<1
Eriachne mucronata	.4	<1
Acacia adoxa var. *adoxa*	.5	<1
Hakea lorea subsp. *lorea*	2	<1
Dicrastylis cordifolia		<1
Ptilotus calostachyus	.6	<1
Acacia tenuissima	.4	<1
Clerodendrum floribundum var. *angustifolium*	.1	<1
Goodenia microptera	.4	<1

R14129

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 557885 **mE** 7567223 **mN** **Lat.** -21.9986 **Long.** 117.5608

Habitat Lower-Slope

Aspect S **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** Nil % cover

Vegetation U ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\bi;M+ ^*Acacia atkinsiana*\^shrub\3\r;G ^*Triodia wiseana*,*Triodia epactia*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age 3 - 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	1
Acacia atkinsiana		2	6
Petalostylis labicheoides		2	1
Triodia wiseana		0.4	15
Triodia epactia		0.4	4
Cassytha capillaris		Climber	<1
Paraneurachne muelleri		0.4	<1
Goodenia stobbsiana		0.3	<1

		Rutila
Hibiscus sturtii var. *campylochlamys*	0.4	<1
Senna glutinosa subsp. *glutinosa*	2	<1
Eulalia aurea	0.4	<1
Keraudrenia nephrosperma	0.4	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.2	<1
Gompholobium oreophilum	0.4	<1
Hakea chordophylla	0.4	<1
Mirbelia viminalis	1.2	<1
Ptilotus calostachyus	0.4	<1
Amphipogon sericeus	0.3	<1
Acacia bivenosa	1.6	<1
Ptilotus astrolasius	0.2	<1

R14130

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 565896 **mE** 7578299 **mN** **Lat.** -21.8982 **Long.** 117.6379

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 75 % cover **Weeds** 5 % cover

Vegetation M+ ^*Acacia citrinoviridis*,^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\r;G ^^*Chrysopogon fallax*,*Triodia epactia*,*Cenchrus ciliaris*\^tussock grass,hummock grass\2\i

Veg. Condition Very Good

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia citrinoviridis		4	6
Acacia pyrifolia var. *pyrifolia*		3	1
Chrysopogon fallax		.6	10
Triodia epactia		.6	10
* *Cenchrus ciliaris*		.6	5
Eulalia aurea		.4	2
Tribulus macrocarpus		.1	<1
Aristida contorta		.2	<1

		Rutila
Goodenia forrestii	.2	<1
Acacia dictyophleba	.4	<1
Indigofera monophylla	.4	<1
Pentalepis trichodesmoides subsp. *trichodesmoides*	1	<1
Anthobolus leptomerioides	2	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)	.2	<1
Sida arsiniata	.4	<1
Corchorus tectus	1	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1	<1
Hakea lorea subsp. *lorea*	2	<1
Grevillea wickhamii	2.5	<1
Gossypium australe	1.5	<1
Corymbia hamersleyana	4	<1
Eremophila longifolia	1.8	<1
Ptilotus obovatus	.6	<1
Themeda triandra	.8	<1
Evolvulus alsinoides var. *villosicalyx*	.3	<1
Enneapogon polyphyllus	.3	<1
Cucumis maderaspatanus	Climber	<1
Rhynchosia minima	.3	<1
Alternanthera nana	.1	<1
Solanum lasiophyllum	.6	<1

R14131

Staff SK/AF **Date** 29/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 597131 **mE** 7621405 **mN** **Lat.** -21.5074 **Long.** 117.9378

Habitat Mid-Slope

Aspect E **Slope** Moderate

Soil Type Red brown loam

Rock Type Basalt

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 5 % cover ; 0-2cm cm in depth

Bare ground 50 % cover **Weeds** 0 % cover

Vegetation M ^*Hakea lorea* subsp. *lorea*\^shrub\4\bi;G+ ^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Hakea lorea subsp. *lorea*		3	<1
Triodia wiseana		.6	40
Cullen leucochaites		1.6	<1
Indigofera monophylla		.4	<1
Boerhavia coccinea		.2	<1
Grevillea pyramidalis subsp. *leucadendron*		.7	<1
Cassytha capillaris		Climber	<1
Triodia epactia		.4	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		.1	<1

R14132

Staff SK/AF **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 576203 **mE** 7589730 **mN** **Lat.** -21.7946 **Long.** 117.7372

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Mixed alluvial

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 3 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^^*Eucalyptus xerothermica*,*Corymbia hamersleyana*,*Corymbia deserticola* subsp. *deserticola*\^tree\6\r;M ^^*Acacia atkinsiana*,*Acacia trachycarpa*,*Acacia bivenosa*\^shrub\4\i;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus xerothermica		5	2
Corymbia hamersleyana		7	2
Corymbia deserticola subsp. *deserticola*		6	1
Acacia atkinsiana		3	8
Acacia trachycarpa		2	2
Acacia bivenosa		2	2
Triodia epactia		.6	40

		Rutila
Acacia ancistrocarpa	1.5	<1
Eucalyptus gamophylla	3	<1
Senna artemisioides subsp. *oligophylla*	1	1
Ptilotus calostachyus	1	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.5	<1
Goodenia forrestii	.4	<1
Grevillea wickhamii	2	<1
Indigofera monophylla	.6	<1
Gossypium australe	.6	<1
Eulalia aurea	1	<1
Acacia tumida var. *pilbarensis*	2	<1
Senna glutinosa subsp. *glutinosa*	2	<1
Mollugo molluginea	.2	<1
Corchorus tectus	1	<1
Ptilotus astrolasius	.4	<1
Bonamia erecta	.4	<1
Goodenia stobbsiana	.4	<1
Solanum elatius	1	<1
Senna glutinosa x ?	1	<1
Hibiscus sturtii var. *campylochlamys*	.5	<1
Hakea lorea subsp. *lorea*	3	<1
Pterocaulon sphacelatum	.3	<1
Scaevola parvifolia subsp. *pilbarae*	.3	<1
Isotropis atropurpurea	.6	<1
Acacia tenuissima	.5	<1

Rutila

R14133

Staff JKN **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Coolawanyah - boolgeeda land system

MGA Zone 50 571896 **mE** 7587062 **mN** **Lat.** -21.8188 **Long.** 117.6956

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 10-20 % cover ; 6-20 mm in size **Litter** 4 % cover ; 1 cm in depth

Bare ground 90 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*,^*Eucalyptus gamophylla*\^tree,mallee shrub\6\r;M+ ^^*Acacia atkinsiana*,*Acacia ancistrocarpa*,*Acacia trachycarpa* (dwarf variant)\^shrub\3\i;G ^^*Triodia epactia*, *Isotropis atropurpurea*,*Corchorus tectus*\^hummock grass,shrub\1\i

Veg. Condition Excellent

Disturbance

Fire Age 1 - 2 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	2
Eucalyptus gamophylla		2.5	1
Acacia atkinsiana		1.2	5
Acacia ancistrocarpa		1.3	5
Grevillea wickhamii subsp. *hispidula*		2	1
Triodia epactia		0.3	6
Corchorus tectus		0.4	4

Rutila

Isotropis atropurpurea	0.4	4
Acacia inaequilatera	3	<1
Acacia trachycarpa (dwarf variant)	1.2	2
Acacia tenuissima	1.2	2
Sida cardiophylla	0.4	<1
Solanum diversiflorum	0.3	<1
Rhyncharrhena linearis	Climber	<1
Indigofera monophylla	0.3	<1
Acacia adoxa var. *adoxa*	0.3	1
Goodenia microptera	0.25	<1
Goodenia stobbsiana	0.3	<1
Santalum lanceolatum	1.5	<1
Scaevola parvifolia subsp. *pilbarae*	0.2	<1
Dodonaea coriacea	0.3	<1
Acacia tumida var. *pilbarensis*	2	2
Hibiscus sturtii var. *campylochlamys*	0.4	<1
Gossypium australe	0.3	<1
Petalostylis labicheoides	2.2	<1
Acacia pyrifolia var. *pyrifolia*	1.5	<1
Keraudrenia nephrosperma	0.4	<1
Eremophila longifolia	1.7	<1
Senna glutinosa subsp. *glutinosa*	1.7	<1
Acacia dictyophleba	1.7	<1
Hibiscus sturtii var. *platychlamys*	0.4	<1
Duperreya commixta	Climber	<1
Abutilon sp. Pilbara (W.R. Barker 2025)		<1
Eulalia aurea	0.4	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	1.4	<1

R14134

Staff JKN **Date** 30/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 590677 **mE** 7611549 **mN** **Lat.** -21.5968 **Long.** 117.8760

Habitat Flat

Aspect N **Slope** Very Gentle

Soil Type Red brown clay loam

Rock Type Basalt, granite

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia inaequilatera*\^shrub\3\bi;G+ ^*Triodia wiseana*, *Triodia epactia*\^hummock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age 3 - 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	0.5
Acacia inaequilatera		4.5	1
Triodia wiseana		0.4	25
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		0.4	<1
Senna glutinosa subsp. *glutinosa*		1.9	<1
Triodia epactia		0.5	2
Indigofera monophylla		0.4	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1

R14135

Staff JKN **Date** 31/07/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Chichester

MGA Zone 50 591289 **mE** 7607286 **mN** **Lat.** -21.6353 **Long.** 117.8821

Habitat Open Depression

Aspect NW **Slope** Very Gentle

Soil Type Brown loamy sand

Rock Type N/a

Loose Rock 2-10 % cover ; 2-6 mm in size **Litter** <1 % cover ; 1 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia inaequilatera*,*Acacia trachycarpa*\^shrub\3\r;G+ ^*Triodia epactia*,*Pluchea tetranthera*\^hummock grass,shrub\2\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	0.5
Acacia inaequilatera		2	2
Acacia trachycarpa		2	1
Triodia epactia		0.7	40
Tephrosia supina		0.4	<1
Gossypium australe		0.4	<1
Pluchea tetranthera		0.5	1
Zornia muelleriana		0.05	<1

Rutila

Bulbostylis barbata		0.05	<1
Synaptantha tillaeacea var. *tillaeacea*		0.05	<1
Goodenia nuda	P 4	0.4	<1
Indigofera colutea		0.05	<1
Indigofera monophylla		0.15	<1
Mollugo molluginea		0.15	<1
Euphorbia australis var. *subtomentosa*		0.05	<1
Senna notabilis		0.05	<1
Indigofera linnaei		0.05	<1
Polycarpaea corymbosa var. *corymbosa*		0.1	<1
Pterocaulon sphacelatum		0.3	<1
Hakea lorea subsp. *lorea*		2.2	<1
Sida rohlenae subsp. *rohlenae*		0.6	<1
Eragrostis cumingii		0.05	<1
Aristida holathera var. *holathera*		0.3	<1
Eragrostis eriopoda		0.3	<1
Goodenia microptera		0.2	<1
Cyperus blakeanus		0.2	<1
Solanum diversiflorum		0.15	<1
Triodia wiseana		0.4	<1
Cullen martinii		0.3	<1
Indigofera linifolia		0.15	<1
Desmodium filiforme		0.05	<1
Bonamia media		0.05	<1
Evolvulus alsinoides var. *villosicalyx*		0.3	<1
Solanum horridum		0.1	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		0.05	<1
Crotalaria medicaginea var. *neglecta*		0.3	<1
Ipomoea muelleri		Climber	<1
Chrysopogon fallax		0.3	<1
Wahlenbergia tumidifructa		0.15	<1

R14136

Staff JKN **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location

MGA Zone 50 562959 **mE** 7574235 **mN** **Lat.** -21.9351 **Long.** 117.6097

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Ironstone

Rock Type

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 3 % cover ; 1 cm in depth

Bare ground 40 % cover **Weeds** <1 % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\r;M+ ^*Acacia trachycarpa* (dwarf variant),^*Acacia ancistrocarpa*,*Grevillea wickhamii* subsp. *hispidula*\^shrub\3\i;G ^*Triodia epactia*,*Eulalia aurea*, *Bonamia erecta*\^hummock grass,tussock grass,shrub\2\c

Veg. Condition Excellent

Disturbance Cattle

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	4
Acacia trachycarpa (dwarf variant)		1.6	6
Acacia ancistrocarpa		1.7	4
Grevillea wickhamii subsp. *hispidula*		1.8	1
Triodia epactia		0.5	55
Sida echinocarpa		1.4	<1
Indigofera monophylla		0.15	<1

		Rutila
Bonamia erecta	0.2	1
Acacia tumida var. *pilbarensis*	2.2	<1
Corchorus tectus	0.4	<1
Ptilotus astrolasius	0.5	<1
Ptilotus nobilis subsp. *nobilis*	0.3	<1
Acacia atkinsiana	1.5	<1
Ptilotus calostachyus	0.6	<1
Acacia inaequilatera	2	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1
Hibiscus sturtii var. *grandiflorus*	0.3	<1
Gossypium australe	0.3	<1
Hakea lorea subsp. *lorea*	1.6	<1
Acacia colei var. *colei*	2.3	<1
Jasminum didymum subsp. *lineare*	1.6	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.2	<1
Eulalia aurea	0.4	2
Paraneurachne muelleri	0.3	<1
Duperreya commixta	Climber	<1
Acacia dictyophleba	1.4	<1
Goodenia forrestii	0.05	<1
Tribulus macrocarpus	0.05	<1

R14137

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 560041 **mE** 7567793 **mN** **Lat.** -21.9934 **Long.** 117.5816

Habitat Outwash

Aspect S **Slope** Very Gentle

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock >90% cover ; 6-20 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 20 % cover **Weeds** Nil % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Eucalyptus xerothermica*\^tree\6\r;M ^*Acacia bivenosa*,^*Acacia pyrifolia* var. *pyrifolia*,*Grevillea wickhamii* subsp. *hispidula*\^shrub\3\i;G ^*Triodia epactia*\^hummock grass\2\d

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	3
Acacia bivenosa		1.6	8
Acacia pyrifolia var. *pyrifolia*		2	2
Triodia epactia		0.5	75
Gossypium australe		0.3	<1
Indigofera monophylla		0.3	<1
Bonamia erecta		0.3	<1

Rutila

Senna artemisioides subsp. *oligophylla*		1.4	<1
Stylobasium spathulatum		2	<1
Jasminum didymum subsp. *lineare*		0.5	<1
Eulalia aurea		0.5	<1
Hakea chordophylla		2	<1
Acacia spondylophylla		0.6	<1
Acacia dictyophleba		1.8	<1
Grevillea wickhamii subsp. *hispidula*		2.2	1
Triodia wiseana		0.3	<1
Sida echinocarpa		0.6	<1
Acacia atkinsiana		2	1
Senna glutinosa subsp. *glutinosa*		1.6	<1
Santalum lanceolatum		1.6	<1
Eucalyptus xerothermica		6	2
Senna artemisioides subsp. *oligophylla* x *helmsii*		0.5	<1
Abutilon lepidum		1.4	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)		0.3	<1
Goodenia nuda	P 4	0.3	<1
Hakea lorea subsp. *lorea*		0.5	<1
Heliotropium ovalifolium		0.3	<1
Acacia adoxa var. *adoxa*		0.4	<1
Hibiscus sturtii var. *campylochlamys*		0.3	<1
Goodenia muelleriana		0.2	<1
Grevillea pyramidalis subsp. *leucadendron*		0.5	<1

R14138

Staff JKN **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 553920 **mE** 7564455 **mN** **Lat.** -22.0237 **Long.** 117.5225

Habitat Lower-Slope

Aspect SW **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation U ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Hakea chordophylla*\^shrub\4\bi;G+ ^*Triodia wiseana*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	0.5
Hakea chordophylla		3.5	0.5
Triodia wiseana		0.4	50
Acacia ancistrocarpa		2	<1
Grevillea wickhamii subsp. *hispidula*		3.5	<1
Senna glutinosa subsp. *glutinosa*		1.8	<1
Sida arenicola		1.5	<1
Acacia elachantha		1.5	<1

Rutila

Acacia adoxa var. *adoxa*	0.3	<1
Ptilotus calostachyus	0.4	<1
Goodenia stobbsiana	0.4	<1

R14139

Staff SK/AF **Date** 4/08/2014 **Season**

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 548054 **mE** 7560722 **mN** **Lat.** -22.0576 **Long.** 117.4657

Habitat Flat

Aspect **Slope** N/A

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; **Litter** 2 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M ^^*Eucalyptus gamophylla*,*Acacia atkinsiana*,*Acacia elachantha*\^shrub\4\i;G ^^*Triodia epactia*, *Triodia wiseana*,*Paraneurachne muelleri*\^hummock grass,tussock grass\2\c

Veg. Condition Excellent

Disturbance Cattle evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	2
Eucalyptus leucophloia subsp. *leucophloia*		8	1
Eucalyptus gamophylla		4	8
Acacia atkinsiana		3	5
Acacia elachantha		2	1
Triodia epactia		.6	35
Triodia wiseana		.6	5

Rutila

Paraneurachne muelleri	.3	2
Acacia tumida var. *pilbarensis*	2	<1
Gompholobium oreophilum	.5	<1
Ptilotus astrolasius	.4	<1
Senna glutinosa subsp. *pruinosa*	1.5	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.5	<1
Acacia dictyophleba	2	<1
Jasminum didymum subsp. *lineare*	Climber	<1
Goodenia microptera	.2	<1
Indigofera monophylla	.5	<1
Grevillea wickhamii	2	<1
Aristida holathera var. *holathera*	.4	<1
Acacia adoxa var. *adoxa*	.5	<1
Amphipogon sericeus	.3	<1
Corchorus tectus	1	<1
Cymbopogon ambiguus	1	<1
Goodenia stobbsiana	.3	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	1	<1
Bonamia erecta	.3	<1
Senna symonii	.7	<1
Themeda triandra	.6	<1
Ptilotus calostachyus	.5	<1
Gossypium australe	1	<1
Eulalia aurea	.5	<1
Isotropis atropurpurea	.6	<1
Acacia monticola	2.5	<1

R14140

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 582690 **mE** 7594800 **mN** **Lat.** -21.7485 **Long.** 117.7997

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown sandy loam

Rock Type Basalt

Loose Rock 20-50 % cover ; **Litter** <1 % cover ; <1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\bi;M ^*Acacia elachantha*\^shrub\4\bi;G ^*Triodia epactia*, ^*Triodia wiseana*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	1
Acacia elachantha		2.5	1
Triodia epactia		.5	30
Triodia wiseana		.5	5
Triodia angusta		.5	1
Fimbristylis dichotoma		.1	<1
Indigofera monophylla		.3	<1
Grevillea pyramidalis subsp. *leucadendron*		1.7	<1

		Rutila
Gossypium australe	1	<1
Acacia trachycarpa (dwarf variant)	.5	<1
Goodenia microptera	.2	<1
Swainsona stenodonta	.4	<1
Hibiscus coatesii	.2	<1
Pluchea dentex	.3	<1
Evolvulus alsinoides var. *villosicalyx*	.2	<1
Stemodia grossa	.6	<1
Hakea lorea subsp. *lorea*	1	<1
Hakea chordophylla	1.5	<1
Acacia tenuissima	1	<1
Acacia maitlandii	1.5	<1
Pluchea ferdinandi-muelleri	.4	<1
Swainsona formosa	.2	<1
Corchorus tectus	.8	<1
Synaptantha tillaeacea var. *tillaeacea*	.1	<1
Mollugo molluginea	.1	<1
Sporobolus australasicus	.1	<1

R14141

Staff SK/AF **Date** 1/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 580481 **mE** 7590995 **mN** **Lat.** -21.7829 **Long.** 117.7785

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Brown clay

Rock Type Chert

Loose Rock 0 % cover ; 2-6 mm in size **Litter** 10 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** <1 % cover

Vegetation U+ ^*Acacia citrinoviridis*,^*Corymbia hamersleyana*\^tree\6\c;G ^*Triodia epactia*,^*Themeda triandra*\^hummock grass,tussock grass\2\i

Veg. Condition Excellent

Disturbance Cattle grazing

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia citrinoviridis		7	60
Corymbia hamersleyana		8	2
Triodia epactia		.6	15
Themeda triandra		.5	2
* *Bidens bipinnata*		.2	<1
Paraneurachne muelleri		.4	<1
Phyllanthus maderaspatensis		.4	<1
Duperreya commixta		2	<1

Rutila

Carissa lanceolata	1.5	<1
* *Vachellia farnesiana*	2	<1
Aeschynomene indica	.5	<1
Hybanthus aurantiacus	.3	<1
Sida spinosa	.3	<1
Eragrostis tenellula	.3	<1
Eucalyptus leucophloia subsp. *leucophloia*	6	<1
* *Malvastrum americanum*	.3	<1
Evolvulus alsinoides var. *decumbens*	.2	<1
* *Setaria verticillata*	.4	<1
Alternanthera nana	.3	<1
Rhynchosia minima	Climber	<1
Pterocaulon sphacelatum	.4	<1
Brachyachne convergens	.1	<1
Digitaria brownii	.2	<1
Rostellularia adscendens var. *clementii*	.2	<1
Acacia tumida var. *pilbarensis*	1.5	<1

R14142

Staff SK/AF **Date** 2/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 567965 **mE** 7583182 **mN** **Lat.** -21.8541 **Long.** 117.6578

Habitat Low Undulating Hills

Aspect SE **Slope** Very Gentle

Soil Type Brown loam

Rock Type Shale

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation G+ ^*Triodia brizoides*,^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Cattle evidence

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Triodia brizoides		.7	35
Triodia wiseana		.6	5
Acacia bivenosa		1	<1
Acacia pruinocarpa		1.5	<1
Indigofera monophylla		.8	<1
Senna glutinosa subsp. *pruinosa*		2	<1
Acacia synchronicia		.5	<1
Acacia pyrifolia var. *pyrifolia*		1.6	<1

R14143

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 557285 **mE** 7567073 **mN** **Lat.** -22.0000 **Long.** 117.5550

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 4 % cover ; 1 - 2 cm cm in depth

Bare ground 30 % cover **Weeds** Nil % cover

Vegetation U ^*Eucalyptus xerothermica*,^*Corymbia hamersleyana*\^tree\6\bi;M+ ^*Acacia tumida* var. *pilbarensis*,*Acacia atkinsiana*\^shrub\4\i;G ^*Triodia epactia*,^*Triodia wiseana*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance

Fire Age > 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	0.5
Acacia tumida var. *pilbarensis*		2.5	15
Triodia epactia		0.6	35
Triodia wiseana		0.6	25
Acacia adoxa var. *adoxa*		1.6	<1
Eriachne mucronata		0.3	<1
Acacia atkinsiana		2	2
Petalostylis labicheoides		2.2	<1

Rutila

Duperreya commixta	Climber	<1
Indigofera monophylla	0.4	<1
Eucalyptus leucophloia subsp. *leucophloia*	3	<1
Eucalyptus xerothermica	6	0.5
Jasminum didymum subsp. *lineare*	0.4	<1
Santalum lanceolatum		<1
Ptilotus nobilis subsp. *nobilis*	0.1	<1
Senna glutinosa subsp. *glutinosa*	1.8	<1
Eulalia aurea	0.4	<1
Themeda triandra	0.4	<1
Senna artemisioides subsp. *oligophylla*	2	<1
Acacia bivenosa	1.4	<1
Acacia pyrifolia var. *pyrifolia*	1.5	<1
Acacia tenuissima	0.4	<1
Rhynchosia minima	Climber	<1

R14144

Staff SK/AF **Date** 4/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 546413 **mE** 7561275 **mN** **Lat.** -22.0527 **Long.** 117.4498

Habitat Lower-Slope

Aspect S **Slope** Very Gentle

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 80 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;G ^*Triodia wiseana*,^*Triodia epactia*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle evidence

Fire Age >10 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		8	5
Triodia wiseana		.5	15
Triodia epactia		.6	2
Acacia tenuissima		.6	<1
Acacia maitlandii		.2	<1
Aristida holathera var. *holathera*		.4	<1
Senna artemisioides subsp. *oligophylla*		.7	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		.1	<1

Rutila

Indigofera monophylla	.3	<1
Paraneurachne muelleri	.4	<1
Eulalia aurea	.5	<1
Ptilotus calostachyus	.5	<1
Ptilotus astrolasius	.4	<1
Ptilotus nobilis subsp. *nobilis*	.4	<1
Goodenia stobbsiana	.2	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	.5	<1
Amphipogon sericeus	.3	<1
Senna symonii	.6	<1
Acacia dictyophleba	.6	<1

R14145

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 564727 **mE** 7576554 **mN** **Lat.** -21.9141 **Long.** 117.6267

Habitat Flat

Aspect N/A **Slope** N/A

Soil Type Brown clayey loam

Rock Type Mixed alluvial

Loose Rock <2 % cover ; 6-20 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 75 % cover **Weeds** <1 % cover

Vegetation M+ ^^*Acacia pruinocarpa*,*Acacia ancistrocarpa*,*Acacia inaequilatera*\^shrub\4\r;G ^*Triodia epactia*\^hummock grass\2\i

Veg. Condition Excellent

Disturbance Cattle evidence, some weeds

Fire Age >5

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia pruinocarpa		4	3
Acacia ancistrocarpa		3	3
Acacia inaequilatera		3	1
Triodia epactia		.6	25
Acacia trachycarpa		1.5	<1
Ptilotus nobilis subsp. *nobilis*		.2	<1
Hakea lorea subsp. *lorea*		1	<1
Cymbopogon obtectus		.7	<1

Rutila

Duperreya commixta	Climber	<1
Sida arsiniata	.5	<1
Acacia aptaneura	3.5	<1
Eremophila latrobei subsp. *filiformis*	2	<1
* *Cenchrus ciliaris*	.5	<1
Cheilanthes sieberi subsp. *sieberi*	.1	<1
Sclerolaena cornishiana	.3	<1
Cullen leucochaites	1	<1
Eulalia aurea	.7	<1
Goodenia microptera	.4	<1
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	.4	<1
Acacia synchronicia	1.5	<1
Tribulus macrocarpus	Prostrate	<1
Acacia dictyophleba	3	<1
Senna artemisioides subsp. *oligophylla*	1.5	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1	<1
Aristida contorta	.3	<1
Enneapogon polyphyllus	.3	<1
Solanum lasiophyllum	.4	<1
Hibiscus sturtii var. *grandiflorus*	.3	<1
Lysiana casuarinae	Parasite	<1
Rhynchosia minima	Climber	<1
Eriachne pulchella subsp. *dominii*	.1	<1
Goodenia microptera	.4	<1
Gossypium australe	.2	<1
Cucumis maderaspatanus	Climber	<1
Corchorus tectus	.5	<1
Salsola australis	.4	<1
Pterocaulon sphacelatum	.4	<1
Euphorbia coghlanii	.2	<1
Acacia pyrifolia var. *pyrifolia*	2.5	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)	.3	<1

R14146

Staff SK/AF **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 551435 **mE** 7562737 **mN** **Lat.** -22.0393 **Long.** 117.4984

Habitat Lower-Slope

Aspect SE **Slope** Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 0-1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia maitlandii*,^*Acacia inaequilatera*\^shrub\3\r;G ^*Triodia wiseana*,^*Acacia adoxa* var. *adoxa*\^hummock grass,shrub\1\i

Veg. Condition Excellent

Disturbance Nil

Fire Age <10 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	1
Acacia maitlandii		1.5	4
Acacia inaequilatera		2	2
Triodia wiseana		.5	25
Acacia adoxa var. *adoxa*		.5	3
Hakea chordophylla		3	<1
Senna glutinosa subsp. *glutinosa*		.8	<1
Acacia dictyophleba		1.8	<1

Rutila

Ptilotus calostachyus	.6	<1
Paraneurachne muelleri	.4	<1
Grevillea wickhamii	2	<1
Keraudrenia nephrosperma	.8	<1
Ptilotus astrolasius	.2	<1
Acacia tenuissima	.7	<1
Acacia ancistrocarpa	1.2	<1
Acacia monticola	1.3	<1
Amphipogon sericeus	.4	<1

R14148

Staff JKN **Date** 3/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 556201 **mE** 7564896 **mN** **Lat.** -22.0197 **Long.** 117.5445

Habitat Open Depression - outwash area

Aspect S **Slope** Very Gentle

Soil Type Red brown clay loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 4 % cover ; 1 cm in depth

Bare ground 15 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*,^*Eucalyptus xerothermica*\^tree\6\r;M ^*Acacia tumida* var. *pilbarensis*,*Gossypium australe*\^shrub\3\r;G ^*Triodia epactia*,^*Themeda triandra*,*Eulalia aurea*\^hummock grass,tussock grass\2\d

Veg. Condition Very Good

Disturbance Cattle

Fire Age 3 - 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		6	3
Eucalyptus xerothermica		6	1
Acacia tumida var. *pilbarensis*		1.8	3
Triodia epactia		0.4	35
Themeda triandra		0.6	25
Eulalia aurea		0.6	10
Indigofera monophylla		0.4	<1

Rutila

Corchorus tectus		0.5	<1
Triodia wiseana		0.4	<1
Gossypium australe		1.7	1
Cucumis maderaspatanus		Climber	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.2	<1
Alternanthera nana		0.3	<1
* *Malvastrum americanum*		0.5	<1
Crotalaria medicaginea var. *neglecta*		0.4	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)		1.5	<1
Euphorbia sp.		0.3	<1
Pterocaulon sphacelatum		0.3	<1
Rhynchosia minima		Climber	<1
Gossypium robinsonii		0.5	<1
Stemodia grossa		0.4	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		0.5	<1
Jasminum didymum subsp. *lineare*		0.4	<1
Isotropis atropurpurea		0.5	<1
Acacia pyrifolia var. *pyrifolia*		1	<1
Solanum diversiflorum		0.4	<1
Polymeria ambigua		0.1	<1
Cullen leucochaites		0.3	<1
Hakea lorea subsp. *lorea*		0.5	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*		0.4	<1
Evolvulus alsinoides var. *villosicalyx*		0.3	<1
Grevillea pyramidalis subsp. *leucadendron*		0.5	<1
Senna artemisioides subsp. *oligophylla*		1.5	<1
Eremophila longifolia		1.4	<1
Chrysopogon fallax		0.6	<1
Paraneurachne muelleri		0.4	<1
Heliotropium cunninghamii		0.2	<1
Ptilotus astrolasius		0.3	<1
Santalum lanceolatum		0.4	<1
Aristida holathera var. *holathera*		0.5	<1
Goodenia nuda	P4	0.4	<1
Goodenia forrestii		0.3	<1
Bonamia erecta		0.4	<1
Eriachne tenuiculmis		0.5	<1
Phyllanthus maderaspatensis		0.4	<1
Acacia dictyophleba		0.4	<1
Hybanthus aurantiacus		0.4	<1
Paraneurachne muelleri		0.4	<1
Bonamia sp. Dampier (A.A. Mitchell PRP 217)			<1
Senna glutinosa subsp. *glutinosa x oligophylla*			<1
Cleome viscosa		0.2	<1
Mollugo molluginea		0.05	<1
Goodenia microptera		0.3	<1

R14149

Staff SK/AF **Date** 5/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 553239 **mE** 7553681 **mN** **Lat.** -22.1211 **Long.** 117.5162

Habitat Open Depression

Aspect N/A **Slope** N/A

Soil Type Brown loam

Rock Type Ironstone

Loose Rock 20-50 % cover ; 20-60 mm in size **Litter** 2 % cover ; 1 cm in depth

Bare ground 60 % cover **Weeds** <1 % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia pyrifolia* var. *pyrifolia*\^shrub\4\bi;G ^^*Triodia epactia*,*Themeda triandra*,*Paraneurachne muelleri*\^hummock grass,tussock grass\2\c

Veg. Condition Excellent

Disturbance Cattle grazing, some weeds

Fire Age >5

Notes Area to the east and south has been recently burnt. Southern end of rail corridor

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		8	2
Acacia pyrifolia var. *pyrifolia*		3	<1
Triodia epactia		.6	35
Themeda triandra		.5	2
Paraneurachne muelleri		.4	1
Polycarpaea longiflora		.3	<1
Evolvulus alsinoides var. *villosicalyx*		.3	<1
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)		.6	<1

Rutila

Heliotropium cunninghamii		.2	<1
Aristida holathera var. *holathera*		.4	<1
Cucumis maderaspatanus		.5	<1
Corchorus lasiocarpus subsp. *parvus*		1.1	<1
Polymeria ambigua		.4	<1
Ptilotus astrolasius		.4	<1
Pterocaulon sphacelatum		.5	<1
Mollugo molluginea		.2	<1
Indigofera monophylla		.5	<1
Pterocaulon serrulatum		.5	<1
Goodenia nuda	P 4	.3	<1
Euphorbia australis var. *subtomentosa*		.2	<1
Enneapogon lindleyanus		.4	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		.3	<1
* *Cenchrus ciliaris*		.5	<1
Gossypium australe		1	<1
Senna artemisioides subsp. *helmsii*		1.4	<1
Eulalia aurea		.5	<1
Jasminum didymum subsp. *lineare*		Climber	<1
Enneapogon polyphyllus		.3	<1
Senna artemisioides subsp. *oligophylla x glutinosa*		1.3	<1
Eriachne aristidea		.3	<1
Tephrosia sp. Fortescue (A.A. Mitchell 606)		.5	<1
Heliotropium tenuifolium		.3	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		.4	<1
Digitaria brownii		.4	<1
Eragrostis eriopoda		.4	<1
Eriachne tenuiculmis		.4	<1
Cymbopogon procerus		.6	<1
Ptilotus fusiformis		.3	<1
Hybanthus aurantiacus		.4	<1
Trichodesma zeylanicum var. *zeylanicum*		1	<1
Goodenia stobbsiana		.3	<1
Cleome viscosa		.5	<1

R14150

Staff SK/AF **Date** 5/08/2014 **Season** A

Revisit

Type R 50 m x 50 m

Location Rutila Rail

MGA Zone 50 542875 **mE** 7559718 **mN** **Lat.** -22.0668 **Long.** 117.4156

Habitat Crest

Aspect E **Slope** Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 2 % cover ; 0-1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U ^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\r;M+ ^^*Eucalyptus gamophylla*,*Acacia pyrifolia* var. *pyrifolia*,*Acacia maitlandii*\^shrub\4\i;G ^*Triodia wiseana*,^*Waltheria virgata*\^hummock grass,shrub\1\c

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes Top of highest hill, Blackjack

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	2
Eucalyptus gamophylla		2.5	10
Acacia pyrifolia var. *pyrifolia*		2.5	1
Acacia maitlandii		2	1
Triodia wiseana		.5	40
Waltheria virgata		.5	1
Goodenia stobbsiana		.2	<1

		Rutila
Hakea chordophylla	2	<1
Dampiera candicans	.3	<1
Eriachne mucronata	.3	<1
Ptilotus astrolasius	.4	<1
Jasminum didymum subsp. *lineare*	1	<1
Cymbopogon ambiguus	.6	<1
Corymbia hamersleyana	3	<1
Senna glutinosa subsp. *glutinosa*	1.5	<1
Acacia pruinocarpa	1	<1
Dodonaea lanceolata var. *lanceolata*	1.2	<1
Dodonaea coriacea	.5	<1
Corchorus lasiocarpus subsp. *parvus*	.5	<1
Cassytha capillaris	.5	<1

R14151

Staff JKN **Date** 5/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 546370 **mE** 7559338 **mN** **Lat.** -22.0702 **Long.** 117.4495

Habitat Cest of low hill

Aspect W **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** 1 % cover ; 1 cm in depth

Bare ground 85 % cover **Weeds** Nil % cover

Vegetation M+ ^*Acacia ancistrocarpa*\^shrub\3\r;G ^*Triodia* aff. *melvillei*,^*Amphipogon sericeus*\^hummock grass,tussock grass\1\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia ancistrocarpa		2	4
Triodia aff. *melvillei*		0.3	10
Amphipogon sericeus		0.3	10
Eucalyptus leucophloia subsp. *leucophloia*		3	<1
Corymbia deserticola subsp. *deserticola*		3	<1
Hakea chordophylla		3	<1
Ptilotus astrolasius		0.2	<1
Ptilotus calostachyus		0.4	<1

		Rutila
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	0.05	<1
Eriachne mucronata	0.3	<1
Mollugo molluginea	0.05	<1
Goodenia stobbsiana	0.3	<1
Themeda triandra	0.5	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.3	<1
Eulalia aurea	0.3	<1
Senna glutinosa subsp. *glutinosa*	3.5	<1
Triodia epactia	0.4	<1
Cymbopogon ambiguus	0.4	<1
Chrysopogon fallax	0.5	<1
Fimbristylis simulans	0.05	<1
Aristida holathera var. *holathera*	0.4	<1
Schizachyrium fragile	0.1	<1

R14152

Staff JKN **Date** 5/08/2014 **Season** A

Revisit

Type Q 25 m x 100 m

Location Rutila Rail

MGA Zone 50 542434 **mE** 7558090 **mN** **Lat.** -22.0815 **Long.** 117.4113

Habitat Creek

Aspect N/A **Slope** N/A

Soil Type Red brown sand

Rock Type Ironstone

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 3 % cover ; 1 cm in depth

Bare ground 70 % cover **Weeds** Nil % cover

Vegetation U+ ^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia tumida* var. *pilbarensis*\^shrub\3\r;G ^*Triodia epactia*,^*Corchorus tectus*,*Bonamia erecta*\^hummock grass,shrub\2\i

Veg. Condition Excellent

Disturbance

Fire Age 3 - 5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		7	4
Acacia tumida var. *pilbarensis*		2	6
Triodia epactia		0.5	10
Corchorus tectus		0.6	10
Paraneurachne muelleri		0.4	5
Gossypium australe		1.5	<1
Themeda triandra		0.5	5
Bonamia erecta		0.2	8

Rutila

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)		1.5	<1
Acacia pyrifolia var. *pyrifolia*		1.5	<1
Goodenia stobbsiana		0.1	<1
Senna glutinosa subsp. *glutinosa*		0.4	<1
Digitaria brownii		0.3	<1
Scaevola spinescens		1	<1
Jasminum didymum subsp. *lineare*		1	<1
Duperreya commixta		Climber	<1
Ptilotus astrolasius		0.3	<1
Chrysopogon fallax		0.5	<1
Aristida holathera var. *holathera*		0.3	<1
Mollugo molluginea		0.1	<1
Alternanthera nana		0.1	<1
Indigofera monophylla		0.3	<1
Gomphrena cunninghamii		0.05	<1
Heliotropium cunninghamii		0.3	<1
Goodenia microptera		0.3	<1
Waltheria indica		0.3	<1
Abutilon lepidum		0.1	<1
Triodia wiseana		0.4	<1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	P 3	0.5	<1
Eriachne mucronata		0.3	<1
Hybanthus aurantiacus		0.3	<1
Hibiscus sturtii var. *campylochlamys*		0.5	<1
Melhania oblongifolia		0.4	<1
Euphorbia tannensis subsp. *eremophila*		0.3	<1
Sida sp. verrucose glands (F.H. Mollemans 2423)		0.1	<1
Rhynchosia minima		Climber	<1
Indigofera colutea		0.1	<1
Senna artemisioides subsp. *oligophylla*		1.4	<1
Evolvulus alsinoides var. *villosicalyx*		0.1	<1
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)		0.4	5
Evolvulus alsinoides var. *decumbens*		0.2	<1

R14153

Staff JKN **Date** 5/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 542868 **mE** 7559593 **mN** **Lat.** -22.0680 **Long.** 117.4155

Habitat Upper-Slope

Aspect S **Slope** Moderate

Soil Type Red brown loam

Rock Type Ironstone

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 75% cover **Weeds** Nil% cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*,*Corymbia hamersleyana*\^tree\6\r;G ^*Triodia wiseana*,*Waltheria virgata*\^hummock grass,shrub\1\i

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		7	3
Corymbia hamersleyana		5	1
Triodia wiseana		0.4	25
Goodenia cusackiana		0.1	<1
Waltheria virgata		0.3	1
Hakea chordophylla		3	<1
Dampiera candicans		0.4	<1
Eriachne mucronata		0.3	<1

		Rutila
Acacia pyrifolia var. *pyrifolia*	2	<1
Mollugo molluginea	0.1	<1
Cymbopogon ambiguus	0.5	<1
Corchorus lasiocarpus subsp. *lasiocarpus*	0.5	<1
Ptilotus fusiformis	0.3	<1
Ptilotus astrolasius	0.4	<1
Aristida holathera var. *holathera*	0.3	<1
Hybanthus aurantiacus	0.3	<1
Acacia pruinocarpa	1.6	<1
Calytrix carinata	0.1	<1
Goodenia triodiophila	0.5	<1
Acacia dictyophleba	1.6	<1
Eucalyptus gamophylla	2.1	<1
Goodenia stobbsiana	0.05	<1

R14155

Staff JKN **Date** 6/08/2014 **Season** A

Revisit

Type Q 50 m x 50 m

Location Rutila Rail

MGA Zone 50 585665 **mE** 7598349 **mN** **Lat.** -21.7163 **Long.** 117.8283

Habitat Flat

Aspect W **Slope** Very Gentle

Soil Type Red brown loam

Rock Type Ironstone, Basalt, Quartz

Loose Rock >90% cover ; 20-60 mm in size **Litter** <1 % cover ; <1 cm in depth

Bare ground 50 % cover **Weeds** Nil % cover

Vegetation M+ ^*Acacia inaequilatera*\^shrub\4\bi;G ^*Triodia wiseana*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Acacia inaequilatera		2.2	1
Triodia wiseana		0.4	45
Swainsona stenodonta		0.4	<1
Hakea chordophylla		0.3	<1
Solanum phlomoides		0.3	<1
Trichodesma zeylanicum var. *zeylanicum*		0.4	<1
Corchorus tectus		0.4	<1
Aristida latifolia		0.3	<1
Senna notabilis		0.1	<1

Rutila

Cymbopogon ambiguus	0.2	<1
Hibiscus sturtii var. *campylochlamys*	0.2	<1
Solanum lasiophyllum	0.3	<1
Cassytha capillaris	Creeper	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*	1.2	<1
Grevillea wickhamii subsp. *hispidula*	2.2	<1
Senna glutinosa subsp. *glutinosa*	2	<1

R14156

Staff SK/AF **Date** 6/08/2014 **Season** A

Revisit

Type R 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583509 **mE** 7593228 **mN** **Lat.** -21.7626 **Long.** 117.8077

Habitat Crest

Aspect N/A **Slope** Gentle

Soil Type Red brown loam

Rock Type ?chert

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 4 % cover ; 0-1 cm in depth

Bare ground 60 % cover **Weeds** 0 % cover

Vegetation U+ ^*Eucalyptus leucophloia* subsp. *leucophloia*,^*Corymbia hamersleyana*\^tree\6\r;M ^*Acacia tenuissima*,^*Acacia* sp.\^shrub\3\r;G ^*Triodia brizoides*,^*Triodia epactia*\^hummock grass\1\c

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes Mackay land system, south of Roebourne Wittenoom road

Species	WA Cons.	Height (m)	Cover (%)
Eucalyptus leucophloia subsp. *leucophloia*		6	8
Acacia tenuissima		1	3
Acacia sp.		1.5	1
Triodia brizoides		.5	40
Indigofera monophylla		.5	<1
Sida sp. Pilbara (A.A. Mitchell PRP 1543)		.6	<1
Senna glutinosa subsp. x *luerssenii*		.8	<1
Acacia adoxa var. *adoxa*		.4	<1

Rutila

Ptilotus calostachyus	.8	<1
Triodia epactia	.5	1
Fimbristylis dichotoma	.3	<1
Goodenia stobbsiana	.3	<1
Senna glutinosa subsp. *glutinosa*	1	<1
Dodonaea coriacea	.5	<1
Clerodendrum floribundum var. *angustifolium*	1.5	<1
Solanum diversiflorum	.3	<1
Solanum cleistogamum	.3	<1
Corymbia hamersleyana	4	<1

R14157

Staff SK/AF **Date** 6/08/2014 **Season** A

Revisit

Type R 50 m x 50 m

Location Rutila Rail

MGA Zone 50 583513 **mE** 7593478 **mN** **Lat.** -21.7604 **Long.** 117.8077

Habitat Minor drainage

Aspect N/A **Slope** Very Gentle

Soil Type Red brown loam

Rock Type ?chert

Loose Rock 50-90 % cover ; 20-60 mm in size **Litter** 8 % cover ; 0-3 cm in depth

Bare ground 35 % cover **Weeds** 0 % cover

Vegetation U ^*Corymbia hamersleyana*,^*Eucalyptus leucophloia* subsp. *leucophloia*\^tree\6\bi;M+ ^*Acacia monticola*,^*Acacia tumida* var. *pilbarensis*\^shrub\3\i;G ^*Triodia epactia*\^hummock grass\2\c

Veg. Condition Excellent

Disturbance Nil

Fire Age >5 years

Notes

Species	WA Cons.	Height (m)	Cover (%)
Corymbia hamersleyana		4	1
Eucalyptus leucophloia subsp. *leucophloia*		5	<1
Acacia monticola		1.8	20
Acacia tumida var. *pilbarensis*		2	10
Triodia epactia		.7	65
Grevillea wickhamii		2	<1
Acacia adoxa var. *adoxa*		.4	<1
Acacia maitlandii		1.5	<1

Rutila

Ptilotus astrolasius	.4	<1
Fimbristylis dichotoma	.2	<1
Hybanthus aurantiacus	.3	<1

R14R1

Staff LA/AF **Date** 15/07/2014 **Season** A

Revisit

Type R

Location Rutila Rail

MGA Zone 50 573425 **mE** 7698078 **mN** **Lat.** -20.8158 **Long.** 117.7056

Habitat Crest

Aspect N **Slope** Steep

Soil Type Brown loam

Rock Type Quartz

Loose Rock 20-50 % cover ; **Litter** 2 % cover

Bare ground 80 % cover **Weeds** <1 % cover

Vegetation U+ ^*Ficus brachypoda*\^tree\6\r;M ^*Grevillea pyramidalis* subsp. *leucadendron*,^*Tephrosia rosea* var. *clementii*\^shrub\3\r;G ^^*Eriachne mucronata*,*Triodia wiseana*,*Triodia epactia*\^tussock grass, hummock grass\2\i

Veg. Condition Very Good

Disturbance No evidence

Fire Age

Notes Releve encompassing slopes and crest of quartz hill

Species	WA Cons.	Height (m)	Cover (%)
Ehretia saligna var. *saligna*		1.3	<1
Tephrosia rosea var. *clementii*		.6	2
Triodia wiseana		0.5	5
Boerhavia coccinea		.2	<1
* *Cenchrus ciliaris*		.4	<1
Senna artemisioides subsp. *oligophylla* x *helmsii*		.5	<1
Acacia ancistrocarpa		1.4	<1

Rutila

Evolvulus alsinoides var. *villosicalyx*	.2	<1
Gomphrena cunninghamii	.3	<1
Triumfetta clementii	.4	<1
Cleome viscosa	.5	<1
Cucumis maderaspatanus	Climber	<1
Solanum lasiophyllum	.2	<1
Jasminum didymum subsp. *lineare*	Climber	<1
Senna glutinosa subsp. *pruinosa*	1.2	<1
Enneapogon polyphyllus	.1	<1
Stemodia grossa	.3	<1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	.3	<1
Hybanthus aurantiacus	.2	<1
Goodenia stobbsiana	.1	<1
Fimbristylis dichotoma	.1	<1
Abutilon lepidum	.1	<1
Eriachne mucronata	.3	5
Tribulus suberosus	.4	<1
Ficus brachypoda	4	2
Crotalaria novae-hollandiae subsp. *novae-hollandiae*	.6	<1
Capparis spinosa var. *nummularia*	.7	<1
Solanum diversiflorum	.4	<1
Grevillea pyramidalis subsp. *leucadendron*	1.5	<1
Cyperus cunninghamii subsp. *cunninghamii*	.3	<1
Triodia epactia	.5	2
Polycarpaea longiflora	.3	<1
Cymbopogon ambiguus	.4	<1
Eriachne pulchella subsp. *dominii*	.1	<1
Grevillea pyramidalis subsp. *leucadendron*	2	1

APPENDIX FIVE: FLORA INVENTORY

Table 26: Flora Inventory

SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE
Acanthaceae		**Asteraceae**		**Caryophyllaceae**		**Cucurbitaceae**	
Rostellularia adscendens var. *clementii*		*Apowollastonia hamersleyensis*		*Polycarpaea corymbosa* var. *corymbosa*		*Cucumis maderaspatanus*	
Aizoaceae		**Bidens bipinnata*		*Polycarpaea holtzei*		**Cucumis melo subsp. agrestis*	
Trianthema glossostigmum		*Calotis plumulifera*		*Polycarpaea longiflora*		**Cyperaceae**	
Trianthema triquetrum		*Chrysocephalum gilesii*		**Celastraceae**		*Bulbostylis barbata*	
Amaranthaceae		**Flaveria trinervia*		*Maytenus* sp. Mt Windell (S. van Leeuwen 846)		*Bulbostylis turbinata*	
**Aerva javanica*		*Helichrysum oligochaetum*	P1	*Stackhousia intermedia*		Cyperaceae sp.	
Alternanthera angustifolia		*Pentalepis trichodesmoides* subsp. *trichodesmoides*		**Chenopodiaceae**		*Cyperus bifax*	
Alternanthera denticulata		*Pentalepis trichodesmoides* subsp. *hispida*	P2	*Dysphania kalpari*		*Cyperus blakeanus*	
Alternanthera nana		*Pluchea dentex*		*Dysphania rhadinostachya* subsp. *rhadinostachya*		*Cyperus cunninghamii* subsp. *cunninghamii*	
Amaranthus undulatus		*Pluchea ferdinandi-muelleri*		*Enchylaena tomentosa* var. *tomentosa*		*Cyperus hesperius*	
Gomphrena affinis subsp. *pilbarensis*		*Pluchea ferdinandi-muelleri x tetranthera*		*Rhagodia eremaea*		*Cyperus ixiocarpus*	
Gomphrena canescens		*Pluchea rubelliflora*		*Salsola australis*		*Cyperus vaginatus*	
Gomphrena cunninghamii		*Pluchea tetranthera*		*Sclerolaena cornishiana*		*Eleocharis geniculata*	
Ptilotus arthrolasius		*Pterocaulon serrulatum*		*Sclerolaena costata*		*Fimbristylis dichotoma*	
Ptilotus astrolasius		*Pterocaulon sphacelatum*		*Sclerolaena densiflora*		*Fimbristylis elegans*	
Ptilotus axillaris		*Pterocaulon sphaeranthoides*		*Sclerolaena hostilis*		*Fimbristylis microcarya*	
Ptilotus calostachyus		**Sigesbeckia orientalis*		*Threlkeldia diffusa*		*Fimbristylis simulans*	
Ptilotus carinatus		**Sonchus oleraceus*		**Cleomaceae**		*Fimbristylis* sp.	
Ptilotus fusiformis		*Streptoglossa bubakii*		*Cleome oxalidea*		*Schoenoplectus subulatus*	
Ptilotus gomphrenoides		*Streptoglossa* sp.		*Cleome uncifera* subsp. *uncifera*		**Elatinaceae**	
Ptilotus helipteroides		**Boraginaceae**		*Cleome viscosa*		*Bergia pedicellaris*	
Ptilotus incanus		*Ehretia saligna* var. *saligna*		**Combretaceae**		**Euphorbiaceae**	
Ptilotus macrocephalus		*Heliotropium crispatum*		*Terminalia canescens*		*Adriana tomentosa* var. *tomentosa*	
Ptilotus murrayi		*Heliotropium cunninghamii*		**Convolvulaceae**		*Euphorbia australis* var. *hispidula*	
Ptilotus nobilis subsp. *nobilis*		*Heliotropium muticum*	P1	*Bonamia erecta*		*Euphorbia australis* var. *subtomentosa*	
Ptilotus obovatus		*Heliotropium ovalifolium*		*Bonamia linearis*		*Euphorbia biconvexa*	
Ptilotus polystachyus		*Heliotropium pachyphyllum*		*Bonamia media*		*Euphorbia boophthona*	
Ptilotus rotundifolius		*Heliotropium tenuifolium*		*Bonamia* sp. (HD94-6)		*Euphorbia coghlanii*	
Apocynaceae		*Heliotropium transforme*		*Bonamia* sp. Dampier (A.A. Mitchell PRP 217)		*Euphorbia drummondii*	
Carissa lanceolata		*Trichodesma zeylanicum* var. *zeylanicum*		*Duperreya commixta*		*Euphorbia schultzii*	
Cynanchum floribundum		**Brassicaceae**		*Evolvulus alsinoides* var. *decumbens*		*Euphorbia* sp.	
Rhyncharrhena linearis		*Lepidium pholidogynum*		*Evolvulus alsinoides* var. *villosicalyx*		*Euphorbia tannensis* subsp. *eremophila*	
Sarcostemma viminale subsp. *australe*		**Campanulaceae**		*Ipomoea coptica*		*Euphorbia sp*	
Araliaceae		*Lobelia arnhemiaca*		*Ipomoea lonchophylla*		*Mallotus nesophilus*	
Astrotricha hamptonii		*Lobelia heterophylla* subsp. *pilbarensis*		*Ipomoea muelleri*			
Trachymene oleracea subsp. *oleracea*		*Wahlenbergia tumidifructa*		*Operculina aequisepala*			
Trachymene sp.		**Capparaceae**		*Polymeria ambigua*			
		Capparis spinosa var. *nummularia*					

Table 26: Flora Inventory

SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE
Fabaceae		**Fabaceae cont'**		**Fabaceae cont'**		**Fabaceae cont'**	
Acacia acradenia		*Acacia tenuissima*		*Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301)	P3	*Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601)	
Acacia adoxa var. *adoxa*		*Acacia tetragonophylla*		*Indigofera trita*		*Tephrosia* sp. Fortescue (A.A. Mitchell 606)	
Acacia ampliceps		*Acacia trachycarpa*		*Isotropis atropurpurea*		*Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	
Acacia ancistrocarpa		*Acacia trachycarpa* (dwarf variant)		*Lotus* sp.		*Tephrosia supina*	
Acacia ancistrocarpa x stellaticeps		*Acacia trachycarpa x tumida*		*Mirbelia viminalis*		*Tephrosia virens*	
Acacia ancistrocarpa x trachycarpa		*Acacia trudgeniana*		*Neptunia dimorphantha*		*Tephrosia remotiflora*	
Acacia aneura		*Acacia tumida* var. *pilbarensis*		*Petalostylis labicheoides*		**Vachellia farnesiana*	
Acacia aptaneura		*Acacia xiphophylla*		*Rhynchosia minima*		*Vigna lanceolata* var. *lanceolata*	
Acacia arida		*Aeschynomene indica*		*Rhynchosia bungarensis*	P4	*Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113)	
Acacia atkinsiana		*Alysicarpus muelleri*		*Senna ?glaucifolia*		*Zornia muelleriana*	
Acacia bivenosa		*Cajanus cinereus*		*Senna artemisioides* subsp. *helmsii*		*Zornia albiflora*	
Acacia citrinoviridis		*Crotalaria cunninghamii*		*Senna artemisioides* subsp. *oligophylla*		**Gentianaceae**	
Acacia colei var. *colei*		*Crotalaria dissitiflora* subsp. *benthamiana*		*Senna artemisioides* subsp. *oligophylla x glutinosa*		*Schenkia clementii*	
Acacia coriacea subsp. *pendens*		*Crotalaria medicaginea* var. *neglecta*		*Senna artemisioides* subsp. *oligophylla x helmsii*		**Goodeniaceae**	
Acacia cowleana		*Crotalaria novae-hollandiae* subsp. *novae-hollandiae*		*Senna ferraria*		*Dampiera candicans*	
Acacia dictyophleba		*Crotalaria ramosissima*		*Senna glutinosa* subsp. *glutinosa*		*Goodenia cusackiana*	
Acacia elachantha		*Cullen cinereum*		*Senna glutinosa* subsp. *glutinosa x oligophylla*		*Goodenia forrestii*	
Acacia hilliana		*Cullen leucanthum*		*Senna glutinosa* subsp. *pruinosa*		*Goodenia heterochila*	
Acacia inaequilatera		*Cullen leucochaites*		*Senna glutinosa* subsp. *x luerssenii*		*Goodenia lamprosperma*	
Acacia maitlandii		*Cullen martinii*		*Senna glutinosa x ?*		*Goodenia microptera*	
Acacia melleodora		*Cullen stipulaceum*		*Senna hamersleyensis*		*Goodenia muelleriana*	
Acacia monticola		*Desmodium campylocaulon*		*Senna notabilis*		*Goodenia nuda*	P4
Acacia monticola x tumida var. *pilbarensis*		*Desmodium filiforme*		*Senna symonii*		*Goodenia pascua*	
Acacia orthocarpa		*Desmodium muelleri*		*Senna venusta*		*Goodenia stobbsiana*	
Acacia pruinocarpa		*Dichrostachys spicata*		*Sesbania cannabina*		*Goodenia triodiophila*	
Acacia pyrifolia var. *pyrifolia*		*Gastrolobium grandiflorum*		*Swainsona formosa*		*Goodenia armitiana*	
Acacia sclerosperma subsp. *sclerosperma*		*Glycine canescens*		*Swainsona kingii*		*Scaevola amblyanthera* var. *centralis*	
Acacia sp.		*Gompholobium oreophilum*		*Swainsona stenodonta*		*Scaevola parvifolia* subsp. *pilbarae*	
Acacia sphaerostachya		*Indigofera colutea*		*Tephrosia clementii*		*Scaevola spinescens*	
Acacia spondylophylla		*Indigofera linifolia*		*Tephrosia rosea* var. *clementii*		*Scaevola* aff. *browniana*	
Acacia stellaticeps		*Indigofera linnaei*		*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186)			
Acacia synchronicia		*Indigofera monophylla*					

Table 26: Flora Inventory

SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE
Gyrostemonaceae		**Malvaceae cont'**		**Malvaceae cont'**		**Myrtaceae cont'**	
Codonocarpus cotinifolius		*Corchorus tridens*		*Triumfetta chaetocarpa*		*Melaleuca bracteata*	
Gyrostemon tepperi		*Gossypium australe*		*Triumfetta clementii*		*Melaleuca glomerata*	
Haloragaceae		*Gossypium robinsonii*		*Triumfetta leptacantha*		*Melaleuca linophylla*	
Haloragis gossei var. *inflata*		*Hibiscus austrinus* var. *austrinus*		*Triumfetta maconochieana*		**Nyctaginaceae**	
Myriophyllum verrucosum		*Hibiscus brachysiphonius*		*Triumfetta propinqua*		*Boerhavia coccinea*	
Hydrocharitaceae		*Hibiscus coatesii*		*Triumfetta ramosa*		*Boerhavia gardneri*	
Vallisneria nana		*Hibiscus goldsworthii*		*Triumfetta* sp.		*Boerhavia paludosa*	
Lamiaceae		*Hibiscus leptocladus*		*Waltheria indica*		*Boerhavia repleta*	
Basilicum polystachyon		*Hibiscus sturtii* var. *campylochlamys*		*Waltheria virgata*		*Boerhavia* sp.	
Clerodendrum floribundum var. *angustifolium*		*Hibiscus sturtii* var. *grandiflorus*		**Marsileaceae**		**Oleaceae**	
Dicrastylis cordifolia		*Hibiscus sturtii* var. *platychlamys*		*Marsilea* sp.		*Jasminum didymum* subsp. *lineare*	
Lauraceae		*Hibiscus verdcourtii*		*Marsilea hirsuta*		**Orobanchaceae**	
Cassytha capillaris		*Keraudrenia nephrosperma*		**Meliaceae**		*Striga curviflora*	
Loranthaceae		*Keraudrenia velutina* subsp. *elliptica*		*Owenia reticulata*		**Papaveraceae**	
Diplatia grandibractea		**Malvastrum americanum*		**Menispermaceae**		**Argemone ochroleuca*	
Lysiana casuarinae		*Melhania oblongifolia*		*Tinospora smilacina*		**Passifloraceae**	
Lythraceae		**Melochia pyramidata*		**Molluginaceae**		**Passiflora foetida* var. *hispida*	
Ammannia baccifera		*Sida arenicola*		*Glinus lotoides*		**Phrymaceae**	
Malvaceae		*Sida arsiniata*		*Mollugo molluginea*		*Mimulus gracilis*	
Abutilon lepidum		*Sida cardiophylla*		**Moraceae**		**Phyllanthaceae**	
Abutilon malvifolium		*Sida clementii*		*Ficus aculeata* var. *indecora*		*Flueggea virosa* subsp. *melanthesoides*	
Abutilon otocarpum		*Sida echinocarpa*		*Ficus brachypoda*		*Phyllanthus erwinii*	
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)		*Sida fibulifera*		**Myrtaceae**		*Phyllanthus maderaspatensis*	
Abutilon sp. Pilbara (W.R. Barker 2025)		*Sida rohlenae* subsp. *rohlenae*		*Calytrix carinata*		*Phyllanthus reticulatus*	
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P1	*Sida* sp. Articulation below (A.A. Mitchell PRP 1605)		*Corymbia candida*		**Plantaginaceae**	
Brachychiton acuminatus		*Sida* sp. Pilbara (A.A. Mitchell PRP 1543)		*Corymbia deserticola* subsp. *deserticola*		*Stemodia grossa*	
Corchorus crozophorifolius		*Sida* sp. Rabbit Flat (B.J. Carter 626)		*Corymbia ferriticola*		*Stemodia kingii*	
Corchorus incanus subsp. *incanus*		*Sida* sp. Shovelanna Hill (S. van Leeuwen 3842)		*Corymbia hamersleyana*		**Poaceae**	
Corchorus laniflorus		*Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90)		*Eucalyptus camaldulensis* subsp. *refulgens*		*Amphipogon sericeus*	
Corchorus lasiocarpus subsp. *lasiocarpus*		*Sida* sp. verrucose glands (F.H. Mollemans 2423)		*Eucalyptus gamophylla*		*Aristida contorta*	
Corchorus lasiocarpus subsp. *parvus*		*Sida spinosa*		*Eucalyptus leucophloia* subsp. *leucophloia*		*Aristida holathera* var. *holathera*	
Corchorus tectus		*Sida* sp. Barlee Range (S. van Leeuwen 1642)	P3	*Eucalyptus victrix*		*Aristida inaequiglumis*	
		Sida sp. B Kimberley Flora (A.A. Mitchell 2745)		*Eucalyptus xerothermica*		*Aristida latifolia*	
Corchorus walcottii		*Triumfetta appendiculata*		*Melaleuca argentea*		*Astrebla pectinata*	

Table 26: Flora Inventory

SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE	SPECIES	CONS. CODE
Poaceae cont'		**Poaceae cont'**		**Pteridaceae**		**Violaceae**	
Astrebla sp.		*Panicum laevinode*		*Cheilanthes brownii*		*Hybanthus aurantiacus*	
Bothriochloa ewartiana		*Paraneurachne muelleri*		*Cheilanthes sieberi* subsp. *sieberi*		**Zygophyllaceae**	
Brachyachne convergens		*Paspalidium clementii*		**Rubiaceae**		*Tribulus hirsutus*	
**Cenchrus ciliaris*		*Perotis rara*		*Oldenlandia crouchiana*		*Tribulus macrocarpus*	
**Cenchrus setiger*		Poaceae sp.		*Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	*Tribulus platypterus*	
Chrysopogon fallax		*Schizachyrium fragile*		*Psydrax latifolia*		*Tribulus suberosus*	
Cymbopogon ambiguus		*Setaria surgens*		*Synaptantha tillaeacea* var. *tillaeacea*			
Cymbopogon obtectus		**Setaria verticillata*		**Santalaceae**			
Cymbopogon procerus		*Sorghum timorense*		*Anthobolus leptomerioides*			
Cymbopogon sp.		*Sporobolus actinocladus*		*Santalum lanceolatum*			
**Cynodon dactylon*		*Sporobolus australasicus*		**Sapindaceae**			
Dactyloctenium radulans		*Themeda triandra*		*Atalaya hemiglauca*			
Dichanthium sericeum subsp. *humilius*		*Triodia* aff. *melvillei*		*Dodonaea coriacea*			
Digitaria brownii		*Triodia angusta*		*Dodonaea lanceolata* var. *lanceolata*			
Digitaria ctenantha		*Triodia brizoides*		*Dodonaea pachyneura*			
Elytrophorus spicatus		*Triodia epactia*		**Scrophulariaceae**			
Enneapogon caerulescens		*Triodia lanigera*		*Eremophila latrobei* subsp. *filiformis*			
Enneapogon lindleyanus		*Triodia schinzii*		*Eremophila latrobei* subsp. *latrobei*			
Enneapogon polyphyllus		*Triodia secunda*		*Eremophila longifolia*			
Enneapogon robustissimus		*Triodia wiseana*		**Solanaceae**			
Enteropogon ramosus		*Tripogon loliiformis*		*Nicotiana benthamiana*			
Eragrostis ?eriopoda		*Urochloa* sp.		*Nicotiana occidentalis* subsp. *occidentalis*			
Eragrostis cumingii		*Xerochloa barbata*		*Solanum ashbyae*			
Eragrostis dielsii		**Polygalaceae**		*Solanum cleistogamum*			
Eragrostis eriopoda		*Polygala glaucifolia*		*Solanum diversiflorum*			
Eragrostis speciosa		**Polygonaceae**		*Solanum elatius*			
Eragrostis tenellula		**Acetosa vesicaria*		*Solanum gabrielae*			
Eragrostis xerophila		**Portulacaceae**		*Solanum horridum*			
Eriachne aristidea		*Calandrinia quadrivalvis*		*Solanum lasiophyllum*			
Eriachne benthamii		*Portulaca oleracea*		*Solanum phlomoides*			
Eriachne ciliata		*Portulaca pilosa*		**Stylidiaceae**			
Eriachne mucronata		**Potamogetonaceae**		*Stylidium fluminense*			
Eriachne obtusa		*Potamogeton tricarinatus*		**Surianaceae**			
Eriachne pulchella subsp. *dominii*		**Proteaceae**		*Stylobasium spathulatum*			
Eriachne sp.		*Grevillea pyramidalis* subsp. *leucadendron*		**Thymelaeaceae**			
Eriachne tenuiculmis		*Grevillea wickhamii*		*Pimelea ammocharis*			
Eulalia aurea		*Grevillea wickhamii* subsp. *hispidula*		*Pimelea holroydii*			
Iseilema vaginiflorum		*Hakea chordophylla*		**Typhaceae**			
Panicum decompositum		*Hakea lorea* subsp. *lorea*		*Typha domingensis*			

APPENDIX SIX: SITE X SPECIES TABLE

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Acanthaceae																																																																																
Rostellularia adscendens var. *clementii*																																																																										1					
Aizoaceae																																																																																
Trianthema glossostigmum																					1																																																										
Trianthema triquetrum									1		1			1																																	1	1						1		1																							
Amaranthaceae																																																																															
**Aerva javanica*																											1														1				1														1																1				
Alternanthera angustifolia																																																																															
Alternanthera denticulata																																																																															
Alternanthera nana																																																																			1												
Amaranthus undulatus																																																												1									1						1					
Gomphrena affinis subsp. *pilbarensis*		1																																														1																																	
Gomphrena canescens																																																																						1										
Gomphrena cunninghamii																																																																															
Ptilotus arthrolasius																							1																																																									
Ptilotus astrolasius								1		1	1	1	1				1	1				1		1	1					1			1		1	1	1	1	1		1	1	1							1	1										1		1	1	1	1						1							
Ptilotus axillaris												1													1																																																							
Ptilotus calostachyus												1					1		1		1			1	1			1													1	1	1								1										1					1											1		
Ptilotus carinatus																																																																															
Ptilotus fusiformis																																																																															
Ptilotus gomphrenoides																																																																															
Ptilotus helipteroides							1			1																																																																					
Ptilotus incanus																																																																															
Ptilotus macrocephalus			1																																																																												
Ptilotus murrayi									1		1																																				1	1						1		1																							
Ptilotus nobilis subsp. *nobilis*																													1																																																			
Ptilotus obovatus		1	1																																																																													
Ptilotus polystachyus																							1																																									1															
Ptilotus rotundifolius																																																																															
Apocynaceae																																																																															
Carissa lanceolata		1	1	1								1				1																																																			1											
Cynanchum floribundum																1											1							1										1																					1			1										
Rhyncharrhena linearis																																																																															
Sarcostemma viminale subsp. *australe*																																																																																
Araliaceae																																																																															
Astrotricha hamptonii																																																																															
Trachymene oleracea subsp. *oleracea*																																																																															
Trachymene sp.																																1																																																
Asteraceae																																																																															
Apowollastonia hamersleyensis																																																																															
**Bidens bipinnata*																																																																															
Calotis plumulifera																																																																			1	1												
Chrysocephalum gilesii			1																																																																												
**Flaveria trinervia*																																																																															
Helichrysum oligochaetum	P1																																																																														
Pentalepis trichodesmoides subsp. *trichodesmoides*																																																																																
Pentalepis trichodesmoides subsp. *hispida*	P2																																																																															
Pluchea dentex																																			1																																													
Pluchea ferdinandi-muelleri												1															1								1					1				1						1																						1							
Pluchea ferdinandi-muelleri x tetranthera																																																															1																
Pluchea rubelliflora																1											1							1																				1						1		1							1						1		1			
Pluchea tetranthera																															1														1																											1							
Pterocaulon serrulatum																																																																															
Pterocaulon sphacelatum		1	1												1	1																																						1		1												1	1										
Pterocaulon sphaeranthoides																																																																													1	
**Sigesbeckia orientalis*																																																																															
**Sonchus oleraceus*																																																																															
Streptoglossa bubakii		1																																																																														
Streptoglossa sp.																1																																												1																			
Boraginaceae																																																																															
Ehretia saligna var. *saligna*																																																																															
Heliotropium crispatum																																																																				1										

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026
Heliotropium cunninghamii																											
Heliotropium muticum	P1								1			1	1					1				1			1		
Heliotropium ovalifolium																											
Heliotropium pachyphyllum																											
Heliotropium tenuifolium																											
Heliotropium transforme																											
Trichodesma zeylanicum var. *zeylanicum*																											
Brassicaceae																											
Lepidium pholidogynum																											
Campanulaceae																											
Lobelia arnhemiaca																											
Lobelia heterophylla subsp. *pilbarensis*																											
Wahlenbergia tumidifructa																											
Capparaceae																											
Capparis spinosa var. *nummularia*																											
Caryophyllaceae																											
Polycarpaea corymbosa var. *corymbosa*																											
Polycarpaea holtzei																											
Polycarpaea longiflora																											
Celastraceae																											
Maytenus sp. Mt Windell (S. van Leeuwen 846)																											
Stackhousia intermedia																											
Chenopodiaceae																											
Dysphania kalpari																											
Dysphania rhadinostachya subsp. *rhadinostachya*																											
Enchylaena tomentosa var. *tomentosa*			1																								
Rhagodia eremaea																											
Salsola australis																											
Sclerolaena cornishiana																											
Sclerolaena costata																											
Sclerolaena densiflora																											
Sclerolaena hostilis									1																		
Threlkeldia diffusa									1																		
Cleomaceae																											
Cleome oxalidea																											
Cleome uncifera subsp. *uncifera*										1								1				1					
Cleome viscosa		1	1																								1
Combretaceae																											
Terminalia canescens																											
Convolvulaceae																											
Bonamia erecta								1	1	1		1	1			1		1				1					
Bonamia linearis																1		1					1				
Bonamia media																											
Bonamia sp. (HD94-6)																											
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		1					1								1		1									1	
Duperreya commixta																										1	
Evolvulus alsinoides var. *decumbens*		1	1	1																							
Evolvulus alsinoides var. *villosicalyx*							1	1		1						1											
Ipomoea coptica									1																		
Ipomoea lonchophylla																											
Ipomoea muelleri																											
Operculina aequisepala																											
Polymeria ambigua			1				1	1								1			1			1			1		1
Cucurbitaceae																											
Cucumis maderaspatanus		1										1				1											
*Cucumis melo subsp. agrestis																											
Cyperaceae																											

SPECIES	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052
Heliotropium cunninghamii																										
Heliotropium muticum																										
Heliotropium ovalifolium																										
Heliotropium pachyphyllum																										
Heliotropium tenuifolium																										
Heliotropium transforme																										
Trichodesma zeylanicum var. *zeylanicum*																										
Brassicaceae																										
Lepidium pholidogynum																										
Campanulaceae																										
Lobelia arnhemiaca																										
Lobelia heterophylla subsp. *pilbarensis*																										
Wahlenbergia tumidifructa																										
Capparaceae																										
Capparis spinosa var. *nummularia*																										
Caryophyllaceae																										
Polycarpaea corymbosa var. *corymbosa*																										
Polycarpaea holtzei																										
Polycarpaea longiflora																										
Celastraceae																										
Maytenus sp. Mt Windell (S. van Leeuwen 846)																										
Stackhousia intermedia																										
Chenopodiaceae																										
Dysphania kalpari																										
Dysphania rhadinostachya subsp. *rhadinostachya*																										
Enchylaena tomentosa var. *tomentosa*																										
Rhagodia eremaea																										
Salsola australis																										
Sclerolaena cornishiana																										
Sclerolaena costata																										
Sclerolaena densiflora																				1	1					
Sclerolaena hostilis																				1	1					
Threlkeldia diffusa																				1	1					
Cleomaceae																										
Cleome oxalidea																										
Cleome uncifera subsp. *uncifera*														1												
Cleome viscosa			1				1											1								
Combretaceae																										
Terminalia canescens																										
Convolvulaceae																										
Bonamia erecta				1					1	1			1	1	1		1									
Bonamia linearis														1												
Bonamia media																										
Bonamia sp. (HD94-6)															1											
Bonamia sp. Dampier (A.A. Mitchell PRP 217)	1	1																						1	1	1
Duperreya commixta											1											1	1			
Evolvulus alsinoides var. *decumbens*																										
Evolvulus alsinoides var. *villosicalyx*					1																					
Ipomoea coptica							1																			
Ipomoea lonchophylla																										
Ipomoea muelleri																										
Operculina aequisepala																										
Polymeria ambigua																										
Cucurbitaceae																										
Cucumis maderaspatanus			1		1																					
*Cucumis melo subsp. agrestis																										
Cyperaceae																										

SPECIES	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Heliotropium cunninghamii																										
Heliotropium muticum																										
Heliotropium ovalifolium																										
Heliotropium pachyphyllum																										
Heliotropium tenuifolium																										
Heliotropium transforme											1															
Trichodesma zeylanicum var. *zeylanicum*																										
Brassicaceae																										
Lepidium pholidogynum			1																							
Campanulaceae																										
Lobelia arnhemiaca																										
Lobelia heterophylla subsp. *pilbarensis*																										
Wahlenbergia tumidifructa																										
Capparaceae																										
Capparis spinosa var. *nummularia*																										
Caryophyllaceae																										
Polycarpaea corymbosa var. *corymbosa*																										
Polycarpaea holtzei																										
Polycarpaea longiflora									1																	
Celastraceae																										
Maytenus sp. Mt Windell (S. van Leeuwen 846)																										
Stackhousia intermedia																										
Chenopodiaceae																										
Dysphania kalpari																1										
Dysphania rhadinostachya subsp. *rhadinostachya*																1										
Enchylaena tomentosa var. *tomentosa*																										
Rhagodia eremaea																										
Salsola australis																										
Sclerolaena cornishiana																										
Sclerolaena costata			1		1																					
Sclerolaena densiflora																										
Sclerolaena hostilis																										
Threlkeldia diffusa																										
Cleomaceae																										
Cleome oxalidea			1																							
Cleome uncifera subsp. *uncifera*				1						1		1							1							
Cleome viscosa			1			1	1		1							1					1		1			
Combretaceae																										
Terminalia canescens																										
Convolvulaceae																										
Bonamia erecta					1						1															
Bonamia linearis				1								1														
Bonamia media																										
Bonamia sp. (HD94-6)																										
Bonamia sp. Dampier (A.A. Mitchell PRP 217)								1					1						1			1				1
Duperreya commixta																			1							
Evolvulus alsinoides var. *decumbens*																										
Evolvulus alsinoides var. *villosicalyx*					1										1	1										
Ipomoea coptica																										
Ipomoea lonchophylla																										
Ipomoea muelleri																1					1		1			
Operculina aequisepala																		1								
Polymeria ambigua						1									1	1	1						1			
Cucurbitaceae																										
Cucumis maderaspatanus							1														1					
*Cucumis melo subsp. agrestis																										
Cyperaceae																										

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Bulbostylis barbata															1														1																									1		1													1										
Bulbostylis turbinata																																																																			1												
Cyperaceae sp.							1			1									1																																							1					1																
Cyperus bifax																																																																															
Cyperus blakeanus																																																																															
Cyperus cunninghamii subsp. *cunninghamii*																																																																															
Cyperus hesperius																																																																															
Cyperus ixiocarpus																																		1																																														
Cyperus vaginatus																1											1																			1														1		1							1					1		1			
Eleocharis geniculata																																																																															
Fimbristylis dichotoma																												1			1	1																																															
Fimbristylis elegans																																		1																																														
Fimbristylis microcarya									1		1																1																																										1	1									
Fimbristylis simulans																																																																															
Fimbristylis sp.						1																																																																									
Schoenoplectus subulatus																																																																															
Elatinaceae																																																																															
Bergia pedicellaris																																																																															
Euphorbiaceae																																																																															
Adriana tomentosa var. *tomentosa*																											1																																																				
Euphorbia australis var. *hispidula*																																																																											1					
Euphorbia australis var. *subtomentosa*			1					1				1	1					1									1	1		1										1										1							1											1								1			
Euphorbia biconvexa																																																																															
Euphorbia boophthona																																																																															
Euphorbia coghlanii			1		1	1						1		1													1																			1																							1		1			1		1			
Euphorbia drummondii																																																																															
Euphorbia schultzii																	1											1																																																				
Euphorbia sp.											1					1								1						1				1																										1		1																	
Euphorbia tannensis subsp. *eremophila*				1				1																																																						1																	
Euphorbia sp																																																																															
Mallotus nesophilus																																																																															
Fabaceae																																																																															
Acacia acradenia																1					1			1																				1					1			1														1													
Acacia adoxa var. *adoxa*																																																																															
Acacia ampliceps												1				1											1							1																																				1					1		1			
Acacia ancistrocarpa										1			1			1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1			1	1	1	1	1				1					1	1	1				1			1			1		1		1	1						1					1		
Acacia ancistrocarpa x stellaticeps																																			1																																													
Acacia ancistrocarpa x trachycarpa																																																																					1										
Acacia aneura																																																																															
Acacia aptaneura																																																																															
Acacia arida							1	1									1	1																						1	1														1			1										1													
Acacia atkinsiana																																																																													1		
Acacia bivenosa										1	1	1		1		1				1	1			1											1					1	1			1																		1			1		1	1											
Acacia citrinoviridis																																																																															
Acacia colei var. *colei*								1																			1																																							1			1			1							
Acacia coriacea subsp. *pendens*																																														1														1		1							1					1		1			
Acacia cowleana																																																																															
Acacia dictyophleba																																																																															
Acacia elachantha																																																																															
Acacia hilliana																																																																															
Acacia inaequilatera								1		1					1			1	1			1		1	1	1				1			1				1	1	1					1					1	1	1	1	1									1			1		1				1	1						1
Acacia maitlandii																																1																																															
Acacia melleodora																							1	1																																								1															
Acacia monticola																																																																															
Acacia monticola x tumida var. *pilbarensis*																																																																															
Acacia orthocarpa																																																													1																		
Acacia pruinocarpa																																																																															
Acacia pyrifolia var. *pyrifolia*		1	1				1				1	1	1	1	1	1	1			1				1	1			1	1	1	1	1	1	1		1	1		1	1	1	1				1				1		1					1	1	1	1	1	1	1		1			1	1				1	1	1	1		1	1
Acacia sclerosperma subsp. *sclerosperma*		1	1	1																																																																												

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Acacia sp.																																																																																
Acacia sphaerostachya																																											1						1																																	
Acacia spondylophylla																																																			1				1																											
Acacia stellaticeps								1	1			1						1		1	1	1	1				1									1								1						1	1													1						1			1							
Acacia synchronicia											1																																																									1				1							
Acacia tenuissima																																																																														1		
Acacia tetragonophylla																																																																																
Acacia trachycarpa								1								1												1											1				1						1	1				1							1		1	1		1							1					1		1			
Acacia trachycarpa (dwarf variant)																																																																														1		
Acacia trachycarpa x tumida																																																		1																															
Acacia trudgeniana																																																																																
Acacia tumida var. *pilbarensis*																							1	1							1	1																				1																													1		
Acacia xiphophylla																																															1							1																														
Aeschynomene indica																																																																																
Alysicarpus muelleri																																																																					1											
Cajanus cinereus																											1																			1																						1											1		1		1	
Crotalaria cunninghamii																1												1							1																																		1											
Crotalaria dissitiflora subsp. *benthamiana*																																																																																
Crotalaria medicaginea var. *neglecta*		1	1													1																1																																	1									1	1	1					1			
Crotalaria novae-hollandiae subsp. *novae-hollandiae*																																1																																																
Crotalaria ramosissima																																																																					1											
Cullen cinereum																																																																																
Cullen leucanthum																											1																		1	1										1		1	1		1																		1			
Cullen leucochaites																																													1																																	1	
Cullen martinii																						1																																																										
Cullen stipulaceum																																																																																
Desmodium campylocaulon					1																																																																											
Desmodium filiforme																																																																					1											
Desmodium muelleri						1																																																													1	1													
Dichrostachys spicata																																																																																
Gastrolobium grandiflorum																																																																																
Glycine canescens																																																																																
Gompholobium oreophilum																																																																																
Indigofera colutea																										1					1														1											1																					1			
Indigofera linifolia									1		1					1																		1																																			1	1	1										
Indigofera linnaei																																													1																																			
Indigofera monophylla							1	1		1				1		1	1	1	1			1		1			1				1	1				1		1			1								1	1							1	1		1		1						1					1		1	1	1	1	1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	P3																																																																														
Indigofera trita																1																																																			1		1	1								
Isotropis atropurpurea																		1														1																																								1							
Lotus sp.																																																																																
Mirbelia viminalis																																																																																
Neptunia dimorphantha									1																																																										1												
Petalostylis labicheoides																																																											1																					
Rhynchosia minima		1	1	1	1	1	1	1								1												1																	1							1											1		1		1				1	1	1	1		1					1			
Rhynchosia bungarensis	P4																																																																														
Senna ?glaucifolia																																																																																
Senna artemisioides subsp. *helmsii*																																																																																
Senna artemisioides subsp. *oligophylla*		1	1	1															1								1	1														1											1																											1							
Senna artemisioides subsp. *oligophylla x glutinosa*																																																																																
Senna artemisioides subsp. *oligophylla x helmsii*																1								1			1																																					1		1															
Senna ferraria																																																																																
Senna glutinosa subsp. *glutinosa*										1																													1												1																												1
Senna glutinosa subsp. *glutinosa x oligophylla*																																																																		1														
Senna glutinosa subsp. *pruinosa*																					1																																								1																			

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Senna glutinosa subsp. *x luerssenii*																																								1																								1																	
Senna glutinosa x ?																																																																															
Senna hamersleyensis																																																																															
Senna notabilis												1			1	1		1					1		1			1							1	1												1																									1					1					1	1	1			
Senna symonii																																																																															
Senna venusta																																																																										1					
Sesbania cannabina																1																					1																																						1							1		1			
Swainsona formosa								1																	1						1																																																		
Swainsona kingii																																																																															
Swainsona stenodonta																																												1																																			1	
Tephrosia clementii												1				1																																																													
Tephrosia rosea var. *clementii*																																																								1		1																							
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)																																																																															
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)													1					1				1			1															1															1																			1														
Tephrosia sp. Fortescue (A.A. Mitchell 606)																																																																															
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)				1	1	1	1			1			1		1		1									1		1	1			1			1					1	1											1							1											1	1		1	1									1
Tephrosia supina			1																																																																												
Tephrosia virens		1	1																																																																												
Tephrosia remotiflora																																																																															
**Vachellia farnesiana*		1					1																																									1												1				1					1	1													
Vigna lanceolata var. *lanceolata*																																		1																																															
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)					1																																																																	1								
Zornia muelleriana																																1																																																	
Zornia albiflora																																																																															
Gentianaceae																																																																															
Schenkia clementii																																																																															
Goodeniaceae																																																																															
Dampiera candicans																							1																																																	1							
Goodenia cusackiana																																																							1																								
Goodenia forrestii		1	1				1	1																														1									1											1											1		1										
Goodenia heterochila																																																																															
Goodenia lamprosperma																																		1																																			1												
Goodenia microptera							1	1		1				1					1				1			1													1														1																															
Goodenia muelleriana							1																																																																								
Goodenia nuda	P4							1																																																																						
Goodenia pascua					1	1																																																																		1								
Goodenia stobbsiana																					1	1																				1		1							1				1						1																		1		1		1
Goodenia triodiophila																																																																															
Goodenia armitiana																							1																																																							
Scaevola amblyanthera var. *centralis*								1				1				1																																																		1																	
Scaevola parvifolia subsp. *pilbarae*																																																																													1		
Scaevola spinescens			1	1				1																																																																							
Scaevola aff. *browniana*																																			1																														1														
Gyrostemonaceae																																																																															
Codonocarpus cotinifolius																																								1			1																																					
Gyrostemon tepperi																							1																																																							
Haloragaceae																																																																															
Haloragis gossei var. *inflata*																																																																															
Myriophyllum verrucosum																																																																															
Hydrocharitaceae																																																																															
Vallisneria nana																																																																															
Lamiaceae																																																																															
Basilicum polystachyon																																																																															
Clerodendrum floribundum var. *angustifolium*																																							1																																							
Dicrastylis cordifolia																																																																															
Lauraceae																																																																															

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Cassytha capillaris								1	1			1				1	1		1					1			1		1	1										1									1																				1						1			1				
Loranthaceae																																																																																
Diplatia grandibractea																																																																																
Lysiana casuarinae																																																																															
Lythraceae																																																																															
Ammannia baccifera																																																																											1			
Malvaceae																																																																															
Abutilon lepidum			1																																												1																																		
Abutilon malvifolium																																																																															
Abutilon otocarpum																																																																															
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)																																																																															
Abutilon sp. Pilbara (W.R. Barker 2025)																																																																															
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P1																													1																																																				
Brachychiton acuminatus																																																																															
Corchorus crozophorifolius																																																																															
Corchorus incanus subsp. *incanus*																1											1							1																							1																								
Corchorus laniflorus															1							1						1	1			1			1			1	1											1	1	1	1								1		1											1							
Corchorus lasiocarpus subsp. *lasiocarpus*																																																																															
Corchorus lasiocarpus subsp. *parvus*																																																																															
Corchorus tectus								1			1	1	1	1	1	1	1	1						1	1	1				1	1		1							1	1	1		1	1									1											1	1		1	1					1	1				1
Corchorus tridens					1																																																																										
Corchorus walcottii		1	1	1						1																																															1											1		1										
Gossypium australe																														1							1			1	1																1	1							1											1			
Gossypium robinsonii																																																																											1			
Hibiscus austrinus var. *austrinus*																											1																			1																																	
Hibiscus brachysiphonius																																																																															
Hibiscus coatesii																																																																															
Hibiscus goldsworthii																																																																															
Hibiscus leptocladus																		1									1																																																				
Hibiscus sturtii var. *campylochlamys*																																1																																		1													
Hibiscus sturtii var. *grandiflorus*																																																																															
Hibiscus sturtii var. *platychlamys*																																																																1															
Hibiscus verdcourtii																																																																		1												
Keraudrenia nephrosperma																																																																												1		
Keraudrenia velutina subsp. *elliptica*																							1																																																								
**Malvastrum americanum*		1	1	1												1																																		1									1	1								1	1								1			
Melhania oblongifolia																																																																															
**Melochia pyramidata*																																														1																																	
Sida arenicola																							1																											1											1																		
Sida arsiniata							1			1																																															1																					
Sida cardiophylla																																																																															
Sida clementii							1	1						1		1																						1			1									1									1								1													
Sida echinocarpa																																																																															
Sida fibulifera		1	1	1	1	1					1																																																								1	1		1	1								
Sida rohlenae subsp. *rohlenae*																1																																																		1										1			
Sida sp. Articulation below (A.A. Mitchell PRP 1605)																																																																															
Sida sp. Pilbara (A.A. Mitchell PRP 1543)																									1										1			1																									1									1							
Sida sp. Rabbit Flat (B.J. Carter 626)																																																																1															
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)																																																																															
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)																																																																															
Sida sp. verrucose glands (F.H. Mollemans 2423)																																																																															

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Sida spinosa																																																																																
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3																																																																															
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)																							1																																										1															
Triumfetta appendiculata																1																																																						1										
Triumfetta chaetocarpa																																																																																
Triumfetta clementii		1					1									1												1	1											1																										1		1		1									
Triumfetta leptacantha																																																																																
Triumfetta maconochieana																																																																																
Triumfetta propinqua																																																																																
Triumfetta ramosa																1																																																1					1										
Triumfetta sp.																							1														1	1																																										
Waltheria indica								1																			1																							1																															
Waltheria virgata																																																																																
Marsileaceae																																																																																
Marsilea sp.																																																																																
Marsilea hirsuta																																																						1																											
Meliaceae																																																																																
Owenia reticulata																																																																																
Menispermaceae																																																																																
Tinospora smilacina																																																																														1	
Molluginaceae																																																																																
Glinus lotoides																																																																																
Mollugo molluginea								1		1		1	1		1		1	1				1		1	1			1	1		1	1										1									1				1	1		1			1														1				1
Moraceae																																																																																
Ficus aculeata var. *indecora*																																																																																
Ficus brachypoda																																																																																
Myrtaceae																																																																																
Calytrix carinata																																																																																
Corymbia candida																																																																			1											
Corymbia deserticola subsp. *deserticola*																																				1																																								1		
Corymbia ferriticola																																																																																
Corymbia hamersleyana								1				1				1																			1				1	1	1					1				1	1						1								1	1									1			1	1
Eucalyptus camaldulensis subsp. *refulgens*																																		1																										1																1			
Eucalyptus gamophylla																																																																																
Eucalyptus leucophloia subsp. *leucophloia*																																																																																
Eucalyptus victrix																1											1																			1														1		1							1					1		1			
Eucalyptus xerothermica																																																																																
Melaleuca argentea																																		1																										1		1																	
Melaleuca bracteata																																																																																
Melaleuca glomerata																																																												1		1												1		1			
Melaleuca linophylla																1																		1																																								1		1			
Nyctaginaceae																																																																																
Boerhavia coccinea								1				1			1													1												1												1	1			1										1		1	1	1			1		1				1
Boerhavia gardneri																	1																																																															
Boerhavia paludosa																																																																																
Boerhavia repleta																																																									1	1																					
Boerhavia sp.																																																																					1						1			
Oleaceae																																																																																
Jasminum didymum subsp. *lineare*																1																																														1												1					
Orobanchaceae																																																																																
Striga curviflora																																		1																																													
Papaveraceae																																																																																
**Argemone ochroleuca*																																																												1																			
Passifloraceae																																																																																
**Passiflora foetida* var. *hispida*																																																												1																			
Phrymaceae																																																																																
Mimulus gracilis																																																																			1											
Phyllanthaceae																																																																																
Flueggea virosa subsp. *melanthesoides*																																																												1		1												1		1			
Phyllanthus erwinii																																																																																
Phyllanthus maderaspatensis		1			1	1										1																		1																																1	1	1	1					1		1			

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Phyllanthus reticulatus																																																																															
Plantaginaceae																																																																															
Stemodia grossa																1											1	1		1				1										1					1													1							1					1		1			
Stemodia kingii																																																																															
Poaceae																																																																															
Amphipogon sericeus																																																																															
Aristida contorta		1	1		1								1												1	1					1				1			1	1																			1												1									
Aristida holathera var. *holathera*								1								1		1				1	1		1	1				1											1				1																1			1					1	1							1		
Aristida inaequiglumis																																																																															
Aristida latifolia																																																																															
Astrebla pectinata																																																																															
Astrebla sp.																																																																															
Bothriochloa ewartiana																1																																														1							1										
Brachyachne convergens											1																																																																				
**Cenchrus ciliaris*		1		1	1			1								1											1							1											1	1	1	1						1		1	1		1	1		1				1		1	1					1		1			
**Cenchrus setiger*																																																																										1					
Chrysopogon fallax		1	1	1			1	1				1				1																																																		1		1	1										
Cymbopogon ambiguus																												1				1																																															
Cymbopogon obtectus																																																																															
Cymbopogon procerus																																		1																																											1			
Cymbopogon sp.																																																											1							1													
**Cynodon dactylon*																																																																												1			
Dactyloctenium radulans																																															1	1						1		1																								
Dichanthium sericeum subsp. *humilius*		1	1	1	1	1																																																												1	1			1								
Digitaria brownii																																																																															
Digitaria ctenantha																																																																															
Elytrophorus spicatus																																																																															
Enneapogon caerulescens																																								1	1																																						
Enneapogon lindleyanus																																																																															
Enneapogon polyphyllus																																																																															
Enneapogon robustissimus																																																																															
Enteropogon ramosus																																																																															
Eragrostis ?eriopoda								1																	1	1																																																						
Eragrostis cumingii																1											1				1			1																				1															1										
Eragrostis dielsii																																															1	1						1		1																								
Eragrostis eriopoda																						1	1							1											1				1																					1															
Eragrostis speciosa																																		1																																														
Eragrostis tenellula																																																																										1		1			
Eragrostis xerophila		1	1	1	1	1	1				1																																														1									1	1		1	1								
Eriachne aristidea																		1																																																			1										
Eriachne benthamii		1									1																																																									1	1										
Eriachne ciliata																																										1									1																													
Eriachne mucronata												1																																																															1				
Eriachne obtusa								1																																																													1										
Eriachne pulchella subsp. *dominii*										1														1																																																									
Eriachne sp.																																																		1																																
Eriachne tenuiculmis																																																														1														1			
Eulalia aurea																																		1																																								1		1			
Iseilema vaginiflorum																																																																			1												
Panicum decompositum																																																																															
Panicum laevinode																																																																															
Paraneurachne muelleri								1															1																											1														1															
Paspalidium clementii																																																									1																					
Perotis rara																																																																															
Poaceae sp.																										1																																				1		1															
Schizachyrium fragile																																			1																																												
Setaria surgens																																																																															
**Setaria verticillata*																1																																																									1					
Sorghum timorense																																																																							1								
Sporobolus actinocladus								1																						1					1																												1																
Sporobolus australasicus		1	1								1			1		1														1				1													1							1															1										
Themeda triandra																1																																																															
Triodia aff. *melvillei*																																																																															
Triodia angusta												1		1		1																														1	1	1						1		1				1		1				1			1										
Triodia brizoides																																																																														1	
Triodia epactia							1	1	1		1		1	1		1	1	1	1	1		1			1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		1		1	1	1	1	1		1

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Triodia lanigera																		1	1		1	1		1	1								1			1	1	1					1						1	1	1				1	1								1	1							1							
Triodia schinzii																							1																																																								
Triodia secunda									1																																																						1																
Triodia wiseana										1	1	1	1	1	1		1							1				1	1		1				1					1	1	1		1								1	1								1		1			1		1		1			1		1			1	1
Tripogon loliiformis																																																																															
Urochloa sp.																																																																															
Xerochloa barbata																																																1																															
Polygalaceae																																																																															
Polygala glaucifolia																																																																															
Polygonaceae																																																																															
**Acetosa vesicaria*																																																																															
Portulacaceae																																																																															
Calandrinia quadrivalvis																											1							1																																														
Portulaca oleracea		1	1						1		1																																					1																															
Portulaca pilosa																																		1																																														
Potamogetonaceae																																																																															
Potamogeton tricarinatus																																																																															
Proteaceae																																																																															
Grevillea pyramidalis subsp. *leucadendron*												1	1				1	1							1	1					1		1								1				1						1	1								1						1									1				1
Grevillea wickhamii																																1	1								1										1																												
Grevillea wickhamii subsp. *hispidula*																				1	1	1																																							1																1		
Hakea chordophylla			1							1			1					1		1	1		1							1												1			1				1	1			1																			1							
Hakea lorea subsp. *lorea*								1																																	1																																						1
Pteridaceae																																																																															
Cheilanthes brownii																																																																															
Cheilanthes sieberi subsp. *sieberi*																																																																															
Rubiaceae																																																																															
Oldenlandia crouchiana																																																																															
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3																																																																														
Psydrax latifolia																																																																															
Synaptantha tillaeacea var. *tillaeacea*																																																																					1											
Santalaceae																																																																															
Anthobolus leptomerioides																																																																															
Santalum lanceolatum																																																																															
Sapindaceae																																																																															
Atalaya hemiglauca																																																												1																			
Dodonaea coriacea																							1																																								1														1		
Dodonaea lanceolata var. *lanceolata*																																																																															
Dodonaea pachyneura																																																																															
Scrophulariaceae																																																																															
Eremophila latrobei subsp. *filiformis*																																																																															
Eremophila latrobei subsp. *latrobei*																																																																															
Eremophila longifolia		1	1	1																																																																											
Solanaceae																																																																															
Nicotiana benthamiana																																																																															
Nicotiana occidentalis subsp. *occidentalis*																																																																										1					
Solanum ashbyae																																																																															
Solanum cleistogamum																																																																															
Solanum diversiflorum																						1			1			1																																								1											
Solanum elatius																																																																															
Solanum gabrielae																																																																															
Solanum horridum																																																																															
Solanum lasiophyllum		1	1	1				1			1																			1																																						1		1									1
Solanum phlomoides																																																																															
Stylidiaceae																																																																															
Stylidium fluminense																																																																															
Surianaceae																																																																															
Stylobasium spathulatum																																																																															
Thymelaeaceae																																																																															

Table 27: Site x species table

SPECIES	CONS.	R14001	R14002	R14003	R14004	R14005	R14006	R14007	R14008	R14009	R14010	R14011	R14012	R14013	R14014	R14015	R14016	R14017	R14018	R14019	R14020	R14021	R14022	R14023	R14024	R14025	R14026	R14027	R14028	R14029	R14030	R14031	R14032	R14033	R14034	R14035	R14036	R14037	R14038	R14039	R14040	R14041	R14042	R14043	R14044	R14045	R14046	R14047	R14048	R14049	R14050	R14051	R14052	R14053	R14054	R14055	R14056	R14057	R14058	R14059	R14060	R14061	R14062	R14063	R14064	R14065	R14066	R14067	R14068	R14069	R14070	R14071	R14072	R14073	R14074	R14075	R14076	R14077	R14078
Pimelea ammocharis																1														1																																																	
Pimelea holroydii																																																																														
Typhaceae																																																																														
Typha domingensis																																																																														
Violaceae																																																																														
Hybanthus aurantiacus							1	1		1		1	1			1	1										1						1		1				1																			1		1		1				1			1										
Zygophyllaceae																																																																														
Tribulus hirsutus																																																																														
Tribulus macrocarpus																																																																														
Tribulus platypterus																																																																														1
Tribulus suberosus																												1																							1										1																		

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Acanthaceae																																																																																
Rostellularia adscendens var. *clementii*																					1				1		1		1	1																																	1																
Aizoaceae																																																																															
Trianthema glossostigmum																								1				1							1																																														
Trianthema triquetrum																																																																															
Amaranthaceae																																																																															
**Aerva javanica*																																																																															
Alternanthera angustifolia																																																																															1
Alternanthera denticulata																													1																																																				
Alternanthera nana																									1		1											1	1						1	1		1				1											1						1				1						
Amaranthus undulatus																									1																							1																															
Gomphrena affinis subsp. *pilbarensis*																											1					1																																															
Gomphrena canescens																																																																															
Gomphrena cunninghamii			1																																													1																									1					1	
Ptilotus arthrolasius																																																																															
Ptilotus astrolasius			1		1																			1												1	1		1	1	1		1	1	1	1	1	1	1		1			1				1			1					1		1	1	1	1	1	1	1			1		
Ptilotus axillaris																																																																															
Ptilotus calostachyus																	1	1					1					1							1	1	1		1	1	1			1					1	1	1			1				1		1	1					1		1				1				1			
Ptilotus carinatus																			1	1																																																											
Ptilotus fusiformis																		1																																																				1				1					
Ptilotus gomphrenoides																			1	1									1	1																																																	
Ptilotus helipteroides																																																																															
Ptilotus incanus																																								1																																							
Ptilotus macrocephalus																																																																															
Ptilotus murrayi																																																																															
Ptilotus nobilis subsp. *nobilis*																			1			1		1			1					1					1		1	1					1	1	1	1										1							1	1	1												
Ptilotus obovatus																																													1							1																											
Ptilotus polystachyus																																																																															
Ptilotus rotundifolius																																																																															1
Apocynaceae																																																																															
Carissa lanceolata																									1																																						1																
Cynanchum floribundum																																																																															
Rhyncharrhena linearis																											1										1							1											1																								
Sarcostemma viminale subsp. *australe*																																																																														1
Araliaceae																																																																															
Astrotricha hamptonii																																																																															1
Trachymene oleracea subsp. *oleracea*	1																																																																														
Trachymene sp.																																																																															
Asteraceae																																																																															
Apowollastonia hamersleyensis																																																																															1
**Bidens bipinnata*																											1																																				1																
Calotis plumulifera																																																																															
Chrysocephalum gilesii																																																																															
**Flaveria trinervia*																																						1																																									
Helichrysum oligochaetum																																																																															1
Pentalepis trichodesmoides subsp. *trichodesmoides*																															1		1																			1																											
Pentalepis trichodesmoides subsp. *hispida*																																																																															1
Pluchea dentex											1																											1	1																							1																	
Pluchea ferdinandi-muelleri																																																														1																	
Pluchea ferdinandi-muelleri x tetranthera																																																																															
Pluchea rubelliflora	1						1				1																																																																					
Pluchea tetranthera													1																																												1																						
Pterocaulon serrulatum																																																																						1									
Pterocaulon sphacelatum			1					1										1								1	1					1						1	1				1		1									1			1						1				1		1	1									
Pterocaulon sphaeranthoides				1																																																																												
**Sigesbeckia orientalis*																																																																															1
**Sonchus oleraceus*																																						1																																									
Streptoglossa bubakii																			1	1	1																																																											
Streptoglossa sp.																																																																																
Boraginaceae																																																																																
Ehretia saligna var. *saligna*											1					1																																																														1	
Heliotropium crispatum																																																																																

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Heliotropium cunninghamii			1																												1	1		1					1						1	1	1	1																					1	1			1						
Heliotropium muticum																																																																															
Heliotropium ovalifolium																																																											1																					
Heliotropium pachyphyllum																																																																															1
Heliotropium tenuifolium																																																																						1									
Heliotropium transforme																																																																															
Trichodesma zeylanicum var. *zeylanicum*	1		1	1	1											1		1													1	1																1																						1					1				
Brassicaceae																																																																															
Lepidium pholidogynum																																																																															
Campanulaceae																																																																															
Lobelia arnhemiaca							1									1																																																															
Lobelia heterophylla subsp. *pilbarensis*																																																																															1
Wahlenbergia tumidifructa																																																									1																						
Capparaceae																																																																															
Capparis spinosa var. *nummularia*																																																																														1	
Caryophyllaceae																																																																															
Polycarpaea corymbosa var. *corymbosa*																																																									1																						
Polycarpaea holtzei																																																																															1
Polycarpaea longiflora	1		1																																				1									1																						1								1	
Celastraceae																																																																															
Maytenus sp. Mt Windell (S. van Leeuwen 846)																																											1																																							
Stackhousia intermedia																																																																															1
Chenopodiaceae																																																																															
Dysphania kalpari																																																																															
Dysphania rhadinostachya subsp. *rhadinostachya*																															1																																																		
Enchylaena tomentosa var. *tomentosa*																																																																															
Rhagodia eremaea																													1																																																			
Salsola australis																						1									1	1																																			1												
Sclerolaena cornishiana																																																																			1												
Sclerolaena costata																																																																															
Sclerolaena densiflora																																																																															
Sclerolaena hostilis																																																																															
Threlkeldia diffusa																																																																															
Cleomaceae																																																																															
Cleome oxalidea																																																																															
Cleome uncifera subsp. *uncifera*																																																																															
Cleome viscosa	1		1	1							1																1				1			1					1						1	1		1	1																				1	1								1	
Combretaceae																																																																															
Terminalia canescens	1																																																																															
Convolvulaceae																																																																															
Bonamia erecta				1																						1																	1	1		1	1	1		1				1				1	1		1								1				1						
Bonamia linearis																																																																															
Bonamia media																																																									1																						
Bonamia sp. (HD94-6)																																																																															
Bonamia sp. Dampier (A.A. Mitchell PRP 217)		1			1							1												1							1		1						1										1							1	1									1			1			1							
Duperreya commixta																										1	1								1								1			1									1			1					1		1		1						1						
Evolvulus alsinoides var. *decumbens*																																											1																				1										1						
Evolvulus alsinoides var. *villosicalyx*																		1									1				1							1					1		1	1	1	1				1					1					1							1	1			1					1	
Ipomoea coptica																																																																															
Ipomoea lonchophylla																			1																																																													
Ipomoea muelleri	1										1														1									1					1																		1																						
Operculina aequisepala																																																																															
Polymeria ambigua	1			1																							1											1	1									1																					1	1									
Cucurbitaceae																																																																															
Cucumis maderaspatanus			1	1				1										1								1						1							1						1			1				1															1		1	1								1	
**Cucumis melo subsp. agrestis*																					1						1																																																				
Cyperaceae																																																																															

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Bulbostylis barbata																															1																										1																							
Bulbostylis turbinata																																																																																
Cyperaceae sp.																																																																																
Cyperus bifax																													1	1																																																			
Cyperus blakeanus																									1																																1																							
Cyperus cunninghamii subsp. *cunninghamii*																																																																														1	
Cyperus hesperius																																																																															1
Cyperus ixiocarpus																																																																																
Cyperus vaginatus	1			1			1					1					1														1																1	1																																									
Eleocharis geniculata	1						1																																																																								
Fimbristylis dichotoma									1			1	1																																																			1														1	1	1	
Fimbristylis elegans																																																																																
Fimbristylis microcarya																																																																																
Fimbristylis simulans																																					1																																					1							
Fimbristylis sp.																																																																																
Schoenoplectus subulatus																																																																															1
Elatinaceae																																																																																
Bergia pedicellaris																																																																															1
Euphorbiaceae																																																																																
Adriana tomentosa var. *tomentosa*																																		1																																															
Euphorbia australis var. *hispidula*																																																																																
Euphorbia australis var. *subtomentosa*		1	1	1													1																	1			1				1									1			1											1																	1										
Euphorbia biconvexa											1																						1		1																																													
Euphorbia boophthona																																																1																																
Euphorbia coghlanii	1			1																					1																																											1														
Euphorbia drummondii																													1																																																			
Euphorbia schultzii	1										1																																																																				
Euphorbia sp.				1																																	1							1			1																									1											
Euphorbia tannensis subsp. *eremophila*																															1														1																																	1						
Euphorbia sp																																							1																																									
Mallotus nesophilus																																																																															1
Fabaceae																																																																																
Acacia acradenia																																								1																																								
Acacia adoxa var. *adoxa*															1													1													1				1					1	1					1				1	1	1				1			1										1	1		
Acacia ampliceps	1						1																																																																								
Acacia ancistrocarpa								1								1			1									1	1	1						1		1		1	1													1			1				1	1			1		1								1	1				1						1	
Acacia ancistrocarpa x stellaticeps																																																																																
Acacia ancistrocarpa x trachycarpa																																																																																
Acacia aneura																											1																																																					
Acacia aptaneura																																																																			1															
Acacia arida																																																																																
Acacia atkinsiana																								1		1		1							1		1							1						1	1			1	1			1	1		1				1																		
Acacia bivenosa																1									1										1		1		1	1														1			1					1					1	1																			
Acacia citrinoviridis								1																			1	1			1	1	1		1																			1											1																			
Acacia colei var. *colei*																																																										1																						
Acacia coriacea subsp. *pendens*	1						1				1					1									1																																																					
Acacia cowleana																																																																															1
Acacia dictyophleba																															1						1	1		1	1			1	1	1	1				1			1			1	1		1					1	1	1	1						1					
Acacia elachantha															1			1																					1						1		1	1	1														1	1	1																		
Acacia hilliana																																																	1																													
Acacia inaequilatera					1	1		1	1			1	1	1				1															1													1	1	1								1	1	1	1											1	1								1				
Acacia maitlandii													1		1																									1								1														1				1		1				1						1		
Acacia melleodora																																																																																
Acacia monticola																1		1																						1																					1							1									1		
Acacia monticola x tumida var. *pilbarensis*																																									1																																					
Acacia orthocarpa																																								1																																								
Acacia pruinocarpa								1																												1				1																								1			1				1			1					
Acacia pyrifolia var. *pyrifolia*	1	1	1	1				1			1					1									1		1				1		1	1	1			1	1	1				1		1	1				1			1				1					1	1		1		1	1	1		1	1					
Acacia sclerosperma subsp. *sclerosperma*																									1																																																							

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105
Acacia sp.										1		1	1	1			1						1				
Acacia sphaerostachya																											
Acacia spondylophylla																											
Acacia stellaticeps																											
Acacia synchronicia																											
Acacia tenuissima																							1				
Acacia tetragonophylla								1																			
Acacia trachycarpa	1	1		1							1		1			1									1	1	
Acacia trachycarpa (dwarf variant)																											
Acacia trachycarpa x tumida																											
Acacia trudgeniana						1																					
Acacia tumida var. *pilbarensis*			1							1						1											
Acacia xiphophylla																				1		1					
Aeschynomene indica																											
Alysicarpus muelleri																											1
Cajanus cinereus	1			1			1				1					1											
Crotalaria cunninghamii																											
Crotalaria dissitiflora subsp. *benthamiana*																			1	1							
Crotalaria medicaginea var. *neglecta*	1			1							1					1											
Crotalaria novae-hollandiae subsp. *novae-hollandiae*																											
Crotalaria ramosissima																											
Cullen cinereum																			1								
Cullen leucanthum																											
Cullen leucochaites					1	1								1													
Cullen martinii																											
Cullen stipulaceum																											
Desmodium campylocaulon																											
Desmodium filiforme																											
Desmodium muelleri																											
Dichrostachys spicata																											
Gastrolobium grandiflorum																											
Glycine canescens																											
Gompholobium oreophilum																											
Indigofera colutea																1											
Indigofera linifolia																											
Indigofera linnaei																											
Indigofera monophylla		1	1		1	1		1				1	1	1		1		1						1		1	1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)																											
Indigofera trita																											
Isotropis atropurpurea																											
Lotus sp.																				1	1						
Mirbelia viminalis																											
Neptunia dimorphantha																			1		1	1					
Petalostylis labicheoides	1	1								1																	
Rhynchosia minima								1								1			1	1	1				1	1	1
Rhynchosia bungarensis																											
Senna ?glaucifolia																					1						
Senna artemisioides subsp. *helmsii*																											1
Senna artemisioides subsp. *oligophylla*			1													1			1								1
Senna artemisioides subsp. *oligophylla x glutinosa*																											
Senna artemisioides subsp. *oligophylla x helmsii*								1																			
Senna ferraria																											
Senna glutinosa subsp. *glutinosa*								1	1			1	1	1	1	1	1						1			1	
Senna glutinosa subsp. *glutinosa x oligophylla*																											
Senna glutinosa subsp. *pruinosa*					1									1	1		1	1									

SPECIES	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132
Acacia sp.																											
Acacia sphaerostachya																											
Acacia spondylophylla																											
Acacia stellaticeps																											
Acacia synchronicia																											
Acacia tenuissima														1					1				1				1
Acacia tetragonophylla																											
Acacia trachycarpa																											1
Acacia trachycarpa (dwarf variant)										1	1						1	1	1	1							
Acacia trachycarpa x tumida																											
Acacia trudgeniana																											
Acacia tumida var. *pilbarensis*							1	1				1	1								1						1
Acacia xiphophylla																											
Aeschynomene indica																											
Alysicarpus muelleri																			1								
Cajanus cinereus																											
Crotalaria cunninghamii																											
Crotalaria dissitiflora subsp. *benthamiana*																											
Crotalaria medicaginea var. *neglecta*					1	1						1				1		1	1	1	1						
Crotalaria novae-hollandiae subsp. *novae-hollandiae*																											
Crotalaria ramosissima																											
Cullen cinereum		1	1																								
Cullen leucanthum																											
Cullen leucochaites					1																					1	
Cullen martinii																											
Cullen stipulaceum																											
Desmodium campylocaulon																											
Desmodium filiforme																											
Desmodium muelleri																											
Dichrostachys spicata																											
Gastrolobium grandiflorum																											
Glycine canescens											1																
Gompholobium oreophilum													1											1			
Indigofera colutea					1											1		1	1	1							
Indigofera linifolia											1					1											
Indigofera linnaei											1	1				1											
Indigofera monophylla	1			1		1	1		1			1	1					1	1	1	1		1		1	1	1
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)																											
Indigofera trita																											
Isotropis atropurpurea												1					1										1
Lotus sp.																											
Mirbelia viminalis													1											1			
Neptunia dimorphantha		1																									
Petalostylis labicheoides																								1			
Rhynchosia minima					1		1				1	1				1		1	1	1	1		1		1		
Rhynchosia bungarensis																											
Senna ?glaucifolia																											
Senna artemisioides subsp. *helmsii*																											
Senna artemisioides subsp. *oligophylla*				1	1											1	1	1	1				1				1
Senna artemisioides subsp. *oligophylla x glutinosa*																											
Senna artemisioides subsp. *oligophylla x helmsii*					1	1			1							1		1	1	1	1	1	1		1		
Senna ferraria																											
Senna glutinosa subsp. *glutinosa*								1	1				1	1			1	1	1	1	1	1	1	1			1
Senna glutinosa subsp. *glutinosa x oligophylla*																											
Senna glutinosa subsp. *pruinosa*														1			1					1					

SPECIES	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Acacia sp.																						1			
Acacia sphaerostachya																									
Acacia spondylophylla					1																				
Acacia stellaticeps																									
Acacia synchronicia										1			1												
Acacia tenuissima	1							1			1	1		1								1			
Acacia tetragonophylla																									
Acacia trachycarpa			1										1												
Acacia trachycarpa (dwarf variant)	1			1				1																	
Acacia trachycarpa x tumida																									
Acacia trudgeniana																									
Acacia tumida var. *pilbarensis*	1			1			1		1		1				1				1				1		
Acacia xiphophylla																									
Aeschynomene indica									1																
Alysicarpus muelleri																									
Cajanus cinereus																									
Crotalaria cunninghamii																									
Crotalaria dissitiflora subsp. *benthamiana*																									
Crotalaria medicaginea var. *neglecta*			1												1										
Crotalaria novae-hollandiae subsp. *novae-hollandiae*																								1	
Crotalaria ramosissima																									
Cullen cinereum																									
Cullen leucanthum																									
Cullen leucochaites													1		1										
Cullen martinii			1																						
Cullen stipulaceum																									1
Desmodium campylocaulon																									
Desmodium filiforme			1																						
Desmodium muelleri																									
Dichrostachys spicata																									1
Gastrolobium grandiflorum																									1
Glycine canescens																									
Gompholobium oreophilum							1																		
Indigofera colutea			1																1						
Indigofera linifolia			1																						
Indigofera linnaei			1																						
Indigofera monophylla	1	1	1	1	1		1	1		1	1	1			1	1			1			1			
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)																			1						
Indigofera trita																									
Isotropis atropurpurea	1						1								1										
Lotus sp.																									
Mirbelia viminalis																									
Neptunia dimorphantha																									
Petalostylis labicheoides	1										1														
Rhynchosia minima									1		1		1		1				1						
Rhynchosia bungarensis																									1
Senna ?glaucifolia																									
Senna artemisioides subsp. *helmsii*																1									
Senna artemisioides subsp. *oligophylla*					1						1	1	1		1				1						
Senna artemisioides subsp. *oligophylla x glutinosa*																1									
Senna artemisioides subsp. *oligophylla x helmsii*				1	1		1						1		1						1			1	
Senna ferraria																									1
Senna glutinosa subsp. *glutinosa*	1	1			1	1					1			1			1	1	1		1	1			
Senna glutinosa subsp. *glutinosa x oligophylla*															1										
Senna glutinosa subsp. *pruinosa*							1			1														1	

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098
Senna glutinosa subsp. *x luerssenii*																		1		
Senna glutinosa x ?																				
Senna hamersleyensis																				1
Senna notabilis	1			1							1					1				
Senna symonii															1					
Senna venusta											1									
Sesbania cannabina	1						1				1					1				
Swainsona formosa																		1		
Swainsona kingii																				
Swainsona stenodonta						1			1											
Tephrosia clementii																				
Tephrosia rosea var. *clementii*																				
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)			1																	
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)																				
Tephrosia sp. Fortescue (A.A. Mitchell 606)					1															
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)																				
Tephrosia supina																				
Tephrosia virens												1								
Tephrosia remotiflora																				
**Vachellia farnesiana*																				
Vigna lanceolata var. *lanceolata*																				
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)																				
Zornia muelleriana																				
Zornia albiflora																				
Gentianaceae																				
Schenkia clementii																				
Goodeniaceae																				
Dampiera candicans										1		1					1			
Goodenia cusackiana																				
Goodenia forrestii				1																
Goodenia heterochila																				
Goodenia lamprosperma			1																	
Goodenia microptera																				
Goodenia muelleriana																				
Goodenia nuda																				
Goodenia pascua																				
Goodenia stobbsiana						1				1		1	1				1	1		
Goodenia triodiophila																				
Goodenia armitiana																				
Scaevola amblyanthera var. *centralis*																				
Scaevola parvifolia subsp. *pilbarae*																				
Scaevola spinescens																				
Scaevola aff. *browniana*																				
Gyrostemonaceae																				
Codonocarpus cotinifolius																				
Gyrostemon tepperi																				
Haloragaceae																				
Haloragis gossei var. *inflata*																				
Myriophyllum verrucosum							1													
Hydrocharitaceae																				
Vallisneria nana																				
Lamiaceae																				
Basilicum polystachyon																				
Clerodendrum floribundum var. *angustifolium*																1		1		
Dicrastylis cordifolia																				
Lauraceae																				

SPECIES	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118
Senna glutinosa subsp. *x luerssenii*		1													1					
Senna glutinosa x ?																				
Senna hamersleyensis	1	1																		
Senna notabilis																		1		
Senna symonii				1																
Senna venusta																				
Sesbania cannabina					1														1	
Swainsona formosa																				
Swainsona kingii																		1		
Swainsona stenodonta																				
Tephrosia clementii																				
Tephrosia rosea var. *clementii*																				
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)					1						1		1	1					1	
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)																		1		
Tephrosia sp. Fortescue (A.A. Mitchell 606)																				
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)																1				
Tephrosia supina																				
Tephrosia virens																				
Tephrosia remotiflora							1													
**Vachellia farnesiana*					1	1			1	1								1		
Vigna lanceolata var. *lanceolata*																				
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)																		1		
Zornia muelleriana																				
Zornia albiflora																				
Gentianaceae																				
Schenkia clementii																				
Goodeniaceae																				
Dampiera candicans																	1			1
Goodenia cusackiana																1				
Goodenia forrestii											1	1							1	
Goodenia heterochila							1													
Goodenia lamprosperma					1														1	
Goodenia microptera												1					1			
Goodenia muelleriana																				
Goodenia nuda						1												1	1	
Goodenia pascua																				
Goodenia stobbsiana			1					1							1		1			1
Goodenia triodiophila																				
Goodenia armitiana																				
Scaevola amblyanthera var. *centralis*																				
Scaevola parvifolia subsp. *pilbarae*																				
Scaevola spinescens																				
Scaevola aff. *browniana*																				
Gyrostemonaceae																				
Codonocarpus cotinifolius																				
Gyrostemon tepperi																				
Haloragaceae																				
Haloragis gossei var. *inflata*																				
Myriophyllum verrucosum																				
Hydrocharitaceae																				
Vallisneria nana																				
Lamiaceae																				
Basilicum polystachyon					1				1	1										
Clerodendrum floribundum var. *angustifolium*												1				1				
Dicrastylis cordifolia																				
Lauraceae																				

SPECIES	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138
Senna glutinosa subsp. *x luerssenii*																				
Senna glutinosa x ?														1						
Senna hamersleyensis																				
Senna notabilis																	1			
Senna symonii																				
Senna venusta																				
Sesbania cannabina																				
Swainsona formosa					1			1												
Swainsona kingii																				
Swainsona stenodonta																				
Tephrosia clementii																				
Tephrosia rosea var. *clementii*																				
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)								1												
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)																			1	
Tephrosia sp. Fortescue (A.A. Mitchell 606)						1	1													
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)													1							
Tephrosia supina			1														1			
Tephrosia virens																				
Tephrosia remotiflora																				
**Vachellia farnesiana*																				
Vigna lanceolata var. *lanceolata*																				
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)																				
Zornia muelleriana																	1			
Zornia albiflora																				
Gentianaceae																				
Schenkia clementii																				
Goodeniaceae																				
Dampiera candicans																				
Goodenia cusackiana		1																		
Goodenia forrestii					1			1				1		1				1		
Goodenia heterochila																				
Goodenia lamprosperma																				
Goodenia microptera						1	1	1		1					1		1			
Goodenia muelleriana																			1	
Goodenia nuda			1		1												1		1	
Goodenia pascua																				
Goodenia stobbsiana	1			1					1		1			1	1					1
Goodenia triodiophila																				
Goodenia armitiana																				
Scaevola amblyanthera var. *centralis*																				
Scaevola parvifolia subsp. *pilbarae*				1		1								1	1					
Scaevola spinescens																				
Scaevola aff. *browniana*																				
Gyrostemonaceae																				
Codonocarpus cotinifolius																				
Gyrostemon tepperi																				
Haloragaceae																				
Haloragis gossei var. *inflata*																				
Myriophyllum verrucosum																				
Hydrocharitaceae																				
Vallisneria nana																				
Lamiaceae																				
Basilicum polystachyon																				
Clerodendrum floribundum var. *angustifolium*					1					1										
Dicrastylis cordifolia										1										
Lauraceae																				

SPECIES	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Senna glutinosa subsp. *x luerssenii*																1			
Senna glutinosa x ?																			
Senna hamersleyensis																			
Senna notabilis															1				
Senna symonii	1					1													
Senna venusta																			
Sesbania cannabina																			
Swainsona formosa		1																	
Swainsona kingii																			
Swainsona stenodonta		1													1				
Tephrosia clementii																			
Tephrosia rosea var. *clementii*																		1	
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)									1	1			1						
Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	1						1												
Tephrosia sp. Fortescue (A.A. Mitchell 606)										1									
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)																		1	
Tephrosia supina																			
Tephrosia virens																			
Tephrosia remotiflora																			
**Vachellia farnesiana*			1																
Vigna lanceolata var. *lanceolata*																			
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)																			
Zornia muelleriana																			
Zornia albiflora																			1
Gentianaceae																			
Schenkia clementii																			1
Goodeniaceae																			
Dampiera candicans											1			1					
Goodenia cusackiana														1					
Goodenia forrestii									1										
Goodenia heterochila																			
Goodenia lamprosperma																			
Goodenia microptera	1	1					1		1				1						
Goodenia muelleriana																			
Goodenia nuda									1	1									
Goodenia pascua																			
Goodenia stobbsiana	1					1				1	1	1	1	1		1		1	
Goodenia triodiophila														1					
Goodenia armitiana																			
Scaevola amblyanthera var. *centralis*																			
Scaevola parvifolia subsp. *pilbarae*																			
Scaevola spinescens													1						
Scaevola aff. *browniana*																			
Gyrostemonaceae																			
Codonocarpus cotinifolius																			
Gyrostemon tepperi																			
Haloragaceae																			
Haloragis gossei var. *inflata*																			1
Myriophyllum verrucosum																			
Hydrocharitaceae																			
Vallisneria nana																			1
Lamiaceae																			
Basilicum polystachyon																			
Clerodendrum floribundum var. *angustifolium*																1			
Dicrastylis cordifolia																			
Lauraceae																			

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105
Cassytha capillaris			1		1												1							1	1	
Loranthaceae																										
Diplatia grandibractea																										
Lysiana casuarinae																										
Lythraceae																										
Ammannia baccifera	1										1					1											
Malvaceae																										
Abutilon lepidum																											1
Abutilon malvifolium																			1	1							
Abutilon otocarpum																										1	1
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)																1											
Abutilon sp. Pilbara (W.R. Barker 2025)																										
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)																										
Brachychiton acuminatus																1											
Corchorus crozophorifolius			1																								
Corchorus incanus subsp. *incanus*																										
Corchorus laniflorus																										
Corchorus lasiocarpus subsp. *lasiocarpus*																										
Corchorus lasiocarpus subsp. *parvus*			1																								1
Corchorus tectus	1	1		1	1			1								1										1	
Corchorus tridens																										
Corchorus walcottii																										
Gossypium australe		1		1				1			1			1		1		1							1		1
Gossypium robinsonii							1				1					1											
Hibiscus austrinus var. *austrinus*																										
Hibiscus brachysiphonius																				1	1						
Hibiscus coatesii																										
Hibiscus goldsworthii																										
Hibiscus leptocladus																										
Hibiscus sturtii var. *campylochlamys*																										
Hibiscus sturtii var. *grandiflorus*																										
Hibiscus sturtii var. *platychlamys*																										
Hibiscus verdcourtii																										
Keraudrenia nephrosperma																										
Keraudrenia velutina subsp. *elliptica*																										
*Malvastrum americanum																1			1	1							1
Melhania oblongifolia																										
*Melochia pyramidata																										
Sida arenicola																										
Sida arsiniata																										
Sida cardiophylla																										
Sida clementii																										
Sida echinocarpa																										
Sida fibulifera																			1	1	1	1					
Sida rohlenae subsp. *rohlenae*	1			1							1					1											
Sida sp. Articulation below (A.A. Mitchell PRP 1605)																	1										
Sida sp. Pilbara (A.A. Mitchell PRP 1543)			1													1											
Sida sp. Rabbit Flat (B.J. Carter 626)																										
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)																										
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)																											1
Sida sp. verrucose glands (F.H. Mollemans 2423)			1																							1	1

SPECIES	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133
Cassytha capillaris								1					1	1	1						1			1		1		
Loranthaceae																											
Diplatia grandibractea																											
Lysiana casuarinae								1																				
Lythraceae																											
Ammannia baccifera																											
Malvaceae																											
Abutilon lepidum																											
Abutilon malvifolium																											
Abutilon otocarpum					1																1							
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)				1																								
Abutilon sp. Pilbara (W.R. Barker 2025)																													1
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)																											
Brachychiton acuminatus																											
Corchorus crozophorifolius				1			1					1																
Corchorus incanus subsp. *incanus*																											
Corchorus laniflorus																											
Corchorus lasiocarpus subsp. *lasiocarpus*																											
Corchorus lasiocarpus subsp. *parvus*				1																								
Corchorus tectus	1				1	1		1		1	1	1				1		1	1	1	1	1			1		1	1
Corchorus tridens											1																	
Corchorus walcottii																											
Gossypium australe						1			1		1	1		1		1		1	1	1	1				1		1	1
Gossypium robinsonii							1				1	1																
Hibiscus austrinus var. *austrinus*																											
Hibiscus brachysiphonius																											
Hibiscus coatesii																											
Hibiscus goldsworthii																											
Hibiscus leptocladus																											
Hibiscus sturtii var. *campylochlamys*					1													1	1	1	1	1		1			1	1
Hibiscus sturtii var. *grandiflorus*					1																							
Hibiscus sturtii var. *platychlamys*																		1										1
Hibiscus verdcourtii																											
Keraudrenia nephrosperma	1							1		1									1			1		1				1
Keraudrenia velutina subsp. *elliptica*																											
*Malvastrum americanum											1					1		1										
Melhania oblongifolia												1						1										
*Melochia pyramidata																											
Sida arenicola										1																			
Sida arsiniata																									1			
Sida cardiophylla																													1
Sida clementii																											
Sida echinocarpa																		1			1							
Sida fibulifera																											
Sida rohlenae subsp. *rohlenae*																											
Sida sp. Articulation below (A.A. Mitchell PRP 1605)																											
Sida sp. Pilbara (A.A. Mitchell PRP 1543)									1	1			1	1										1				
Sida sp. Rabbit Flat (B.J. Carter 626)																											
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)													1	1														
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)												1						1			1						1	1
Sida sp. verrucose glands (F.H. Mollemans 2423)											1	1				1		1			1				1			

SPECIES	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Cassytha capillaris																1				1				
Loranthaceae																							
Diplatia grandibractea																								1
Lysiana casuarinae												1												
Lythraceae																							
Ammannia baccifera																							
Malvaceae																							
Abutilon lepidum				1														1					1	
Abutilon malvifolium																							
Abutilon otocarpum																							
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)																							
Abutilon sp. Pilbara (W.R. Barker 2025)																							
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)																							
Brachychiton acuminatus																							
Corchorus crozophorifolius																							
Corchorus incanus subsp. *incanus*																							
Corchorus laniflorus																							
Corchorus lasiocarpus subsp. *lasiocarpus*																			1					
Corchorus lasiocarpus subsp. *parvus*															1	1									
Corchorus tectus			1				1	1					1		1				1		1				
Corchorus tridens																							
Corchorus walcottii																							
Gossypium australe		1	1	1		1	1					1		1	1			1						
Gossypium robinsonii														1										
Hibiscus austrinus var. *austrinus*																							
Hibiscus brachysiphonius																							
Hibiscus coatesii							1																	
Hibiscus goldsworthii																								1
Hibiscus leptocladus																							
Hibiscus sturtii var. *campylochlamys*				1														1		1				
Hibiscus sturtii var. *grandiflorus*			1									1												
Hibiscus sturtii var. *platychlamys*																							
Hibiscus verdcourtii																							
Keraudrenia nephrosperma													1											
Keraudrenia velutina subsp. *elliptica*																							
*Malvastrum americanum								1						1										
Melhania oblongifolia																		1						
*Melochia pyramidata																							
Sida arenicola					1																			
Sida arsiniata												1												
Sida cardiophylla																							
Sida clementii																							
Sida echinocarpa			1	1																				
Sida fibulifera																							
Sida rohlenae subsp. *rohlenae*		1																						
Sida sp. Articulation below (A.A. Mitchell PRP 1605)																							
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	1			1								1						1				1			
Sida sp. Rabbit Flat (B.J. Carter 626)																							
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)																							
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)														1	1			1						
Sida sp. verrucose glands (F.H. Mollemans 2423)												1		1	1			1						

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104
Sida spinosa																			1	1	1					
Sida sp. Barlee Range (S. van Leeuwen 1642)																										
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)																										
Triumfetta appendiculata																										
Triumfetta chaetocarpa																									1	
Triumfetta clementii		1														1										
Triumfetta leptacantha																										
Triumfetta maconochieana																		1								
Triumfetta propinqua	1			1																						
Triumfetta ramosa																										
Triumfetta sp.																										
Waltheria indica			1																						1	
Waltheria virgata																										
Marsileaceae																										
Marsilea sp.																									1	
Marsilea hirsuta																										
Meliaceae																										
Owenia reticulata																										
Menispermaceae																										
Tinospora smilacina											1					1										
Molluginaceae																										
Glinus lotoides																										
Mollugo molluginea		1		1					1			1	1				1							1		
Moraceae																										
Ficus aculeata var. *indecora*																										
Ficus brachypoda																										
Myrtaceae																										
Calytrix carinata																										
Corymbia candida																										
Corymbia deserticola subsp. *deserticola*																										
Corymbia ferriticola																										
Corymbia hamersleyana				1		1			1				1	1		1	1									1
Eucalyptus camaldulensis subsp. *refulgens*	1						1				1					1									1	
Eucalyptus gamophylla															1											
Eucalyptus leucophloia subsp. *leucophloia*										1					1		1						1	1		
Eucalyptus victrix	1		1	1							1					1									1	
Eucalyptus xerothermica																										
Melaleuca argentea	1						1																			
Melaleuca bracteata							1																			
Melaleuca glomerata	1						1				1														1	
Melaleuca linophylla	1										1														1	
Nyctaginaceae																										
Boerhavia coccinea	1		1		1													1								
Boerhavia gardneri																										
Boerhavia paludosa																					1					
Boerhavia repleta																				1						
Boerhavia sp.				1															1							
Oleaceae																										
Jasminum didymum subsp. *lineare*											1				1	1				1						
Orobanchaceae																										
Striga curviflora																										
Papaveraceae																										
*Argemone ochroleuca																										
Passifloraceae																										
*Passiflora foetida var. hispida																										
Phrymaceae																										
Mimulus gracilis																										
Phyllanthaceae																										
Flueggea virosa subsp. *melanthesoides*	1															1									1	
Phyllanthus erwinii																										
Phyllanthus maderaspatensis	1		1	1							1					1			1	1	1				1	

SPECIES	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131
Sida spinosa	1			1																							
Sida sp. Barlee Range (S. van Leeuwen 1642)																											
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)																											
Triumfetta appendiculata																											
Triumfetta chaetocarpa					1																						
Triumfetta clementii																											
Triumfetta leptacantha																											
Triumfetta maconochieana														1													
Triumfetta propinqua																											
Triumfetta ramosa																											
Triumfetta sp.																											
Waltheria indica					1			1					1									1					
Waltheria virgata														1													
Marsileaceae																											
Marsilea sp.																											
Marsilea hirsuta																											
Meliaceae																											
Owenia reticulata																											
Menispermaceae																											
Tinospora smilacina																											
Molluginaceae																											
Glinus lotoides																											
Mollugo molluginea						1					1		1						1	1							
Moraceae																											
Ficus aculeata var. *indecora*																											
Ficus brachypoda																											
Myrtaceae																											
Calytrix carinata																											
Corymbia candida												1															
Corymbia deserticola subsp. *deserticola*																		1					1				
Corymbia ferriticola																											
Corymbia hamersleyana	1				1	1		1	1		1			1		1	1		1	1	1	1	1	1		1	
Eucalyptus camaldulensis subsp. *refulgens*													1														
Eucalyptus gamophylla																		1		1	1			1			
Eucalyptus leucophloia subsp. *leucophloia*										1				1	1	1		1					1		1		
Eucalyptus victrix			1	1	1			1					1														
Eucalyptus xerothermica												1					1										
Melaleuca argentea																											
Melaleuca bracteata																											
Melaleuca glomerata				1				1																			
Melaleuca linophylla																											
Nyctaginaceae																											
Boerhavia coccinea					1	1							1						1			1					1
Boerhavia gardneri																											
Boerhavia paludosa																											
Boerhavia repleta																											
Boerhavia sp.																											
Oleaceae																											
Jasminum didymum subsp. *lineare*														1			1		1	1		1	1	1			
Orobanchaceae																											
Striga curviflora																											
Papaveraceae																											
*Argemone ochroleuca																											
Passifloraceae																											
*Passiflora foetida var. hispida																											
Phrymaceae																											
Mimulus gracilis																											
Phyllanthaceae																											
Flueggea virosa subsp. *melanthesoides*																											
Phyllanthus erwinii								1																			
Phyllanthus maderaspatensis	1		1	1	1			1				1	1									1					

SPECIES	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Sida spinosa										1																
Sida sp. Barlee Range (S. van Leeuwen 1642)																										1
Sida sp. B Kimberley Flora (A.A. Mitchell 2745)																										
Triumfetta appendiculata																										
Triumfetta chaetocarpa																										
Triumfetta clementii																									1	
Triumfetta leptacantha																										1
Triumfetta maconochieana																										
Triumfetta propinqua																										
Triumfetta ramosa																										
Triumfetta sp.																										
Waltheria indica																				1						
Waltheria virgata																		1			1					
Marsileaceae																										
Marsilea sp.																										
Marsilea hirsuta																										
Meliaceae																										
Owenia reticulata																										1
Menispermaceae																										
Tinospora smilacina																										
Molluginaceae																										
Glinus lotoides																										1
Mollugo molluginea	1			1					1							1	1		1	1	1					
Moraceae																										
Ficus aculeata var. *indecora*																										1
Ficus brachypoda																									1	
Myrtaceae																										
Calytrix carinata																					1					
Corymbia candida																										
Corymbia deserticola subsp. *deserticola*	1																		1							
Corymbia ferriticola																										1
Corymbia hamersleyana	1	1	1	1	1	1	1	1	1	1		1			1	1	1	1		1	1		1	1		
Eucalyptus camaldulensis subsp. *refulgens*																										
Eucalyptus gamophylla	1	1						1										1			1					
Eucalyptus leucophloia subsp. *leucophloia*								1		1		1	1					1	1		1		1	1		
Eucalyptus victrix																										
Eucalyptus xerothermica	1					1						1				1										
Melaleuca argentea																										
Melaleuca bracteata																										
Melaleuca glomerata																										
Melaleuca linophylla																										
Nyctaginaceae																										
Boerhavia coccinea																									1	
Boerhavia gardneri																										
Boerhavia paludosa																										
Boerhavia repleta																										
Boerhavia sp.																										
Oleaceae																										
Jasminum didymum subsp. *lineare*					1	1		1				1				1	1	1		1					1	
Orobanchaceae																										
Striga curviflora																										
Papaveraceae																										
*Argemone ochroleuca																										
Passifloraceae																										
*Passiflora foetida var. hispida																										
Phrymaceae																										
Mimulus gracilis																										
Phyllanthaceae																										
Flueggea virosa subsp. *melanthesoides*																										
Phyllanthus erwinii																										
Phyllanthus maderaspatensis										1						1										

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Phyllanthus reticulatus																1																																																																
Plantaginaceae																																																																															
Stemodia grossa	1		1				1	1			1					1											1	1					1						1	1																											1							1								1	
Stemodia kingii																			1	1	1								1	1																																																	
Poaceae																																																																															
Amphipogon sericeus																								1											1		1							1							1										1					1		1			1							
Aristida contorta			1																													1													1		1	1				1															1												
Aristida holathera var. *holathera*									1																						1			1		1			1	1		1		1	1	1	1		1						1				1					1		1	1		1	1	1					
Aristida inaequiglumis																										1																1																																			
Aristida latifolia								1											1		1																								1																															1				
Astrebla pectinata																											1																																																							
Astrebla sp.																																																																															1
Bothriochloa ewartiana																									1														1					1																																			
Brachyachne convergens																			1		1																																										1																
Cenchrus ciliaris			1				1																		1						1	1	1	1				1	1							1				1				1																	1			1									1	
Cenchrus setiger																									1																																																							
Chrysopogon fallax								1																			1					1						1	1					1		1	1	1	1				1					1																		1			1	1								
Cymbopogon ambiguus														1																												1				1	1	1																	1											1	1		1	1			1	
Cymbopogon obtectus																																																																			1													
Cymbopogon procerus	1		1	1							1					1									1																								1																								1											
Cymbopogon sp.																																																																															
**Cynodon dactylon*																																						1																																									
Dactyloctenium radulans																																																																															
Dichanthium sericeum subsp. *humilius*																			1										1																																																		
Digitaria brownii			1																									1					1													1	1	1	1																1							1				1						
Digitaria ctenantha																											1																					1																															
Elytrophorus spicatus																																																																															1
Enneapogon caerulescens																																																																															
Enneapogon lindleyanus	1		1													1																							1						1			1																								1									
Enneapogon polyphyllus																																													1							1														1			1									1	
Enneapogon robustissimus																																																1																															
Enteropogon ramosus																									1																																																							
Eragrostis ?eriopoda																																																																															
Eragrostis cumingii																									1		1			1								1																			1																							
Eragrostis dielsii																																						1																																									
Eragrostis eriopoda																																	1											1		1	1	1												1												1									
Eragrostis speciosa																																																																															
Eragrostis tenellula																									1					1																																			1																
Eragrostis xerophila																																																																															
Eriachne aristidea																																						1								1																						1									
Eriachne benthamii																													1	1																																																
Eriachne ciliata																																										1																																				
Eriachne mucronata										1		1		1			1						1													1				1	1	1			1		1			1															1						1	1	1	1				1	
Eriachne obtusa																																																																															
Eriachne pulchella subsp. *dominii*			1			1			1				1					1						1							1	1		1																																					1										1	
Eriachne sp.																																																																															
Eriachne tenuiculmis	1										1																				1		1	1					1										1																							1	1									
Eulalia aurea	1								1								1										1	1					1		1	1	1		1	1	1			1	1	1	1	1	1			1	1		1	1			1	1		1				1	1	1		1	1		1								
Iseilema vaginiflorum																																																																															
Panicum decompositum																													1																																																			
Panicum laevinode																			1		1																																																										
Paraneurachne muelleri																																		1					1	1			1	1	1	1	1	1		1	1							1			1		1			1		1	1	1			1						
Paspalidium clementii				1																																																																													
Perotis rara																											1																																																							
Poaceae sp.																																																																															
Schizachyrium fragile																																																																									1							
Setaria surgens																																						1																																									
**Setaria verticillata*																																						1																								1																
Sorghum timorense																																																																															
Sporobolus actinocladus																						1																																																										
Sporobolus australasicus																									1												1																								1																	
Themeda triandra																											1							1				1	1					1		1			1	1					1										1		1		1				1	1		1	1						
Triodia aff. *melvillei*													1																													1							1																							1							
Triodia angusta																																																														1																
Triodia brizoides																							1	1				1																																			1												1			
Triodia epactia	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1			1	1	1	1	1				1	1				1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1		1	1	1		1	1		1	1			1	1	1	

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Triodia lanigera																																																																																
Triodia schinzii																																																																																
Triodia secunda																																																																																
Triodia wiseana					1	1			1			1	1	1	1			1				1		1												1	1			1	1	1							1	1	1		1			1	1		1	1	1	1		1	1	1		1	1		1		1	1	1			1	
Tripogon loliiformis																																											1																																					
Urochloa sp.																										1																																																			
Xerochloa barbata																																																																																
Polygalaceae																																																																																
Polygala glaucifolia																	1																																																													
Polygonaceae																																																																																
**Acetosa vesicaria*																																		1																																													
Portulacaceae																																																																																
Calandrinia quadrivalvis																																																																																
Portulaca oleracea																			1																																																											
Portulaca pilosa																																																																																
Potamogetonaceae																																																																																
Potamogeton tricarinatus																																																																															1
Proteaceae																																																																																
Grevillea pyramidalis subsp. *leucadendron*	1	1		1		1			1			1				1		1																						1						1								1						1			1						1								1	
Grevillea wickhamii			1					1		1		1	1										1																		1				1						1		1		1							1						1								1		
Grevillea wickhamii subsp. *hispidula*														1			1											1			1		1		1	1	1		1										1						1			1	1	1															1				
Hakea chordophylla															1													1				1	1		1	1				1		1							1		1								1	1		1						1			1	1		1	1				
Hakea lorea subsp. *lorea*								1						1		1										1	1										1	1			1			1	1	1	1			1		1	1	1			1	1	1			1					1		1										
Pteridaceae																																																																																
Cheilanthes brownii														1																																																																
Cheilanthes sieberi subsp. *sieberi*																											1													1																											1												
Rubiaceae																																																																																
Oldenlandia crouchiana																																																																															1
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)																																																																															1
Psydrax latifolia																																																																															1
Synaptantha tillaeacea var. *tillaeacea*																									1																															1					1																	
Santalaceae																																																																																
Anthobolus leptomerioides																																																				1																												
Santalum lanceolatum																1										1																												1				1						1				1										
Sapindaceae																																																																																
Atalaya hemiglauca											1																			1		1	1																																													
Dodonaea coriacea																	1						1												1					1															1																1					1			
Dodonaea lanceolata var. *lanceolata*																																																																							1								
Dodonaea pachyneura																																																																															1
Scrophulariaceae																																																																																
Eremophila latrobei subsp. *filiformis*																																																																			1												
Eremophila latrobei subsp. *latrobei*																																																																															1
Eremophila longifolia																1										1																1		1	1						1			1														1										
Solanaceae																																																																																
Nicotiana benthamiana																																																																															1
Nicotiana occidentalis subsp. *occidentalis*	1			1																										1																																																
Solanum ashbyae																																		1																																													
Solanum cleistogamum																																																																												1			
Solanum diversiflorum																1																		1				1		1															1		1											1						1		1	
Solanum elatius																																																						1																								
Solanum gabrielae																																																																															1
Solanum horridum				1						1																																														1																						
Solanum lasiophyllum																																	1																		1														1								1			1	
Solanum phlomoides				1								1	1			1		1																																																								1				
Stylidiaceae																																																																																
Stylidium fluminense	1																																																																													
Surianaceae																																																																																
Stylobasium spathulatum																																																											1																				
Thymelaeaceae																																																																																

Table 27: Site x species table

SPECIES	R14079	R14080	R14081	R14082	R14083	R14084	R14085	R14086	R14087	R14088	R14089	R14090	R14091	R14092	R14093	R14094	R14095	R14096	R14097	R14098	R14099	R14100	R14101	R14102	R14103	R14104
Pimelea ammocharis																										
Pimelea holroydii																										
Typhaceae																										
Typha domingensis							1																			
Violaceae																										
Hybanthus aurantiacus	1		1	1												1									1	
Zygophyllaceae																										
Tribulus hirsutus																										
Tribulus macrocarpus																										
Tribulus platypterus	1				1																					
Tribulus suberosus																										

SPECIES	R14105	R14106	R14107	R14108	R14109	R14110	R14111	R14112	R14113	R14114	R14115	R14116	R14117	R14118	R14119	R14120	R14121	R14122	R14123	R14124	R14125	R14126	R14127	R14128	R14129	R14130
Pimelea ammocharis																										
Pimelea holroydii				1																						
Typhaceae																										
Typha domingensis																										
Violaceae																										
Hybanthus aurantiacus					1								1									1				
Zygophyllaceae																										
Tribulus hirsutus																					1					
Tribulus macrocarpus						1																				1
Tribulus platypterus																										
Tribulus suberosus																										

SPECIES	R14131	R14132	R14133	R14134	R14135	R14136	R14137	R14138	R14139	R14140	R14141	R14142	R14143	R14144	R14145	R14146	R14148	R14149	R14150	R14151	R14152	R14153	R14155	R14156	R14157	R14R1	Opps
Pimelea ammocharis																											
Pimelea holroydii																											
Typhaceae																											
Typha domingensis																											
Violaceae																											
Hybanthus aurantiacus											1						1	1			1	1			1	1	
Zygophyllaceae																											
Tribulus hirsutus																											
Tribulus macrocarpus						1									1												
Tribulus platypterus																											
Tribulus suberosus																										1	

APPENDIX SEVEN: CONSERVATION SIGNIFICANT FLORA

Table 28: Conservation significant flora locations

SPECIES NAME	COLLECTOR	EASTINGS (GDA 94, MGA 50)	NORTHINGS (GDA 94, MGA 50)	NUMBER
Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (P1)	AF	596404.612	7663954.065	10
	AF	596372.718	7663934.659	150
	AF	596396.961	7663853.272	20
	LA/AF	596391.427	7663901.564	Not recorded
Goodenia nuda (P4)	AF	569660.463	7681540.52	1
	AF	579041.35	7700036.135	20
	AF	578288.508	7700069.766	30
	AF	552703.641	7556021.498	5
	AF	553249.716	7553675.643	3
	AF	553222.951	7553599.466	10
	AF	553446.551	7553599.149	20
	JKN	556998.76	7564836.951	3
	JKN	556443.173	7564951.633	1
	JKN	556399.587	7564914.154	3
	JKN	556314.137	7564887.893	3
	JKN	541907.475	7562639.827	3
	JKN	544779.634	7559575.003	3
	JKN	542604.127	7558366.112	1
	LA/AF	575331.351	7699462.273	Not recorded
	SK/AF	578297.276	7590080.343	Not recorded
	JKN	553479.414	7563326.392	1
	JKN	555681.749	7564620.938	3
	SK/AF	549979.939	7561746.149	Not recorded
	JKN	541947.246	7562655.329	3
	JKN	591289.199	7607285.52	Not recorded
	JKN	560041.117	7567793.088	2
	JKN	556200.84	7564896.046	30
	SK/AF	553239.213	7553680.549	Not recorded
Helichrysum oligochaetum (P1)	SK	565708.625	7582735.175	Not recorded
	SK	565702.917	7582704.316	20+
	SK	566144.699	7582790.484	Not recorded
	SK	566779.831	7582633.747	5+
	SK	566844.85	7582615.21	50+
Heliotropium muticum (P1)	LA/AF	575380.369	7699462.163	1
	AF	582858.094	7681524.773	150
	AF	578763.8	7684815.076	1
	AF	576394.182	7691392.122	1
	RD/SB	594285.567	7674155.548	20+
	RD/SB	591590.769	7678367.64	50+
	RD/SB	592516.912	7677785.836	50+
	RD/SB	592387.173	7677670.227	50+
	RD/SB	592311.051	7677514.029	50+
	RD/SB	592104.971	7677257.828	50+
	RD/SB	586730.883	7681032.977	50+

SPECIES NAME	COLLECTOR	EASTINGS (GDA 94, MGA 50)	NORTHINGS (GDA 94, MGA 50)	NUMBER
Heliotropium muticum (P1)	RD/SB	586820.535	7681000.411	50+
	RD/SB	586941.075	7680970.008	50+
	RD/SB	587196.028	7680918.202	10+
	LA/AF	574765.402	7700864.337	Not recorded
	LA/AF	578738.889	7684868.653	Not recorded
	LA/AF	576417.887	7691343.978	Not recorded
	LA/AF	582841.349	7681565.034	Not recorded
	RD/SB	592708.333	7678076.538	Not recorded
	RD/SB	594401.807	7670352.777	Not recorded
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301) (P3)	SK	546149.749	7561636.411	100+
	JKN	542083.451	7554054.695	15
	JKN	542064.75	7554003.827	5
	JKN	542087.541	7553887.763	4
	JKN	542160.236	7554035.229	10
	JKN	542135.321	7554089.976	10
	JKN	542161.404	7554124.553	5
	JKN	542241.919	7554149.463	15
	JKN	542434.397	7558090.289	Not recorded
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)	SK	583727.214	7597908.046	100+
	JKN	584236.234	7598385.343	10
	JKN	583945.255	7598086.671	10
	JKN	583945.255	7598086.671	10
	JKN	583999.96	7598005.577	10
Pentalepis trichodesmoides subsp. *hispida* (P2)	SK	586412.156	7599467.406	1
Rhynchosia bungarensis (P4)	SK	548446.693	7560017.638	1
	SK	548381.603	7559686.984	1
	SK	548430.759	7559835.601	10+
	SK	548422.575	7560025.903	10+
	SK	543858.316	7559622.538	30+
	SK	543710.368	7559661.249	200+
	SK	543342.784	7559708.866	200+
	JKN	542080.67	7554056.252	5
	JKN	542046.103	7553973.437	5
	JKN	542069.167	7553920.355	5
	JKN	543357.279	7555426.114	40
	JKN	543066.304	7555427.357	5
Sida sp. Barlee Range (S. van Leeuwen 1642) (P3)	JKN	542067.313	7553921.245	6
	JKN	542050.111	7554006.523	1
	JKN	542142.312	7554043.468	3
	JKN	542136.42	7554115.322	3
	JKN	542161.404	7554124.553	3
	JKN	542253.969	7554142.789	1
	JKN	543188.48	7555595.492	2
	JKN	543197.929	7555580.413	2
	JKN	543324.88	7555459.742	2
	JKN	543324.88	7555459.742	2

Collectors: AF = Andrew Fry, JKN = Jared Nelson, LA = Lyn Atkins, RD = Richard Daniel, SB = Sonya Bateman, SK = Stephen Kern

APPENDIX EIGHT: VEGETATION TYPE DETAILS

'Other common or characteristic species' are either dominant in one or more of the characteristic quadrats (but not sufficiently common to form part of the description), or occur in at least half of the quadrats, or (for singleton quadrats) are also considered as characteristic.

Vegetation type code: **Aa_3Te**
Vegetation type description: *Acacia ancistrocarpa, Acacia bivenosa* and *Acacia arida* tall-mid open to scattered shrubland over *Triodia epactia* and *Triodia wiseana* mid-low open hummock grassland
Other common or characteristic species: *Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia, Acacia synchronicia, Bonamia erecta, Carissa lanceolata, Chrysopogon fallax, Eragrostis xerophila, Grevillea pyramidalis* subsp. *leucadendron, Hakea chordophylla, Hybanthus aurantiacus, Indigofera monophylla, Ptilotus astrolasius, Sida arsiniata, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)
Quadrats/relevès: 14006, R14009, R14010, R14012, R14019, R14057 (**Plate 18** and **Plate 19**)
Extent: 3 656.28 0ha **Proportion of study area**: 6.41%
Vegetation Condition: Excellent – Very Good **Disturbance**: Cattle grazing
Associated landform/s: Plain
Land system/s: Mostly Mallina, also Boolaloo, Boolgeeda, Calcrete, Gregory, Horseflat, Macroy, Ruth
Priority Flora: *Heliotropium muticum* (P1)
Floristics notes: This vegetation type does not form a clear floristic group, with three of the quadrats characterising it forming a group within the dendrogram (in supergroup 4, with vegetation type **AiTw(1)**), and the other three scattered (one also in supergroup 4; the others in supergroup 6).
Other notes: This vegetation type occurred in the northern portion of the rail corridor, in the Roebourne Plains IBRA subregions. In some areas there was no mid stratum (and never an upper stratum). In other areas the *Acacia* spp. listed as characteristic and common species, and *Carissa lanceolata* (rarely, largely associated with shallow drainage), *Grevillea pyramidalis* subsp. *leucadendron* and *Hakea chordophylla* were at varying densities and dominance, and the vegetation type was shrubbier than either of the images portray.

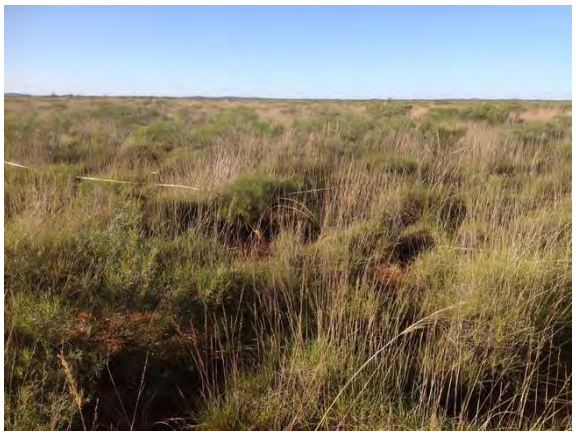


Plate 18: Vegetation type Aa_3Te; quadrat R14006

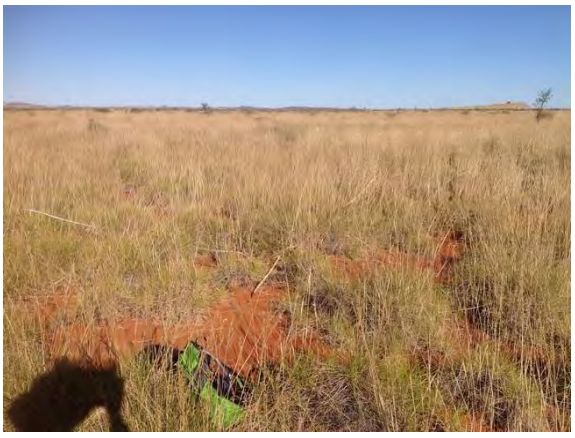


Plate 19: Vegetation type Aa_3Te; quadrat R14009

Vegetation type code: **Aa_3Tl**

Vegetation type description: *Acacia ancistrocarpa, Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall-mid open-sparse shrubland over *Triodia lanigera, Triodia epactia* and *Acacia stellaticeps* mid-low hummock grassland/shrubland with occasional *Corymbia hamersleyana* and *Corymbia deserticola* subsp. *deserticola* low scattered trees

Other common or characteristic species: *Acacia acradenia, Acacia tumida* var. *pilbarensis, Corchorus tectus, Grevillea pyramidalis* subsp. *leucadendron, Indigofera monophylla, Pluchea ferdinandi-muelleri, Polymeria ambigua, Ptilotus astrolasius, Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601), *Triodia wiseana*

Quadrats/relevès: R14017, R14018, R14020, R14021, R14023, R14024, R14029, (R14030), R14032, R14034, R14035, R14036, R14037, R14038, R14042, R14048, R14049, R14064, R14071 (**Plate 20** and **Plate 21)**

Extent: 15 385.36ha **Proportion of study area**: 26.97%

Vegetation Condition: Excellent – Very Good **Disturbance**: Cattle grazing

Associated landform/s: Valley floor; occasionally lower slope

Land system/s: Mostly Boolaloo, Boolgeeda, Ruth, Uaroo; also Calcrete, Capricorn, Gregory, Macroy, Mallina, River

Priority Flora: *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P1), *Heliotropium muticum* (P1)

Floristics notes: Vegetation type **Aa_3Tl** was scattered over two supergroups in the floristic dendrogram. Most of supergroup 6 have been interpreted as this vegetation type; the remaining quadrats were scattered throughout supergroup 4 and have been interpreted as belonging in this vegetation type due to the characteristic species.

Other notes: The ground stratum species *Triodia lanigera* is most characteristic species; the mid stratum species, generally *Acacia*, varied in composition and density, from absent to open. Quadrat R14030 was associated with the edge of a large granite outcrop and, whilst the vegetation appeared similar to surrounding areas except for *Acacia tumida* var. *pilbarensis* that formed a narrow line at the base of the rocks, floristically it was somewhat of an outlier.

It occurred as a mappable, discrete (broadly defined) unit and in a mosaic with vegetation type **Ts**; the mosaic extent was 13.32 ha (0.02% of the study area).

This vegetation type occurred in the northern portion of the rail corridor, in the Roebourne plains IBRA subregion.

Plate 20: General view of vegetation type Aa_3Tl on Boolaloo land system

Plate 21: Vegetation type Aa_3Tl; quadrat R14064

Vegetation type code: **Aa_4As_3**
Vegetation type description: *Acacia arida* mid sparse shrubland over *Acacia stellaticeps, Triodia epactia* and *Bonamia erecta* low shrubland/hummock grassland with *Corymbia hamersleyana* scattered low trees
Other common or characteristic species: *Acacia colei* var. *colei, Acacia trachycarpa, *Cenchrus ciliaris, Chrysopogon fallax, Hakea lorea* subsp. *lorea, Rhynchosia minima*
Quadrats/relevès: R14007 (**Plate 22**)
Extent: 40.91 ha **Proportion of study area**: 0.07%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Outwash area of plain
Land system/s: Horseflat, Mallina
Priority Flora: *Goodenia nuda* (P4), *Heliotropium muticum* (P1)
Floristics notes: Quadrat R14007 was in supergroup 8 in the floristic dendrogram, and was interpreted as a discrete vegetation type based on its characteristic species. No quadrats in close geographical proximity were associated with R14007.
Other notes: This vegetation type occurred in the northern portion of the rail corridor, in the Roebourne plains IBRA subregion.

Plate 22: Vegetation type Aa_4As_3; quadrat R14007

Vegetation type code: **Aa_4Tl**
Vegetation type description: *Acacia arida* and *Acacia ancistrocarpa* mid open shrubland over *Triodia lanigera, Acacia spondylophylla* and *Triodia epactia* mid (low) hummock grassland/shrubland
Other common or characteristic species: *Acacia inaequilatera, Goodenia cusackiana, Goodenia stobbsiana, Tribulus suberosus*
Quadrats/relevès: R14050, R14054 (**Plate 23**)
Extent: 802.41 ha **Proportion of study area**: 1.41%
Vegetation Condition: Excellent **Disturbance**: None noted
Associated landform/s: Lower to mid slopes, often south-facing
Land system/s: Mostly Rocklea, Ruth; also Boolgeeda, River, Satirist
Priority Flora: None
Floristics notes: The two quadrats comprising this vegetation type occurred within the same broad floristic group within supergroup 4 in the floristic dendrogram. Vegetation type **Aa_4As_3** is most floristically similar to vegetation type **ApTw**.
Other notes: This vegetation type occurred on the northern edges of the Chichester Range.

Plate 23: Vegetation type Aa_4Tl; quadrat R14054

Vegetation type code: **Aa_5Tw**
Vegetation type description: *Acacia atkinsiana, Hakea chordophylla* and *Acacia ancistrocarpa* tall-mid sparse shrubland over *Triodia wiseana* and *Triodia epactia* low hummock grassland with *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees
Other common or characteristic species: *Amphipogon sericeus, Grevillea wickhamii* subsp. *hispidula, Keraudrenia nephrosperma, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *glutinosa, Sida arenicola, Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
Quadrats/relevès: R14115, R14129, R14138 (**Plate 24** and **Plate 25**)
Extent: 964.74 ha **Proportion of study area**: 1.69%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Lower slopes
Land system/s: Mostly Boolgeeda; also Newman, River
Priority Flora: None
Floristics notes: The quadrats that define this vegetation type occurred within a larger floristic group associated with hills and slopes in the Hamersley Range, in supergroup 7.
Other notes: This vegetation type occurred on the lower slopes of the Hamersley Range.

Plate 24: Vegetation type Aa_5Tw; quadrat R14129

Plate 25: Vegetation type Aa_5Tw; quadrat R14138

Vegetation type code: **Ac_1ApTe**
Vegetation type description: *Acacia citrinoviridis* low woodland or tall to mid shrubland over *Acacia pyrifolia* var. *pyrifolia, Acacia trachycarpa* and *Acacia pruinocarpa* tall-mid shrubland over *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia atkinsiana, Acacia inaequifolia, Acacia trachycarpa, *Cenchrus ciliaris, Chrysopogon fallax, Corchorus tectus, Corymbia hamersleyana, Eulalia aurea, Hakea lorea* subsp. *lorea, Indigofera monophylla, Rhynchosia minima*
Quadrats/relevès: R14086, R14104, R14130 (**Plate 26**)
Extent: 605.61 ha **Proportion of study area**: 1.06%
Vegetation Condition: Excellent – Very Good **Disturbance**: Cattle grazing
Associated landform/s: Flat valley floors; alluvium
Land system/s: Boolgeeda, Coolibah, Jurrawarina, Urandy
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: The quadrats that define this vegetation type are closely spaced on the floristic dendrogram in supergroup 8, forming a small group within vegetation types associated with broad drainage lines, floodplains and low-lying areas. This vegetation type is most similar to vegetation type **AiTe(1)**.
Other notes: Broad *Acacia citrinoviridis* floodplain/valley floor in the Fortescue Valley.

Plate 26: Vegetation type Ac_1ApTe; quadrat R14086

Vegetation type code: **Ac_1Te**
Vegetation type description: *Acacia citrinoviridis* and *Corymbia hamersleyana* low woodland over *Triodia epactia, Themeda triandra* and *Chrysopogon fallax* mid-low hummock grassland/tussock grassland
Other common or characteristic species: **Bidens bipinnata, Digitaria brownii, *Malvastrum americanum, Pterocaulon sphacelatum, Rostellularia adscendens* var. *clementii, Rhynchosia minima, Sida spinosa, Urochloa* sp.
Quadrats/relevès: R14105, R14141 (**Plate 27**)
Extent: 115.05 ha **Proportion of study area**: 0.20%
Vegetation Condition: Excellent – Good **Disturbance**: Cattle grazing, weedy
Associated landform/s: Floodplain, open depression
Land system/s: Boolgeeda, Jurrawarina, McKay, River
Priority Flora: None
Floristics notes: The two quadrats defining this vegetation type are adjacent on the floristic dendrogram and form a small discrete group that includes quadrat R14116 that is the only representative of vegetation type **Cc_2AbBe**, in supergroup 8.
Other notes: Floodplain in Fortescue Valley and southern edges of Chichester Range.

Plate 27: Vegetation type Ac_1Te; quadrat R14105

Vegetation type code: **AiTe(1)**
Vegetation type description: *Acacia inaequilatera* and *Acacia acradenia* tall sparse shrubland over *Triodia epactia* and *Triodia wiseana* mid tussock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia bivenosa, Cajanus cinereus, Cynanchum floribundum, Corchorus tectus, Pluchea ferdinandi-muelleri, Swainsona stenodonta*
Quadrats/relevès: R14043 (**Plate 28**)
Extent: 880.28 ha **Proportion of study area**: 1.54%
Vegetation Condition: Excellent **Disturbance**: No disturbance
Associated landform/s: Lower slopes
Land system/s: Mostly Boolgeeda, also River, Rocklea, Ruth, Satirist
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: This vegetation type is interpreted as a discrete vegetation type.
Other notes: This vegetation type occurs immediately adjacent to (north and south), and to the south of a large dolerite dyke, at the junction of the Roebourne and Chichester IBRA subregions, and a few areas to the south. The vegetation immediately to the south of the dyke had a few unique species (e.g. *Capparis spinos*a var. *nummularia*, foreground, **Plate 29**) however these did not continue for more than 1-2 m into the surrounding vegetation. Aside from an old, disused track and borrow pit that was probably created when soil was excavated to make a passable track through a pass in the dyke, there is no signs of disturbance.

Plate 28: Vegetation type AiTe(1); quadrat R14043

Plate 29: Vegetation immediately adjacent to the dolerite dyke

Vegetation type code: **AiTe(2)**
Vegetation type description: *Acacia inaequilatera* and *Acacia ancistrocarpa* tall-mid sparse-scattered shrubland over *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Acacia dictyophleba, Acacia pruinocarpa, *Cenchrus ciliaris, Corchorus tectus, Corymbia hamersleyana, Cullen leucochaites, Eriachne pulchella* subsp. *dominii, Eulalia aurea, Goodenia microptera, Hibiscus sturtii* var. *grandiflorus, Rhynchosia minima, Salsola australis, Senna artemisioides* subsp. *oligophylla, Senna artemisioides* subsp. *oligophylla x helmsii, Tribulus macrocarpus*
Quadrats/relevès: R14110, R14145 (**Plate 30**)
Extent: 1 167.65ha **Proportion of study area**: 20.05%
Vegetation Condition: Excellent – Very Good **Disturbance**: Cattle grazing
Associated landform/s: Valley floor, alluvial plain
Land system/s: Mostly Urandy; also Coolibah, Jurrawarrina
Priority Flora: None
Floristics notes: The quadrats comprising this vegetation type form a discrete group in the floristic dendrogram in supergroup 8 with others associated with vegetation type **Ac_1ApTe**.
Other notes: This vegetation type occurs on the valley floor on the Fortescue River floodplain.

Plate 30: Vegetation type AiTe(2); quadrat R14110

Vegetation type code: **AiTe(3)**
Vegetation type description: *Acacia inaequilatera* and *Acacia trachycarpa* mid sparse shrubland over *Triodia epactia* and *Pluchea tetranthera* mid (low) hummock grassland/shrubland with *Corymbia hamersleyana* low scattered trees
Other common or characteristic species: *Aristida holathera* var. *holathera, Bonamia media, Chrysopogon fallax, Cullen martinii, Cyperus blakeanus, Desmodium filiforme, Eragrostis cumingii, Eragrostis eriopoda, Hakea lorea* subsp. *lorea, Indigofera colutea, Indigofera linifolia, Indigofera linnaei, Indigofera monophylla, Ipomoea muelleri, Pterocaulon sphacelatum, Wahlenbergia tumidifructa, Zornia muelleriana*
Quadrats/relevès: R14135 (**Plate 31**)
Extent: 75.53 ha **Proportion of study area**: 0.13%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Open Depression
Land system/s: Granitic
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: This vegetation type is interpreted as a discrete vegetation type.
Other notes: This vegetation type is associated with the valley floor within Chichester Range.

Plate 31: Vegetation type AiTe(3); quadrat R14135

Vegetation type code: **AiTw(1)**
Vegetation type description: *Acacia inaequilatera* tall sparse or scattered shrubland over *Triodia wiseana* and *Triodia epactia* mid-low hummock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia elachantha, Acacia monticola, Aristida latifolia, Clerodendrum floribundum* var. *angustifolium, Corchorus tectus, Grevillea pyramidalis* subsp. *leucadendron, Grevillea wickhamii* subsp. *hispidula, Hakea chordophylla, Hibiscus sturtii* var. *campylochlamys, Solanum phlomoides, Trichodesma zeylanicum* var. *zeylanicum, Triumfetta maconochieana*
Quadrats/relevès: R14096, R14155 (Plate 32)
Extent: 344.92 ha **Proportion of study area**: 0.60%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Valley (flat)
Land system/s: Mostly Rocklea; also Wona
Priority Flora: *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
Floristics notes: The quadrats that comprise this vegetation type form a floristic group with the quadrats that define vegetation type **Aa_3Te**, in supergroup 4.
Other notes: Valley floors within Rocklea land system within the Chichester Range and on the edge of the Roebourne IBRA subregion; basalt soils.

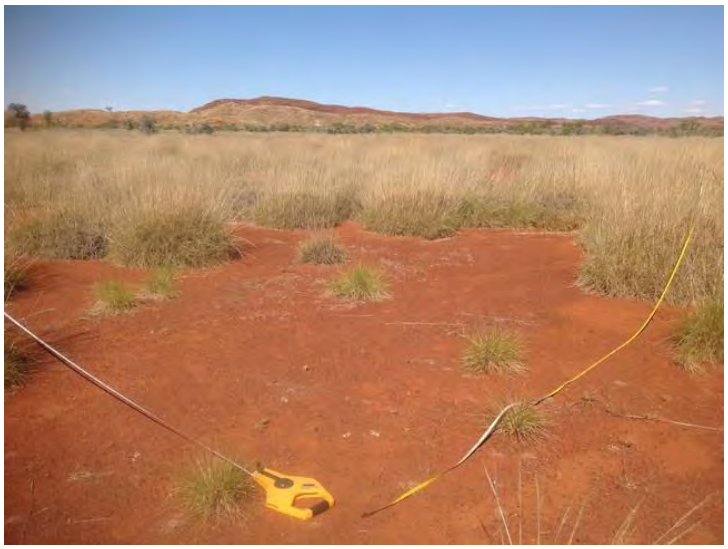


Plate 32: Vegetation type AiTw(1); quadrat R14155

Vegetation type code: **AiTw(2)**
Vegetation type description: *Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia* and *Hakea lorea* subsp. *lorea* tall sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia brizoides* mid-low hummock grassland
Other common or characteristic species: *Acacia acradenia, Boerhavia coccinea, Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Corymbia hamersleyana, Cullen leucochaites, Grevillea pyramidalis* subsp. *leucadendron, Indigofera monophylla, Ptilotus astrolasius, Tephrosia* sp. Fortescue (A.A. Mitchell 606), *Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)
Quadrats/relevès: R14051, R14052, R14072, R14077, R14078, R14083, R14131 (**Plate 33** and **Plate 34**)
Extent: 6 158.36 ha **Proportion of study area**: 10.79%
Vegetation Condition: Excellent **Disturbance**: None or minimal
Associated landform/s: Slopes and crests
Land system/s: Mostly Rocklea; also Black, Boolaloo, Boolgeeda, Capricorn, Granitic, Macroy, River, Wona
Priority Flora: *Pentalepis trichodesmoides* subsp. *trichodesmoides* (P2)
Floristics notes: Except for one quadrat (R14077), all quadrats formed a discrete group in the floristic dendrogram in supergroup 5. Vegetation type **AiTw(2)** is most floristically similar to vegetation type **AiTw(3)** that also occurred in the Chichester Range, except further to the south and on a different substrate.
Other notes: Basalt soils or Black and Rocklea land systems in the Chichester Range.

Plate 33: Vegetation type AiTw(2); quadrat R14051

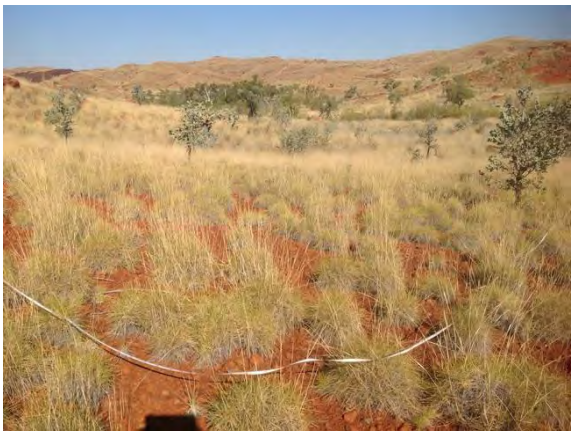


Plate 34: Vegetation type AiTw(2); quadrat R14078

Vegetation type code: **AiTw(3)**
Vegetation type description: *Acacia inaequilatera, Grevillea pyramidalis* subsp. *leucadendron* and *Acacia* sp. tall sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia* aff. *melvillei* hummock grassland with *Corymbia hamersleyana* low scattered trees
Other common or characteristic species: *Acacia trudgeniana, Eriachne pulchella subsp. dominii, Fimbristylis dichotoma, Goodenia stobbsiana, Grevillea wickhamii, Indigofera monophylla, Mollugo molluginea, Senna glutinosa* subsp. *glutinosa, Solanum phlomoides, Swainsona stenodonta*
Quadrats/relevès: R14084, R14087, R14090, R14091 (**Plate 35**)
Extent: 1 428.60ha **Proportion of study area**: 2.50%
Vegetation Condition: Excellent **Disturbance**: No disturbance noted
Associated landform/s: Slopes and crests of undulating hills
Land system/s: Mostly Granitic; also Capricorn, Rocklea
Priority Flora: None
Floristics notes: This vegetation type forms a discrete group in the floristics dendrogram in supergroup 5; see also notes for vegetation type **AiTw(2)**.
Other notes: Occurs on granite-derived soils in the Chichester Range.

Plate 35: Vegetation type AiTw(3); quadrat R14090

Vegetation type code: **AmEe**
Vegetation type description: *Acacia melleodora* tall open shrubland over *Eragrostis eriopoda* and *Aristida holathera* var. *holathera* mid open tussock grassland
Other common or characteristic species: *Bonamia erecta, Dodonaea coriacea, Paraneurachne muelleri, Ptilotus astrolasius, Ptilotus polystachyus, Senna artemisioides* subsp. *oligophylla x helmsii, Sida* sp. Rabbit Flat (B.J. Carter 626), *Triodia epactia, Triodia lanigera, Triumfetta ramosa*
Quadrats/relevès: R14063
Extent: 273.36 ha **Proportion of study area**: 0.48%
Vegetation Condition: Excellent **Disturbance**: No disturbance noted
Associated landform/s: Upper slope and crest of large Aeolian sand dune
Land system/s: Mostly Gregory; also Ruth
Priority Flora: None
Floristics notes: Floristically, quadrat R14063 (in supergroup 6 in the dendrogram) is most similar to vegetation type **As_3**. Both occur on the same land system (Gregory), however they are considered separate vegetation types due to the different dominant species.
Other notes: Aeolian sand in the Roebourne IBRA subregion.

(no image)

Vegetation type code: **AoTe**
Vegetation type description: *Acacia orthocarpa* and *Acacia pyrifolia* var. *pyrifolia* tall open shrubland over *Triodia epactia, Indigofera monophylla* and *Triodia wiseana* mid hummock grassland/shrubland
Other common or characteristic species: *Acacia ancistrocarpa, Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Corchorus laniflorus, Grevillea wickhamii* subsp. *hispidula, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *pruinosa, Sida arenicola, Tribulus suberosus*
Quadrats/relevès: R14060 (**Plate 36**)
Extent: 273.36 ha **Proportion of study area**: 0.48%
Vegetation Condition: Excellent **Disturbance**: Minimal
Associated landform/s: Slopes and crests of hills
Land system/s: Mostly Ruth; also Boolgeeda, Capricorn, Gregory, Mallina, Uaroo
Priority Flora: None
Floristics notes: The quadrat that comprises this vegetation type occurs within a larger floristic group that includes vegetation types **Aa_3Te**, **Aa_4As_3** and **ChAbTw**, in supergroup 4. It is considered as a separate vegetation type as a result of the differing dominant species.
Other notes: Occurs on hills within the Roebourne IBRA subregion.

Plate 36: Vegetation type AoTe; quadrat R14060

Vegetation type code: **ApTe**

Vegetation type description: *Acacia pyrifolia* var. *pyrifolia, Acacia trachycarpa* and *Petalostylis labicheoides* tall-mid open shrubland over *Triodia epactia, *Cenchrus ciliaris* and **Aerva javanica* mid-low tussock grassland/hummock grassland/shrubland

Other common or characteristic species: *Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Corchorus tectus, Corymbia hamersleyana, Cullen leucanthum, Gossypium australe, Grevillea pyramidalis* subsp. *leucadendron, Grevillea wickhamii* subsp. *hispidula, Indigofera monophylla, Triodia wiseana, Triumfetta clementii*

Quadrats/relevès: R14056, R14058, R14080, R14111 (**Plate 37** and **Plate 38**)

Extent: 1 101.31 ha **Proportion of study area**: 1.93%

Vegetation Condition: Excellent – Poor **Disturbance**: Cattle grazing

Associated landform/s: Valley floor, lower slopes (Rocklea land system), floodplains

Land system/s: Black, Boolgeeda, Granitic, Macroy, River, Rocklea, Ruth, Satirist, Uaroo, Urandy

Priority Flora: None

Floristics notes: Except for quadrat R14074 that is in supergroup 5 (and is the only quadrat not associated with alluvial soil), all of the defining quadrats for this vegetation type occur as a discrete floristic group in supergroup 8. Floristic supergroup 8 is associated with drainage lines (except those dominated by *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca* spp.) and floodplain areas.

Other notes: This vegetation type occurs on alluvial soil, but not always directly associated with the drainage lines. Most of this vegetation type occurs within the Chichester Range, with some in the Fortescue Valley. The vegetation condition is variable for this vegetation type, depending on grazing.

Plate 37: Vegetation type ApTe; quadrat R14080

Plate 38: Vegetation type ApTe; quadrat R14111

Vegetation type code: **ApTw**
Vegetation type description: *Acacia pyrifolia* var. *pyrifolia, Acacia ancistrocarpa* and *Acacia inaequilatera* tall sparse shrubland over *Triodia wiseana* and *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Boerhavia coccinea, Boerhavia gardneri, Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Corchorus laniflorus, Corchorus tectus, Cymbopogon ambiguus, Euphorbia schultzii, Grevillea pyramidalis* subsp. *leucadendron, Grevillea wickhamii, Indigofera monophylla, Ptilotus calostachyus, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Triumfetta clementii*
Quadrats/relevès: R14014, R14016, R14025, R14027, R14028, R14031, R14041, R14074 (**Plate 39**)
Extent: 4 204.61 ha **Proportion of study area**: 7.37%
Vegetation Condition: Excellent **Disturbance**: No disturbance noted
Associated landform/s: Hill slopes, occasionally valleys
Land system/s: Mostly Ruth; also Black, Boolaloo, Boolgeeda, Capricorn, Gregory, Macroy, Mallina, River, Rocklea, Uaroo
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: This is an interpreted vegetation type; most of the quadrats occur within supergroup 4 of the floristics dendrogram that is associated with hills and valleys in the Roebourne IBRA subregion, and less frequently in the Chichester Range.
Other notes: Largely associated with the Ruth (land system) hills in the northern portion of the study area in the Roebourne IBRA subregion.

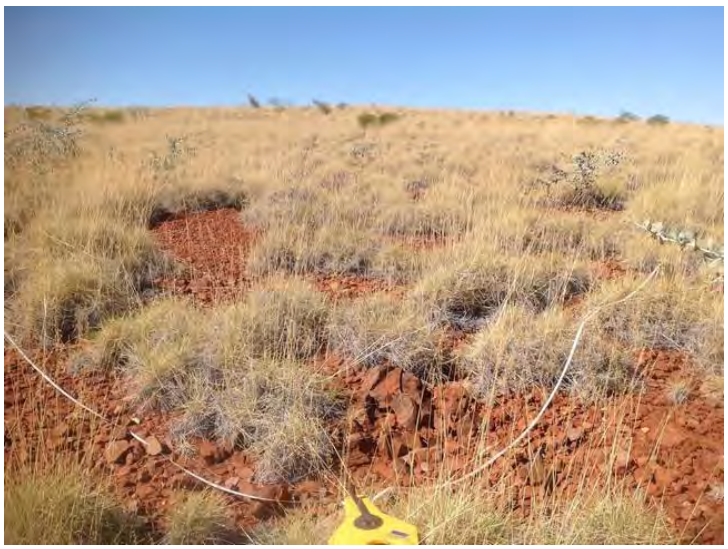


Plate 39: Vegetation type ApTw; quadrat R14028

Vegetation type code: **As_1Cf**
Vegetation type description: *Acacia sclerosperma* subsp. *sclerosperma* and *Carissa lanceolata* tall shrubland over *Chrysopogon fallax, Eragrostis xerophila* and **Cenchrus ciliaris* mid tussock grassland
Other common or characteristic species: *Acacia pyrifolia* var. *pyrifolia, Aristida contorta, Cleome viscosa, Corchorus walcottii, Dichanthium sericeum* subsp. *humilius, Eremophila longifolia, Goodenia forrestii, *Malvastrum americanum, Polymeria ambigua, Portulaca oleracea, Pterocaulon sphacelatum, Ptilotus obovatus, Rhynchosia minima, Scaevola spinescens, Senna artemisioides* subsp. *oligophylla, Sida fibulifera, Solanum lasiophyllum, Sporobolus australasicus, Tephrosia* sp.
Quadrats/relevès: R14001, R14002, R14003 (**Plate 40**)
Extent: 25.53ha **Proportion of study area**: 0.05%
Vegetation Condition: Very Good **Disturbance**: Cattle grazing
Associated landform/s: Plain (flat)
Land system/s: Horseflat
Priority Flora: None
Floristics notes: This vegetation type forms a discrete group within the floristics dendrogram, and is most closely associated with other vegetation types of the Horseflat land system.
Other notes: This vegetation type occurs at the far northern end of the rail corridor, on the Horseflat land system in the Roebourne IBRA subregion. Review of previous survey reports in this vicinity have not identified an equivalent shrubland (Astron Environmental Services 2005; Mattiske Consulting Pty Ltd 2006; 2008; 2013a).

Plate 40: Vegetation type As_1Cf; quadrat R14003

Vegetation type code: **As_3**
Vegetation type description: *Acacia stellaticeps* and *Triodia schinzii* low shrubland/mid hummock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia melleodora, Acacia tumida var. pilbarensis, Bonamia linearis, Dampiera candicans, Dodonaea coriacea, Eragrostis eriopoda, Gyrostemon tepperi, Hakea chordophylla, Indigofera monophylla, Paraneurachne muelleri, Ptilotus arthrolasius, Ptilotus polystachyus, Sida arenicola*
Quadrats/relevès: R14022 (**Plate 41**)
Extent: 122.33 ha **Proportion of study area**: 0.21%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Lower slope of dunes
Land system/s: Mostly Gregory; also Capricorn, Ruth
Priority Flora: None
Floristics notes: Floristically, quadrat R14022 (in supergroup 6 in the dendrogram) is most similar to vegetation type **AmEe**. Both occur on the same land system (Gregory), however they are considered separate vegetation types due to the different dominant species.
Other notes: This vegetation type occurs in the Roebourne IBRA subregion

Plate 41: Vegetation type As_3; quadrat R14022

Vegetation type code: **AxSb**
Vegetation type description: *Acacia xiphophylla* tall shrubland over *Streptoglossa bubakii, Stemodia kingii* and *Triodia wiseana* low open shrubland/hummock grassland
Other common or characteristic species: *Abutilon malvifolium, Boerhavia repleta, Crotalaria dissitiflora subsp. benthamiana, Hibiscus brachysiphonius, Neptunia dimorphantha, Ptilotus carinatus, Ptilotus gomphrenoides, Salsola australis, Senna hamersleyensis, Sida fibulifera, Sida spinosa, Sporobolus actinocladus*
Quadrats/relevès: R14098, R14100 (**Plate 42**)
Extent: 61.92 ha **Proportion of study area**: 0.11%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat elevated plain; cracking clay soil
Land system/s: Boolgeeda, Coolibah, McKay, Rocklea, Wona
Priority Flora: *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
Floristics notes: The two quadrats defining this vegetation type occurred as a discrete group in the floristics dendrogram, in supergroup 2 with other quadrats also occurring on the Wona land system, and with quadrats located on the Fortescue River floodplain, similarly on clay soil.
Other notes: This vegetation type occurs in the Chichester Range.

Plate 42: Vegetation type AxSb; quadrat R14098

Vegetation type code: **Cc_2AbBe**
Vegetation type description: *Corymbia candida* mid woodland over *Acacia bivenosa* and *Acacia elachantha* tall open shrubland over *Bothriochloa ewartiana, Themeda triandra* and *Chrysopogon fallax* low sparse tussock grassland
Other common or characteristic species: *Acacia dictyophleba, Acacia pyrifolia* var. *pyrifolia, Acacia trachycarpa* (dwarf variant), **Cenchrus ciliaris, Corchorus tridens, *Cynodon dactylon, Cyperus vaginatus, Eragrostis cumingii, Eragrostis dielsii, Eucalyptus xerothermica, Eulalia aurea, *Flaveria trinervia, Glycine canescens, Gossypium robinsonii, *Malvastrum americanum, Triodia epactia, *Vachellia farnesiana*
Quadrats/relevès: R14116 (**Plate 43**)
Extent: 17.69 ha **Proportion of study area**: 0.03%
Vegetation Condition: Good **Disturbance**: Cattle grazing, recent fire; weedy
Associated landform/s: Open depression; broad, shallow drainage
Land system/s: River, Boolgeeda
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: The quadrat defining this vegetation type occurs in a broad floristic group (in supergroup 8) in the floristics dendrogram. It is floristically most similar to vegetation type **Ac_1Te** that also occupies broad drainage areas.
Other notes: This vegetation type is located in the Hamersley IBRA subregion.

Plate 43: Vegetation type Cc_2AbBe; quadrat R14116

Vegetation type code: **Cc_2Eb**
Vegetation type description: *Corymbia candida* low open woodland over *Eriachne benthamii*, *Triodia epactia* and *Chrysopogon fallax* mid tussock grassland/hummock grassland with *Acacia inaequilatera* and *Acacia pyrifolia* var. *pyrifolia* tall scattered shrubs
Other common or characteristic species: *Acacia bivenosa, Acacia synchronicia, Carissa lanceolata, *Cenchrus ciliaris, Corymbia hamersleyana, Dichanthium sericeum* subsp. *humilius, Eragrostis xerophila, Goodenia forrestii, *Malvastrum americanum, Mimulus gracilis, Neptunia dimorphantha. Polymeria ambigua, Sida fibulifera, Triodia wiseana, *Vachellia farnesiana*
Quadrats/relevès: R14067 (**Plate 44**)
Extent: 12.76 ha **Proportion of study area**: 0.02%
Vegetation Condition: Good **Disturbance**: Heavily grazed (cattle)
Associated landform/s: Open depression (shallow drainage line); alluvial soil
Land system/s: Horseflat
Priority Flora: None
Floristics notes: The quadrat defining this vegetation type is grouped with other quadrats on the Horseflat land system, in supergroup 1.
Other notes: Similar to Mattiske Consulting (2006) vegetation type Dw6 that occurred nearby. It occurs near the northern end of the rail corridor, in the Roebourne IBRA subregion.

Plate 44: Vegetation type Cc_2Eb; quadrat R14067

Vegetation type code: **CdAa$_5$Te**
Vegetation type description: *Corymbia deserticola* subsp. *deserticola, Corymbia hamersleyana* and *Eucalyptus xerothermica* low open woodland over *Acacia atkinsiana* and *Grevillea wickhamii* tall open shrubland over *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia bivenosa, Acacia tenuissima, Acacia trachycarpa, Acacia trachycarpa* (dwarf variant)*, Acacia tumida* var. *pilbarensis, Aristida holathera* var. *holathera, Corchorus tectus, Dodonaea coriacea, Eulalia aurea, Indigofera monophylla, Keraudrenia nephrosperma, Ptilotus calostachyus, Scaevola parvifolia* subsp. *pilbarae, Senna glutinosa* subsp. *glutinosa*
Quadrats/relevès: R14076, R14113, R14132 (**Plate 45** and **Plate 46**)
Extent: 2 667.85 ha **Proportion of study area**: 4.68%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Valley flat
Land system/s: Mostly Boolgeeda, also Hooley, Jurrawarrina, McKay, Newman, Urandy
Priority Flora: None
Floristics notes: This vegetation type occurs within a broad floristic group largely consisting of vegetation type **ChAa$_5$Te** in supergroup 7.
Other notes: This vegetation type occurs on the Fortescue River floodplain.

Plate 45: Vegetation type CdAa$_5$Te; quadrat R14076

Plate 46: Vegetation type CdAa$_5$Te; quadrat R14132

Vegetation type code: **ChAa$_1$Ta**
Vegetation type description: *Corymbia hamersleyana* low open woodland over *Acacia acradenia, Acacia ancistrocarpa* and *Acacia inaequilatera* tall sparse shrubland over *Triodia angusta* and *Triodia epactia* low hummock grassland
Other common or characteristic species: *Acacia bivenosa, Acacia colei* var. *colei, Cajanus cinereus, *Cenchrus ciliaris, Grevillea pyramidalis* subsp. *leucadendron, Ptilotus astrolasius, Scaevola amblyanthera* var. *centralis, Triodia wiseana*
Quadrats/relevès: R14065 (**Plate 47**)
Extent: 156.86 ha **Proportion of study area**: 0.27%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Open depression; outwash area on quartz soil
Land system/s: Mostly Ruth; also Boolgeeda, Calcrete, Macroy, Mallina, River
Priority Flora: None
Floristics notes: Floristically the quadrat that defines this vegetation type is not closely related to other quadrats in the dendrogram. It is broadly floristically similar to vegetation types **AiTw(1)** and **ChAbTw**.
Other notes: Occurs in the northern portion of the rail corridor in the Roebourne IBRA subregion.

Plate 47: Vegetation type ChAa$_1$Ta; quadrat R14065

Vegetation type code: **ChAa$_5$Te**

Vegetation type description: *Corymbia hamersleyana, Eucalyptus gamophylla* and *Eucalyptus xerothermica* low open woodland over *Acacia atkinsiana, Grevillea wickhamii* and *Acacia ancistrocarpa* mid open-sparse shrubland over *Triodia epactia* and *Eulalia aurea* mid-low hummock grassland/tussock grassland

Other common or characteristic species: *Acacia adoxa* var. *adoxa, Acacia bivenosa, Acacia dictyophleba, Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia, Acacia trachycarpa* (dwarf variant)*, Acacia tumida* var. *pilbarensis, Bonamia erecta, Corchorus tectus, Gossypium australe, Hakea lorea* subsp. *lorea, Indigofera monophylla, Isotropis atropurpurea, Santalum lanceolatum*

Quadrats/relevès: R14133, R14136, R14137 (**Plate 48** and **Plate 49**)

Extent: 1 828.65 ha **Proportion of study area**: 3.21%

Vegetation Condition: Excellent **Disturbance**: Cattle grazing, recent fire

Associated landform/s: Flat valley floors and outwash areas

Land system/s: Mostly Boolgeeda, also Jurrawarrina, McKay, Newman, River, Urandy

Priority Flora: *Goodenia nuda* (P4)

Floristics notes: The quadrats defining this vegetation type fall within floristic supergroup 7 of the dendrogram, with other quadrats in vegetation types **CdAa$_5$Te**, **ChAeTt** and **ChAtTe**.

Other notes: Valley floors characterised by *Acacia atkinsiana* in the mid stratum. This vegetation type occurs towards the southern end of the rail corridor in the Fortescue and Hamersley IBRA subregions.

Plate 48: Vegetation type ChAa$_5$Te; quadrat R14133

Plate 49: Vegetation type ChAa$_5$Te; quadrat R14137

Vegetation type code: **ChAbTw**
Vegetation type description: *Corymbia hamersleyana* and *Grevillea pyramidalis* subsp. *leucadendron* low open woodland or scattered trees over *Acacia bivenosa* and *Acacia arida* tall-mid sparse shrubland over *Triodia wiseana, Triodia epactia* and *Triodia angusta* mid open tussock grassland
Other common or characteristic species: *Acacia pyrifolia* var. *pyrifolia, Boerhavia coccinea, Bonamia erecta, Cassytha capillaris, Corchorus tectus, Enneapogon caerulescens, Gossypium australe, Pluchea ferdinandi-muelleri, Ptilotus astrolasius, Ptilotus calostachyus, Rhynchosia minima, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356
Quadrats/relevès: R14011, R14039, R14040 (**Plate 50**)
Extent: 214.20 ha **Proportion of study area**: 0.38%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing, sometimes none noted
Associated landform/s: Plain (flat)
Land system/s: Mostly Calcrete; also Macroy, Ruth, Uaroo
Priority Flora: *Heliotropium muticum* (P1)
Floristics notes: The quadrats defining this vegetation type form a discrete floristic group within the dendrogram, in supergroup 4.
Other notes: Located in the northern portion of the rail corridor, in scattered locations. In the Roebourne IBRA subregion.

Plate 50: Vegetation type ChAbTw; quadrat R14011

Vegetation type code: **ChAeTt**
Vegetation type description: *Corymbia hamersleyana* and *Eucalyptus xerothermica* low open woodland over *Acacia elachantha* and *Maytenus* sp. Mt Windell (S. van Leeuwen 846) mid sparse shrubland over *Themeda triandra, Eulalia aurea* and *Chrysopogon fallax* mid tussock grassland
Other common or characteristic species: *Aristida holathera* var. *holathera, Aristida inaequiglumis, Bonamia erecta, Bothriochloa ewartiana, Corchorus tectus, Eragrostis eriopoda, Eremophila longifolia, Gossypium australe, *Malvastrum americanum, Paraneurachne muelleri, Pterocaulon sphacelatum, Ptilotus astrolasius, Triodia epactia*
Quadrats/relevès: R14121 (**Plate 51**)
Extent: 111.20 ha **Proportion of study area**: 0.19 %
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Drainage line
Land system/s: Mostly Boolgeeda; also Newman, River
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: Occurs within a floristic group associated with minor drainage lines (vegetation types **ChAa$_5$Te** and **ChAtTe**), in supergroup 8. It has been interpreted as a separate vegetation type due to its differing mid and ground stratum species.
Other notes: Grassy drainage line in Hamersley IBRA subregion.

Plate 51: Vegetation type ChAeTt; quadrat R14121

Vegetation type code: **ChAiCf**
Vegetation type description: *Corymbia hamersleyana* low open woodland over *Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia* and *Eremophila longifolia* tall open shrubland over *Chrysopogon fallax, Triodia epactia* and *Themeda triandra* mid tussock grassland/hummock grassland
Other common or characteristic species: *Acacia dictyophleba, Acacia elachantha, Acacia trachycarpa* (dwarf variant), *Aristida latifolia, *Cenchrus ciliaris, Corchorus tectus, Cymbopogon ambiguus, Digitaria brownii, Enneapogon lindleyanus, Enneapogon polyphyllus, Eragrostis eriopoda, Eulalia aurea, Goodenia forrestii, Gossypium australe, Grevillea pyramidalis* subsp. *leucadendron, Hakea lorea* subsp. *lorea, Indigofera monophylla, *Malvastrum americanum, Paraneurachne muelleri, Ptilotus astrolasius, Ptilotus obovatus, Sida echinocarpa, Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90), *Sida* sp. verrucose glands (F.H. Mollemans 2423)
Quadrats/relevès: R14123 (**Plate 52**)
Extent: 83.10 ha **Proportion of study area**: 0.15%
Vegetation Condition: Excellent **Disturbance**: None noted
Associated landform/s: Valley floor
Land system/s: Boolgeeda; rarely Newman
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: Occurs within a floristic group associated with minor drainage lines and valley floors, in supergroup 8. It has been interpreted as a separate vegetation type due to its differing mid and ground stratum species.
Other notes: Close to drainage line in Hamersley IBRA subregion.

Plate 52: Vegetation type ChAiCf; quadrat R14123

Vegetation type code: **$ChAt_2Te$**

Vegetation type description: *Corymbia hamersleyana* low open woodland over *Acacia tumida* var. *pilbarensis* and *Acacia pyrifolia* var. *pyrifolia* tall-mid sparse shrubland over *Triodia epactia*, *Themeda triandra* and *Paraneurachne muelleri* mid hummock grassland/tussock grassland

Other common or characteristic species: *Acacia dictyophleba, Acacia inaequilatera, Aristida holathera* var. *holathera, Bonamia erecta, *Cenchrus ciliaris, Chrysopogon fallax, Corchorus tectus, Cymbopogon procerus, Digitaria brownii, Eremophila longifolia, Eriachne tenuiculmis, Eucalyptus xerothermica, Eulalia aurea, Goodenia forrestii, Goodenia microptera, Goodenia nuda, Gossypium australe, Heliotropium cunninghamii, Indigofera monophylla, Mollugo molluginea, Ptilotus astrolasius, Rhynchosia minima, Senna glutinosa* subsp. *glutinosa, Sid*a sp. spiciform panicles (E. Leyland s.n. 14/8/90), *Sida* sp. verrucose glands (F.H. Mollemans 2423), *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186)

Quadrats/relevès: R14123, R14126, R14143, R14148, R14149, R14152, R14157 (**Plate 53** and **Plate 54**)

Extent: 570.52 ha **Proportion of study area**: 1.00%

Vegetation Condition: Excellent – Very Good **Disturbance**: Cattle grazing

Associated landform/s: Valley floor, open drainage depression, minor creekline, outwash

Land system/s: Mostly Boolgeeda; also McKay, Newman, River, Rocklea, Wona

Priority Flora: *Goodenia nuda* (P4), *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) (P3)

Floristics notes: The quadrats that define this vegetation type are, with two exceptions, all within a small floristic group, with quadrats associated with vegetation type **$ChAa_5Te$** and **ChAeTt**, in supergroup 8.

Other notes: This vegetation type occurs in the southern part of the rail corridor in the valleys of the Hamersley Range.

Plate 53: Vegetation type $ChAt_2Te$; quadrat R14126

Plate 54: Vegetation type $ChAt_2Te$; quadrat R14149

Vegetation type code: **EgAa$_5$Te**

Vegetation type description: *Eucalyptus gamophylla and Corymbia hamersleyana* low open mallee shrubland/woodland over *Acacia atkinsiana, Acacia inaequilatera* and *Acacia trachycarpa* (dwarf variant) tall-mid open-sparse shrubland over *Triodia epactia, Paraneurachne muelleri* and *Triodia wiseana* mid-low hummock grassland/tussock grassland

Other common or characteristic species: *Acacia adoxa* var. *adoxa, Acacia dictyophleba, Acacia elachantha, Acacia pyrifolia* var. *pyrifolia, Amphipogon sericeus, Bonamia erecta, Chrysopogon fallax, Corchorus tectus, Corymbia deserticola* subsp. *deserticola, Cymbopogon ambiguus, Eragrostis eriopoda, Eremophila longifolia, Eucalyptus leucophloia* subsp. *leucophloia, Eulalia aurea, Goodenia microptera, Gossypium australe, Grevillea wickhamii, Hakea lorea* subsp. *lorea, Indigofera monophylla, Ptilotus astrolasius, Senna artemisioides* subsp. *oligophylla x helmsii, Senna glutinosa* subsp. *glutinosa, Themeda triandra*

Quadrats/relevès: R14122, R14124, R14125, R14128, R14139 (**Plate 55** and **Plate 56**)

Extent: 2 663.71 ha **Proportion of study area**: 4.67%

Vegetation Condition: Excellent **Disturbance**: Cattle grazing

Associated landform/s: Flat valley floors

Land system/s: Mostly Boolgeeda; also Newman, River

Priority Flora: *Goodenia nuda* (P4), *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)

Floristics notes: This vegetation type has been interpreted based on dominant species. Representative quadrats are located in supergroups 7 and 8 in the floristics dendrogram.

Other notes: Valley floors characterised by *Eucalyptus gamophylla* in the upper or mid stratum and *Acacia atkinsiana* in the mid stratum. This vegetation type occurs towards the southern end of the rail corridor in the Hamersley IBRA subregion.

Plate 55: Vegetation type EgAa$_5$Te; quadrat R14125

Plate 56: Vegetation type EgAa$_5$Te; quadrat R14128

Vegetation type code: **ElAa$_3$Tm**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia deserticola* subsp. *deserticola* low open woodland over *Acacia ancistrocarpa* mid sparse shrubland over *Triodia* aff. *melvillei* and *Amphipogon sericeus* mid-low hummock grassland/tussock grassland
Other common or characteristic species: *Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Goodenia stobbsiana, Grevillea wickhamii* subsp. *hispidula, Hakea chordophylla, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *glutinosa, Themeda triandra, Triodia epactia, Triodia wiseana*
Quadrats/relevès: R14127, R14151 (**Plate 57** and **Plate 58**)
Extent: 262.36 ha **Proportion of study area**: 0.46%
Vegetation Condition: Excellent **Disturbance**: None noted
Associated landform/s: Crest of low hills
Land system/s: Boolgeeda, Newman
Priority Flora: None
Floristics notes: This vegetation type has been interpreted as such due to its characteristic ground stratum species.
Other notes: Ecoscape has undertaken a number of flora and vegetation surveys in the Hamersley Range and has observed this vegetation type (or similar) during a number of these (Ecoscape 2010a; 2011a; 2012b; 2014b). Ecoscape considers this vegetation type (characterised by *Triodia* aff. *melvillei*) to be locally uncommon and confined to the central Hamersley Range on minor rises within valleys.

Plate 57: Vegetation type ElAa$_3$Tm; quadrat R14127

Plate 58: Vegetation type ElAa$_3$Tm; quadrat R14151

Vegetation type code: **ElAs$_2$Te**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland or scattered trees over *Acacia* sp., *Acacia inaequilatera* and *Acacia tumida* subsp. *pilbarensis* tall sparse shrubland over *Triodia epactia* low hummock grassland
Other common or characteristic species: *Dampiera candicans, Eriachne mucronata, Goodenia stobbsiana, Grevillea wickhamii, Senna glutinosa* subsp. *glutinosa, Senna glutinosa* subsp. *pruinosa*
Quadrats/relevès: R14088, R14092, R14095 (**Plate 59**)
Extent: 125.06 ha **Proportion of study area**: 0.22%
Vegetation Condition: Excellent **Disturbance**: None
Associated landform/s: Upper slope and crests
Land system/s: Capricorn
Priority Flora: None
Floristics notes: This vegetation type has been interpreted as such from the quadrat's common characteristic species and geographical and landform similarities.
Other notes: Located in the Chichester Range.

Plate 59: Vegetation type ElAs$_2$Te; quadrat R14095

Vegetation type code: **ElEgTw**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Eucalyptus gamophylla, Acacia pyrifolia* var. *pyrifolia* and *Acacia maitlandii* low open mallee shrubland/tall open shrubland over *Triodia wiseana* and *Waltheria virgata* low hummock grassland/shrubland
Other common or characteristic species: *Acacia pruinocarpa, Corchorus lasiocarpus* subsp. *parvus, Corymbia hamersleyana, Cymbopogon ambiguus, Dampiera candicans, Dodonaea coriacea, Dodonaea lanceolata* var. *lanceolata, Eriachne mucronata, Hakea chordophylla, Ptilotus astrolasius, Senna glutinosa* subsp. *glutinosa*
Quadrats/relevès: R14150 (**Plate 60**)
Extent: 11.11 ha **Proportion of study area**: 0.02%
Vegetation Condition: Excellent **Disturbance**: No disturbance
Associated landform/s: Crest
Land system/s: Newman
Priority Flora: None
Floristics notes: This quadrat defining this vegetation type occurs in a broad floristic group with other quadrats of the hills and slopes of the Hamersley Range.
Other notes: This vegetation type occurs on the highest hills included in the rail corridor study area. The characteristic mid stratum species *Eucalyptus gamophylla* is generally associated with valley floors, but also occurs on high hills (but not slopes) of the Hamersley Range.

Plate 60: Vegetation type ElEgTw; relevè R14150

Vegetation type code: **ElTe**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* mid open woodland to scattered trees over *Triodia epactia, Triodia brizoides* and *Triodia wiseana* hummock grassland
Other common or characteristic species:
Acacia atkinsiana, Acacia bivenosa, Acacia sp., *Acacia tenuissima, Amphipogon sericeus, Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Dodonaea coriacea, Eriachne mucronata, Eriachne pulchella* subsp. *dominii, Goodenia stobbsiana, Grevillea wickhamii, Indigofera monophylla, Mollugo molluginea, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *glutinosa, Senna symonii, Trianthema glossostigmum*
Quadrats/relevès: R14101, R14102 (**Plate 61**)
Extent: 612.24 ha **Proportion of study area**: 1.07%
Vegetation Condition: Excellent **Disturbance**: None noted
Associated landform/s: Slopes and crests of undulating hills
Land system/s: McKay
Priority Flora: None
Floristics notes: This vegetation type is included in a broad floristic group that includes other vegetation types from the hills of the Hamersley Range, and is considered a separate vegetation type due to different dominant and its physical location in the Chichester Range.
Other notes: This vegetation type occurs in theChichester Range.

Plate 61: Vegetation type ElAs$_2$Te(1); quadrat R14101

Vegetation type code: **ElTw(1)**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland over *Triodia wiseana* and *Eriachne mucronata* mid-low hummock grassland/tussock grassland with *Grevillea wickhamii* and *Hakea chordophylla* tall-mid scattered shrubs
Other common or characteristic species: *Acacia acradenia, Acacia dictyophleba, Acacia maitlandii, Acacia pruinocarpa, Acacia pyrifolia* var. *pyrifolia, Aristida holathera* var. *holathera, Dampiera candicans, Goodenia cusackiana, Mirbelia viminalis, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *glutinosa, Sida* sp. Pilbara (A.A. Mitchell PRP 1543), *Waltheria virgata*
Quadrats/relevès: R14114, R14118, R14119, R14120, R14153 (**Plate 62**)
Extent: 2 766.68 ha **Proportion of study area**: 4.85%
Vegetation Condition: Excellent **Disturbance**: No disturbance
Associated landform/s: Hill slopes and crests
Land system/s: Mostly Newman; also Boolgeeda, River
Priority Flora: *Indigofera* sp. Bungaroo Creek (S. van Leeuwen 4301) (P3), *Rhynchosia bungarensis* (P4), *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3)
Floristics notes: This quadrat defining this vegetation type occurs in a broad floristic group with other quadrats of the hills and slopes of the Hamersley Range.
Other notes: This vegetation type occurs on the hill slopes and crests of the Hamersley Range. Frequently the upper stratum is very sparse, consisting of scattered trees. Ecoscape considers this vegetation type to be common on the hills of the Hamersley Range (Ecoscape 2010a; 2011a; 2012b; 2014b).

Plate 62: Vegetation type ElTw(1); quadrat R14153

Vegetation type code: **ElTw(2)**
Vegetation type description: *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low open woodland over *Triodia wiseana* and *Triodia epactia* mid-low hummock grassland
Other common or characteristic species: *Acacia adoxa* var. *adoxa, Acacia ancistrocarpa, Acacia dictyophleba, Acacia inaequilatera, Acacia maitlandii, Acacia tenuissima, Amphipogon sericeus, Hakea chordophylla, Paraneurachne muelleri, Ptilotus astrolasius, Ptilotus calostachyus, Senna glutinosa* subsp. *glutinosa, Senna symonii*
Quadrats/relevès: R14093, R14144, R14146 (**Plate 63**)
Extent: 948.73 ha **Proportion of study area**: 1.66%
Vegetation Condition: Excellent **Disturbance**: Minor cattle grazing or no disturbance
Associated landform/s: Footslopes and valley floor
Land system/s: Boolgeeda, Newman, rarely River
Priority Flora: None
Floristics notes: This quadrat defining this vegetation type occurs in a broad floristic group with other quadrats of the hills and slopes of the Hamersley Range.
Other notes: This vegetation type occurs on the footslopes and valley edges of the Hamersley Range. Frequently the upper stratum is very sparse, consisting of scattered trees.

Plate 63: Vegetation type ElTw(2); quadrat R14093

Vegetation type code: **$EvApCc_1$**
Vegetation type description: *Eucalyptus victrix, Corymbia hamersleyana* and *Acacia coriacea* subsp. *pendens* mid-low open woodland over *Acacia pyrifolia* var. *pyrifolia* tall sparse shrubland over **Cenchrus ciliaris, Triodia angusta* and *Triodia epactia* low tussock grassland/hummock grassland
Other common or characteristic species: *Acacia trachycarpa, Cullen leucanthum, Cyperus vaginatus, Euphorbia coghlanii, Goodenia forrestii, Hibiscus austrinus var. austrinus, *Melochia pyramidata, Senna artemisioides* subsp. *oligophylla, *Vachellia farnesiana*
Quadrats/relevès: R14045 (**Plate 64**)
Extent: 448.15 ha **Proportion of study area**: 0.79%
Vegetation Condition: Poor **Disturbance**: Heavily grazed (cattle)
Associated landform/s: Alluvial floodplain, at times with deeply incised braided channels
Land system/s: Mostly River; also Boolaloo, Boolgeeda, Calcrete, Macroy, Rocklea, Ruth, Sherlock, Uaroo
Priority Flora: None
Floristics notes: This vegetation type occurs within a floristic group that includes other wide, rocky drainage line vegetation types (supergroup 9 that includes the larger drainage lines in the study area).
Other notes: This vegetation type occurs on a broad floodplain dissected by a number of narrow, deeply incised creeks (convoluted channels of the Sherlock River). Occurs in the Roebourne IBRA subregion close to the Chichester Range.

Plate 64: Vegetation type $EvApCc_1$; quadrat R14045

Vegetation type code: **EvApTe**
Vegetation type description: *Eucalyptus victrix* and *Corymbia hamersleyana* mid open woodland-scattered trees over *Acacia pyrifolia* var. *pyrifolia* and *Acacia tumida* var. *pilbarensis* tall shrubland-scattered shrubs over *Triodia epactia, Tephrosia rosea* var. Fortescue creeks (M.I.H Brooker 2186) and **Cenchrus ciliaris* mid-low open hummock grassland/shrubland/tussock grassland
Other common or characteristic species: *Acacia citrinoviridis*, *Acacia trachycarpa, Atalaya hemiglauca, Boerhavia coccinea, Cleome viscosa, Corchorus crozophorifolius, Corchorus lasiocarpus* subsp. *parvus, Cymbopogon procerus, Eriachne tenuiculmis, Eucalyptus camaldulensis* subsp. *refulgens, Eulalia aurea, Euphorbia australis* var. *subtomentosa, Goodenia forrestii, Grevillea wickhamii, Heliotropium cunninghamii, Hybanthus aurantiacus, Indigofera monophylla, Melaleuca glomerata, Phyllanthus maderaspatensis, Stemodia grossa, Waltheria indica*
Quadrats/relevès: R14081, R14082, R14109, R14112, R14117 (**Plate 65** and **Plate 66**)
Extent: 541.99 ha **Proportion of study area**: 0.95%
Vegetation Condition: Excellent – Good **Disturbance**: Cattle grazing
Associated landform/s: Drainage line (creek, river), outwash plain
Land system/s: Mostly River; also Boolaloo, Boolgeeda, Granitic, Macroy, Newman, Rocklea, Urandy
Priority Flora: *Goodenia nuda* (P4)
Floristics notes: This vegetation type has been interpreted based on common characteristic species and land form, although all definitive quadrats are within the same broad floristic group within supergroup 8.
Other notes: Broad drainage lines within the Chichester, Fortescue and Hamersley IBRA subregions.

Plate 65: Vegetation type EvApTe; quadrat R14081

Plate 66: Vegetation type EvApTe; quadrat R14109

Vegetation type code: **$EvAt_1Te$**
Vegetation type description: *Eucalyptus victrix* mid woodland-open woodland over *Acacia trachycarpa, Acacia ampliceps* and *Acacia pyrifolia* var. *pyrifolia* tall shrubland-sparse shrubland over *Triodia epactia* and **Cenchrus ciliaris* mid open hummock grassland/tussock grassland
Other common or characteristic species: *Acacia bivenosa, Acacia colei* var. *colei, Acacia stellaticeps, Bothriochloa ewartiana, Chrysopogon fallax*, *Corchorus incanus* subsp. *incanus, Corymbia hamersleyana, Crotalaria cunninghamii, Cullen leucanthum, Cynanchum floribundum, Cyperus vaginatus, Eragrostis cumingii, Fimbristylis microcarya, Hybanthus aurantiacus, Indigofera linifolia, *Malvastrum americanum, Melaleuca linophylla, Phyllanthus maderaspatensis, Pluchea rubelliflora, Polymeria ambigua, Stemodia grossa, Triodia angusta*
Quadrats/relevès: R14015, R14026, R14068 (**Plate 67**)
Extent: 396.58 ha **Proportion of study area**: 0.70%
Vegetation Condition: Good – Poor **Disturbance**: Cattle grazing
Associated landform/s: Sandy drainage lines
Land system/s: Boolaloo, Boolgeeda, Calcrete, Horseflat, Mallina, River, Ruth, Satirist, Uaroo
Priority Flora: None
Floristics notes: This vegetation type occurs within a floristic group that includes other sandy drainage line vegetation types (supergroup 9 that includes the larger drainage lines in the study area).
Other notes: This vegetation type represents the sandy riparian areas in the northern portion of the rail corridor, in the Roebourne IBRA subregion. This vegetation type is heavily impacted by cattle that use the creeklines as trails.

Plate 67: Vegetation type $EvAt_1Te$; quadrat R14026

Vegetation type code: **EvCb**
Vegetation type description: *Eucalyptus victrix* low open woodland over *Cyperus bifax* and *Eriachne benthamii* low sedgeland/tussock grassland with **Vachellia farnesiana* tall scattered shrubs
Other common or characteristic species: *Alternanthera denticulata, Basilicum polystachyon, Cullen cinereum, Dichanthium sericeum* subsp. *humilius, Euphorbia drummondii, Neptunia dimorphantha, Panicum decompositum, Phyllanthus maderaspatensis, Ptilotus gomphrenoides, Rhagodia eremaea, Rostellularia adscendens* var. *clementii, Stemodia kingii*
Quadrats/relevès: R14107 (**Plate 68**)
Extent: 28.90 ha **Proportion of study area**: 0.05%
Vegetation Condition: Very Good **Disturbance**: Heavy grazing (cattle)
Associated landform/s: Outer banks of Fortescue River
Land system/s: Boolgeeda, Coolibah
Priority Flora: None
Floristics notes: Occurs in the same floristic group as **EvMgEb** from the channel of the Fortescue River.
Other notes: This vegetation type occurs in the Fortescue Valley.

Plate 68: Vegetation type EvCb; quadrat R14107

Vegetation type code: **EvMgEb**
Vegetation type description: *Eucalyptus victrix* and *Acacia citrinoviridis* mid woodland over *Melaleuca glomerata* and **Vachellia farnesiana* tall sparse shrubland over *Eriachne benthamii* and *Cyperus bifax* low open tussock grassland/sedgeland
Other common or characteristic species: *Basilicum polystachyon, Cullen cinereum, Eragrostis cumingii, Eragrostis tenellula, Phyllanthus maderaspatensis, Pimelea holroydii, Ptilotus gomphrenoides, Rostellularia adscendens* var. *clementii, Sida spinosa, Stemodia kingii*
Quadrats/relevès: R14108 (Plate 69)
Extent: 37.00 ha **Proportion of study area**: 0.06 %
Vegetation Condition: Very good **Disturbance**: Heavy cattle grazing
Associated landform/s: Fortescue River channel
Land system/s: Mostly Coolibah; also Jurrawarrina, Urandy
Priority Flora: *Helichrysum oligochaetum* (P1)
Floristics notes: Occurs in the same floristic group as the quadrat defining vegetation type **EvCb**, in supergroup 2.
Other notes: This vegetation type occurs in the Fortescue Valley.

Plate 69: Vegetation type EvMgEb; quadrat R14108

Vegetation type code: **EvMlCv**

Vegetation type description: *Eucalyptus victrix, Eucalyptus camaldulensis* subsp. *refulgens* and *Acacia coriacea* subsp. *pendens* mid-low woodland over *Melaleuca linophylla, Melaleuca glomerata* and *Acacia trachycarpa* tall open shrubland over *Cyperus vaginatus*, *Triodia epactia* and **Cenchrus ciliaris* mid open sedgeland/hummock grassland/tussock grassland

Other common or characteristic species: *Acacia pyrifolia* var. *pyrifolia, Atalaya hemiglauca, Cajanus cinereus, *Cenchrus setiger, Cleome viscosa, Crotalaria medicaginea* var. *neglecta, Cymbopogon procerus, *Cynodon dactylon, Eriachne tenuiculmis, Eulalia aurea, Flueggea virosa* subsp. *melanthesoides, Gossypium australe, Hybanthus aurantiacus, Ipomoea muelleri, Melaleuca argentea, Phyllanthus maderaspatensis, Pluchea rubelliflora, Rhynchosia minima, Sesbania cannabina, Stemodia grossa*

Quadrats/relevès: R14059, R14061, R14073, R14075, R14089, R14094, R14103 (**Plate 70** and **Plate 71**)

Extent: 632.39ha **Proportion of study area**: 1.10%

Vegetation Condition: Excellent – Good **Disturbance**: Cattle grazing

Associated landform/s: River; rocky or coarse sand, or braided channel, outwash area

Land system/s: Black, Boolgeeda, Capricorn, Granitic, Macroy, McKay, River, Rocklea, Ruth, Uaroo

Priority Flora: None

Floristics notes: All quadrats defining this vegetation type form within two groups in supergoup 9 in the floristics dendrogram.

Other notes: This vegetation type is associated with the major drainage line (Sherlock River for quadrat R14059 and Nunyerry Creek) through the Chichester Range.

Plate 70: Vegetation type EvMlCv; quadrat R14061

Plate 71: Vegetation type EvMlCv; quadrat R14089

Vegetation type code: **Ex_1**
Vegetation type description: *Eragrostis xerophila, Dichanthium sericeum* subsp. *humilius* and *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113) low tussock grassland/vineland
Other common or characteristic species: *Desmodium muelleri, Euphorbia coghlanii, Goodenia pascua, Phyllanthus maderaspatensis, Rhynchosia minima, Sida fibulifera, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Triodia epactia*
Quadrats/relevès: R14004, R14005, R14066, R14070 (**Plate 72**)
Extent: 1 091.38 ha **Proportion of study area**: 1.89%
Vegetation Condition: Very Good **Disturbance**: Cattle grazing
Associated landform/s: Clay plain
Land system/s: Horseflat, rarely Mallina
Priority Flora: None
Floristics notes: This vegetation type forms a discrete group within the floristics dendrogram, in supergroup 1. It is most similar to other vegetation types on the Horseflat land system.
Other notes: This vegetation type represents the P3 'Horseflat Land System of the Roebourne Plains' PEC, and occurs near the northern end of the rail corridor on the Roebourne IBRA subregion. This vegetation type is most likely an amalgam of a number of vegetation units recognised during previous surveys nearby, including CP2, CP3, CP5 (Astron Environmental Services 2005); CP2, CP3 and CP5 (Mattiske Consulting Pty Ltd 2006) and vegetation unit G8 (Mattiske Consulting Pty Ltd 2013a).
This vegetation type is heavily grazed.

Plate 72: Vegetation type Ex_1; quadrat R14066

Vegetation type code: **FbGpEm**

Vegetation type description: *Ficus brachypoda* low open woodland over *Grevillea pyramidalis* subsp. *leucadendron* and *Tephrosia rosea* var. *clementii* mid sparse shrubland over *Eriachne mucronata, Triodia wiseana* and *Triodia epactia* mid open tussock grassland/hummock grassland

Other common or characteristic species: *Abutilon lepidum, Capparis spinosa* var. *nummularia, Cenchrus ciliaris, Cymbopogon ambiguus, Cyperus cunninghamii* subsp. *cunninghamii, Ehretia saligna* var. *saligna, Enneapogon polyphyllus, Eriachne pulchella* subsp. *dominii, Gomphrena cunninghamii, Hybanthus aurantiacus, Polycarpaea longiflora, Solanum diversiflorum, Solanum lasiophyllum, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Tribulus suberosus*

Quadrats/relevès: R14R1 (**Plate 73** and **Plate 74**)

Extent: 2.48 ha **Proportion of study area**: 0.004%

Vegetation Condition: Very Good **Disturbance**: None noted although site is weedy

Associated landform/s: Quartz hill

Land system/s: Mallina

Priority Flora:

Floristics notes: This vegetation type has been interpreted as a discrete unit based on its dominant and characteristic species. It is floristically loosely associated with a number of vegetation types occurring on rocky hills, is supergroup 4.

Other notes: The relevè takes in the vegetation of the slopes and crest of a quartz hill. It is located near the northern end of the rail corridor in the Roebourne IBRA subregion.

Plate 73: Vegetation type FbGpEm; relevè R14R1

Plate 74: Vegetation type FbGpEm; relevè R14R1

Vegetation type code: **FPg1** (Mattiske Consulting Pty Ltd 2006)
Vegetation type description: *Triodia epactia, Eragrostis xerophila* and *Eriachne benthamii* mid-low hummock grassland with tall *Acacia inaequilatera* and *Carissa lanceolata* scattered clumps of shrubs
Other common or characteristic species:
Quadrats/relevès: See Mattiske (2006)
Extent: 82.69 ha **Proportion of study area**: 0.14%
Vegetation Condition: Very Good **Disturbance**: Cattle grazing
Associated landform/s: Clay plain
Land system/s: Horseflat, Mallina
Priority Flora: *Goodenia nuda* (P4)
Mattiske Consulting (2006) identified *Acacia glaucocaesia* (P3) as being characteristic of this vegetation type however this species was not recorded in this portion of the study area, nor recorded elsewhere along the rail corridor (although it was observed nearby)
Floristics notes: This vegetation type was not included in the floristic analysis.
Other notes: Located in the Roebourne IBRA subregion. This vegetation type is potentially included in a subtype of the P3 'Horseflat Land System of the Roebourne Plains' PEC. Ecoscape did not record any quadrats in this vegetation type as it considered Mattiske's description to be adequate.

(no image)

Vegetation type code: **HcTe**
Vegetation type description: *Hakea chordophylla* and *Grevillea pyramidalis* subsp. *leucadendron* tall sparse shrubland over *Triodia epactia* and **Cenchrus ciliaris* mid hummock grassland/tussock grassland
Other common or characteristic species: *Acacia trachycarpa, *Aerva javanica, Aristida holathera* var. *holathera, Cleome viscosa, Corchorus tectus, Cullen leucanthum, Cullen leucochaites, Eragrostis eriopoda, Indigofera colutea, Indigofera linnaei, Pluchea tetranthera*
Quadrats/relevès: R14044 (**Plate 75**)
Extent: 357.14 ha **Proportion of study area**: 0.62%
Vegetation Condition: Good **Disturbance**: Cattle grazing
Associated landform/s: Alluvial flat
Land system/s: River, rarely Ruth
Priority Flora: None
Floristics notes: This vegetation type is loosely associated with quadrats associated with vegetation type **ApTe** in floristics supergroup 8 that also occur on alluvial soil.
Other notes: Located in the Roebourne IBRA subregion.

Plate 75: Vegetation type HcTe; quadrat R14044

Vegetation type code: **MaMgCv**

Vegetation type description: *Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *refulgens* mid open forest-open woodland over *Melaleuca glomerata, Acacia ampliceps* and *Acacia coriacea* subsp. *pendens* tall sparse shrubland-scattered shrubs over *Cyperus vaginatus* and *Stemodia grossa* mid open sedgeland/forbland

Other common or characteristic species: *Acacia trachycarpa, Ammannia baccifera, Cajanus cinereus, *Cenchrus ciliaris, Eleocharis geniculata, Eriachne tenuiculmis, Eucalyptus victrix, Flueggea virosa* subsp. *melanthesoides, Grevillea pyramidalis* subsp. *leucadendron, Lobelia arnhemiaca, Melaleuca bracteata, Melaleuca linophylla, Myriophyllum verrucosum, Pluchea rubelliflora, Sesbania cannabina, Stylidium fluminense, Terminalia canescens, Typha domingensis*

Quadrats/relevès: R14079, R14085 (**Plate 76** and **Plate 77**)

Extent: 39.79 ha **Proportion of study area**: 0.07%

Vegetation Condition: Excellent **Disturbance**: Cattle grazing

Associated landform/s: Drainage line; creek; spring; braided channel

Land system/s: Granitic, River, Rocklea

Priority Flora: None

Floristics notes: Floristically this vegetation type is associated with other vegetation type of the arger drainage lines (**EvMlCv**) is floristic supergroup 9.

Other notes: *Melaleuca argentea* is the characteristic species of this vegetation type, and is at times of sufficient density to be considered as an open forest. Vegetation type **MaMgCv** occurs along Nunyerry Creek, in the Chichester Range, and is associated with or close to permanent or semi-permanent pools and springs.

Plate 76: Vegetation type MaMgCv; quadrat R14079

Plate 77: Vegetation type MaMgCv; quadrat R14085

Vegetation type code: **MaMlCi**
Vegetation type description: *Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *refulgens* low open woodland over *Melaleuca linophylla* tall open shrubland over *Cyperus ixiocarpus* mid sparse sedgeland
Other common or characteristic species: *Acacia ampliceps, Acacia pyrifolia* var. *pyrifolia, *Cenchrus ciliaris, Corchorus incanus* subsp. *incanus, Crotalaria cunninghamii, Cymbopogon procerus, Cynanchum floribundum, Eragrostis cumingii, Eragrostis speciosa, Eulalia aurea, Fimbristylis elegans, Goodenia lamprosperma, Indigofera linifolia, Ipomoea coptica, Phyllanthus maderaspatensis, Pluchea rubelliflora, Portulaca pilosa, Sesbania cannabina, Stemodia grossa, Striga curviflora, Triodia epactia, Vigna lanceolata* var. *lanceolata*
Quadrats/relevès: R14033 (**Plate 78**)
Extent: 271.08 ha **Proportion of study area**: 0.47%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: River
Land system/s: Mostly River; also Boolaloo, Calcrete, Uaroo
Priority Flora: None
Floristics notes: The quadrat defining this vegetation type occurs with vegetation type **Evt$_1$Te** that is also associated with wide sandy drainage lines, in floristics supergroup 9.
Other notes: This vegetation type is associated with the Sherlock River where it flows through an area of granite outcrops associated with the Boolaloo land system.

Plate 78: Vegetation type MaMlCi; quadrat R14033

Vegetation type code: **Sb**
Vegetation type description: *Streptoglossa bubakii, Sida fibulifera* and *Stemodia kingii* low open shrubland/herbland
Other common or characteristic species: *Aristida latifolia, Brachyachne convergens, Neptunia dimorphantha, Panicum laevinode, Phyllanthus maderaspatensis, Rhynchosia minima, Sida spinosa*
Quadrats/relevès: R14097, R14099 (**Plate 79**)
Extent: 31.81 ha **Proportion of study area**: 0.06%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat
Land system/s: Wona
Priority Flora: *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
Floristics notes: The quadrats defining this vegetation type occur in a small floristic group with other Wona land system vegetation type (**AxSb**), in supergroup 2.
Other notes: This vegetation type occurs largely on the Wona land system in the southern portion of the Chichester Range. Advice from the DPaW Species and Communities Branch and additional survey after the wet season will be required to determine if it meets the criteria for inclusion in the 'Four plant assemblages of the Wona Land System' PEC, P1 subtype 'Cracking clays of the Chichester and Mungaroona Range'.

Plate 79: Vegetation type Sb; quadrat R14099

Vegetation type code: **Ta**
Vegetation type description: *Triodia angusta* and *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Dichanthium sericeum* subsp. *humilius, Eragrostis xerophila, Euphorbia coghlanii, Goodenia pascua, Indigofera trita, Operculina aequisepala, Rhynchosia minima, Sida fibulifera, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113)
Quadrats/relevès: R14013 (**Plate 80**)
Extent: 231.73 ha **Proportion of study area**: 0.40%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat plain
Land system/s: Boolgeeda, Macroy, Mallina, River, Ruth
Priority Flora: None
Floristics notes: This vegetation type was interpreted as a discrete vegetation type due to its combination of dominant *Triodia* spp. It is most floristically similar to other vegetation types that occur on the Mallina land system, in particular vegetation type **Aa_3Te**, in supergroup 4.
Other notes: This vegetation type occurred to the south of a small range of hills, in the Roebourne IBRA subregion.

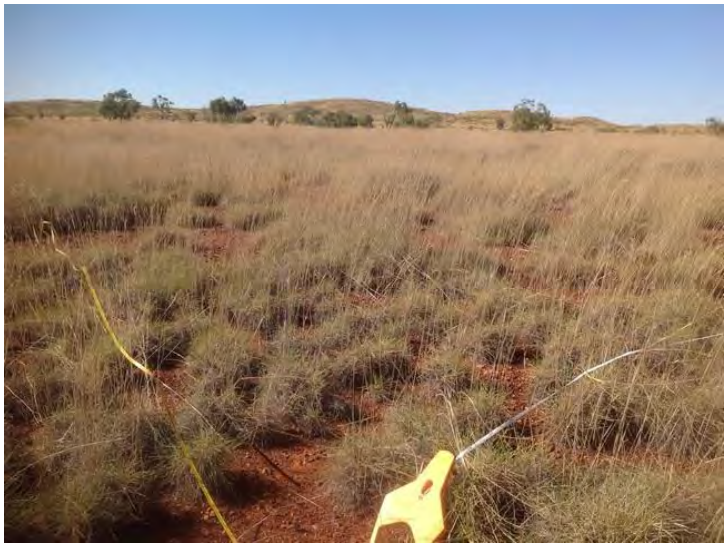


Plate 80: Vegetation type Ta; quadrat R14013

Vegetation type code: **Tb**
Vegetation type description: *Triodia brizoides* and *Triodia epactia* mid-low hummock grassland with *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low scattered trees
Other common or characteristic species: *Acacia adoxa* var. *adoxa, Acacia atkinsiana, Acacia* sp., *Acacia tenuissima, Fimbristylis dichotoma, Goodenia stobbsiana, Grevillea wickhamii, Indigofera monophylla, Ptilotus calostachyus*
Quadrats/relevès: R14106, R14142, R14156 (**Plate 81)**
Extent: 981.68 ha **Proportion of study area**: 1.72%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Slopes and crests of undulating hills
Land system/s: Boolgeeda, Coolibah, Jurrawarrina, McKay, Newman
Priority Flora: None
Floristics notes: This vegetation type is interpreted from field observations.
Other notes: Occurs in the Fortescue IBRA subregion.

Plate 81: Vegetation type Tb; quadrat R14142

Vegetation type code: **Te(1)**
Vegetation type description: *Triodia epactia* and *Triodia secunda* low hummock grassland
Other common or characteristic species: *Acacia stellaticeps, Bonamia erecta, Fimbristylis microcarya, Heliotropium muticum, Indigofera linifolia, Ipomoea coptica, Maireana* sp., *Neptunia dimorphantha, Portulaca oleracea, Ptilotus murrayi, Sclerolaena hostilis, Sclerolaena* sp., *Trianthema triquetra*
Quadrats/relevès: R14008 (**Plate 82**)
Extent: 32.05 ha **Proportion of study area**: 0.06%
Vegetation Condition: Very Good **Disturbance**: Cattle grazing
Associated landform/s: Alluvial plain
Land system/s: Horseflat; rarely Mallina
Priority Flora: *Heliotropium muticum* (P1)
Floristics notes: Floristically this vegetation type is associated with other vegetation types associated with clay soils, but not with other Horseflat land system vegetation types. It is placed in supergroup 3 in the floristics dendrogram, and is loosely associated with vegetation types **Te(3)** and **Te(4)**.
Other notes: This vegetation type occurs on an outwash plain between braided drainage lines, and may be considered to represent a subtype of the P3 'Horseflat Land System of the Roebourne Plains' PEC. It occurs near the northern end of the rail corridor, in the Roebourne IBRA subregion. It is in the same patch of vegetation, but outside of this study area, mapped as vegetation unit S6 (Mattiske Consulting Pty Ltd 2013a) however there are few species in common.

Plate 82: Vegetation type Te(1); quadrat R14008

Vegetation type code: **Te(2)**
Vegetation type description: *Triodia epactia* and *Triodia wiseana* low hummock grassland with *Corymbia hamersleyana* low scattered trees over *Acacia elachantha* tall scattered shrubs
Other common or characteristic species: *Acacia maitlandii, Acacia tenuissima, Acacia trachycarpa* (dwarf variant), *Corchorus tectus, Fimbristylis dichotoma, Goodenia microptera, Gossypium australe, Grevillea pyramidalis* subsp. *leucadendron, Hakea chordophylla, Hakea lorea* subsp. *lorea, Hibiscus coatesii, Indigofera monophylla, Pluchea dentex, Pluchea ferdinandi-muelleri, Swainsona formosa, Swainsona stenodonta, Triodia angusta*
Quadrats/relevès: R14140 (**Plate 83**)
Extent: 162.96 ha **Proportion of study area**: 0.28%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat
Land system/s: Mostly Rocklea; also McKay, Wona
Priority Flora: None
Floristics notes: This vegetation type has been interpreted as a discrete vegetation type based on the dominant (but scattered) mid stratum. It is most floristically similar to vegetation types **Aa_4As_3** and **AiTe(3)**, in supergroup 8.
Other notes: Occurs on basalt derived soils on the Fortescue River floodplain.

Plate 83: Vegetation type Te(2)e; quadrat R14140

Vegetation type code: **Te(3)**
Vegetation type description: *Triodia epactia, Sclerolaena hostilis* and *Triodia angusta* mid-low open hummock grassland/chenopod shrubland with occasional low *Acacia xiphophylla* scattered trees
Other common or characteristic species: *Abutilon lepidum, *Cenchrus ciliaris, Dactyloctenium radulans, Eragrostis dielsii, Gomphrena affinis* subsp. *pilbarensis, Ptilotus murrayi, Sclerolaena densiflora, Sclerolaena* sp., *Trianthema triquetrum, Xerochloa barbata*
Quadrats/relevès: R14046, R14047 (**Plate 84**)
Extent: 57.57 ha **Proportion of study area**: 0.10%
Vegetation Condition: Very Good – Good **Disturbance**: Cattle grazing
Associated landform/s: Flat plain
Land system/s: River, Sherlock
Priority Flora: None
Floristics notes: The quadrats defining this vegetation type occur as a discrete group within the floristics dendrogram, in supergroup 3.
Other notes: This vegetation type occurs in the Roebourne IBRA subregion, close to the Chichester Range.

Plate 84: Vegetation type Te(3); near quadrat R14046

Vegetation type code: **Te(4)**
Vegetation type description: *Triodia epactia, Triodia angusta* and *Triodia lanigera* mid hummock grassland with scattered low *Acacia xiphophylla* trees
Other common or characteristic species: *Bulbostylis barbata, *Cenchrus ciliaris, Dactyloctenium radulans, Eragrostis dielsii, Lepidium pholidogynum, Marsilea hirsuta, Pluchea rubelliflora, Pterocaulon sphacelatum, Ptilotus murrayi, Trianthema triquetrum*
Quadrats/relevès: R14053, R14055 (**Plate 85)**
Extent: 352.55 ha **Proportion of study area**: 0.61%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat alluvial plain
Land system/s: Mostly Satirist; also Boolgeeda, River, Rocklea, Ruth
Priority Flora: None
Floristics notes: The quadrats comprising this vegetation type form a discrete floristic group within the floristics dendrogram, in supergroup 3.
Other notes: This vegetation type occurs on an alluvial plain within the northern part of the Chichester Range.

Plate 85: Vegetation type Te(4); quadrat R14053

Vegetation type code: **Ts**
Vegetation type description: *Triodia secunda, Triodia wiseana* and *Triodia epactia* mid hummock grassland
Other common or characteristic species: *Acacia ancistrocarpa, Acacia bivenosa, Acacia inaequilatera, Acacia pyrifolia* var. *pyrifolia, Acacia stellaticeps, Cleome uncifera* subsp. *uncifera, Corchorus laniflorus Indigofera monophylla, Pluchea ferdinandi-muelleri x tetranthera, Ptilotus astrolasius, Sida* sp. Pilbara (A.A. Mitchell PRP 1543), *Sporobolus actinocladus*
Quadrats/relevès: R14062 (**Plate 86**)
Extent: 9.34 ha **Proportion of study area**: 0.02%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Flat plain
Land system/s: Boolaloo
Priority Flora: None
Floristics notes: This has been interpreted as a discrete vegetation type based on the dominance of Triodia secunda. It is most similar, floristically, to vegetation types **Aa_3Tl** and **Aa_3Te**, in supergroup 6
Other notes: Occurs intermittently on shallow soil over granite, frequently in a mosaic with vegetation type **Aa_3Tl**. Most occurrences are too small to map as a discrete unit.

Plate 86: Vegetation type Ts; quadrat R14062

Vegetation type code: **Tw(1)**
Vegetation type description: *Triodia wiseana* and *Eragrostis xerophila* mid hummock grassland/tussock grassland
Other common or characteristic species: *Aristida contorta, Aristida holathera* var. *holathera, Corchorus walcottii, Fimbristylis microcarya, Gomphrena canescens, Goodenia forrestii, Indigofera linifolia, Indigofera trita, Polymeria ambigua, Sida fibulifera, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)
Quadrats/relevès: R14069 (**Plate 87**)
Extent: 12.24 ha **Proportion of study area**: 0.02%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing
Associated landform/s: Clay plain
Land system/s: Horseflat; rarely Mallina
Priority Flora: None
Floristics notes: Floristically vegetation type **Tw(1)** occurs as a discrete group in supergroup 1 in the floristics dendrogram, with most other vegetation types associated with the Horseflat land system.
Other notes: This vegetation type occurs in the north of the study area, in the Roebourne IBRA subregion. It is located immediately adjacent to vegetation type **Ex_1** that represents the P3 'Horseflat Land System of the Roebourne Plains' PEC, an may represent a subtype of the PEC.

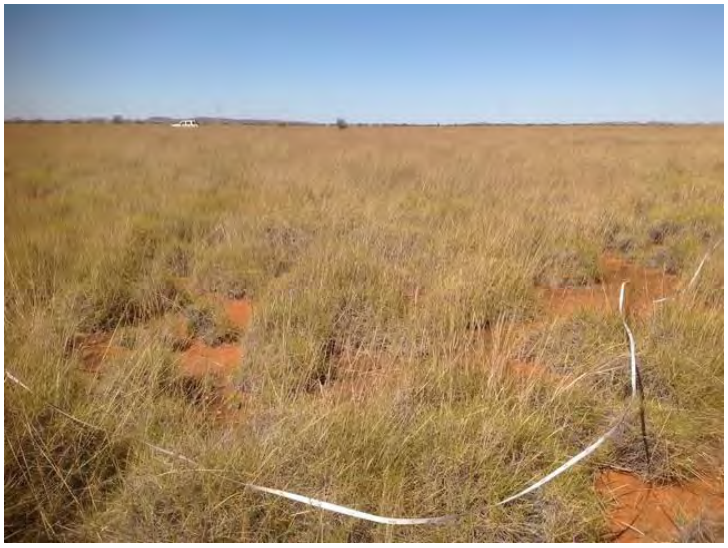


Plate 87: Vegetation type Tw(1); quadrat R14069

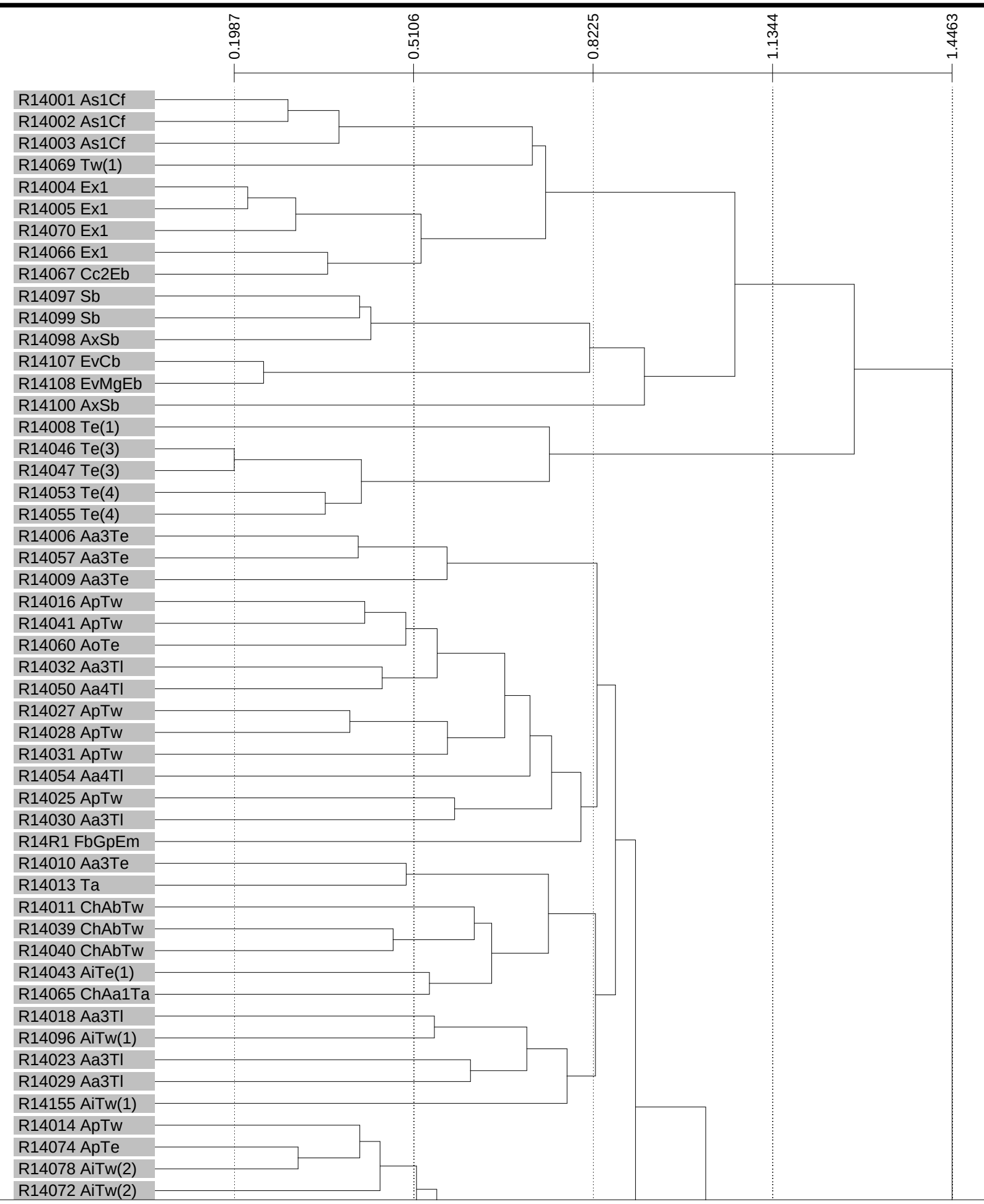
Vegetation type code: **Tw(2)**
Vegetation type description: *Triodia wiseana* and *Triodia epactia* low open hummock grass with *Corymbia hamersleyana* low scattered trees over *Acacia inaequilatera* mid scattered shrubs
Other common or characteristic species: *Bonamia* sp. Dampier (A.A. Mitchell PRP 217), *Indigofera monophylla, Senna glutinosa* subsp. *glutinosa, Sida* sp. Pilbara (A.A. Mitchell PRP 1543)
Quadrats/relevès: R14134 (**Plate 88**)
Extent: 317.26 ha **Proportion of study area**: 0.55%
Vegetation Condition: Excellent **Disturbance**: Cattle grazing, fire 3-5 years previously
Associated landform/s: Valley
Land system/s: Mostly Boolgeeda; also Granitic, River, Rocklea
Priority Flora: None
Floristics notes: This vegetation type has been interpreted as a discrete vegetation type. It is floristically associated with other vegetation types in the Chichester Range in supergroup 5.
Other notes: This vegetation type occurs in the Chichester Range.

Plate 88: Vegetation type Tw(2); quadrat R14134

APPENDIX NINE: FLORISTIC ANALYSIS DENDROGRAM

Fusion Type: Flexible UPGMA Beta = -0.10
On Association: Kulczynski Columns Created on: 10:44:34, November 25, 2014

Column Fusion Dendrogram



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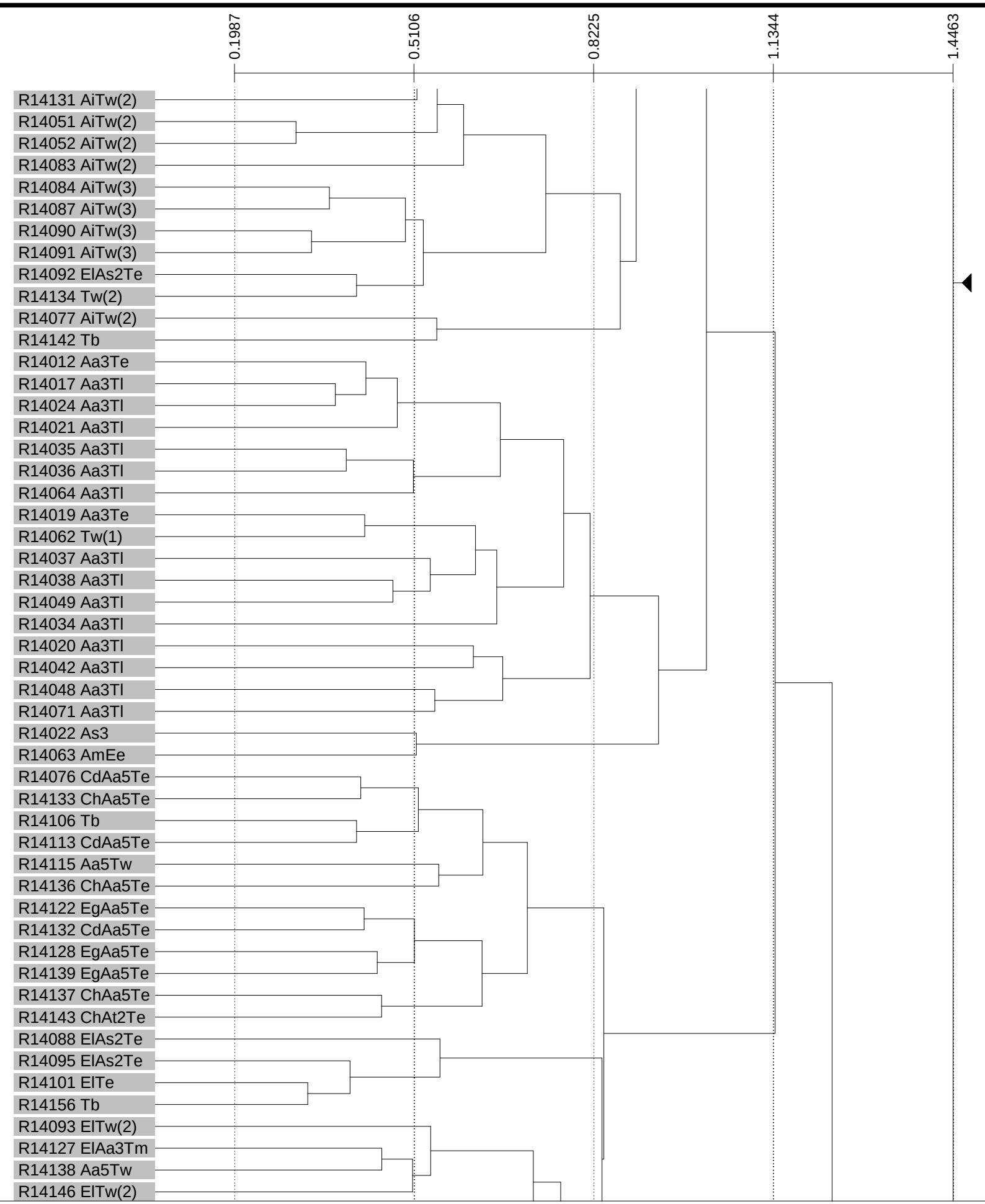

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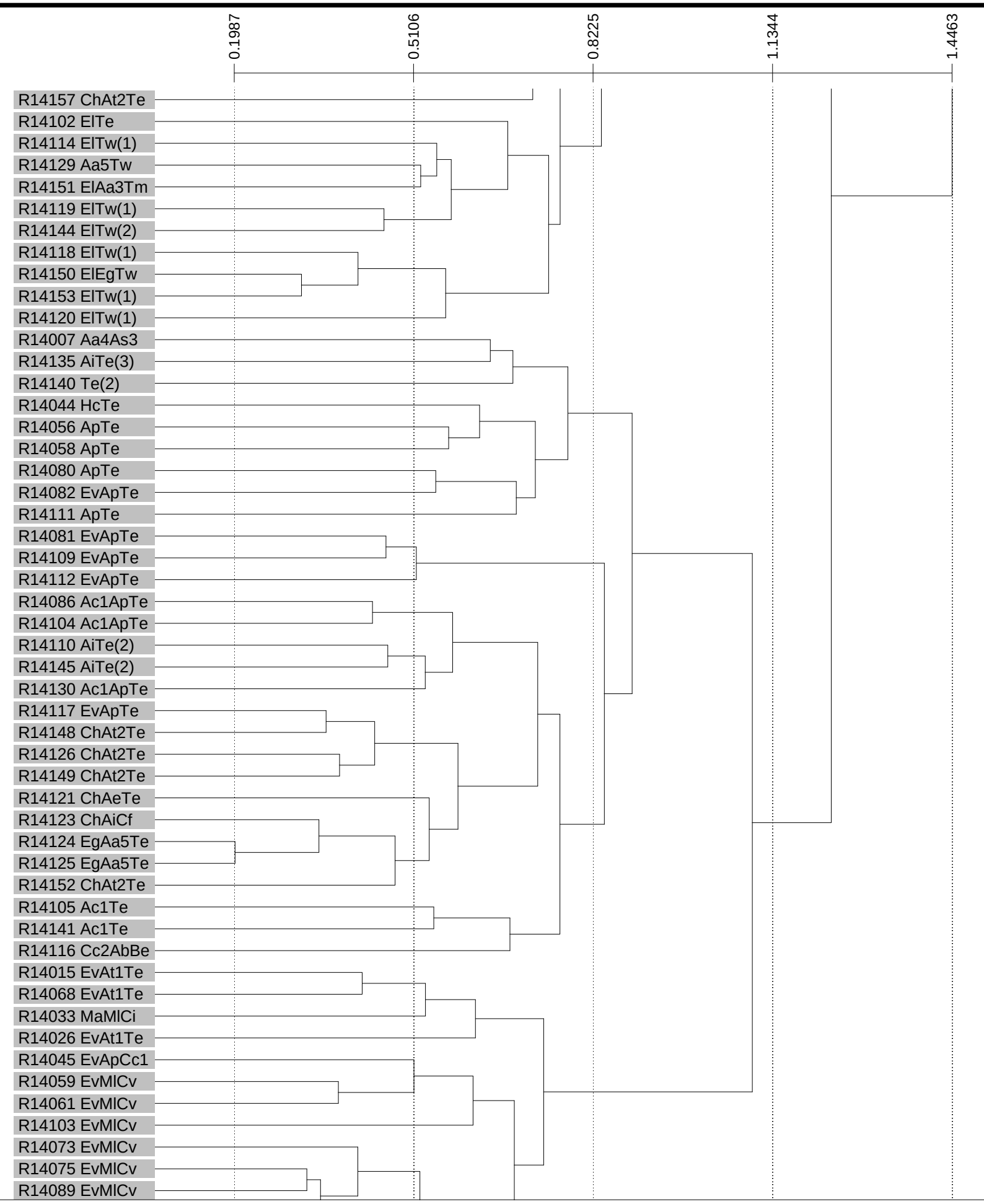
Column Fusion Dendrogram



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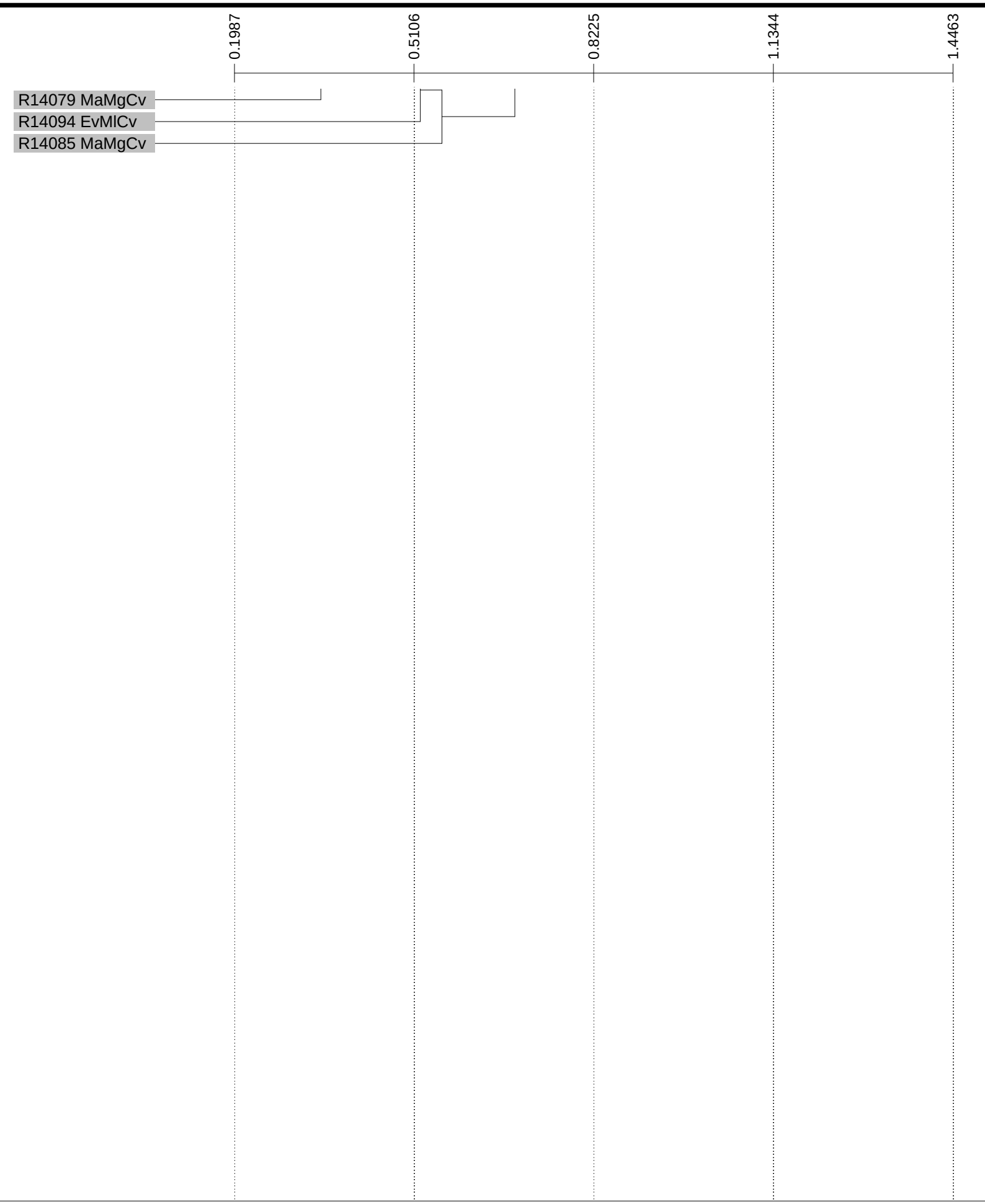
On Association: Kulczynski Columns Created on: 10:44:34, November 25, 2014

Column Fusion Dendrogram



APPENDIX TEN: CONSERVATION LIKELIHOOD ASSESSMENT

Table 29: Conservation significant flora likelihood assessment

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
T								
Lepidium catapycnon	Skeletal	Hillsides	*Triodia wiseana*, *Acacia bivenosa, A. inaequilatera, A. pruinocarpa, A. pyrifolia, T.* sp. Shovelanna Hill	Y	N	Y	50-100 km*	Highly unlikely
Thryptomene wittweri	Skeletal red stony soils	Breakaways, stony creek beds	*Eucalyptus kingsmillii*	Y	N	N	>100 km*	Highly unlikely
P1								
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Orange brown sandy loam, red sand, clay	Sandplain, dunes, floodplain	Grassland, shrubland, *Acacia* shrubland	Y	Y	Y	Previously 20-50 km*	Known (recorded)
Acacia leeuweniana	Granitic sandy loam	Granite outcrop high in landscape	*Acacia retivenea, A. tumida, Terminalia canescens*	Y	N	Y	20-50 km	Unlikely
Bothriochloa decipiens var. *cloncurrensis*	Loam, clay	Damp depression, clay pan	*Eucalyptus camaldulensis*, Mulga	Y	Y	Y	50-100 km*	Unlikely
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	Clay	Flats	Mulga, grassland	Y	Y	Y	20-50 km	Possible
Calotis squamigera	Pebbly loam	Plain	*Acacia xiphophylla*, Mulga	Y	Y	Y	50-100 km*	Unlikely
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	Red-brown skeletal soils, ironstone	Steep slopes, summits	*Eucalyptus kingsmillii*	Y	Y	N	>100 km*	Highly unlikely
Eremophila sp. Hamersley Range (K. Walker KW 136)	Ironstone	Hill crest, cliff top , gorge top	Mulga	Y	Y	Y	>100 km*	Highly unlikely
Eremophila sp. Snowy Mountain (S. van Leeuwen 3737)	Ironstone	High hill	*Eucalyptus leucophloia, Corymbia hamersleyana*, Mulga	Y	N	Y	>100 km*	Highly unlikely
Eremophila sp. West Angelas (S. van Leeuwen 4068)	Banded ironstone	High in landscape, hill summit, scree	*Eucalyptus gamophylla, E. kingsmillii*, Mulga	Y	N	N	>100 km*	Highly unlikely
Eremophila spongiocarpa	Alluvium	Weakly saline alluvial plain on margins of marsh	*Tecticornia* spp., Mulga, *Frankenia* sp.	Y	N	N	>100 km*	Highly unlikely
Eucalyptus lucens	Ironstone	Rocky slopes and mountain tops, high in the landscape	*Eucalyptus kingsmillii*	Y	N	N	50-100 km*	Highly unlikely
Euphorbia inappendiculata var. *queenslandica*	Cracking clay	Clay plain, depression	*Eriachne benthamii, Themeda* sp. Hamersley Station, grassland	Y	Y	Y	20-50 km	Possible

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Helichrysum oligochaetum	Red clay	Alluvial plains, drainage lines	*Eucalyptus camaldulensis, E. victrix*	Y	Y	Y	<10 km	Known (recorded)
Heliotropium muticum	Sand, clayey sand, granite	Sandplain, floodplain	*Acacia* shrubland, *Acacia stellaticeps, Triodia*	Y	Y	Y	Previously <10 km	Known (recorded)
Hibiscus sp. Mt Brockman (E. Thoma ET 1354)	Ironstone	Gorges, crevices, gullies	*Corymbia ferriticola*	Y	Y	N	20-50 km	Unlikely
Josephinia sp. Marandoo (M.E. Trudgen 1554)	Alluvial	Drainage lines, plains	Mulga, *Acacia* spp.	Y	Y	Y	<10 km* †	Possible
Nicotiana heterantha	Black clay, alluvial sand, sandy clay	Seasonally wet flats, floodplain, creeklines	*Tecticornia, Eucalyptus victrix*	Y	Y	N	10-20 km	Possible
Senna sp. Millstream (E. Leyland s.n. 30/8/1990)	Cracking clay	Creek bed	-	Y	Y	Y	50-100 km*	Unlikely
Sida sp. Hamersley Range (K. Newbey 10692)	Scree, skeletal soil	Gorge, cliff	*Acacia pruinocarpa, Corymbia ferriticola, Eucalyptus gamophylla, E. leucophloia,*	Y	Y	Y	<10 km	Possible
Sporobolus pulchellus	Sand, sandstone, sandy ironstone	Rocky hills	-	Y	N	N	No records*	Highly unlikely
Tephrosia rosea var. Port Hedland (A.S. George 1114)	Sand, sandy loam	Coastal dunes, plains	*Acacia coriacea, Triodia epactia, Spinifex longifolius, Acacia stellaticeps, *Cenchrus ciliaris*	Y	N	N	10-20km	Unlikely
Tetratheca fordiana	Ironstone	Cliff, crest, ridge	*Eucalyptus kingsmillii, Triodia wiseana*	Y	N	N	>100 km*	Highly unlikely
Teucrium pilbaranum	Clay, calcrete	Crab hole plain in a river floodplain, margin of calcrete table	*Chrysopogon fallax*, *Eucalyptus victrix*, *Eriachne benthamii*	Y	N	Y	20-50 km*	Unlikely
Triodia sp. Karijini (S. van Leeuwen 4111)	Ironstone, banded ironstone	Hilltops, upper slopes, high hills	*Eucalyptus kingsmillii, Eucalyptus leucophloia, Corymbia hamersleyana*	Y	Y	Y	>100 km*	Highly unlikely
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	Clay loam	Plain	*Acacia* thicket over mixed grassland. *Acacia aneura, Eucalyptus ?xerothermica, Themeda ?triandra*	Y	Y	Y	>100 km*	Unlikely
P2								
Adiantum capillus-veneris	-	Moist, sheltered sites in gorges and on cliff walls	-	?	Y	?	20-50 km*	Highly unlikely
Cladium procerum	Alluvium	Perennial pools, coastal swamps, gorges	*Cyperus, Typha*, date palms	Y	Y	Y	10-20 km	Possible
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	Stony	Slopes, flats, drainage lines	Mulga, *Corymbia hamersleyana*	Y	Y	Y	>100 km*	Unlikely

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Euphorbia australis var. glabra	Alluvium, cracking clay	Flats, drainage lines	*Eucalyptus victrix*, grassland	Y	Y	Y	20-50 km	Possible
Euphorbia inappendiculata var. *inappendiculata*	Clay, cracking clay	Floodplain, plain, high in landscape	*Aristida* and *Astrebla* grasslands, *Acacia xiphophylla*	Y	Y	Y	20-50 km	Possible
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	Stony soil, Brockman Iron Formation	Hill summits, high in landscape	*Eucalyptus kingsmillii, E, leucophloia* & *E. gamophylla* over *Acacia aneura, A. rhodophloia* over *Scaevola acacioides, Eremophila latrobei* over *Triodia wiseana*	Y	N	N	>100 km*	Highly unlikely
Ipomoea racemigera	Basalt, ?alluvium	Valley	Grassland	Y	Y	Y	50-100 km*	Unlikley
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Red-brown pebbly/rocky loam amongst boulders	Drainage lines, gullies	Mulga, *Triodia* grassland, *Eucalyptus leucophloia*	Y	Y	Y	50-100 km††	Possible
Paspalidium retiglume	Clay, cracking clay	Plain	Grassland, *Neptunia*	Y	Y	Y	<10 km	Possible
Pentalepis trichodesmoides subsp. *hispida*	Basalt, loam, stony clay sand, alluvium	Screes, drainage lines, hills	*Triodia*	Y	Y	Y	50-100 km*	Known (recorded)
Pilbara trudgenii	Ironstone, skeletal soil	Hill summits, steep slopes, screes, cliff faces	*Corymbia ferriticola*, Mulga, *Eucalyptus kingsmillii, Astrotricha hamptonii*	Y	N	N	>100 km*	Highly unlikely
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	Skeletal, brown gritty soil over basalt	Summits of hills, steep hills	*Eucalyptus kingsmillii* and *Eucalyptus* aff. *hamersleyana* over *Acacia hamersleyensis* over *Ptilotus rotundifolius* over *Triodia* sp. (SVL 2476).	Y	N	N	50-100 km*	Highly unlikely
Spartothamnella puberula	Rocky loam, sandy or skeletal soils, clay	Hills, gorges	*Eucalyptus leucophloia, Corymbia ferriticola*	Y	Y	Y	20-50 km	Possible
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Sand, gibber plain	Plain	*Triodia longiceps, T. pungens*	Y	Y	Y	50-100 km*	Possible
Vigna sp. central (M.E. Trudgen 1626)	Clay, alluvium	Valleys	*Triodia epactia*, Mulga, *Corymbia hamersleyana*	Y	Y	Y	10-20 km	Possible
P3								
Acacia daweana	Stony red loam, colluvium	Low rocky rises, along drainage lines, scree	*Eucalyptus gamophylla, Corymbia deserticola, C. hamersleyana*	Y	Y	Y	<10 km	Possible
Acacia subtiliformis	Calcrete	On rocky calcrete plateau	*Eucalyptus leucophloia, Triodia wiseana, T. basedowii*	Y	Y	Y	>100 km*	Unlikely
Astrebla lappacea	Clay	Plain	*Acacia xiphophylla*, grassland	Y	Y	Y	10-20 km	Possible

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Calotis latiuscula	Sand, loam, clay, calcrete	Rocky hillsides, floodplains, rocky creeks or river beds	*Themeda triandra*, Mulga	Y	Y	Y	20-50 km	Possible
Dampiera anonyma	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite	Hill summits, upper slopes	*Eucalyptus leucophloia, E. kingsmillii, Acacia hamersleyensis*	Y	N	N	10-20 km	Highly unlikely
Dampiera metallorum	Skeletal red-brown gravely soils over banded ironstone	Steep slopes and summits	*Eucalyptus gamophylla, E. kingsmillii, E. leucophloia*	Y	N	N	>100 km*	Highly unlikely
Eragrostis crateriformis	Clayey loam or clay	Creek banks, depressions	Grassland, *Acacia* spp, *Triodia* spp., Buffel grass	Y	Y	Y	50-100 km*	Possible
Eragrostis surreyana	Red-brown clay	Drainage line	*Eucalyptus victrix, E. camaldulensis, Melaleuca*	Y	Y	Y	20-50 km	Possible
Eremophila magnifica subsp. *velutina*	Skeletal soils over ironstone	Summits, hills, rocky areas on slopes	*Eucalyptus leucophloia*	Y	N	Y	10-20 km	Highly unlikely
Fimbristylis sieberiana	Mud, skeletal soil pockets	Pool edges, sandstone cliffs	*Cyperus, Eleocharis, Cladium*	Y	Y	Y	20-50 km*	Possible
Geijera salicifolia	Skeletal soils, stony soils	Massive rock scree, gorges	*Eucalyptus leucophloia, E. xerothermica*	Y	Y	Y	50-100 km*	Possible
Glycine falcata	Black clayey sand	Floodplains. Along drainage depressions in crabhole plains on river	*Eriachne* grassland,	Y	Y	Y	20-50 km	Possible
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Red-brown clay soil, calcrete	Low undulating plain, swampy plains	*Melaleuca eleuterostachya, Acacia bivenosa* over *Triodia wiseana, Triodia angusta*	Y	Y	Y	20-50 km	Possible
Gymnanthera cunninghamii	Sand, clay loam	River bed, floodplain	*Eucalyptus victrix, E. camaldulensis*, near Mangroves	Y	Y	Y	20-50 km	Possible
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	Alluvium	Creeks and gorges	*Corymbia hamersleyana, Eucalyptus xerothermica, E. victrix*	Y	Y	Y	<10 km	Known (recorded)
Indigofera sp. Gilesii (M.E. Trudgen 15869)	Pebbly loam amongst boulders & outcrops, Brockman Iron Formation	Hills	*Eucalyptus gamophylla, E. leucophloia, Corymbia ferriticola*	Y	Y	Y	50-100 km*	Unlikely
Iotasperma sessilifolium	Cracking clay, black loam.	Edges of waterholes, plains, drainage line	Herbland, grassland	Y	Y	Y	<10 km	Possible

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Cracking clay, basalt	Gently undulating plain with large surface rocks, flat crabholed plain	*Astrebla, Eriachne* and *Themeda* grasslands	Y	Y	Y	10-20 km	Known (recorded)
Olearia mucronata	Ironstone	Cliffs, hills, upper slopes	*Eucalyptus leucophloia, Astrotricha hamptonii,* Mulga	Y	Y	Y	50-100 km*	Unlikely
Owenia acidula	-	Creek	-	?	Y	?	50-100 km*	Unlikely
Pleurocarpaea gracilis	Skeletal, brown gritty soil over ironstone	Hill summit	*Eucalyptus leucophloia* and *E. gamophylla* over *Senna pruinosa, Acacia bivenosa, A. maitlandii* and *A. pyrifolia* over *A. marramamba* over *Triodia* sp.	Y	N	Y	50-100 km*	Highly unlikely
Polymeria distigma	Sandy soil, clay	Coastal plain, floodplain	*Astrebla pectinata*	Y	Y	?	20-50 km	Possible
Ptilotus subspinescens	Ironstone, basalt, quartz	Gentle rocky slopes, screes and the bases of screes	*Triodia angusta, T. longiceps, T. wiseana, Eucalyptus leucophloia*, Mulga	Y	Y	Y	20-50 km	Possible
Rhagodia sp. Hamersley (M. Trudgen 17794)	Sandy loam, alluvium	Floodplain / lower slopes	Mulga, *Eucalyptus leucophloia, E. xerothermica*	Y	Y	Y	20-50 km	Possible
Rostellularia adscendens var. *latifolia*	Ironstone, calcrete	Near creeks, rocky hills	*Eucalyptus victrix, Corymbia ferriticola*, Mulga, *E. xerothermica, E. kingsmillii*	Y	Y	Y	<10 km	Possible
Sida sp. Barlee Range (S. van Leeuwen 1642)	Skeletal red soils pockets	Steep slope, drainage lines, gullies	*Eucalyptus leucophloia, Acacia citrinoviridis, A. pruinocarpa, Corymbia ferriticola*	Y	Y	Y	10-20 km	Known (recorded)
Solanum albostellatum	Cracking clay	Plain, floodplain	Grassland	Y	Y	Y	20-50 km	Possible
Solanum kentrocaule	Ironstone, basalt	Hills, occasionally creeks	*Eucalyptus leucophloia, E. kingsmillii*	Y	Y	N	50-100 km*	Highly unlikely
Stackhousia clementii	Clay, tidal silt	Floodplain, saline silt	Grassland (*Themeda* sp. Hamersley Station), *Eucalyptus victrix*	Y	Y	Y	10-20 km	Possible
Swainsona thompsoniana	Clay	Flat crabholed plain	Open *Eremophila maculata* shrubland over moderately dense herbs, tussock grassland of *Astrebla pectinata*	Y	Y	N	10-20 km	Possible
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Red clay	Clay pan, grass plain	*Polymeria* sp. Hamersley (M.E. Trudgen 11353) herbland with *Chrysopogon fallax, Astrebla pectinata, Aristida latifolia* very open tussock grassland	Y	Y	Y	20-50 km	Possible
Triodia sp. Mt Ella (M.E. Trudgen 12739)	Light orange-brown, pebbly loam	Amongst rocks & outcrops, gully slopes, scree	*Eucalyptus leucophloia*, Mulga	Y	Y	Y	>100 km*	Highly unlikely

SPECIES	SOIL	LANDFORM	VEGETATION	SOIL TYPE PRESENT	LANDFORM PRESENT	ASSOCIATED VEGETATION PRESENT	DISTANCE TO NEAREST RECORD*	LIKELIHOOD OF OCCURRENCE
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	Ironstone, pisolite (Robe land system)	Rocky hills and mesas	*Eucalyptus leucophloia, Triodia wiseana*	N	Y	Y	50-100 km*	Highly unlikely
Vigna sp. rockpiles (R. Butcher et al. RB 1400)	Skeletal	Rock piles, scree	*Triodia epactia, T. angusta, Terminalia supranitifolia, Brachychiton acuminatus, Acacia inaequifolia*	Y	Y	Y	50-100 km*	Unlikely
P4								
Acacia bromilowiana	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt	Rocky hills, breakaways, scree slopes, gorges, creek beds	*Eucalyptus leucophloia, Corymbia hamersleyana*	Y	N	Y	20-50 km	Highly unlikely
Eremophila magnifica subsp. *magnifica*	Skeletal soils over ironstone.	Rocky screes	*Eucalyptus leucophloia, Corymbia hamersleyana*	Y	N	Y	10-20 km	Highly unlikely
Goodenia nuda	Red--brown clay loam, ironstone	Mostly low lying areas (floodplains, outwash areas), occasionally hills	*Acacia tumida* tall shrubland with mixed grass understorey including *Triodia epactia*	Y	Y	Y	Within alignment	Known (recorded)
Livistona alfredii	-	Edges of permanent pools, with flowing water	*Eucalyptus camaldulensis*	?	N	Y	20-50 km	Highly unlikely
Rhynchosia bungarensis	Pebbly, coarse sand	Banks of flow line	*Corymbia hamersleyana, Eucalyptus camaldulensis, Triodia wiseana, E. victrix*	Y	Y	Y	<10 km	Known (recorded)
Significant According to *Guidance Statement No. 51*								
Unnamed *Josephinia* sp.	Rocky outcrops	Hills, gorges	*Acacia monticola, Triodia wiseana, Corymbia hamersleyana, Eucalyptus leucophloia*	Y	Y	Y	<10 km††	Possible

* estimated using *NatureMap* (DPaW 2007-2014) measuring tool; other distances are from DPaW database search results or Ecoscape records

† record is listed as *Josephinia* ?sp. Marandoo on *NatureMap* (DPaW 2007-2014); the nearest verified record is over 50 km distant

†† Ecoscape record

APPENDIX ELEVEN: DESKTOP ASSESSMENT OF ALTERNATIVE ALIGNMENTS

INTRODUCTION

Desktop Scope

This desktop investigation presents the physical and biological characteristics for the area covering the Nunyerry Gap Alternate Far East ('Far East') and Near West Options, as detailed in Ecoscape proposal 9869-3228-14P V8. The study area consists of the provided rail centrelines with a 1 km buffer applied.

The locations of the alternative alignments and rail corridor as surveyed are shown on **Map 8**.

PHYSICAL ENVIRONMENT

Geology

There are 11 geological units mapped by the Geological Survey of Western Australia within the Near West study area and 19 within the Far East study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996), shown below in **Table 30** and **Table 31**.

Table 30: Geological units in the Near West study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996)

UNIT	DESCRIPTION	EXTENT IN STUDY AREA (HA)	PROPORTION OF STUDY AREA (%)
AFh	Sandstone, conglomerate, siltstone, shale, and felsic pyroclastic rocks	336.29	10.70
AFk	Kylena Formation: massive or amygdaloidal basalt, basaltic andesite, and dacite; local komatiitic basalt and rhyolite	430.06	13.69
AFm	Maddina Formation: massive, vesicular, and amygdaloidal basalt and basaltic andesite	607.65	19.34
AFr	Mount Roe Basalt: massive, vesicular, and glomeroporphyritic basalt	27.07	0.86
AFt	Tumbiana Formation: mafic to felsic volcaniclastic sandstone, pyroclastic rocks, and fine- to medium-grained clastic sedimentary rock; minor basalt, chert, dolomite, and limestone	633.55	20.17
AFtc	Meentheena Member: dark grey stromatolitic dolomite and limestone, carbonate-rich pyroclastic rocks, mudstone, and siltstone	55.30	1.76
AgYfr	Flat Rocks Tonalite: biotite-bearing tonalite; strongly foliated; locally interleaved with abundant massive to weakly foliated, K-feldspar porphyritic monzogranite; metamorphosed	835.54	27.10
Auk	Serpentine-talc-tremolite rock after komatiite; pseudomorphed olivine spinifex textures	3.49	0.11
Czc	Colluvium - dissected consolidated clay, silt, sand, and gravel deposits; derived from adjacent rock outcrop	153.17	4.88
Czcb	Colluvium, dissected by present-day drainage, with gilgai surface in areas of expansive clay	22.13	0.70
Qao	Alluvial sand, silt, and clay in floodplains adjacent to main drainage channels	21.43	0.68
TOTAL		**3125.68**	**100**

Table 31: Geological units in the Far East study area (Hickman & Smithies 2000; Smithies & Hickman 2004; Thorne *et al*. 1996)

UNIT	DESCRIPTION	EXTENT IN STUDY AREA (HA)	PROPORTION OF STUDY AREA (%)
AFh	Sandstone, conglomerate, siltstone, shale, and felsic pyroclastic rocks	103.57	1.08
AFjo	Woodiana Member: quartz-rich sandstone, chert, chert breccia, and mudstone; locally includes lithic volcaniclastic sandstone	79.32	0.83
AFjsl	Variegated, light-coloured mudstone and siltstone	407.51	4.25
AFjslg	Carbonaceous mudstone and siltstone, chert, and local dolomite beds	389.69	4.07
AFk	Kylena Formation: massive or amygdaloidal basalt, basaltic andesite, and dacite; local komatiitic basalt and rhyolite	107.45	1.12
AFm	Maddina Formation: massive, vesicular, and amygdaloidal basalt and basaltic andesite	2380.76	24.85
AFr	Mount Roe Basalt: massive, vesicular, and glomeroporphyritic basalt	804.52	8.40
AFt	Tumbiana Formation: mafic to felsic volcaniclastic sandstone, pyroclastic rocks, and fine- to medium-grained clastic sedimentary rock; minor basalt, chert, dolomite, and limestone	45.20	0.47
AgYel	Ellawarrina Monzogranite: biotite-bearing monzogranite; metamorphosed	15.15	0.16
AgYfr	Flat Rocks Tonalite: biotite-bearing tonalite; strongly foliated; locally interleaved with abundant massive to weakly foliated, K-feldspar porphyritic monzogranite; metamorphosed	1994.68	20.82
AgYmh	Hornblende-bearing monzogranite to granodiorite, undivided; metamorphosed	137.49	1.44
Aog	Metagabbro, medium to coarse grained	12.01	0.13
Auk	Serpentine-talc-tremolite rock after komatiite; pseudomorphed olivine spinifex textures	21.67	0.23
Aus	Serpentinized ultramafic rock	26.82	0.28
Czc	Colluvium - dissected consolidated clay, silt, sand, and gravel deposits; derived from adjacent rock outcrop	892.69	9.32
Czcb	Colluvium, dissected by present-day drainage, with gilgai surface in areas of expansive clay	64.78	0.68
Qaa	Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains	490.99	5.12
Qao	Alluvial sand, silt, and clay in floodplains adjacent to main drainage channels	900.90	9.40
Qwf	Ferruginous sheetwash sand, silt, and clay in outwash fans, with clasts of iron formation	705.22	7.36
TOTAL		**9580.41**	**100**

Land Systems

According to land system mapping (Van Vreeswyk *et al.* 2004), six land types and seven land systems (grouped according to land type on the basis of a combination of landform, soil, vegetation, and drainage characteristics) intersect with the study areas (**Table 32**, **Table 33** and **Table 34**). Land systems are shown on **Map 8**.

Table 32: : Extent of land systems within the Near West study area and regional representation (Van Vreeswyk *et al*. 2004)

LAND SYSTEM	EXTENT WITHIN STUDY AREA (KM^2)	PROPORTION OF STUDY AREA (%)	PILBARA EXTENT (KM^2)	PROPORTION OF TOTAL WITHIN THE STUDY AREA (%)
Capricorn	5.22	16.60	5296.00	0.098
Granitic	10.31	32.83	4020.00	0.257
Rocklea	14.32	45.58	22993.00	0.062
Wona	1.57	4.99	1815.00	0.086
TOTAL	**31.41**	**100**		

Table 33: Extent of land systems within the Far East study area and regional representation (Van Vreeswyk *et al*. 2004)

LAND SYSTEM	EXTENT WITHIN STUDY AREA (KM^2)	PROPORTION OF STUDY AREA (%)	PILBARA EXTENT (KM^2)	PROPORTION OF TOTAL WITHIN THE STUDY AREA (%)
Boolgeeda	6.59	6.87	7748.00	0.08
Capricorn	1.54	1.60	5296.00	0.03
Granitic	21.94	22.90	4020.00	0.55
Hooley	2.10	2.19	590.00	0.36
Jurrawarrina	0.07	0.07	664.00	0.01
Macroy	5.77	6.02	13095.00	0.04
McKay	11.56	12.07	4202.00	0.28
River	2.07	2.16	4088.00	0.05
Robe	0.55	0.58	865.00	0.06
Rocklea	33.40	34.86	22993.00	0.15
Wona	10.22	10.67	1815.00	0.56
TOTAL	**95.80**	**100**		

Table 34: Descriptions of land types and systems within the study areas (Van Vreeswyk *et al*. 2004)

UNIT	DESCRIPTION
Land type 1	**Hills and ranges with spinifex grasslands**
Capricorn land system	Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs.
Granitic land system	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.
McKay land system	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.
Rocklea land system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands
Land type 3	**Plateaux, mesas and breakaways with spinifex grasslands**
Robe land system	Low limonite mesas and buttes supporting soft spinifex (and occasionally hard spinifex) grasslands
Land type 8	**Stony plains with spinifex grasslands**
Boolgeeda land system	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
Macroy land system	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands.
Land type 9	**Stony gilgai plains with tussock grasslands and spinifex grasslands**
Wona land system	Basalt upland gilgai plains supporting Roebourne Plains grass and Mitchell grass tussock grasslands, minor hard spinifex grasslands or annual grasslands/herbfields.
Land type 12	**Wash plains on hardpan with groved mulga shrublands (sometimes spinifex understory)**
Jurrawarrina land system	Hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses.
Land type 15	**Alluvial plains with snakewood shrublands**
Hooley land system	Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands.
Land type 17	**River plains with grassy woodlands and shrublands, and tussock grasslands**
River land system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.

BIOLOGICAL ENVIRONMENT

Biogeographic Region

The Near West study area occurs solely within the Chichester biogeographic subregion, the Far East study area occurs across both the Chichester and Fortescue biogeographic subregions. For detailed descriptions of subregion characteristics refer to **Section 3.1** of this report.

Flora

Commonwealth Protected Matters Search

Both study areas occur within the buffer area of a recent Commonwealth Department of the Environment (DoE) online database search (*Protected Matters Search Tool* (*PMST*, Australian Government and DoE 2014)). A review of the Commonwealth *Species Profile and Threats Database* (DoE 2014) lists was also previously conducted covering the study areas.

No Commonwealth protected species were identified by these searches as occurring in the vicinity of the study areas. The full report can be provided on request.

DPaW Threatened and Priority Database Search

A DPaW Threatened Flora database search (DPaW reference 20-0514FL) of an early version of the main line study area and 40 km buffer identified 78 vascular conservation significant taxa (species, subspecies and varieties) with validated populations within the search area buffer. This search included the area covered by the Nunyerry Gap Alternate Far East and Near West Options.

No Threatened or Priority Flora species were identified as occurring within the study areas.

The P2 species *Paspalidium retiglume* was identified as occurring in close proximity (less than 1 km) to the Far East study area on the Wona land system; this species is likely to occur within the study area across the Wona system.

NatureMap Search

A *NatureMap* (DPaW 2007-2014) search for conservation significant flora known from nearby was conducted using an approximate centre point of the alternative alignments and a 40 km buffer (**Figure 8**).

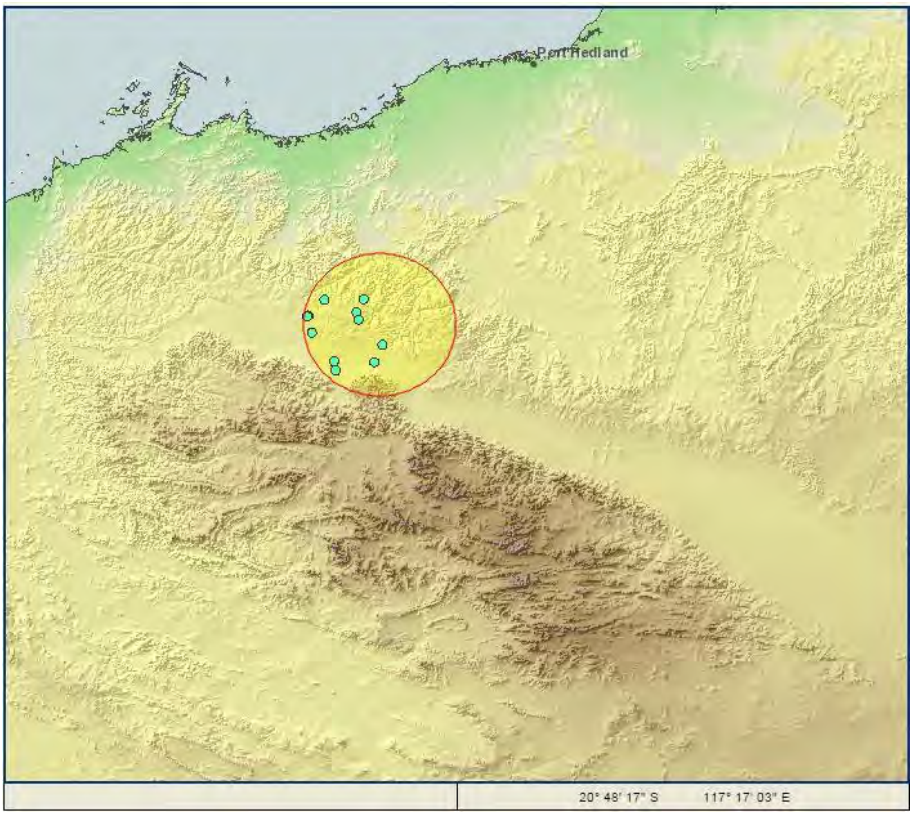


Figure 8: *NatureMap* (DPaW 2007-2014) search area (alternate alignments)

The *NatureMap* search identified 12 PF (**Table 35**). Ecoscape considers most species as having potential to occur, except for *Livistona alfredii* that requires significant pools that are unlikely in the alternate alignments.

Table 35: *NatureMap* (DPaW 2007-2014) search results for alternate alignments

SPECIES NAME	CONS. CODE
Cladium procerum	P2
Euphorbia australis var. *glabra*	P2
Goodenia nuda	P4
Helichrysum oligochaetum	P1
Iotasperma sessilifolium	P3
Josephinia sp. Marandoo (M.E. Trudgen 1554)	P1
Livistona alfredii	P4
Nicotiana heterantha	P1
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3
Paspalidium retiglume	P2
Stackhousia clementii	P3
Swainsona thompsoniana	P3

Nearby Records

The previous Ecoscape survey, which is the subject of the main report, identified:

- *Pentalepis trichodesmoides* subsp. *hispida* (P2) within the original rail corridor, and also within the Near West option, on rocky basalt soil of the Rocklea land system
- *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3) within the original rail corridor, and also within the Near West option, associated with cracking clay soils of the Wona land system
- *Goodenia nuda* (P4) within the original rail corridor, and also at the confluence of both options in the north, and close to the southern terminus of the Far East option.

These results are shown on **Map 8**.

Vegetation and Ecological Communities

Vegetation Association Mapping

The pre-European vegetation associations identified from the study areas (DAFWA 2012) and their pre-European and current extents are listed in **Table 36** and **Table 37** (Government of Western Australia 2013). The total extent of the Pilbara bioregion is 17 808 657.06 ha.

Table 36: Pre-European vegetation associations within the Near West study area (Government of Western Australia 2013)

VEGETATION ASSOCIATION	PILBARA BIOREGION			EXTENT WITHIN THE STUDY AREA	
	PRE-EUROPEAN EXTENT (ha)	CURRENT EXTENT (ha)	% REMAINING	EXTENT (ha)	PROPORTION (%)
173	1,752,520.89	1,747,677.63	99.72	971.6982	0.05
569	59,337.69	59,337.69	100.00	1089.905	1.84
587	580,728.60	580,696.99	99.99	1079.839	0.19

Table 37: Pre-European vegetation associations within the Far East study area (Government of Western Australia 2013)

VEGETATION ASSOCIATION	PILBARA BIOREGION			EXTENT WITHIN THE STUDY AREA	
	PRE-EUROPEAN EXTENT (ha)	CURRENT EXTENT (ha)	% REMAINING	EXTENT (ha)	PROPORTION (%)
173	1,752,520.89	1,747,677.63	99.72	3508.52	0.20
175	507,860.18	507,466.82	99.92	616.20	0.12
569	59,337.69	59,337.69	100.00	2699.06	4.55
587	580,728.60	580,696.99	99.99	1496.72	0.26
607	120,789.19	120,599.81	99.84	1259.91	1.04

Threatened and Priority Ecological Communities

Review of the DPaW TEC list (DPaW Species & Communities Branch 2014a) indicates that the only TEC in the Pilbara defined by vegetation is the vulnerable '*Themeda* grasslands on cracking clay (Hamersley Station, Pilbara)'.

There are no Commonwealth-listed TECs within the Pilbara bioregion (DoE 2014), consequently none were identified by the *PMST* search (Australian Government and DoE 2014).

DPaW Ecological Communities Database Search

A DPaW Ecological Communities database search (reference 21-0514EC) was conducted for an earlier version of the rail corridor study area and a 40 km buffer which includes the Nunyerry Gap Alternate Far East and Near West Options. This dataset was used to assess the study areas for potential presence of PECs.

The previous search identified the TEC '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' as occurring around 70 km to the south of the Nunyerry Gap Alternate Far East and Near West Options.

One PEC was identified as occurring within the study areas (DPaW Species & Communities Branch 2014b).; the P1-P3 'Four plant assemblages of the Wona Land System' (previously 'Cracking clays of the Chichester and Mungaroona Range') The community is described as:

> *a system of basalt upland gilgai plains with tussock grasslands occurs throughout the Chichester Range in the Chichester-Millstream National Park, Mungaroona Range Nature Reserve and on adjacent pastoral leases. There are a series of community types identified within the Wona Land System gilgai plains that are considered susceptible to known threats such as grazing or have constituent rare/restricted species, as follows:*
>
> *P1 Cracking clays of the Chichester and Mungaroona Range. This grassless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa*
>
> *P1 Annual Sorghum grasslands on self mulching clays. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range*
>
> *P3(iii) Mitchell grass plains (*Astrebla *spp.) on gilgai*

*P3(iii) Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai (typical type, heavily grazed).*

The 'Four plant assemblages of the Wona Land System' PEC is located in the vicinity of Mt Florance homestead. Both options intersect with this PEC or its buffer:

- the Near West option study area intersects the 500 m administrative buffer associated with the PEC at the southern tip of the study area. The study area includes 5.8 ha of area mapped as buffer.
- the Far East option study area intersects both the area of administrative buffer and the area mapped as PEC; field observations during the original corridor survey confirm this record. A combined 1 449.6 ha of mapped area is included within the study area.

Ecoscape identified an area that is potentially part of the above PEC (vegetation type **Sb**) during the field survey of the original alignment; the location of this potential PEC is shown on **Map 8**, along with the locations of the Wona land system.

CONCLUSIONS

The flora and vegetation attributes that are likely to be of significance for the two alternative alignments are:

- the P1-P3 'Four plant assemblages of the Wona Land System' PEC that is known to occur within the Far east option, and the administrative buffer area which is known to correspond with both options
- known conservation significant flora identified from within the alternative alignments; *Pentalepis trichodesmoides* subsp. *hispida* (P2), *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3) and *Goodenia nuda* (P4), although P3 and P4 taxa are unlikely to have a significant impact on environmental approvals whereas buffers are frequently applied for P1 and P2 taxa
- the potential for conservation significant flora to occur within the alignments, particularly *Paspalidium retiglume* (P2) however all of the species (except *Livistona alfredii*) identified by the *NatureMap* (**Table 35**) search may occur..

No TECs or TF are likely to occur within the alternative alignments.

576000 581000 586000 591000 596000 601000

7610000 7605000 7600000 7595000 7590000

Wona System
River System
Rocklea System
Boolgeeda System
Boolaloo System
Macroy System
Capricorn System
Granitic System
McKay System
Jurrawarrina System
Hooley System
Robe System

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) 3
Swainsona thompsoniana

Iotasperma sessilifolium 3

Goodenia nuda 4

Pentalepis trichodesmoides subsp. hispida 2

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) 3

Paspalidium retiglume 2

CHICHESTER RANGE
MOUNT FLORANCE
ROEBOURNE-WITTENOOM ROAD
SHERLOCK RIVER

IMAGERY SOURCE: CAD RESOURCES

GDA 1994 MGA Zone 50

LEGEND

- Homesteads
- Place Names
- Secondary Road
- Minor Road
- Track
- Drainage Lines
- Rutila Rail Corridor
- Far East Deviation
- Near West Deviation
- 1 km buffer Far East Deviation
- 1 km buffer Near West Deviation
- Land System boundaries
- Wona Land System

DPaW Flora Databases

Conservation Status

- 2 Priority 2
- 3 Priority 3

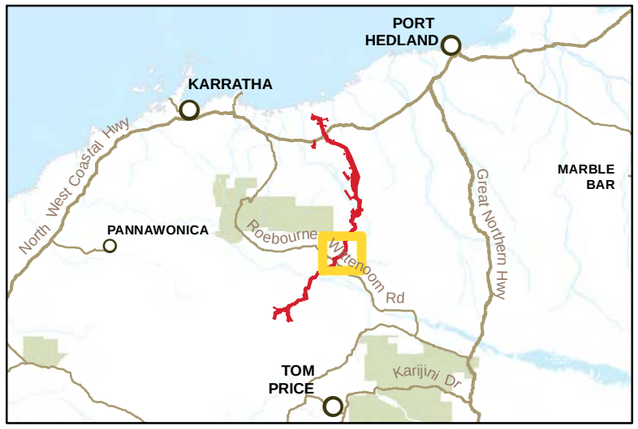
Ecoscape Flora Locations

Conservation Status

- 2 Priority 2
- 3 Priority 3
- 4 Priority 4

Ecoscape Vegetation Mapping

- Potenital PEC



ecoscape

AUTHOR: JN CHECKED: SB
DATE: OCT-14 PROJECT NO: 3228-14 V8

RUTILA RAIL CORRIDOR ECOLOGICAL STUDIES

CLIENT: RUTILA RESOURCES

DESKTOP ASSESSMENT RAIL DEVIATIONS

MAP 8

SCALE 1:90,000 @ A3

0 1 2 3 4 5 km