

# Rio Tinto



**Botanical Survey for an Exploration  
Drilling Program at Juna Downs South  
E47/1943**

**&**

**Supporting Document to a Native  
Vegetation Clearing Permit Application**

**RTIO-HSE-0106538**

**Doc Number: AR-09-04089 & AR-10-06175**

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## Executive Summary

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Rio Tinto Iron Ore (RTIO) proposes to undertake exploration drilling at Juna Downs south within tenement E47/1943 (yet to be granted), which is located 46km south-east of the Marandoo mine within the Pilbara region (Figure 1.1). Under the proposed drilling program more than 1ha of land will be cleared of vegetation for the development of tracks, drill pads and sumps. In order to remove native vegetation within the study area, a Native Vegetation Clearing Permit will be required under s.51C of the *Environmental Protection Act 1986*.

A flora and vegetation survey was conducted by Rio Tinto in 2009 and 2010 to provide information including dominant vegetation types, flora species and fauna habitats to support the application for a Native Vegetation Clearing Permit.

A total of 225 native vascular plant species from 97 plant genera belonging to 35 plant families were recorded within the study area. The list of plant species recorded in this area includes two Priority 3 flora species *Triodia* sp. Mt Ella (M.E. Trudgen 12739) and *Sida* sp. Barlee Range (S. van Leeuwen 1642). In addition, 3 weed species, *Bidens bipinnata* (Bipinnate Beggartick), *Malvastrum americanum* (Spiked Malvastrum) and, *Vachellia farnesiana* (Mimosa Bush) were recorded within the study area.

Eighteen intact vegetation communities were identified within the study area from three broad landform types; stony hillslopes, flats & plains and minor drainage line habitats. No vegetation units were deemed to be Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs).

An assessment against the "10 Clearing Principles" as defined in Schedule 5 of the *Environmental Protection Act 1986* identified clearing within the study area as being unlikely to be at variance with any of the clearing principles.

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# Juna Downs Drilling Program Native Vegetation Clearing Permit Supporting Report

## Contents

<b>Introduction .....</b>	<b>6</b>
1.1 Project Background.....	6
1.2 Scope and Limitations .....	6
1.3 Land Systems .....	7
1.4 Vegetation.....	10
1.5 Reserves and Conservation Areas.....	11
<b>2. Methodology .....</b>	<b>13</b>
2.1 Desktop Study .....	13
2.2 Database Searches .....	13
2.3 Flora and vegetation survey.....	13
2.4 Fauna .....	14
<b>3. Results .....</b>	<b>15</b>
3.1 Vegetation of the Study Area .....	15
3.2 Flora of the Study Area .....	29
3.3 Fauna of the Study Area.....	35
<b>4. Statement Addressing the 10 Clearing Principles .....</b>	<b>39</b>
4.1 Clearing Principles .....	39
<b>5. Recommendations.....</b>	<b>42</b>
<b>6. References .....</b>	<b>43</b>
<b>7. Appendices.....</b>	<b>45</b>

## Tables

<b>Table 1.1:</b> Land Systems occurring within the study area and their representation in the Pilbara bioregion. ....	8
<b>Table 1.2:</b> Area of subregions in the Pilbara Bioregion to be impacted under the current clearing proposal. ....	10
<b>Table 1.3:</b> Beard’s mapping units within the study area, their current and pre-European extent (following Shepherd <i>et al.</i> 2002) and their extent across the study area.....	11
<b>Table 3.1:</b> Dominant Families and Genera .....	29
<b>Table 3.2:</b> Priority Flora returned by database searches for 20km around the study area.....	30
<b>Table 3.3:</b> <i>Triodia</i> sp. My Ella locations .....	32
<b>Table 3.4:</b> Fauna of conservation significance with a 20km radius database search results.....	35

**Table 3.5:** Pebble Mouse Mound (*Pseudomys chapmani*) locations..... 37

## Figures

**Figure 1.1:** Broad location of the Juna Downs Drilling study area in relation to Marandoo Mine Site ..... 9

**Figure 3.1:** Location of Vegetation Units within the Juna Downs Study Area ..... 33

**Figure 3.2:** Location of Priority Flora and Western Pebble-mound Mouse mounds (PMM) within the Juna Downs Study Area..... 33

## Plates

**Plate 3.1:** Vegetation Type 1 ..... 16

**Plate 3.2:** Vegetation Type 2 ..... 16

**Plate 3.3:** Vegetation Type 3 ..... 17

**Plate 3.4:** Vegetation Type 4 ..... 18

**Plate 3.5:** Vegetation Type 5 ..... **Error! Bookmark not defined.**

**Plate 3.6:** Vegetation Type 6 ..... 19

**Plate 3.7:** Vegetation Type 7 ..... 20

**Plate 3.8:** Vegetation type 8..... 20

**Plate 3.9:** Vegetation Type 9 ..... 21

**Plate 3.10:** Vegetation Type 10..... 22

**Plate 3.11:** Vegetation Type 11..... 22

**Plate 3.12:** Vegetation Type 12..... 23

**Plate 3.13:** Vegetation Type 13..... 24

**Plate 3.14:** Vegetation Type 14..... 24

**Plate 3.15:** Vegetation Type 15..... 25

**Plate 3.16:** Vegetation Type 16..... 26

**Plate 3.17:** Vegetation Type 17..... 27

**Plate 3.18:** Vegetation Type 18..... 27

## **Introduction**

### **1.1 Project Background**

Rio Tinto Iron Ore ('RTIO') proposes to undertake exploration drilling at Juna Downs south within tenement E47/1943, which is located 46km south-east of the Marandoo mine within the Pilbara region (Figure 1.1).

The drilling program is to include 45 RC drill holes on 20m by 20m drill pads (200m by 100m grid spacing); the construction of sumps (approximately 5m x 5m x 1m) and tracks. Existing tracks will be used where possible, however approximately 8.2 km of tracks will need to be cleared of vegetation (4 m width).

The proposed drilling project area covers 181.4ha of land, however not all of this area is likely to be cleared of vegetation. As more than 1 ha of native vegetation will be cleared an application for a Native Vegetation Clearing Permit under the *Environmental Protection Act 1986* and *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* will be required.

The proposed clearance area will be referred to as 'the study area' in this report.

### **1.2 Scope and Limitations**

This report describes the methodology employed for the flora and vegetation survey of the study area, as well as documenting the results of the survey, in particular identifying vegetation and flora of particular conservation significance.

The intended use of this report is as a supporting document to Rio Tinto Iron Ore's application for an NVCP. It has been prepared on the basis of a review of existing information for the project area, combined with a site visit by one Rio Tinto botanist; Emil Thoma, on the 26<sup>th</sup> May 2009 the 14<sup>th</sup> of July 2009 and the 23<sup>rd</sup> October 2010.

#### **1.2.1 Limitations**

Limitations of the current study include:

- The study area was only assessed single time over three site visits, at times when conditions were dry and not optimal for collection of ephemeral flora.
- Fungi and non-vascular flora (algae, mosses and liverworts) were not sampled, as is typical for surveys of this nature.
- The assessment of fauna and fauna habitats was based on a desktop review and field observations only, with no systematic trapping undertaken.

### 1.3 Land Systems

The study area occurs over six Land Systems; Boolgeeda, Elimunna, McKay, Newman, Rocklea and Spearhole as described in the rangeland surveys of Payne *et al.* (1988) and van Vreeswyk *et al.* (2004).

The majority of the study area (103.7 ha or 57.4%) occurs within the Boolgeeda Land System which is described in van Vreeswyk *et al.* (2004) as stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands. Geologically it is made up of quaternary colluvium.

38.8% (70.4 ha) of the study area occurs with the Newman Land System which is rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands. Geologically it is made up of Lower Proterozoic jaspilite, chert, siltstone, shale, dolomite and minor acid volcanics.

2.2% (4 ha) of the study area occurs with the Elimunna Land System which is stony plains on basalt supporting sparse acacia and cassia shrublands and patchy tussock grasslands. Geologically it is made up of quaternary colluvium, eluvium and alluvium, Archaean basalt and dolerite.

1.2% (2.2 ha) of the study area occurs with the McKay Land System which is hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands. Geologically it is made up of Lower Proterozoic shale, chert, mudstone, sandstone and dolomite.

0.02% (0.3 ha) of the study area occurs with the Rocklea Land System which is Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands. Geologically it is made up of Archaean basalt, Lower Proterozoic basalt, dolerite, tuff and agglomerate, minor shale and jaspilite.

The remaining 0.8 ha (0.4%) of the study area occurs within the Spearhole Land System which is described in van Vreeswyk *et al.* (2004) as gently undulating gravelly hardpan plains and dissected slopes supporting groved mulga shrublands and hard spinifex. Geologically it is made up of partially cemented Quaternary alluvium and colluvium.

All of these land systems are fairly well represented throughout the Pilbara bioregion.

Table 1.1 below summarises the extent of the Land Systems within the study area and across the Pilbara bioregion.

**Table 1.1: Land Systems occurring within the study area and their representation in the Pilbara bioregion.**

<b>Land System (LS)</b>	<b>Extent in the Pilbara (ha)</b>	<b>Extent within Study Area (ha)</b>	<b>Extent within Study Area as % of total LS area</b>
Boolgeeda	961,635	103.7	0.01
Elimunna	61,700	4	0.006
McKay	420,200	2.2	0.0005
Newman	1,458,000	70.4	0.004
Rocklea	2,299,300	0.3	0.00001
Spearhole	127,000	0.8	0.0006
<b>Total</b>	<b>5,327,835</b>	<b>181.4</b>	<b>0.003</b>



Botanical Survey for Drilling at Juna Downs

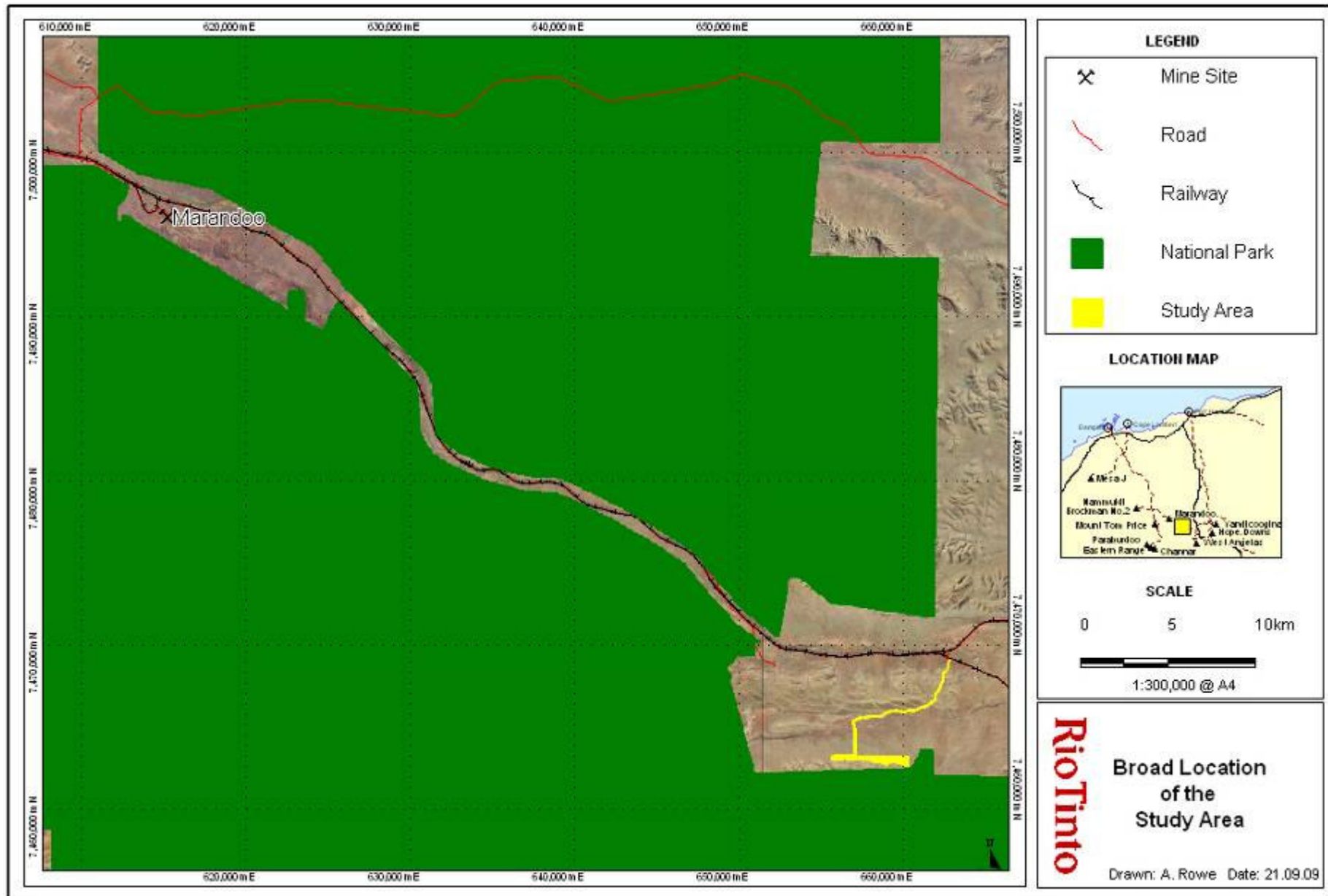


Figure 1.1: Broad location of the Juna Downs Drilling study area in relation to Marandoo Mine Site

## 1.4 Vegetation

### 1.4.1 IBRA Bioregions and Subregions

The study area is located within the Pilbara (PIL) bioregion, as defined in the Interim Bioregionalisation of Australia (IBRA) Report (Environment Australia 2000). The Pilbara Craton has been divided into 4 subregions; Chichester (PIL1), Fortescue Plains (PIL2), Hamersley (PIL3) and Roebourne (PIL4). Only the Hamersley Subregion of the Pilbara Craton is represented within the study area.

The Hamersley subregion comprises the southern section of the Pilbara craton and is characterised by mountainous areas of proterozoic sedimentary ranges and plateaux dissected by gorges (Kendrick 2001a). The vegetation typically consists of mulga woodland over bunch grasses on fine textured soils in valley floors and Snappy Gum (*Eucalyptus leucophloia*) over *Triodia brizoides* on skeletal soils in the ranges. The Hamersley subregion drains into the Fortescue River system to the north, the Ashburton to the south and the Robe to the west (Kendrick 2001a).

The extent of the proposed impact on the Hamersley subregion is quantified in Table 1.2 below.

**Table 1.2: Area of subregions in the Pilbara Bioregion to be impacted under the current clearing proposal.**

Subregion	Area of Subregion (ha)	Area of Subregion within Study Area (ha)	% subregion affected by proposal
Hamersley (PIL3)	6,215,092	181.4	0.0029

### 1.4.2 Beard's Regional Vegetation Mapping

Three vegetation associations have been identified within the study area based on the vegetation units of Beard (1975). These vegetation associations are:

- **Hamersley 567 – Hummock grasslands, shrub steppe; mulga & kanji over soft spinifex & *Triodia basedowii***  
*Acacia* mixed sparse shrubland over *Triodia* open hummock grassland.
- **Hamersley 18- Low woodland; mulga (*Acacia aneura*)**  
*Acacia* open shrubland over *Ptilotus* mixed open forbland
- **Hamersley 82 – Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana***  
*Eucalyptus* sparse mallee shrubland over *Senna* mixed sparse shrubland over *Triodia* open hummock grassland.

Given the scale of Beard’s mapping, these units are only broadly applicable to the vegetation types identified within the study area. The vegetation within the study area is described in greater detail in Section 3.1.

### 1.4.3 Pre-European Vegetation Extent

The pre-European and current extent of native vegetation associations in Western Australia has been interpreted by Shepherd *et al.* (2002) using data from Beard’s (1975) regional vegetation mapping and other vegetation mapping activities as well as satellite imagery and orthophoto interpretation.

Shepherd *et al.* (2002) identified the Pilbara Bioregion as having native vegetation largely intact owing to the absence of intensive agricultural land use practices. As a result, the current extent of Beard’s mapping units listed above has been estimated at 99.9% and 100% of their pre-European extent (Shepherd *et al.* 2002). Although the extent of the vegetation associations remains largely intact, its floristic composition and structural characteristics are likely to have been substantially altered since European settlement by grazing and inappropriate fire regimes (Shepherd *et al.* 2002).

Table 1.3 below presents the pre-European and current extent of the mapping units across its range and the extent of the mapping units within the current study area.

**Table 0.3: Beard’s mapping units within the study area, their current and pre-European extent (following Shepherd *et al.* 2002) and their extent across the study area.**

Beard’s Mapping Unit	Pre-European extent (ha) (Shepherd <i>et al.</i> 2002)	Current extent within Hamersley subregion (ha) (Shepherd <i>et al.</i> 2002)	Extent within study area (ha)	Extent within study area as % of current extent
Hamersley 18	24,675,970	24,659,110	12.9	0.00005
Hamersley 82	2,687,751	2,687,751	165.8	0.006
Hamersley 567	848,590	848,590	2.7	0.0003

## 1.5 Reserves and Conservation Areas

The main conservation reserve in the locality is the A-class Karijini National Park (see figure 1.1). The south-eastern boundary of the study area borders the National Park.

### **1.5.1 Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)**

Threatened Ecological Communities (TECs) are communities which have been found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable". TECs are informally listed by the DEC as they are not formally listed under WA legislation.

Kendrick (2001a) identified one TEC, *Themeda grasslands of Pilbara Region. Grassland plains dominated by the perennial Themeda (kangaroo grass) and many annual herbs and grasses*, as occurring within the Hamersley subregion of the Pilbara bioregion. The Themeda grasslands TEC does not occur within the study area. The closest location of this TEC is 78km north-west of the study area and it will not be either directly or indirectly impacted by the proposal.

Possible TECs that do not meet survey criteria for listing as TECs are added to DEC's Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. Ecological Communities 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, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

No ecological communities listed under the DEC's Priority Ecological Community List (DEC 2010a) occur within the study area. The closest PEC which comprises "Coolabah *Eucalyptus victrix* over *Muehlenbeckia*" occurs approximately 23km south-east of the study area. This PEC is unlikely to be directly or indirectly impacted on by the current proposal.

## **2. Methodology**

### **2.1 Desktop Study**

#### **2.1.1 Literature review**

Approximately 2.4% of the study area has been subjected to previous flora, vegetation and fauna surveys conducted by Mattiske Consulting in 1995 *Flora and Vegetation: Northern Transport Corridor: Yandi Junction* (Mattiske, May 1995) and RioTinto in 2009 *Botanical Survey for Tenement Exploration Drilling at Juna Downs South* (RioTinto, Sept 2009).

The flora and vegetation surveys by Mattiske & RioTinto did not record any conservation significant vegetation types or declared rare/priority flora within the Juna Downs study area.

### **2.2 Database Searches**

The NatureMap database maintained by the WA Museum and Department of Environment and Conservation (DEC) were searched on the 20<sup>th</sup> January 2011 for Declared Rare and Priority Flora, Schedule and Priority fauna encompassing an area of a 40 km radius around the study area (-22 55.59 °S 118.32.48 °E (WGS 84)) (See Appendix 4).

The Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) administered *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act) Protected Matters Search Tool was searched in January 2010 for Matters of National Environmental Significance recorded within and surrounding the study area (10 km radius around the study area) (Appendix 4).

Spatial data for rare flora and fauna held and maintained by RTIO was also searched as part of the desk top study. Any Ecologically Sensitive Areas (ESA), Reserves and/or conservation areas within or surrounding the study area were also identified using relevant GIS layers held by RTIO.

### **2.3 Flora and vegetation survey**

Approximately 77.2% (120 ha) of the study area was systematically traversed on foot using a grid search technique by Rio Tinto botanist Emil Thoma on the 26<sup>th</sup> May and the 14<sup>th</sup> of July 2009, while the remaining 41.4 ha (22.8%) of the study area (south-eastern section) was surveyed in the same fashion on the 23<sup>rd</sup> of October 2010.

All vascular plants encountered within the study area were recorded (Appendix 3). Where an individual plant was not readily identifiable in the field, a voucher specimen was collected, pressed in the field, assigned a

unique specimen code and identified at a later date. Plant specimens collected in the field were identified through the use of relevant published taxonomic keys and comparison with the WA Herbarium reference collection. Botanical data was entered into the Max3 database and nomenclature therefore follows the current listing of scientific names recognised by the Western Australian Herbarium.

Vegetation descriptions for the study area were based on Specht with modifications by Aplin and Trudgen (1977) (Appendix 1). Descriptions were made during traverses where changes in the vegetation structure and composition were observed. A photograph of each vegetation unit, and a location using a hand-held GPS (GDA 94 datum) was taken. These descriptions were then grouped based on similarities of composition, height and cover. Assessment of the overall condition of each vegetation unit was made based on Trudgen (1988) (Appendix 1).

## **2.4 Fauna**

No targeted fauna surveys were undertaken at the study area, rather, incidental sightings of fauna were recorded and available fauna habitats noted and assessed for any significant fauna.

### 3. Results

#### 3.1 Vegetation of the Study Area

Eighteen intact vegetation types were recorded within the study area, (Figure 3.1). Each vegetation type is described in Section 3.1.1 below.

The condition of the vegetation at the time of the survey ranged from Poor to Good. The vegetation along the proposed access track into the main drilling area (southern area) was in Poor condition due to the presence of fencing and grazing (main grazing impacts were around the well) as well as vehicle tracks across approximately 60% of the area. Approximately 10% of the area had also been affected by fire in the last 3 years. Weeds were present.

The vegetation within the main drilling area (southern section) was considered to be in Good condition due to the absence of human disturbances and weeds. The whole area had been affected by a fire event within the last 3 years.

##### 3.1.1 Vegetation Types

###### ***Vegetation Types within the Drilling Area***

###### Vegetation from Stony Hillslopes

###### **Vegetation Type 1 EgAsEiCHTbPmTtCd**

*Eucalyptus gamophylla* low open forest over *Acacia steedmanii* open scrub over *Eremophila longifolia* open shrubland over *Corchorus* sp. Hamersley Range low open shrubland over *Triodia basedowii* open hummock grassland over *Paraneurachne muelleri*, *Themeda triandra* open tussock grassland over *Cyperus dichotoma* very open sedges.

Vegetation condition: Good.

Fire last 3 years.

###### **Vegetation Type 2 EIScSeSsPrTpTbAcAl**

*Eucalyptus leucophloia* low open forest over *Sida cardiophylla*, *S. echinocarpa*, *Solanum sturtianum*, *Ptilotus rotundifolius* low open heath over *Triodia pungens*, *T. basedowii* hummock grassland over *Amphipogon caricinus*, *Aristida latifolia* very open tussock grassland over various *Ptilotus* very open herbs.

Vegetation condition: Good.

Fire last 3 years.



**Plate 3.1 Vegetation Type 1**

Photo taken south at 657121E 7463857N



**Plate 3.2 Vegetation Type 2**

Photo taken south-east at 657082E 7463099N



**Vegetation Type 3 EISpSfScTpTbPmTtEm**

*Eucalyptus leucophloia* low open forest over *Senna pruinosa*, *S. ferraria* open shrubland over *Sida cardiophylla* low shrubland over *Triodia pungens*, *T. basedowii* hummock grassland over *Paraneurachne muelleri*, *Themeda triandra*, *Eriachne mucronata* tussock grassland.

Vegetation condition: Good

Fire last 3 years



**Plate 3.3 Vegetation Type 3**

Photo taken east at 658269E 7462970N

Vegetation from Slight Slopes

**Vegetation Type 4 EIEgAiAsApAbPrSoTwTp**

*Eucalyptus leucophloia*, *E. gamophylla* low woodland over *Acacia inaequilatera*, *A. steedmanii* high open shrubland over *Acacia pachyacra*, *A. bivenosa* open shrubland over *Ptilotus rotundifolius*, *Senna oligophylla* low open shrubland over *Triodia wiseana*, *T. pungens* hummock grassland

Vegetation condition: Very good.

Fire last 3 years.



**Plate 3.4 Vegetation Type 4**

Photo taken north-east at 660382E 7462596N

**Vegetation Type 5 CdEgPrTwTpAc**

*Corymbia deserticola*, *Eucalyptus gamophylla* low open forest over *Ptilotus rotundifolius* low open shrubland over *Triodia wiseana*, *T. pungens* hummock grassland over *Amphipogon caricinus* very open tussock grassland.

Vegetation condition: Very good.

Fire last 3 years.



**Plate 3.5 Vegetation Type 5**

Photo taken: south-east at 660410E 7462952N

## Vegetation from Rocky Outcrops

### **Vegetation Type 6 EISgPrTpTMeTt**

*Eucalyptus leucophloia* low open woodland over *Senna glutinosa* open shrubland over *Ptilotus rotundifolius* low open shrubland over *Triodia pungens*, *Triodia* sp. Mt Ella hummock grassland over *Themeda triandra* open tussock grassland.

Vegetation condition: Very good.

Fire last 3 years.



### **Plate 3.6 Vegetation Type 6**

Photo taken: north-west at 660484E 7462462N

## Vegetation from Flats and Plains

### **Vegetation Type 7 ChCdEgAtPrSsTbAcAlAhPm**

*Corymbia hamersleyana*, *C. deserticola*, *Eucalyptus gamophylla* low open forest over *Acacia trudgeniana* open shrubland over *Ptilotus rotundifolius*, *Solanum sturtianum* low open shrubland over *Triodia basedowii* open hummock grassland over *Amphipogon caricinus*, *Aristida latifolia*, *A. holathera*, *Paraneurachne muelleri* tussock grassland.

Vegetation condition: Good.

Fire last 3 years.



**Plate 3.7 Vegetation Type 7**

Photo taken west at 660167E 7463109N

**Vegetation Type 8 ChGrSsPrPmTtSf**

*Corymbia hamersleyana* low open woodland over *Gossypium robinsonii*, *Stylobasium spathulatum* shrubland over *Ptilotus rotundifolius* low shrubland over *Paraneurachne muelleri*, *Themeda triandra* tussock grassland over *Schizachyrium fragile* open bunch grassland.

Vegetation condition: Good.

Fire last 3 years.



**Plate 3.8 Vegetation Type 8**

Photo taken west at 659850E 7463001N

**Vegetation Type 9 CdEgAsScTpPm**

*Corymbia deserticola*, *Eucalyptus gamophylla* low woodland over *Acacia steedmanii* shrubland over *Sida cardiophylla* low open heath over *Triodia pungens* very open hummock grassland over *Paraneurachne muelleri* tussock grassland.

Vegetation condition: Good.

Fire last 3 years.



**Plate 3.9 Vegetation Type 9**

Photo taken north at 657114E 7464107N

Vegetation from Minor Drainagelines

**Vegetation Type 10 EIAspSgCHRHsTpTMETt**

*Eucalyptus leucophloia* low woodland over *Acacia steedmanii* high open shrubland over *Senna pruinosa*, *S. glutinosa* shrubland over *Corchorus* sp. Hamersley Range, *Hibiscus sturtii* low open heath over *Triodia pungens*, *T.* Mt Ella hummock grassland over *Themeda triandra* tussock grassland.

Vegetation condition: Good.

Fire last 3 years.



**Plate 3.10 Vegetation Type 10**

Photo taken north at 655770E 7463101N

**Vegetation Type 11 EIGrAcTwTpTt**

*Eucalyptus leucophloia* low open woodland over *Gossypium robinsonii*, *Acacia cowleana* shrubland over *Triodia wiseana*, *T. pungens* open hummock grassland over *Themeda triandra* open tussock grassland. Vegetation condition: Very Good. Fire last 3 years.



**Plate 3.11 Vegetation Type 11**

Photo taken south-east at 660538E 7462529N

## **Access Track**

### Vegetation from Hillslopes

#### **Vegetation Type 12 EIAsAtAaSoPrTw**

*Eucalyptus leucophloia* low open forest over *Acacia synchronicia*, *A. tetragonophylla*, *A. atkinsiana* open shrubland over *Senna oligophylla*, *Ptilotus rotundifolius* low open shrubland over *Triodia wiseana* hummock grassland.

Vegetation condition: Good, track.

No recent fire.



#### **Plate 3.12 Vegetation Type 12**

Photo taken north-east at 661609E 7466367N

### Vegetation from Flats and Plains

#### **Vegetation Type 13 ChSspRISgTpTtAc**

*Corymbia hamersleyensis* scattered low trees over *Sida spiciform* panicles, *Rulingia luteiflora*, *Senna glutinosa* open heath over *Triodia pungens* hummock grassland over *Themeda triandra* very open tussock grassland over *Aristida contorta* very open bunch grassland.

Vegetation condition: Poor; track, dry.

Fire history unknown.



**Plate 3.13 Vegetation Type 13**

Photo taken north-east at 660932E 7466084N

**Vegetation Type 14 EtAaAsTwTI**

*Eucalyptus trivalva*, *Acacia aneura* low open forest over *Acacia synchronicia* scattered shrubs over *Triodia wiseana*, *T. longiceps* hummock grassland.

Vegetation condition: Good, track.

No recent fire.



**Plate 3.14 Vegetation type 14**

Photo taken east at 662492E 7468056N



*Clay flats*

**Vegetation Type 15 AaVfSoIaPg**

*Acacia aneura* high open shrubland over \**Vachellia farnesiana* open heath over *Senna oligophylla* low open shrubland over *Ischaemum albovillosum* very open tussock grassland over various bunch grasses, (bunch grass dead) over *Ptilotus gomphrenoides* open herbs.  
Vegetation condition: Poor; track, grazing, dry.  
No recent fire.



**Plate 3.15 Vegetation Type 15**

Photo taken north east at 657456E 7465514N

**Vegetation Type 16 VfIaAISb**

\**Vachellia farnesiana* open shrubland over *Ischaemum albovillosum*, *Aristida latifolia* open tussock grassland over various bunch grasses, open bunch grassland over *Streptoglossa bubakii* herbs.  
Vegetation condition: Poor; track, grazing, dry.  
No recent fire.



**Plate 3.16 Vegetation Type 16**

Photo taken north east at 657051E 7465168N

*Mulga Flats*

**Vegetation Type 17 AaApEFTw**

*Acacia aneura* var. *pilbarana*, *A. pruinocarpa* open scrub over *Eremophila fraseri* open shrubland over *Triodia wiseana* hummock grassland.

Vegetation condition: Poor; track, dry.

No recent fire.

**Vegetation Type 18 AaApEpSfTwTmDsEp**

*Acacia aneura* var. *pilbarana*, *A. pruinocarpa* open scrub over *Eremophila phyllopoda* shrubland over *Sida fibulifera* low scattered shrubs over *Triodia wiseana*, *T. melvillei* hummock grassland over *Dichanthium sericeum* scattered tussock grass over *Enneapogon polyphyllus* very open bunch grassland.

Vegetation condition: Poor; track, fence, dry conditions.

No recent fire.



**Plate 3.17 Vegetation Type 17**

Photo taken east at 658414E 7465606N



**Plate 3.18 Vegetation Type 18**

Photo taken north at 662791E 7468785N

### **3.1.2 Vegetation of Conservation Significance**

None of the vegetation types occurring within the study area are listed as Threatened Ecological communities under either the EPBC Act or under the State listing maintained by DEC (2010b).

The Mulga over spinifex vegetation types 17 & 18 may be considered to be ecosystems at risk, being under threat from frequent bushfires preventing regeneration of the *Acacia* overstorey (Kendrick, 2001). The

small amount of clearing however is unlikely to significantly impact this ecological community at either a local or regional scale.

The remaining vegetation types identified in the study area represent units that are likely to be more widely distributed and relatively well represented in the Hamersley subregion.

## 3.2 Flora of the Study Area

### 3.2.1 Overview of flora within the Study Area

A total of 225 native vascular plant species from 97 plant genera belonging to 35 plant families were recorded within the study area (Appendix 3). The list of plant species recorded in this area includes two Priority 3 flora species *Triodia* sp. Mt Ella (M.E. Trudgen 12739) and *Sida* sp. Barlee Range (S. van Leeuwen 1642). In addition, 3 weed species from 3 genera and 3 families were also recorded in the study area.

In comparison with a similar survey at Marandoo East (20km north west of the study area), which was 165.9 ha in size and recorded 213 taxa of native species from 100 genera and 42 families (Rio Tinto, August 2009), the number of species recorded in the study area appears to be in the expected range for a survey of this size in the locality.

A breakdown of the number of native taxa in the dominant plant families and genera are provided in Table 3.1. These families and genera are those that are generally most diverse and abundant in the vegetation of the Pilbara, and usually have most representation on flora lists from the region.

**Table 3.1: Dominant Families and Genera**

Family	No. of taxa	Genera	No. of taxa
Fabaceae	51	<i>Acacia</i>	25
Poaceae	37	<i>Sida</i>	12
Malvaceae	29	<i>Senna</i>	12
Amaranthaceae	13	<i>Ptilotus</i>	10
Goodeniaceae	10	<i>Eremophila</i>	8

### 3.2.2 Flora of Conservation Significance

The framework under which conservation significance is assigned to WA flora species is presented in Appendix 2.

### 3.2.3 Potential Conservation Significant Flora Known in the Locality

Searches of the DEC Threatened Flora Database and the WA Herbarium identified *Lepidium catapycnon* and *Thryptomene wittweri* as the only Declared Rare Flora (DRF) species that occur within the Pilbara region.

Neither *Lepidium catapycnon* nor *Thryptomene wittweri* have previously been recorded in the Marandoo/Juna Down locality. While the study area does not contain suitable habitat for *Thryptomene wittweri*, it does somewhat for *Lepidium catapycnon* (low stony hills & occasionally stony plains in the Hamersley subregion), however this species has never been recorded from the vicinity of the current study area and with the species'

perennial growth form and distinctive zig zag stem it is unlikely it would have been missed.

Rare flora database searches with the DEC and Rio Tinto Iron Ore's GIS database listed fourteen Priority Flora taxa potentially occurring in the area (Table 3.2).

**Table 3.2: Priority flora returned by database searches for a 20km radius around the study area.**

Scientific Name	Conservation Listing		Habitat
	WCA	EPBCA	
<i>Acacia effusa</i>	P4	NA	Low, dense, spreading, somewhat viscid shrub, 0.3–1 m high, bark 'minni-ritchi'. Fl. yellow, May–Aug. Stony red loam. Scree slopes of low ranges
<i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	NA	Annual herb which has been recorded in clay and clay loam habitats along drainage lines and sheetwash mulga plains.
<i>Dampiera metallorum</i>	P3	NA	Rounded, multistemmed perennial, herb. Grows on skeletal red-brown gravelly soil over banded ironstone. Prefers steep slopes, summits of hills
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	P4	NA	Shrub grows on skeletal soils over ironstone on rocky screes
<i>Eremophila forrestii</i> subsp. <i>Pingandy</i> (M.E. Trudgen 2662)	P2	NA	Description not available.
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	P1	NA	Shrub, 0.5–1.5 m high. Fl. blue, purple, Aug–Sep. Prefers skeletal soils over ironstone. Summits
<i>Indigofera gilesii</i> subsp. <i>gilesii</i> ms	P3	NA	Shrub, grows on pebbly loam amongst boulders & outcrops, hills
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	P2	NA	Description not available.
<i>Pilbara trudgenii</i> ms	P2	T	Gnarled, aromatic shrub, to 1 m high. Fl. Sep. Skeletal, red stony soil over ironstone. Prefers hill summits, steep slopes, screes, cliff faces
<i>Rhodanthe ascendens</i>	P1	NA	Ascending annual, herb, to 0.1 m high. Fl. yellow, Aug. Clay. Prefers roadside verge
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	NA	Herb or shrub, grows on ironstone soils, near creeks, rocky hills

## Botanical Survey for Drilling at Juna Downs

<i>Spartothamnella puberula</i>	P2	NA	Shrub, 0.35–1.5 m high. Fl. blue, white, Sep–Nov. Rocky loam, sandy or skeletal soils, clay. Sandplains, hills
<i>Thryptomene wittweri</i>	R	NA	Spreading or rounded shrub, 0.5–1.5(–2.1) m high. Fl. white, cream, Apr/Jul/Aug. Skeletal red stony soils. Breakaways, stony creek beds.
<i>Vittadinia</i> sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	NA	Description not available.

None of these flora species were recorded during the survey (see section 3.2.4). Several flora species listed in Table 3.2 are considered unlikely to occur at the site given that either:

- Available habitats within the study area are not suitable,
- The species is perennial and readily identifiable in the field and therefore unlikely to have been overlooked during comprehensive traverses of the site by Rio Tinto botanists.

The study area provides suitable habitat for the Priority species' *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684), *Rhodanthe ascendens*, *Rostellularia adscendens* var. *latifolia* and *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662), however, these species may have been overlooked due to their short-lived, annual life-cycle, or their unidentifiable state due to the dry conditions at the time of the survey.

### **3.2.4 Priority Flora Recorded from the Study Area**

Two Priority 3 species; *Triodia* sp. Mt Ella (M.E. Trudgen 12739) and *Sida* sp. Barlee Range (S. van Leeuwen 1642) were recorded in the study area.

#### ***Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)**

One individual plant of this low shrub was recorded within the study area at 656492E, 7463047N (see figure 3.2).

*Sida* sp. Barlee range has been found at a number of sites from the upper Gascoyne (Barlee Range) to the Tom Price region and south to Turee Creek (Florabase, 2010). The range extends for over 220km in an east-west direction and 250km from Turee Creek to Hamersley Station.

Due to the fairly wide distribution of the species through the Pilbara region (a range of 600km from the Ashburton to the East Pilbara (Florabase, 2010)) the disturbance of a single plant is unlikely to impact on the conservation significance of this species.

***Triodia* sp. Mt Ella (M.E. Trudgen 12739) (Priority 3)**

*Triodia* sp. Mt Ella was recorded 13 times within the main drilling study area. The populations ranged from 20 to over 100 individuals with the total plants within the study area estimated at 500 to 600 (see figure 3.2).

This resinous spinifex species is only known from a small area of the Hamersley Range in the vicinity of Mt Ella. It has been recorded numerous times from stony hills habitat in the West Angelas area, and is considered to be geographically restricted and uncommon, but unlikely to be rare (Trudgen and Casson 1998). The current clearing proposal is unlikely to impact on the conservation significance of this species

**Table 3.3: *Triodia* sp. Mt Ella (M.E. Trudgen 12739) locations**

Species Name	Easting	Northing	No
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	657666	7462994	50+
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	658996	7462683	
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	659433	7462949	20
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	659509	7462923	
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	657560	7463096	50+
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	657525	7463150	
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	656796	7463027	100+
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	656492	7463047	scattered
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	656284	7463067	30+
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	655778	7463049	
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	660484	7462462	50
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	600198	7462503	10
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	660009	7462656	50+
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	659750	7462713	50

**3.2.5 Introduced Flora**

Three introduced flora species were recorded throughout the existing and proposed access track; *Bidens bipinnata* (Bipinnate Beggartick), *Malvastrum americanum* (Spiked Malvastrum) and *Vachellia farnesiana* (Mimosa Bush). No weeds were observed within the main drilling area.

While none of these species are Declared Plants under the *Agriculture and Related Resources Protection Act 1976*; a strict weed hygiene procedure should still be followed to prevent further spread or contamination to surrounding areas, especially to Karijini National Park.



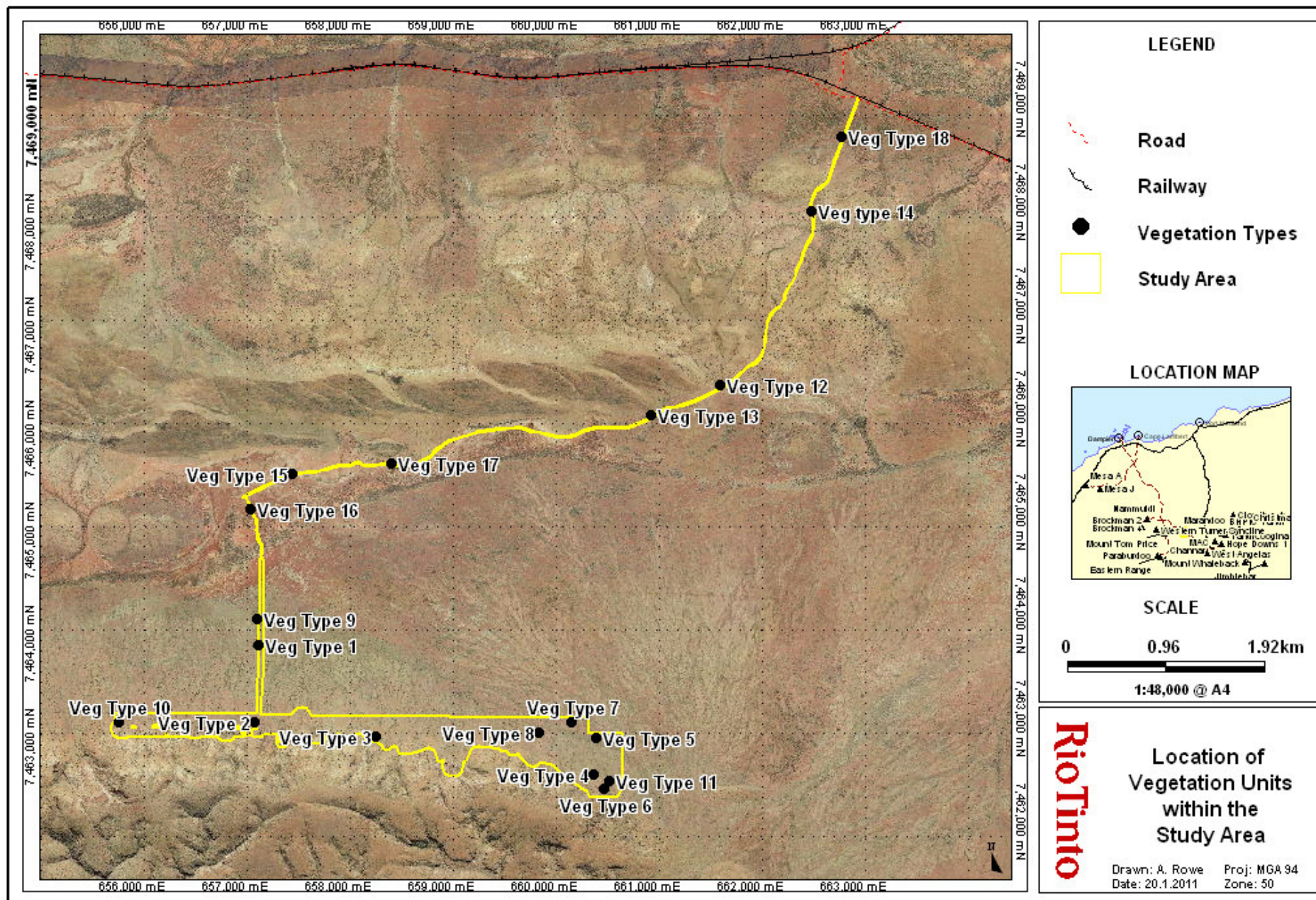


Figure 3.1: Location of Vegetation Units within the Juna Downs Study Area

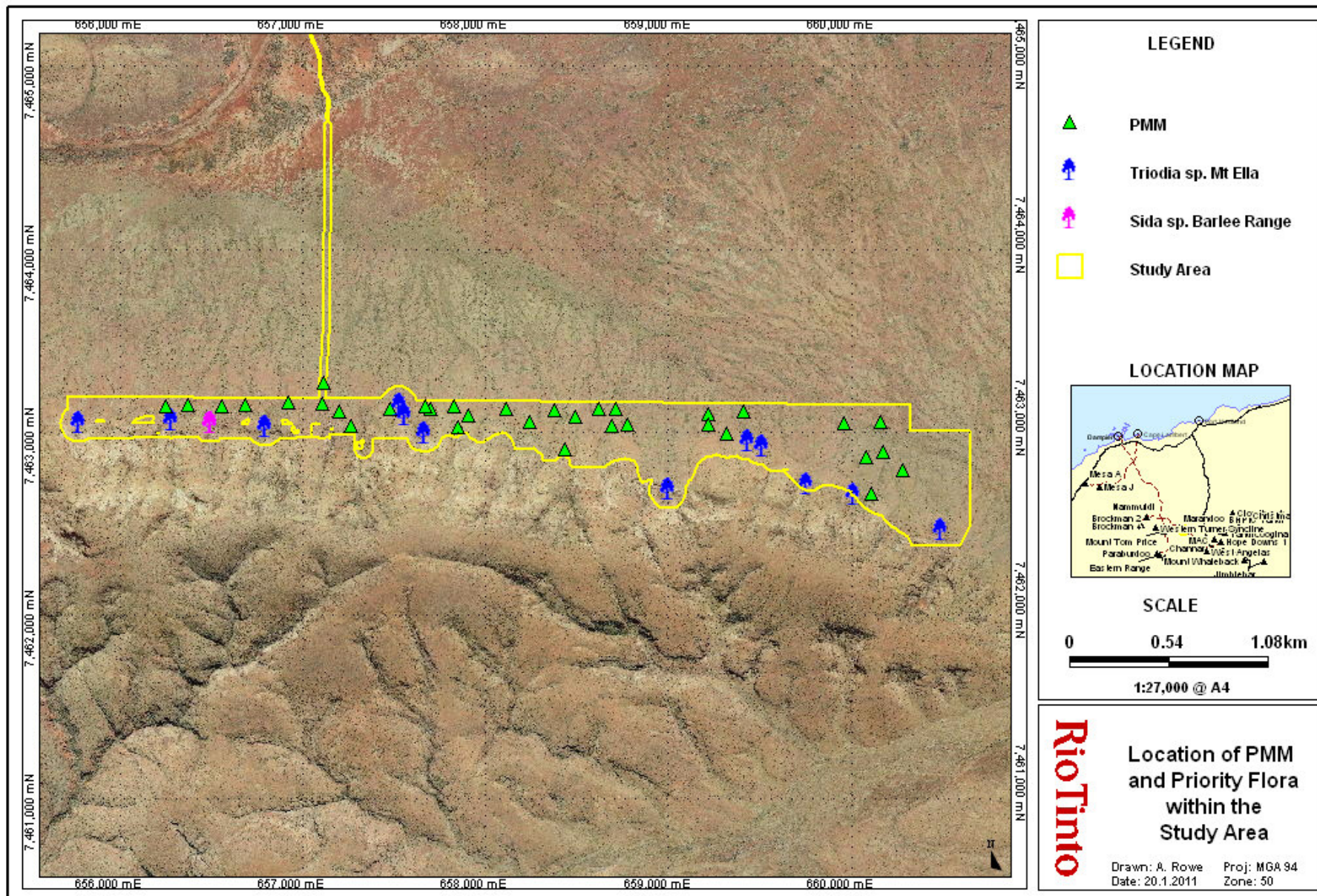


Figure 3.2: Location of Priority Flora and Western Pebble-mound Mouse mounds (PMM) within the Juna Downs Study Area

### 3.3 Fauna of the Study Area

Databases maintained by the WA Museum and the Department of Environment and Conservation (DEC) were searched for Schedule and Priority fauna (see Appendix 4). A search for Protected Matters in the locality according to the *EPBC Act 1999* was also conducted (Appendix 4)

Evidence of one Priority 4 fauna species; Western Pebble-mound Mouse (*Pseudomys chapmani*) was sighted during the survey of the study area (Section 3.3.2). In addition, no significant fauna habitats such as caves, basalt/dolerite rock piles, waterholes, termite mounds, sandy banks, significant riparian vegetation, or significant tree hollows, were observed within the study area.

#### 3.3.1 Desktop Fauna Survey Results

A review of the databases identified 12 conservation significant fauna species as potentially occurring within the study area (Table 3.4).

A number of species returned by the fauna database searches are unlikely to occur at the site due to lack of suitable habitat. The habitat requirements of conservation significant fauna and their likelihood of occurrence within the study area are considered below.

**Table 3.4 Fauna of conservation significance within a 20km radius database search results**

Species	State Level	Federal Level
Night Parrot ( <i>Pezoporus occidentalis</i> )	Schedule 1	Critically Endangered
Northern Quoll ( <i>Dasyurus hallucatus</i> )	Schedule 1	Endangered
Orange Leaf-nosed Bat ( <i>Rhinonicteris aurantius</i> )	Schedule 1	Vulnerable
Pilbara Olive Python ( <i>Liasis olivaceus barroni</i> )	Schedule 1	Vulnerable
Australian Bustard ( <i>Ardeotis australis</i> )	Priority 4	-
Western Pebble-mound Mouse ( <i>Pseudomys chapmani</i> )	Priority 4	-
Short-tailed Mouse ( <i>Leggadina lakedownensis</i> )	Priority 4	-
Oriental Plover ( <i>Charadrius veredus</i> )	-	Migratory
Fork-tailed Swift ( <i>Apus pacificus</i> )	-	Migratory
Rainbow Bee-eater ( <i>Merops ornatus</i> )	-	Migratory
Great Egret ( <i>Ardea alba</i> )	-	Migratory
Cattle Egret ( <i>Ardea ibis</i> )	-	Migratory

### **3.3.2 Likelihood of Occurrence and Impact Assessment**

#### **Potential Schedule 1 (WC Act) and Endangered (EPBC Act) Fauna Species**

##### **Northern Quoll *Dasyurus hallucatus* (Schedule 1)**

The Northern Quoll occurs in a range of habitats including open forest, monsoon rainforest, and savannah woodlands and is most abundant in rocky environments (IUCN 2008). The study area may provide foraging habitat for this species, however the loss of 181.4 ha of fragmented vegetation is unlikely to impact this species, which is known to maintain home ranges of 100 ha (van Dyck and Strahan 2008).

#### **Potential Schedule 1 (WC Act) and Vulnerable (EPBC Act) Fauna Species**

##### **Pilbara Orange Leaf-nosed Bat *Rhinonictotis aurantius* (Scheduled 1)**

The Pilbara Leaf-nosed Bat inhabits abandoned mine shafts, granite rock pile terrain of the east Pilbara and caves formed in gorges that dissect sedimentary geology in the West Pilbara (van Dyck and Strahan 2008). The species has been recorded from sites across the Pilbara bioregion but is rare in all parts of its range.

This species is more influenced by the availability of suitable roost caves than by habitat type (Churchill 1998). There is no suitable roosting habitat (caves) within or adjacent to the study area, therefore it is unlikely the proposed clearing will have any impact on this species.

##### **Pilbara Olive Python *Liasis olivaceus barroni* (Scheduled 1)**

The Pilbara Olive Python is known from throughout the Hamersley and Chichester Ranges, parts of the East Pilbara, the Burrup Peninsula and the Barlee Range Nature reserve. This species typically shelters in logs, flood debris, caves, tree hollows and thick vegetation close to water and rock outcrops (Burbidge 2004).

The study area does not contain habitat suitable for the Pilbara Olive Python, therefore it is unlikely the proposed clearing will have any impact on this species.

#### **Potential Priority (WC Act) Fauna Species**

##### **Western Pebble-Mound Mouse *Pseudomys chapmani* (Priority 4)**

The Western Pebble-mound Mouse (PMM) is confined to the central and eastern Pilbara including Karijini National Park (Menkhorst and Knight 2001). The species is found on stony hillsides with hummock grasslands (Menkhorst and Knight 2001), and is common to very common in suitable

habitat within the Hamersley and Chichester subregions of the Pilbara bioregion.

34 mounds belonging to the PMM were observed within the study area (Table 3.5; Figure 3.2). While this species was recorded within the study area, the small scale clearing suggests that impacts are likely to be restricted to a small number of individuals only. Avoidance of PPM mounds during clearing will mitigate impact on this species, allowing it to disperse into unaffected habitats which border the study area.

**Table 3.5 Western Pebble-mound Mouse (*Pseudomys chapmani*) locations**

	<b>Easting</b>	<b>Northing</b>		<b>Easting</b>	<b>Northing</b>
<b>PMM</b>	657113	7463268	<b>PMM</b>	658709	7463128
<b>PMM</b>	657106	7463160	<b>PMM</b>	658691	7463039
<b>PMM</b>	657262	7463033	<b>PMM</b>	658618	7463127
<b>PMM</b>	657852	7463032	<b>PMM</b>	658492	7463086
<b>PMM</b>	658435	7462907	<b>PMM</b>	658380	7463118
<b>PMM</b>	660107	7462668	<b>PMM</b>	658238	7463057
<b>PMM</b>	660278	7462792	<b>PMM</b>	658113	7463126
<b>PMM</b>	660157	7463054	<b>PMM</b>	657906	7463095
<b>PMM</b>	660169	7462896	<b>PMM</b>	657826	7463140
<b>PMM</b>	660078	7462862	<b>PMM</b>	657701	7463127
<b>PMM</b>	659959	7463049	<b>PMM</b>	657674	7463140
<b>PMM</b>	659407	7463116	<b>PMM</b>	657479	7463127
<b>PMM</b>	659315	7462991	<b>PMM</b>	657202	7463116
<b>PMM</b>	659218	7463044	<b>PMM</b>	656256	7463146
<b>PMM</b>	659218	7463101	<b>PMM</b>	656372	7463149
<b>PMM</b>	658774	7463043	<b>PMM</b>	656562	7463141
<b>PMM</b>	656921	7463163	<b>PMM</b>	656689	7463151

#### **Australian Bustard *Ardeotis australis* (Priority 4)**

The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the state. This species prefers open or lightly wooded grassland including *Triodia* sand plains and is considered scarce to common depending on season and habitat (Johnstone and Storr 1998).

The Australian Bustard may periodically occur within the study area; however the loss of 181.4 ha of fragmented vegetation is unlikely to affect the conservation status of this highly mobile species.

#### **Short-tailed Mouse (*Leggadina lakedownensis*) (Priority 4)**

In Western Australia the distribution of this priority 4 species includes the Pilbara and Kimberley regions (Menkhorst and Knight 2001). Regional records suggest that the primary mainland habitat comprises areas of cracking clay and adjacent habitats, although this species has also been recorded from hilltops and sandy coastal areas near Onslow.

Although *L. lakedownensis* may potentially occur with the study area at times, the loss of 181.4 ha of fragmented vegetation is unlikely to affect the conservation status of this species.

### **Migratory Species**

#### **Oriental Plover *Charadrius veredus* (Migratory)**

The Oriental Plover occurs mainly in the Kimberley and north-eastern interior and is considered a casual visitor elsewhere. The species typically inhabits sparsely vegetated plains, beaches and tidal flats (Johnstone and Storr 1998).

This species may occur within the study area over the summer months (September to March). However the small amount of proposed clearing is not expected to affect the conservation status of this highly mobile species.

#### **Fork-tailed Swift *Apus pacificus* (Migratory)**

This species has a temporally and spatially patchy distribution throughout Australia and has the potential to occur over all habitat types. It may occur in the study area at irregular intervals. The relatively small scale of the proposed activities is unlikely to affect the conservation status of this species.

#### **Rainbow Bee-eater *Merops ornatus* (Migratory)**

The Rainbow Bee-eater is a regular breeding migrant to most of Australia with the exception of Tasmania. The species nests in small holes excavated in sandy banks or flat sandy surfaces (Johnstone and Storr 1998) and occurs in habitats that provide suitable soil for nesting and a tall stratum of vegetation for perching (Higgins 1999).

This species may forage within the study area however, due to a lack of suitable habitat, the species is unlikely to breed. Suitable foraging habitat is widespread across the Hamersley subregion and more broadly across the Pilbara bioregion. The activities will not impact the conservation status of this species.

#### **Great Egret *Ardea alba* (Migratory)**

The Great Egret occurs throughout most of Western Australia, where it is common in the Kimberley and moderately common elsewhere. The species is found mainly around shallow fresh water such as river pools, lakes, large dams and sewage ponds (Johnstone and Storr 1998).

Due to a lack of suitable habitat, the species is unlikely to occur within the study area; hence the activities will not impact the conservation status of this species.

#### **Cattle Egret *Ardea ibis* (Migratory)**

The Cattle Egret is a casual visitor to most of Western Australia. The species prefers well-watered areas such as damp pastures and wetlands, and is not common in arid areas (Johnstone and Storr 1998).

The Cattle Egret is unlikely to occur within the study area due to a lack of suitable habitat.

## **4. Statement Addressing the 10 Clearing Principles**

Under Part V Division 2 of the *Environmental Protection Act 1986*, any clearing of native vegetation will require a permit except where an exemption applies under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, and it is not in an Environmentally Sensitive Area.

Section 4.1 below provides an assessment of the proposed project against the "10 Clearing Principles", as defined under Schedule 5 of the EP Act, to determine whether it is at variance to the Principles.

### **4.1 Clearing Principles**

#### **4.1.1 Comprises a high level of biological diversity**

Eighteen intact vegetation types were recorded from the study area, all of which are relatively typical of the locality and are widely represented throughout the Pilbara bioregion. The total number of flora species recorded from the study area was deemed to be within the expected range for a study area of this size in the locality, and is not considered to represent high species richness. The proposed clearing will therefore not impact any features of high biological diversity.

#### **4.1.2 Potential impact to any significant habitat for fauna indigenous to Western Australia**

The primary habitats present within the study area are reasonably widespread and abundant in the Juna Downs locality. While some scheduled or priority fauna species may utilise the available habitats, the relatively small scale of the proposed development and the lack of specialised habitat suggests that the proposal represents a low risk of significant impact to any conservation significant fauna.

#### **4.1.3 Potential impact to any rare flora**

The entire study area was traversed by one Rio Tinto botanist in May and July 2009 and in October 2010. No Declared Rare flora or EPBC Act listed threatened flora were observed within the study area.

Two Priority 3 species; *Triodia* sp. Mt Ella (M.E. Trudgen 12739) and *Sida* sp. Barlee Range (S. van Leeuwen 1642) were recorded in the study area. As these species are not restricted to the study area it is considered that the clearing of vegetation within the study area is unlikely to affect the conservation status of this species.

#### **4.1.4 Presence of any Threatened Ecological Communities**

No Threatened Ecological Communities or Priority Ecological Communities occur within the study area.

#### **4.1.5 Significance as a remnant of native vegetation in the area that has been extensively cleared**

The majority of the Pilbara region has never been extensively cleared however grazing, inappropriate fire regimes and weed invasion have greatly altered the vegetation in some areas. Historical clearing has taken place for the Marandoo mine area and associated infrastructure; however this is negligible in comparison to the Pilbara-wide representation of Beards vegetation units mapped for the study area; Hamersley 567 (Hummock grasslands, shrub steppe; mulga & kanji over soft spinifex & *Triodia basedowii*), Hamersley 18 (Low woodland; mulga (*Acacia aneura*)) and Hamersley 82 (Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*)

The clearing of vegetation for the current proposal will therefore have no impact on remnant vegetation as there are no remnant vegetation areas or unique stands of vegetation occurring within the current clearance proposal.

#### **4.1.6 Impact on any watercourses and/or wetlands**

There are no swamps, major watercourses, local wetlands, 'Wetlands of Regional Significance' or 'Wetlands of National Significance' occurring within the Study area. The clearing of vegetation within the study area is therefore considered as being unlikely to have any significant impact on watercourses or wetlands.

#### **4.1.7 Potential to cause appreciable land degradation**

The Land Systems within the study area are largely erosion resistant (Van Vreeswyk *et al* 2004). These landscapes are the end point of millions of years of erosion and withstand massive rainfall events associated with summer cyclone events on an annual basis without any appreciable increase in land degradation or erosion.

While the small scale, low impact clearing of the intact native vegetation may exacerbate the spread of weeds through these areas, this is unlikely to cause any appreciable degradation much beyond the immediate clearing envelope.

#### **4.1.8 Potential to impact on the environmental values of any adjacent or nearby conservation areas**

The study area borders on the A-class Karijini National Park.

The proposed drilling activities are considered unlikely to impact on the environmental values of the National Park, beyond what likely impacts have already occurred due to the surrounding developments and infrastructure e.g. Marandoo mine, railway line, access tracks and roads. However a strict weed hygiene procedure is required to prevent further spread or contamination of weed species to the National Park.



**4.1.9 Potential deterioration in the quality of surface or underground water**

The very minor flowlines within the study area would only flow after or during seasonal flood events, or substantial localised falls. Given the proposed drilling activities are low impact ground disturbances over a relative minimal area; it is unlikely that any alteration will occur to surface runoff or groundwater recharge characteristics.

**4.1.10 Potential of clearing to cause, or exacerbate, the incidence or intensity of flooding**

As the proposed drilling activities are low impact ground disturbances over a minimal area, it is unlikely that clearing will significantly increase runoff flow volumes within the study area. It is thus considered unlikely that the clearing of vegetation in the study area will cause, or exacerbate, the incidence of flooding.

## **5. Recommendations**

The following recommendations are made to minimise impacts to the conservation value of vegetation and flora of the areas surrounding the study area;

- In general clearing should be kept to a minimum
- All efforts should be made to avoid the locations of the priority flora and mounds of the Western Pebble-mound Mouse.
- Strict weed hygiene protocols are to be implemented during clearing of the study area in order to prevent vehicles and machinery spreading weed seed or soil material outside the study area, especially within Karijini National Park.

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## 7. Appendices

### Appendix 1: Vegetation Structural Classification\* and Condition Rating Scale.

#### Vegetation Structural Classes\*

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, Sedges, Herbs	Closed tussock grassland / sedgeland / herbland	Tussock grassland / sedgeland / herbland	Open tussock grassland / sedgeland / herbland	Very open tussock grassland / sedgeland / herbland	Scattered tussock grasses / sedges / herbs

\*Based on (Muir 1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970): Aplin T.E.H. (1979). The Flora. Chapter 3 In O'Brien, B.J. (ed.) (1979). *Environment and Science*. University of Western Australia Press; Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. *Records of the Western Australian Museum, Suppl.* No. 3; Specht R.L. (1970). Vegetation. In *The Australian Environment*. 4th edn (Ed. G.W. Leeper). Melbourne.

## Botanical Survey for Drilling at Juna Downs

### Vegetation Condition Scale for use on Pilbara surveys\*

<b>E = Excellent</b> (=Pristine of BushForever) Pristine or nearly so; no obvious signs of damage caused by the activities of European man.
<b>VG = Very Good</b> (= Excellent of BushForever) Some relatively slight signs of damage caused by the 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 <i>*Ursinia anthemoides</i> or <i>*Briza</i> spp., or occasional vehicle tracks.
<b>G = Good</b> (= Very Good of BushForever) More obvious signs of damage caused by the activities of European man, including some obvious 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 <i>*Ehrharta</i> spp.
<b>P = Poor</b> (= Good of BushForever) Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some more aggressive ones such as <i>*Ehrharta</i> spp.
<b>VP = Very Poor</b> (= Degraded of BushForever) 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.
<b>D = Completely Degraded</b> (= Completely Degraded of BushForever) 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.

\* Based on Trudgen M.E. (1988). A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

## **Appendix 2: Framework for Conservation Significance Ranking for Flora and Fauna Species**

### **Legislative Framework for Conservation Significant Flora *Wildlife Conservation Act 1950***

All native flora in Western Australia is protected under the state *Wildlife Conservation Act 1950*. Protected flora which are deemed to be at risk of extinction, rare, or otherwise in need of special protection are listed as "Rare Flora" and published in the *Wildlife Conservation (Rare Flora) Notice 2008*. Specific written approval by the Minister for the Environment is required to take or harm species listed in Schedule 1 or 2 of the *Wildlife Conservation (Rare Flora) Notice 2008*. Flora species which may be rare or threatened in Western Australia but which have not been adequately surveyed for are included in a supplementary conservation list called the Priority Flora List.

In addition to state legislation, some Western Australian native plant species are protected under federal law, namely the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In the Pilbara, two species *Lepidium catapycnon* and *Thryptomene wittweri* are currently listed as "Vulnerable" under the EPBC Act. Proposals that are considered likely to have a significant impact on EPBC Act listed threatened flora are required to be referred to the Federal Minister of Environment for approval.

### **Categories of conservation significance for flora species under the *Wildlife Conservation Act 1950* (Atkins 2006)**

**Declared Rare Flora - Extant Taxa-** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection

**Declared Rare Flora - Presumed Extinct Taxa-** Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently,

**Priority One - Poorly known Taxa-** Taxa which are known from one or a few (generally <5) populations which are under threat.

**Priority Two - Poorly Known Taxa-** Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat.

**Priority Three - Poorly Known Taxa-** Taxa which are known from several populations, and the taxa are not believed to be under immediate threat.

**Priority Four - Rare Taxa-** Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors.

## **Legislative Framework for Conservation Significant Fauna *Wildlife Conservation Act 1950-1979***

Native fauna species that are rare, threatened with extinction, or have high conservation value are specially protected by law under the Western Australian *Wildlife Conservation Act 1950-1979* (WC Act). The *Wildlife Conservation (Special Protected Fauna) Notice* classifies rare and endangered fauna using four distinct conservation codes or schedules (see below).

In addition to the above schedules, the DEC produces a supplementary list of Priority Fauna. Priority Fauna are species that have been identified as requiring further survey and evaluation of their conservation status before deciding whether to list them as Schedule Fauna. Five Priority codes are recognised by the DEC and are presented below

### **DEC Priority Fauna codes**

**Priority One:** Taxa with few, poorly known populations on threatened lands. Taxa which are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Two:** Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Three:** Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

**Priority Four:** Taxa in need of monitoring. Taxa which are considered to have been adequately circumstances change. These taxa are usually represented on conservation surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present lands. Taxa which are declining significantly but are not yet threatened.

**Priority Five:** Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.



### ***Environmental Protection and Biodiversity Conservation Act 1999***

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* affords protection to species, populations and ecological communities threatened at a national level or to species listed as migratory under various international agreements (e.g. CAMBA, JAMBA RoKAMBA, Bonn Convention). Categories relevant to the current study include:

Endangered – Taxa facing a very high risk of extinction in the wild in the near future.

Vulnerable – Taxa facing high risk of extinction in the wild in the medium-term.

Under the EPBC Act, a proposal which is likely to have a significant impact on threatened species, populations or ecological communities or migratory species must be referred to DEWHA for a decision by the Commonwealth Minister for the Environment. A significant impact is determined through application of Significant Impact Criteria (DEWHA 2000).

### **Categories of conservation significance for fauna species under the Wildlife Conservation Act 1950 (Atkins 2006)**

Native fauna species that are rare, threatened with extinction, or have high conservation value are specially protected by law under the Western Australian *Wildlife Conservation Act 1950-1979* (WC Act). The *Wildlife Conservation (Special Protected Fauna) Notice* classifies rare and endangered fauna using four distinct conservation codes or schedules.

**Schedule 1** – Fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.

**Schedule 2** – Fauna which are presumed to be extinct and are declared to be fauna in need of special protection.

**Schedule 3** – Birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection, and

**Schedule 4** – Fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

**EPBC Act Significant Impact Criteria**  
**Conservation Significant Impact Criteria**  
**Code**

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<b><i>Critically Endangered and Endangered Species</i></b>	An action is likely to have a significant impact on critically endangered or endangered species if there is a real chance or possibility that it will: Lead to a long-term decrease in the size of a <i>population</i> , or Reduce the area of occupancy of the species, or Fragment an existing <i>population</i> into two or more populations, or Adversely affect habitat critical to the survival of a species, or Disrupt the breeding cycle of a population, or Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or Interfere with the recovery of the species.
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### Appendix 3: List of Flora Species Recorded from the Study Area

Family	Species
<b>Family: Acanthaceae (325)</b>	<i>Dipteracanthus australasicus</i> subsp. <i>corynothecus</i>
<b>Family: Adiantaceae (007)</b>	<i>Cheilanthes brownii</i> <i>Cheilanthes sieberi</i>
<b>Family: Amaranthaceae (106)</b>	<i>Alternanthera nodiflora</i> <i>Gomphrena cunninghamii</i> <i>Gomphrena kanisii</i> <i>Ptilotus astrolasius</i> <i>Ptilotus calostachyus</i> <i>Ptilotus carinatus</i> <i>Ptilotus clementii</i> <i>Ptilotus exaltatus</i> <i>Ptilotus gaudichaudii</i> <i>Ptilotus gomphrenoides</i> <i>Ptilotus helipteroides</i> <i>Ptilotus obovatus</i> <i>Ptilotus rotundifolius</i>
<b>Family: Araliaceae (280)</b>	<i>Astrotricha hamptonii</i> <i>Trachymene oleracea</i>
<b>Family: Asteraceae (345)</b>	* <i>Bidens bipinnata</i> <i>Calocephalus</i> sp. Wittenoom (A.S. George 1082) <i>Centipeda minima</i> <i>Leiocarpa semicalva</i> <i>Minuria integerrima</i> <i>Pluchea rubelliflora</i> <i>Pterocaulon sphacelatum</i> <i>Streptoglossa bubakii</i> <i>Streptoglossa tenuiflora</i> <i>Vittadinia eremaea</i>
<b>Family: Boraginaceae (310)</b>	<i>Heliotropium inexplicitum</i> <i>Heliotropium ovalifolium</i> <i>Trichodesma zeylanicum</i>
<b>Family: Brassicaceae (138)</b>	<i>Lepidium pedicellosum</i>
<b>Family: Capparaceae (137A)</b>	<i>Capparis lasiantha</i> <i>Capparis mitchellii</i> <i>Capparis umbonata</i> <i>Cleome viscosa</i>
<b>Family: Celastraceae (199)</b>	<i>Maytenus</i> sp. Mt Windell (S. van Leeuwen 846) <i>Stackhousia intermedia</i>
<b>Family: Chenopodiaceae (105)</b>	<i>Dysphania rhadinostachya</i> <i>Maireana villosa</i> <i>Rhagodia eremaea</i> <i>Salsola tragus</i> <i>Sclerolaena cornishiana</i>

**Family: Convolvulaceae (307)**

*Bonamia rosea*  
*Convolvulus angustissima*  
*Duperreya commixta*  
*Evolvulus alsinoides*  
*Ipomoea polymorpha*

**Family: Cucurbitaceae (337)**

*Austrobryonia pilbarensis*  
*Cucumis maderaspatanus*

**Family: Cyperaceae (032)**

*Fimbristylis dichotoma*  
*Fimbristylis oxystachya*

**Family: Euphorbiaceae (185)**

*Euphorbia australis*  
*Euphorbia biconvexa*  
*Euphorbia boophthona*  
*Euphorbia coghlanii*

**Family: Fabaceae (162)**

*Acacia adoxa*  
*Acacia adsurgens*  
*Acacia ancistrocarpa*  
*Acacia aneura*  
*Acacia aneura* var. *pilbarana*  
*Acacia arida*  
*Acacia atkinsiana*  
*Acacia bivenosa*  
*Acacia cowleana*  
*Acacia dictyophleba*  
*Acacia elachantha*  
*Acacia inaequilatera*  
*Acacia maitlandii*  
*Acacia marramamba*  
*Acacia minyura*  
*Acacia monticola*  
*Acacia pachyacra*  
*Acacia pruinocarpa*  
*Acacia pyrifolia*  
*Acacia sericophylla*  
*Acacia sibirica*  
*Acacia steedmanii* subsp. *borealis*  
*Acacia synchronicia*  
*Acacia tenuissima*  
*Acacia trudgeniana*  
*Cullen cinereum*  
*Cullen lachnostachys*  
*Indigofera fractiflexa* ms  
*Indigofera georgei*  
*Indigofera linifolia*  
*Indigofera monophylla*  
*Mirbelia viminalis*  
*Rhynchosia minima*  
*Senna artemisioides* subsp. *artemisioides*  
*Senna artemisioides* subsp. *helmsii*  
*Senna artemisioides* subsp. *oligophylla*  
*Senna ferraria*  
*Senna glaucifolia*  
*Senna glutinosa* subsp. *glutinosa*

*Senna glutinosa* subsp. *pruinosa*  
*Senna glutinosa* subsp. *x luerssenii*  
*Senna hamersleyensis*  
*Senna notabilis*  
*Senna pleurocarpa*  
*Senna* sp. Karijini (M.E. Trudgen 10392)  
*Tephrosia clementii*  
*Tephrosia densa* ms  
*Tephrosia rosea* var. *glabrior* ms  
*Tephrosia rosea* var. *rosea*  
*Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601)  
*Tephrosia supina*  
\**Vachellia farnesiana*

**Family: Goodeniaceae (341)**

*Dampiera candicans*  
*Goodenia cusackiana*  
*Goodenia micrantha*  
*Goodenia microptera*  
*Goodenia pascua*  
*Goodenia prostrata*  
*Goodenia stobbsiana*  
*Goodenia triodiophila*  
*Scaevola parvifolia* subsp. *pilbarae*  
*Scaevola spinescens*

**Family: Gyrostemonaceae (108)**

*Codonocarpus cotinifolius*

**Family: Haloragaceae (276)**

*Haloragis gossei*  
*Haloragis maierae*

**Family: Lamiaceae (313)**

*Clerodendrum floribundum* var. *angustifolium*  
*Prostanthera albiflora*  
*Spartothamnella teucriflora*

**Family: Loranthaceae (097)**

*Amyema gibberula*

**Family: Malvaceae (221)**

*Abutilon cunninghamii*  
*Abutilon fraseri*  
*Corchorus lasiocarpus*  
*Corchorus sidoides*  
*Corchorus* sp. Hamersley Range (S. van Leeuwen 3586)  
*Gossypium australe*  
*Gossypium robinsonii*  
*Hibiscus burtonii*  
*Hibiscus coatesii*  
*Hibiscus sturtii* var. *campylochlamys*  
*Hibiscus sturtii* var. *grandiflorus*  
*Hibiscus sturtii* var. *truncatus*  
*Keraudrenia velutina*  
*Keraudrenia velutina* subsp. *elliptica* ms  
\**Malvastrum americanum*  
*Rulingia luteiflora*  
*Sida arenicola*  
*Sida arsiniata*  
*Sida cardiophylla*

*Sida echinocarpa*  
*Sida excedentifolia* ms  
*Sida fibulifera*  
*Sida platycalyx*  
*Sida* sp. Barlee Range (S. van Leeuwen 1642)  
*Sida* sp. Shovelanna Hill (S. van Leeuwen 3842)  
*Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90)  
*Sida spinosa*  
*Sida trichopoda*  
*Triumfetta leptacantha*  
*Triumfetta maconochieana*

**Family: Moraceae (087)**

*Ficus brachypoda*

**Family: Myrtaceae (273)**

*Calytrix carinata*  
*Corymbia deserticola*  
*Corymbia ferriticola*  
*Corymbia hamersleyana*  
*Eucalyptus gamophylla*  
*Eucalyptus leucophloia*  
*Eucalyptus socialis*  
*Eucalyptus trivalva*  
*Eucalyptus xerothermica*

**Family: Oleaceae (301)**

*Jasminum didymum* subsp. *lineare*

**Family: Phyllanthaceae (185A)**

*Phyllanthus maderaspatensis*

**Family: Poaceae (031)**

*Acrachne racemosa*  
*Amphipogon caricinus*  
*Aristida contorta*  
*Aristida holathera*  
*Aristida inaequiglumis*  
*Aristida latifolia*  
*Aristida obscura*  
*Chrysopogon fallax*  
*Cymbopogon ambiguus*  
*Cymbopogon bombycinus*  
*Cymbopogon obtectus*  
*Dichanthium sericum*  
*Digitaria ammophila*  
*Digitaria brownii*  
*Enneapogon lindleyanus*  
*Enneapogon polyphyllus*  
*Eragrostis setifolia*  
*Eragrostis tenellula*  
*Eragrostis xerophila*  
*Eriachne aristidea*  
*Eriachne benthamii*  
*Eriachne mucronata*  
*Eriachne pulchella* subsp. *dominii*  
*Eulalia aurea*  
*Ischaemum albobillosum*  
*Iseilema membranaceum*  
*Paraneurachne muelleri*  
*Paspalidium rarum*

*Schizachyrium fragile*  
*Sporobolus australasicus*  
*Themeda triandra*  
*Triodia basedowii*  
*Triodia longiceps*  
*Triodia melvillei*  
*Triodia pungens*  
*Triodia* sp. Mt Ella (M.E. Trudgen 12739)  
*Triodia wiseana*

**Family: Proteaceae (090)**

*Grevillea berryana*  
*Grevillea wickhamii*  
*Hakea chordophylla*  
*Hakea lorea*

**Family: Rubiaceae (331)**

*Psydrax latifolia*

**Family: Santalaceae (092)**

*Exocarpos sparteus*  
*Santalum lanceolatum*

**Family: Sapindaceae (207)**

*Dodonaea coriacea*  
*Dodonaea pachyneura*

**Family: Scrophulariaceae (316)**

*Eremophila forrestii* subsp. *forrestii*  
*Eremophila fraseri*  
*Eremophila jucunda*  
*Eremophila lanceolata*  
*Eremophila latrobei* subsp. *glabra*  
*Eremophila latrobei* subsp. *latrobei*  
*Eremophila longifolia*  
*Eremophila phyllopoda*  
*Stemodia grossa*

**Family: Solanaceae (315)**

*Solanum horridum*  
*Solanum lasiophyllum*  
*Solanum phlomoides*  
*Solanum sturtianum*

**Family: Surianaceae (160)**

*Stylobasium spathulatum*

**Family: Thymelaeaceae (263)**

*Pimelea holroydii*

**Family: Zygophyllaceae (173)**

*Tribulus suberosus*

## Appendix 4: Results of the DEC NatureMap Flora and Fauna and EPBC Act Protected Matters Database Searches

# NatureMap Species Report

Created By Guest user on 20/01/2011

Method 'By Circle'  
 Centre 118°32' 39" E, 22°55' 59" S  
 Buffer 20km  
 Group By Conservation Status

Conservation Status	Species	Records
Rare or likely to become extinct	1	6
Priority 1	3	4
Priority 2	4	6
Priority 3	5	17
Priority 4	4	6
Non-conservation taxon	384	784
<b>TOTAL</b>	<b>401</b>	<b>823</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	0009 <i>Thryptomene wittweri</i>		T	
<b>Priority 1</b>				
2.	20427 <i>Brachyscome</i> sp. <i>Wanna Munna Flats (S. van Leeuwen 4662)</i>		P1	
3.	13280 <i>Rhodanthe ascendens</i>		P1	
4.	33026 <i>Vittadinia</i> sp. <i>Coondewanna Flats (S. van Leeuwen 4684)</i>		P1	
<b>Priority 2</b>				
5.	20768 <i>Eremophila forrestii</i> subsp. <i>Pingandy (M.E. Trudgen 2662)</i>		P2	
6.	30374 <i>Oxalis</i> sp. <i>Pilbara (M.E. Trudgen 12725)</i>		P2	
7.	20311 <i>Pilbara trudgenii</i>		P2	
8.	6826 <i>Spartothamnella puberula</i>		P2	
<b>Priority 3</b>				
9.	3316 <i>Acacia effusa</i>		P3	
10.	20378 <i>Dampiera metallorum</i>		P3	
11.	14804 <i>Eremophila magnifica</i> subsp. <i>velutina</i>		P3	
12.	17715 <i>Indigofera gilesii</i> subsp. <i>gilesii</i>		P3	
13.	11556 <i>Rostellularia adscendens</i> var. <i>latifolia</i>		P3	
<b>Priority 4</b>				
14.	24810 <i>Ardeotis australis</i> ( <i>Australian Bustard</i> )		P4	
15.	14893 <i>Eremophila magnifica</i> subsp. <i>magnifica</i>		P4	
16.	24217 <i>Leggadina lakedownensis</i> ( <i>Short-Tailed Mouse</i> )		P4	
17.	24233 <i>Pseudomys chapmani</i> ( <i>Western Pebble-mound Mouse</i> )		P4	
<b>Non-conservation taxon</b>				
18.	4989 <i>Abutilon cryptopetalum</i>			
19.	19589 <i>Abutilon dioicum</i>			
20.	18120 <i>Abutilon fraseri</i> subsp. <i>fraseri</i>			
21.	14805 <i>Abutilon lepidioicum</i>			
22.	4968 <i>Abutilon macrum</i>			
23.	4899 <i>Abutilon malvifolium</i> ( <i>Bastard Marshmallow</i> )			
24.	4902 <i>Abutilon oxycarpum</i> ( <i>Flannel Weed</i> )			
25.	-6206 <i>Abutilon</i> sp.			
26.	11215 <i>Acacia adoxa</i> var. <i>adoxo</i>			
27.	-5479 <i>Acacia adsurgens</i> x <i>rhodophloia</i>			
28.	-9820 <i>Acacia aneura</i> group			
29.	37260 <i>Acacia aptaneura</i>			
30.	3232 <i>Acacia ayeeriana</i>			
31.	3241 <i>Acacia bivenosa</i>			
32.	3272 <i>Acacia cowleana</i> ( <i>Halls Creek Wattle</i> )			
33.	3300 <i>Acacia dictyophleba</i> ( <i>Sandhill Wattle</i> )			
34.	3380 <i>Acacia hamersleyensis</i>			
35.	3370 <i>Acacia hilliana</i>			
36.	3399 <i>Acacia kempeana</i> ( <i>Witchetty Bush</i> )			



# EPBC Act Protected Matters Report: Coordinates

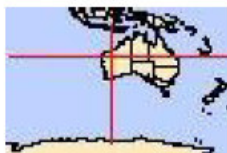
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

You may wish to print this report for reference before moving to other pages or websites.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

**Report created: 18/01/11 13:47:09**



### [Summary](#)

### [Details](#)

[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

### [Caveat](#)

### [Acknowledgements](#)



This map may contain data which are  
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[Coordinates](#)

Buffer: 10Km

## Summary

### Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Significance (Ramsar Wetlands):</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Areas:</a>	None
<a href="#">Threatened Ecological Communities:</a>	None
<a href="#">Threatened Species:</a>	6
<a href="#">Migratory Species:</a>	8

### Other Matters Protected by the EPBC Act

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

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

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

<a href="#">Commonwealth Lands:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	5

<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves:</a>	None

## Report Summary for Extra Information

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

<a href="#">Place on the RNE:</a>	1
<a href="#">State and Territory Reserves:</a>	2
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	5
<a href="#">Nationally Important Wetlands:</a>	None

## Details

### Matters of National Environmental Significance

#### Threatened Species [\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>BIRDS</b>		
<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
<b>MAMMALS</b>		
<a href="#">Dasyurus hallucatus</a> Northern Quoll [331]	Endangered	Species or species habitat likely to occur within area
<a href="#">Rhinonicteris aurantia (Pilbara form)</a> Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area
<b>PLANTS</b>		
<a href="#">Lepidium catapycnon</a> Hamersley Lepidium, Hamersley Catapycnon [9397]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thryptomene wittweri</a> Mountain Thryptomene [16645]	Vulnerable	Species or species habitat likely to occur within area
<b>REPTILES</b>		
<a href="#">Liasis olivaceus barroni</a> Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat may occur within area

#### Migratory Species [\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat may occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret		Species or species habitat may occur within area

[59541]

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

### Migratory Terrestrial Species

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

[Pezoporus occidentalis](#)

Night Parrot [59350]

Endangered

Species or species habitat likely to occur within area

### Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret  
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Charadrius veredus](#)

Oriental Plover, Oriental  
Dotterel [882]

Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

### Listed Marine Species

[\[ Resource Information \]](#)

Name

Status

Type of Presence

#### Birds

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species habitat may occur within area

[Ardea alba](#)

Great Egret, White Egret  
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Charadrius veredus](#)

Oriental Plover, Oriental  
Dotterel [882]

Species or species habitat may occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

## Extra Information

### Places on the RNE

[\[ Resource Information \]](#)

Note that not all Indigenous sites may be listed.

Name

Status

#### Natural

[Hamersley Range National Park \(1977 boundary\)](#)Registered  
WA

### State and Territory Reserves

[\[ Resource Information \]](#)

Unnamed WA41696, WA

Karijini, WA

### Invasive Species

[\[ Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo

and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#"><u>Felis catus</u></a>		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<a href="#"><u>Oryctolagus cuniculus</u></a>		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<a href="#"><u>Vulpes vulpes</u></a>		
Red Fox, Fox [18]		Species or species habitat may occur within area
<b>Plants</b>		
<a href="#"><u>Cenchrus ciliaris</u></a>		
Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
<a href="#"><u>Prosopis spp.</u></a>		
Mesquite, Algaroba [68407]		Species or species habitat may occur within area

## Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed