SEPTEMBER 2011

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# BROCKMAN RESOURCES LIMITED

# MUNJINA-ROY HILL ROAD REALIGNMENT VCP

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# ACRONYMS AND GLOSSARY

| | |
|---|---|
| ***ARRP Act*** | *Agriculture and Related Resources Protection Act 1976* |
| **BOM** | Bureau of Meteorology |
| **DAF** | Department of Agriculture and Food |
| **DEC** | Department of Environment and Conservation |
| **DEFL** | The DEC's Threatened (Declared Rare) Flora Database |
| **DSEWPC** | Department of the Sustainability, Environment, Water, Populations and Communities |
| **DRF** | Declared Rare Flora |
| **ESA** | Environmentally Sensitive Area |
| **EPA** | Environmental Protection Authority |
| ***EP Act*** | *Environmental Protection Act 1986* |
| ***EPBC Act*** | *Environment Protection and Biodiversity Conservation Act 1999* |
| **IBRA** | Interim Biogeographic Regionalisation for Australia |
| **NVIS** | National Vegetation Information System |
| **PEC** | Priority Ecological Community |
| **TEC** | Threatened Ecological Community |
| **WAHERB** | Western Australian Herbarium |
| ***WC Act*** | *Wildlife Conservation Act 1950* |

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# EXECUTIVE SUMMARY

Brockman Resources Limited commissioned *ecologia* Environment (*ecologia*) to undertake a flora and fauna survey of a proposed realignment of the Roy Hill-Munjina Road. The data will be used to support a Vegetation Clearance Permit (VCP) Application.

The realignment will require disturbance to a corridor of vegetation approximately 12.5 km in length, ranging from 35 to approximately 50 metres width. The total area of disturbance is approximately 45.1 hectares

The survey was conducted by two botanists and a zoologist over two days in June 2011. Nine 2,500 $m^2$ quadrats were surveyed to characterise the vegetation structure and the area was searched using a series of transects distanced 50 metres apart.

The Priority 3 taxon *Rhagodia* sp. Hamersley (M. Trudgen 17794) was recorded at two locations within the Study Area. Ten plants were counted in the immediate vicinity of one location and it is considered likely that the taxon has a scattered distribution in this habitat outside the boundaries of the Study Area. Large numbers of this taxon have also been recently recorded to the north of Roy Hill Station and it is considered unlikely that the proposal will impact the viability of this taxon either locally or regionally.

Three fauna species of conservation significance were recorded during the survey: Australian Bustard (*Ardeotis australis*), Bush Stone-curlew (*Burhinus grallarius*) and Rainbow Bee-eater (*Merops ornatus*). Australian Bustards and Bush Stone-curlews are listed by the DEC as Priority 4. The Rainbow Bee-eater is listed as Migratory under the EPBC Act and as Schedule 3 under the WC Act.

The impact of the proposed clearance has been assessed with reference to the 10 Clearing Principles.

The biodiversity of the vegetation is considered comparable with the biodiversity of areas of similar vegetation surveyed elsewhere in the Pilbara. Quadrats in areas assessed as in very good to good condition were of moderate species richness, whereas the species richness of vegetation at the eastern edge of the alignment, assessed as in poor condition, was low.

The Study Area lies within the buffer zone of the Priority 1 PEC Fortescue Marsh and the Priority 3 Fortescue Sand Dunes, however the vegetation present is not representative of either of these PEC's. The alignment passes within approximately 250 m of the Sand Dunes at its nearest location, however no direct or indirect impacts to this community are anticipated.

No vegetation type present is anticipated to be of significance to the native fauna in the Pilbara region. The fauna habitats of the area are considered to be common within the Pilbara.

The proposed alignment runs for a portion of its extent through low lying topography in which temporary pools and weakly defined drainage channels are present. This area supports shrublands and woodlands in which *Acacia aneura* (Mulga) is common or dominant. The design of the road will therefore need to incorporate features such as culverting and dispersal structures to prevent changes to sheet flow which may be deleterious to Mulga.

Although three avian species of conservation species were recorded, the Bush Bustard, Stone Curlew and Rainbow Bee Eater, the relatively narrow corridor of clearance is unlikely to impact the survival of local populations, due to their mobility.

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# 1 INTRODUCTION

Brockman Resources Limited commissioned *ecologia* Environment (*ecologia*) to undertake a flora and fauna survey of a proposed realignment of the Roy Hill-Munjina Road. The data will be used to support a Vegetation Clearance Permit (VCP) Application.

The realignment will require disturbance to a corridor of vegetation approximately 12.5 km in length, ranging from 35 to approximately 50 metres width. The total area of disturbance is approximately 45.1 hectares (Figure 1.1).

## 1.1 LEGISLATIVE FRAMEWORK

Commonwealth and State legislation applicable to the conservation of native flora and fauna includes, but is not limited to, the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*), the *Wildlife Conservation Act 1950* (*WC Act*) and the *Environmental Protection Act 1986* (*EP Act*).

The *EPBC Act* was developed to provide for the protection of the environment, especially those aspects of the environment that are matters of National environmental significance, to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and to promote the conservation of biodiversity. The *EPBC Act* includes provisions to protect native species (in particular to prevent the extinction and promote the recovery of threatened species) and to ensure the conservation of migratory species. In addition to the principles outlined in Section 4a of the *EP Act*, Section 3a of the *EPBC Act* includes the principle of ecologically sustainable development, dictating that decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.

The *WC Act* was developed to provide for the conservation and protection of wildlife in Western Australia. Under Section 14 of this Act, all fauna and flora within Western Australia are protected; however, the Minister may, via a notice published in the Government Gazette, declare a list of flora taxa identified as likely to become extinct, or as rare, or otherwise in need of special protection. The current listing was gazetted on the 17$^{th}$ of August 2010 (*WC Act*, 2010(2)).

## 1.2 SURVEY OBJECTIVES

The EPA's objectives with regards to the management of native flora and vegetation are to:

- Avoid adverse impacts on biological diversity comprising the different plants and animals and the ecosystems they form, at the levels of genetic, species and ecosystem diversity.
- Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.
- Protect Declared Rare Flora (DRF) consistent with the provisions of the *WC Act*.
- Protect other flora species of conservation significance.

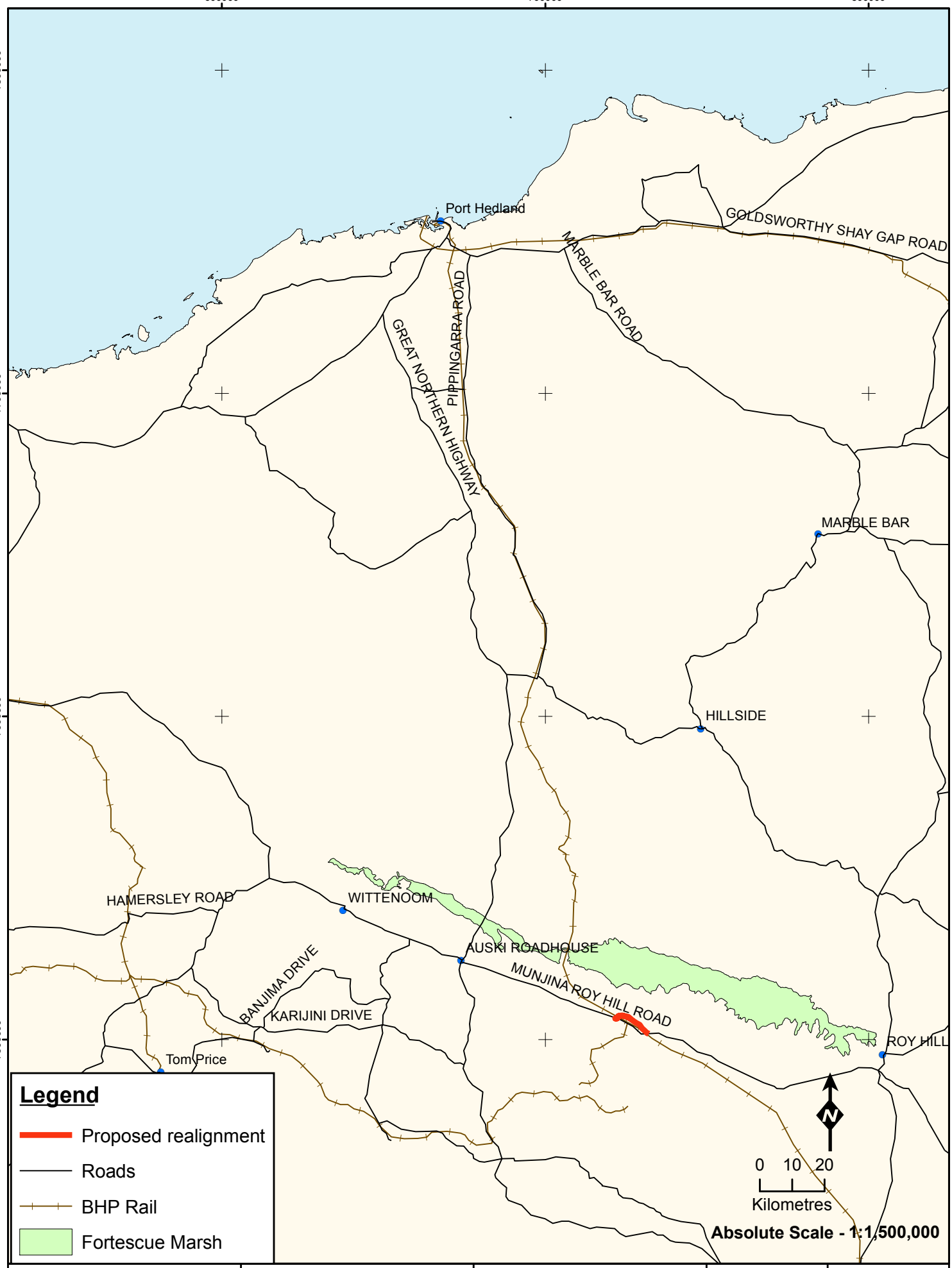
The primary objective of the vegetation and flora assessment was to provide sufficient information to the EPA to allow the impact on the biota of the Study Area of the proposed vegetation clearance to be assessed, thereby ensuring that these objectives will be upheld.

VCP Applications are required to provide sufficient information regarding the areas proposed to be cleared to enable the significance of the biota to be assessed with reference to the 10 Clearing Principles:

1. Native vegetation should not be cleared if it comprises a high level of biological diversity.
2. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
3. Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.
4. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.
5. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
6. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
7. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
8. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
9. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
10. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

The survey therefore aimed to provide the following information

(a) The dominant vegetation units present.
(b) The condition of the vegetation, using the scale of Trudgen (1991) cited in BushForever (2009) and the nature of disturbance detailed.
(c) Surface soil types present.
(d) Landforms/landscape features present such as floodplains, ridgelines, side slopes;
(e) Drainage features present;
(f) Any land management problems such as gully erosion, water logging, salinity, weed invasion, and the extent of the problem (ha or metres); and
(g) Land use history, such as prior clearing/logging, pasture improvement, cultivation, stocking rate, fires and other past disturbances.

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**Location of the Study Area**

| | |
|---|---|
| **Figure: 1.1** | **Drawn:CM** |
| **Project ID: 1363** | **Date: 25/08/11** |

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CJM21

**A4**

# 2 EXISTING ENVIRONMENT

## 2.1 CLIMATE

The Study Area is situated in the Pilbara region of Western Australia and experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Annual evaporation exceeds rainfall by as much as 500 mm per year. Seasonally low but unreliable rainfall, together with high temperatures and high diurnal temperature variations are also characteristic of the region.

Rainfall in the Pilbara is highly unpredictable and recordings are highest at stations around the Hamersley Range which reach altitudes of up to 900 m. The majority of the Pilbara has a bimodal rainfall distribution, resulting in two rainfall maxima per year. From January to March rains result from tropical storms producing sporadic thunderstorms. Tropical cyclones moving south from northern Australian waters also bring sporadic heavy rains. From May to June extensive cold fronts move easterly across the state and occasionally reach the Pilbara. These fronts produce only light winter rains that are ineffective for the growth of plants other than herbs and grasses. Larger perennial species require the intense and prolonged storms of summer. Surface water can be found in some pools and springs in the Pilbara all year round, although watercourses only flow briefly due to the short wet season (Beard, 1975).

The closest BOM weather station to the Study Area is Newman Airport (site number 007176) located approximately 75 km south of the Study Area and was selected to provide an indication of the local climatic conditions of the Study Area (BOM, 2010).

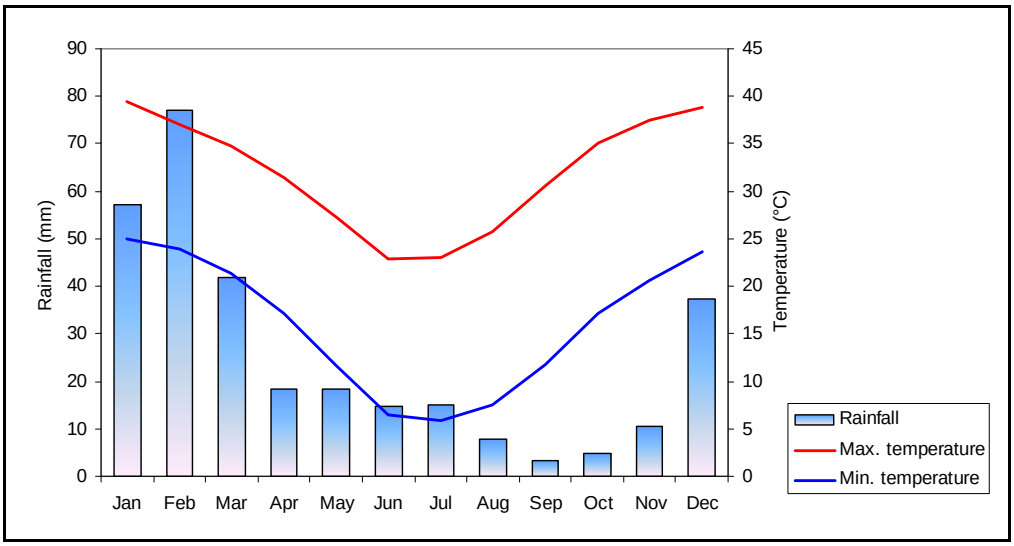



Figure 2.1 – Climatic Summary Data (Newman Airport)

The mean annual rainfall for Newman is 311.6 mm falling over 29 rainfall days. The wettest period is from December to March, when a mean total of 213.3 mm falls over 17 rainfall days; approximately 68% of the mean annual rainfall. The wettest month is February with a mean of 77.0 mm falling over 5 rainfall days (Figure 2.1) (BOM, 2010).

### 2.1.1 Landforms

The Study Area lies within the Pilbara region of the Eremaean Botanical Province (Beard1975). The Pilbara Region is divisible into the Fortescue Valley, in which the study area is located, and Chichester Plateau subregions.

Flats of Cainozoic sediments occur on the Fortescue Valley floors, which were deposited on the less resistant units of the lower Hamersley Group (Thorne & Tyler, 1997). Alluvial plains are present along the Fortescue River. Hardpan wash plains, often with a gravelly or stony surface, are also present within the Fortescue Valley (Tille, 2006).

### 2.1.2 Soils

Tille (2006) compiled available detailed mapping information of Western Australia's Rangelands and Arid Interior into a hierarchy of soil-landscape units providing descriptions of soil-landscape regions, provinces and zones (Tille, 2006).

The Fortescue Province, which incorporates Beard's (1975) Pilbara Region, is described by Tille (2006) as an area of "*hills and ranges (with stony plains and some alluvial plains and sandplains) on the volcanic granitic and sedimentary rocks of the Pilbara Craton*" with "*stony soils with Red loamy earths and Red shallow loams (and some Red/brown non cracking clays, Red deep sandy duplexes and Red deep sands*" (Tille, 2006). The study area lies within the Fortescue Valley Zone, as described below (Table 2.1).

Table 2.1 – Soil Landscape Zones of the Study Area

| Province | Zone | Habitat | Soil | Vegetation |
|---|---|---|---|---|
| Fortescue | Fortescue Valley Zone | Alluvial plains, hardpan wash-plains and sandplains (with stony plains and some lakes) on alluvial deposits over sedimentary rocks of the Hamersley Basin. | Red deep sands, Red loamy earths and Red/brown non-cracking clays with some Red shallow loams and Hard cracking clays. | Mulga shrublands and spinifex grasslands (with some tussock grasslands and halophytic shrublands). |

Source: Tille (2006).

As a consequence of the sparse vegetation cover and the erosive force of heavy summer cyclonic rains, much of the soil on the hill slopes tends to be transported down to the valleys and plains. This is an intermittent and slow process which occurs over a long period of time. Thus, species and associations of vegetation on the hills and slopes tend to be correlated to geology rather than soil type. Along drainage lines, superficial deposits influence the distribution of vegetation, but the presence of surface and groundwater is also a major determining factor (Beard, 1975).

## 2.2 BIOGEOGRAPHIC REGIONS

### 2.2.1 Pilbara Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA, Version 6.1) classifies the Australian continent into regions (bioregions) of similar geology, landform, vegetation, fauna and climate characteristics (Department of Sustainability, Environment, Water, Population and Communities (DSEWPC, 2010). The Pilbara Bioregion is further divided into the Chichester (PIL1), Fortescue Plains (PIL2), Hamersley (PIL3) and Roebourne subregions (PIL4).

Dominant limiting factors and constraints for the Pilbara bioregion listed by Thackway and Cresswell (1995) include extinction of critical weight range (CWR) mammals, wildfire, feral animals (in particular the cat and fox), weeds, and grazing or pastoral activities. The reservation status of the bioregion is 1-5%, which is relatively low (some bioregions have a greater than 10% reservation status).

### 2.2.1.1 Fortescue Plains Subregion

The Study Area occurs within the Fortescue Plains subregion, close to the boundary with the Hamersley subregion. The Fortescue Plains subregion covers approximately 11% of the Pilbara region. The dominant land uses are grazing and native pastures. This subregion features alluvial plains and river frontages, extensive salt marshes, and Mulga-bunch grass and short grass communities on the plains. River gum woodlands fringe drainage lines and an extensive calcrete aquifer feeds numerous permanent springs thus supporting large wetlands in this subregion (Kendrick, 2001).

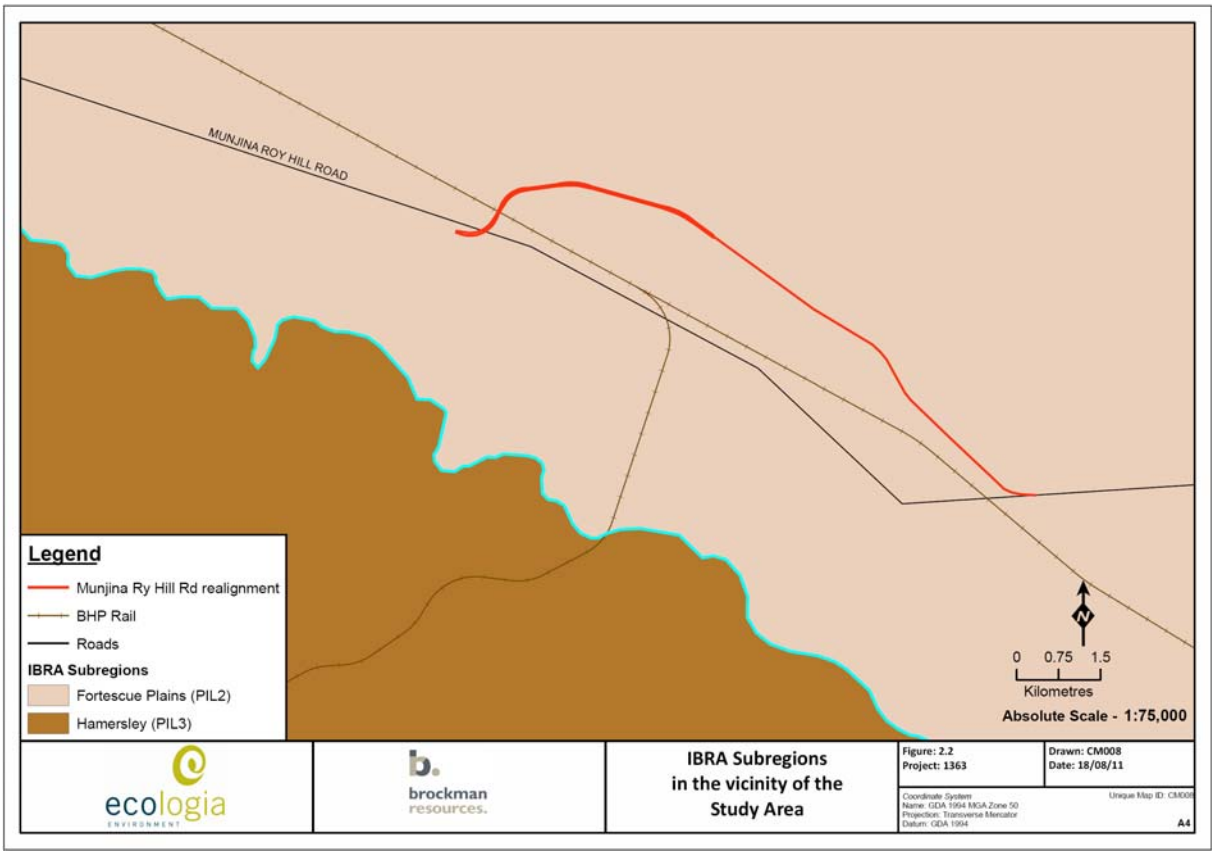



Figure 2.2 – Location of IBRA Subregions relative to the Study Area

## 2.3 LAND SYSTEM CLASSIFICATION

Van Vreeswyk *et al.* (2004) undertook a regional inventory of the Pilbara region to document the land systems present and their condition. The inventory covered 181,723 km$^2$, bounded by the Indian Ocean and Roebourne Plains to the north and west, extending to Broome in the north-east and the Ashburton River catchment in the south.

The Study Area traverses portions of the Divide and Fortescue land systems, with a very small proportion at the western end within the Boolgeeda land system ( Table 2.2).

Table 2.2 – Extent of Land Systems Present Within the Study Area

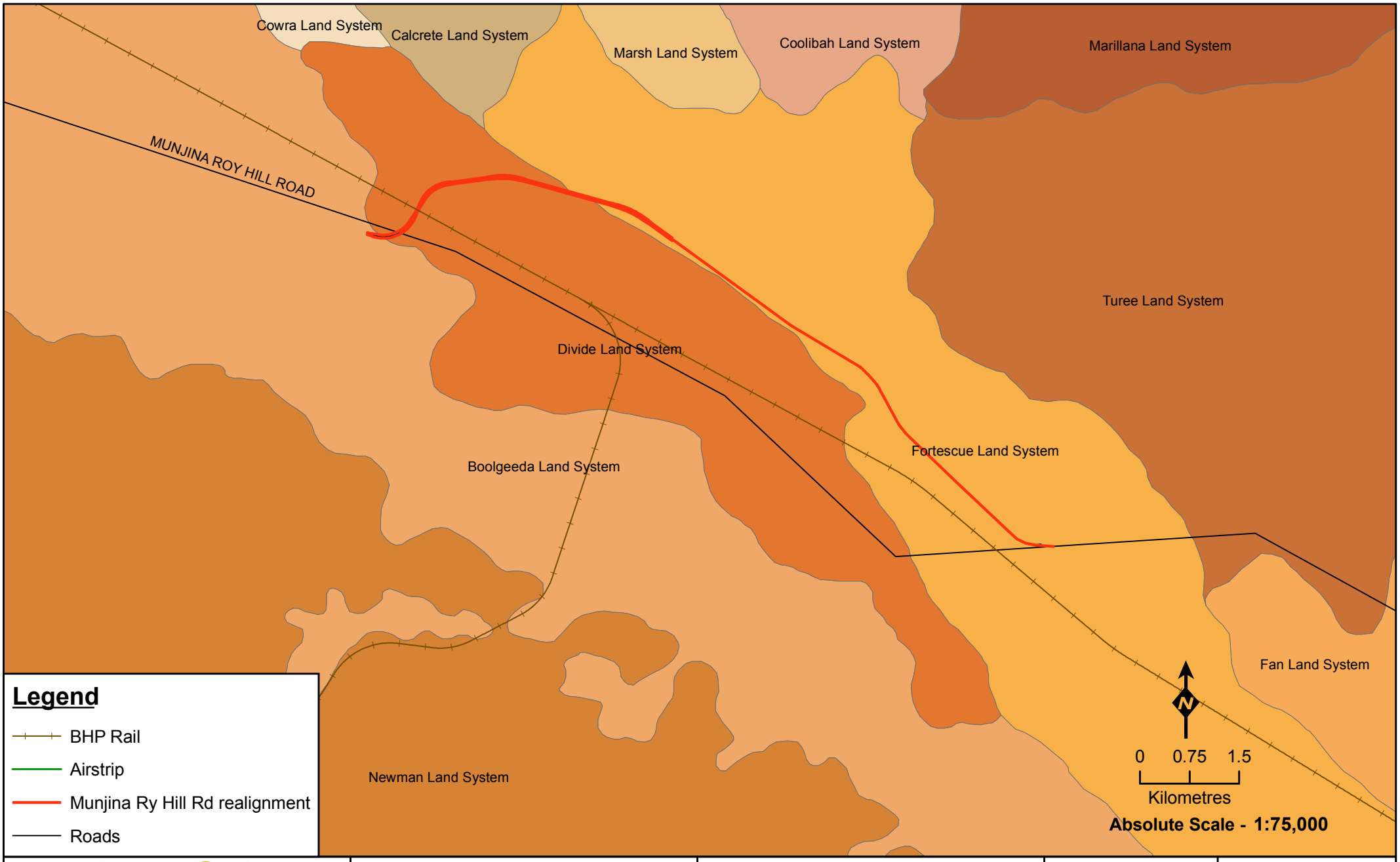
| Land System | Description | Total Area in Pilbara Regional Inventory (km$^2$) | % of area within Pilbara Regional Inventory | Approximate Area in Proposal Area (km$^2$) | Percent of Total Area in Pilbara |
|---|---|---|---|---|---|
| Boolgeeda | Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. | 7,748 | 4.3 | 0.0125 | <<0.0001 |
| Divide | Sandplains and occasional dunes supporting shrubby hard spinifex grasslands. | 5,293 | 2.9 | 0.18180. | 0.0034 |
| Fortescue | Alluvial plains and floodplains supporting patchy grassy woodlands, shrublands and tussock grasslands. | 504 | 0.3 | 0.4489 | 0.089 |

Table 2.3 – Vegetation and Landform Characteristics of the Fortescue and Divide Land Systems

| Land System | Vegetation Condition | % of Land System | Landform | Vegetation Community |
|---|---|---|---|---|
| **Divide** | Very good 91%, Good 3%, Fair 3% Poor 2% Very poor 1%. | <1 | Isolated low hills and stony rises | Hummock grasslands of *Triodia* spp. (hard spinifex) (HSPG). |
| | | 1 | Sand dunes | Hummock grasslands of *T. melvillei* (hard spinifex) or *T. schinzii* (soft spinifex) with numerous shrubs including *Grevillea* and *Acacia* spp. (SHSG, SSSG). |
| | | 76 | Sand plains | Hummock grasslands of *Triodia lanigera, T.basedowii* (hard spinifex) with *Acacia* spp. and other shrubs, occasional mallee eucalypts (SHSG). Occasionally *T. schinzii* (soft spinifex) (SSSG) |
| | | 15 | Plains with thin sand cover | Hummock grasslands of *T. lanigera, T. wiseana* (hard spinifex) (PHSG) or scattered to moderately close tall shrublands including *Acacia aneura* (mulga) with hard spinifex ground layer (PMSS). |
| | | 4 | Stony plains | Hummock grasslands of *T. lanigera, T. wiseana* (hard spinifex) (PHSG) or scattered to moderately close tall shrublands including *Acacia aneura* (mulga) with hard spinifex ground layer (PMSS). |
| | | 3 | Tracts receiving run-on | Scattered to close tall shrublands of *A. aneura, A. kempeana* (witchetty bush) and low shrubs such as *Eremophila forrestii* (Wilcox bush) and ground layer *Triodia* spp. (spinifex) and *Monachather paradoxa* (broad leaved wanderrie) (DAHW, DEAW). |

| Land System | Vegetation Condition | % of Land System | Landform | Vegetation Community |
|---|---|---|---|---|
| **Fortescue** | Very good 7%, Good 20%, Fair 23%, Poor 36%, Very poor 14%. | 50 | Alluvial plains | Patchy tussock grasslands of *Chrysopogon fallax* (ribbon grass), *Eragrostis xerophila* (Roebourne Plains grass) with very scattered *Acacia citrinoviridis*, (black mulga), *A. aneura* (mulga) and *Senna* spp. shrubs or scattered tall, mid height or low shrublands of *Acacia* and *Senna* spp. with patchy tussock grasses (APRG, PMGS). |
| | | 25 | Flood plains, outwash river fans and depressions | Scattered to moderately close tall shrublands/ woodlands of *A. citrinoviridis, A. aneura* and *Eucalyptus victrix* (coolibah) and understorey of tussock grasses (mostly *Chrysopogon fallax*) (DEGW, APRG). |
| | | 10 | Gilgai plains | Tussock grasslands of *Eragrostis xerophila* or *Astrebla* spp. (Mitchell grass) (ARPG, APMG). |
| | | 7 | Hardpan plains | Very scattered tall shrublands of *A. aneura* with a few *Eremophila* and *Senna* spp. low shrubs (HPMS). |
| | | 1 | Groves | Close or closed tall shrublands or woodlands of *Acacia aneura* with mid and low shrubs, *Eremophila forrestii* (Wilcox bush), *Senna* and *Sida* spp. and scattered tussock grasses such as *Chrysopogon fallax* (GMGW). |
| | | 2 | Sandy banks and sheets | Hummock grasslands of *Triodia* sp. (hard spinifex) or *T. pungens* (soft spinifex) with isolated to scattered shrubs of *Acacia* and *Senna* spp. (SHSG, SSSG). |
| | | 2 | Levees - ill-defined | Scattered woodlands with *Eucalyptus victrix* (coolibah), *Acacia citrinoviridis* and other trees with scattered shrubs and *Chrysopogon fallax* and *Cenchrus ciliaris* (buffel grass) tussock grasses (DEGW). |
| | | 3 | Channels - major and minor | Fringing woodlands with *Eucalyptus camaldulensis* (river red gum), *E. victrix, Acacia coriacea* (river jam) and *A. citrinoviridis* with *Chrysopogon fallax* and *Cenchrus ciliaris* tussock grasses (GMEW, DEGW). |

Indicates vegetation units considered present within the Study Area

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# Land systems in the vicinity of the proposed road realignment

**Figure: 2.2**
**Project: 1363**

**Drawn:CM0010**
**Date: 18/8/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM006

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## 2.4 VEGETATION AS DESCRIBED BY SHEPHERD *et al* (BEARD)

The Study Area lies within Beard's (1975) Pilbara region of the Eremaean Botanical Province. The vegetation mapping of Beard and Hopkins throughout Western Australia was subsequently reinterpreted and updated to reflect the National Vegetation Information System (NVIS) standards (Shepherd *et al,* 2002). The Study Area encompasses areas mapped as Units 29 and 111 (Figure 2.4, Table 2.4).

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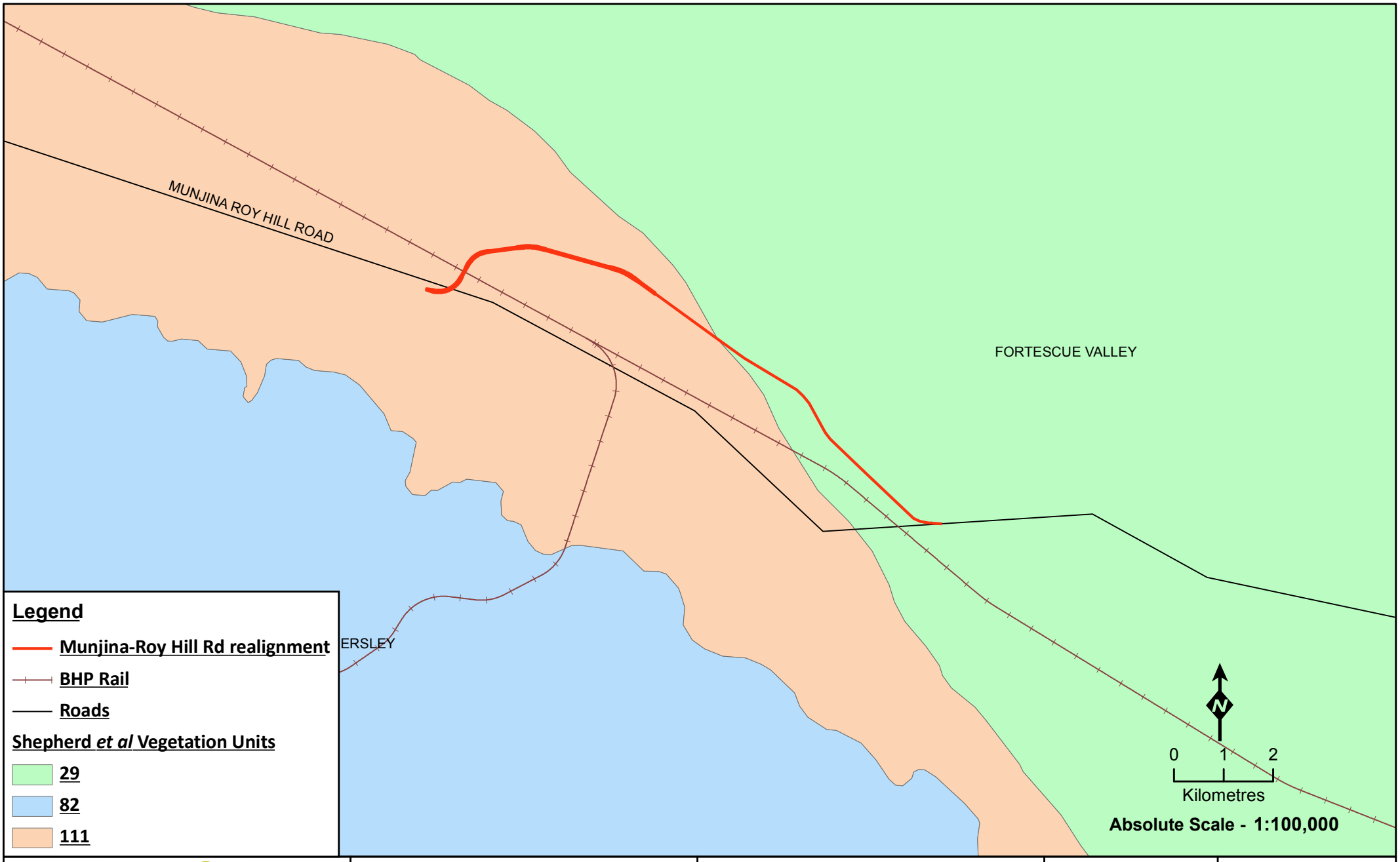
Table 2.4 – Shepherd *et al* / Beard Vegetation Units in the Vicinity of the Study Area

| Shepherd *et al* Unit | | Equivalent Beard Unit | Vegetation Description (Beard) | Total Area in WA ($km^2$) | Area in Realign. ($km^2$) | % Total in WA | % Realign. |
|---|---|---|---|---|---|---|---|
| 29 | | $a_1Lp$ | *Acacia aneura*, trees in groves or patches. | 7,914,567 | 0.213 | <<0.001 | 47 |
| 111 | | $e_{25}Sr\ t_2Hi$ | *Eucalyptus gamophylla* sparse shrubs over *Triodia basedowii* open hummock grassland. | 764,211 | 0.238 | <<0.001 | 53 |

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**Shepherd *et al* Vegetation Units in the Vicinity of the Proposed Realignment**

**Figure: 2.4**
**Project: 1363**

**Drawn:CJM**
**Date: 18/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM012

**A4**

### 2.4.1 Threatened Ecological Communities

Ecological communities are naturally occurring biological assemblages located in a particular type of habitat. At a national level, Threatened Ecological Communities (TECs) are protected under the *EPBC Act.* TECs are listed under this Act as either 'Critically Endangered', 'Endangered' or 'Vulnerable'. A definition of these codes is provided in Table A.1, Appendix A. A search of the DEC's TEC Database was undertaken and no nationally listed TECs occur in the Proposal Area.

The DEC also maintains a list of TECs endorsed by the Minister of Environment (DEC, 2010) that are classified as being either 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' or 'Vulnerable'. A definition of these codes is also provided in Table A.1, Appendix A.

No EPBC-listed or state-listed TECs will be impacted by the proposed clearance.

### 2.4.2 Priority Ecological Communities

The DEC maintains an additional list of Priority Ecological Communities (PECs), for communities that could potentially be classified as TECs, but are not currently adequately defined or surveyed. Communities are placed in this category while consideration can be given to their declaration as a TEC. Five priority codes exist for PECs and these are defined in Table A.2, Appendix A.

The Study Area lies within two PEC buffer zones as described in Table 2.5 and Figure 2.5:

1. the Fortescue Marsh (Priority 1) and
2. The Fortescue Sand Dunes (Priority 3). The western portion of the realignment runs directly north of the Fortescue Sand Dunes for some distance but does not intersect the dunes at any point.

Although the realignment is located within these buffer zones, this does not necessarily imply that the vegetation present is typical of the PEC's. However developments within the buffer zone may have the potential to impact these communities indirectly.

Table 2.5 **–** PECs Buffer Zones Recorded in the Vicinity of the Study Area

| PEC Community | Description | Priority | Percent Study Area within PEC |
|---|---|---|---|
| Fortescue Marsh | Fortescue Marsh on the Fortescue River, east of Mulga Downs, on Marillana and Roy Hill Stations.<br>Endemic *Eremophila* species and several near endemic and new to science samphires. Recorded locality for night parrot and bilby. Several restricted aquatic invertebrates. Specific vegetation types are found on Mulga Downs, only around the marsh, and an unusual system occurs downstream.<br>**Threats:** mining, altered hydrology (watering with fresh water), grazing and weed invasion. | 1 | 100 |
| Fortescue Valley Sand Dunes | These red linear sand dune communities lie on the Divide Land system at the junction of the Hamersley Range and Fortescue Valley, between Weeli Wolli Creek and the low hills to the west. A small number are vegetated with *Acacia dictyophleba* scattered tall shrubs over *Crotalaria cunninghamii, Trichodesma zeylanicum* var. *grandiflorum* open shrubland. They are regionally rare, small and fragile and highly susceptible to threatening processes.<br>Threats: weed invasion especially buffel grass, and erosion. | 3 | 79 |

Source: DEC (Reference number: 19 – 0310, May 2010)

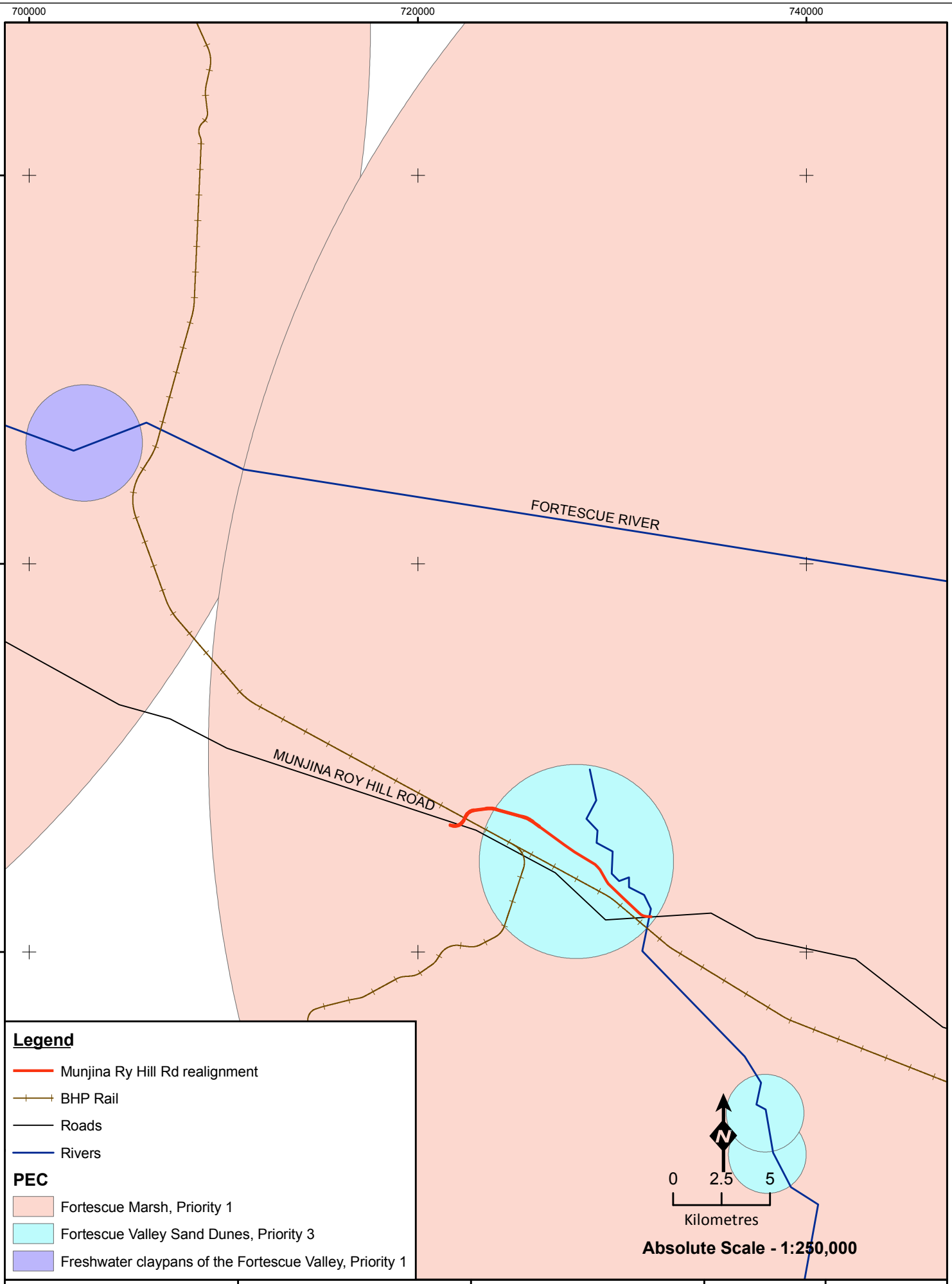
### 2.4.3 Environmentally Sensitive Areas

Environmentally Sensitive Areas are declared in the *Environmental Protection (Clearing of Native Vegetation) Regulation 2004*.

The Study Area lies to approximately 7.5 km south of the Fortescue Marsh ESA (Figure 2.6).

### 2.4.4 Conservation Estates

The National Reserve System (NRS) is a network of protected areas managed for conservation under international guidelines. The Study Area lies approximately 43 km south east of Karijini National Park (Figure 2.6).

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**PECs in the vicinity of the Study Area**

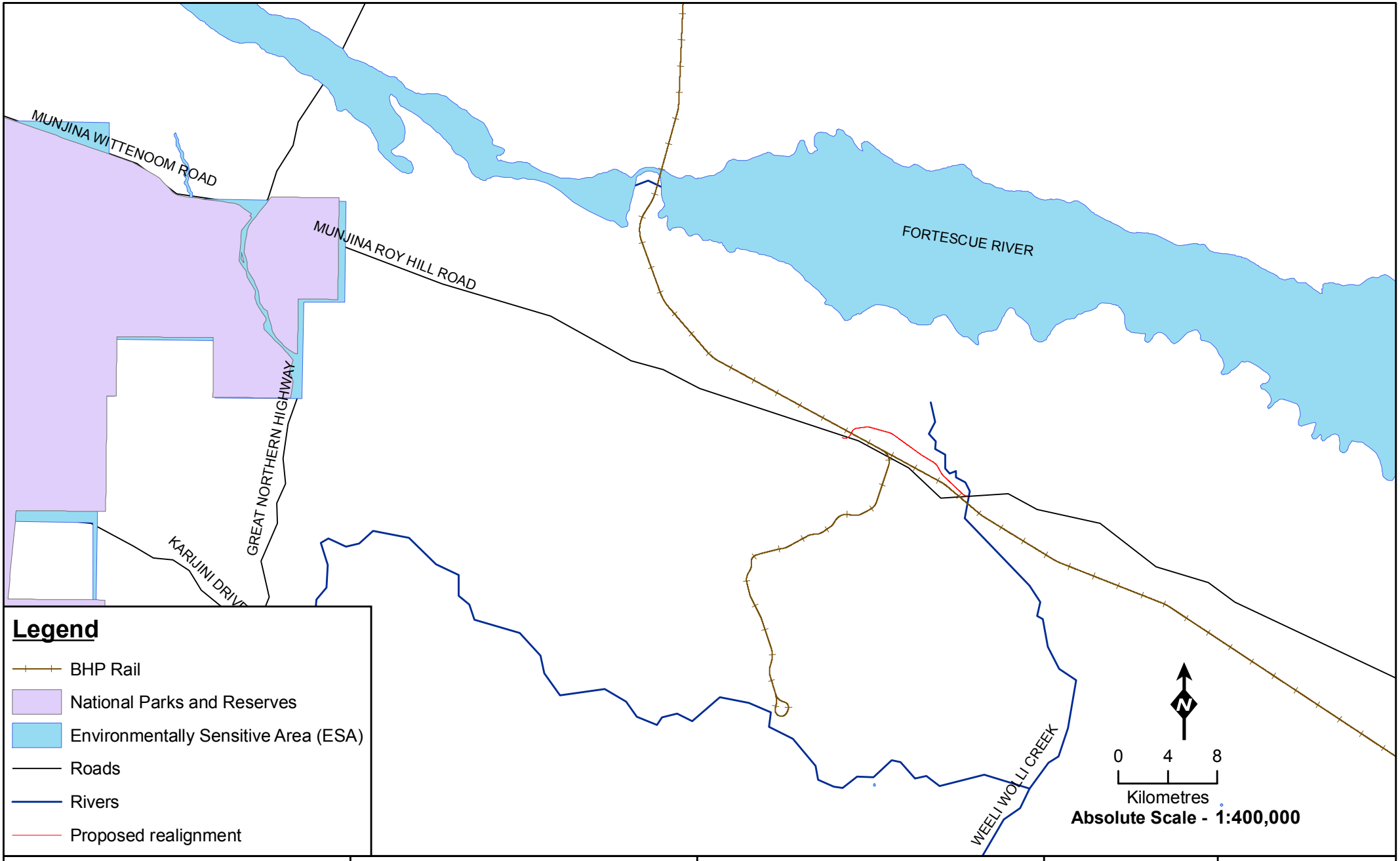
**Figure:2.5**
**Project ID: 1363**

**Drawn: CM014**
**Date: 18/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: RH027

**A4**

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# ESA's and National Parks in the vicinity of the proposed realignment

**Figure: 2.6**
**Project: 1363**

**Drawn: CM**
**Date: 25/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM022

**A4**

### 2.4.5 Flora of Conservation Significance occurring in the vicinity of the Study Area

A search of the DEC's flora databases was conducted applying a buffer of 35 km around the rectangular search area defined in Figure 2.8.

Currently, two DRF taxa are listed as occurring in the Pilbara region; *Lepidium catapycnon* and *Thryptomene wittweri* (WA HERB, December 2010). These species and their preferred habitats are listed in Table 2.6, along with an assessment, based on habitat preference, of the probability of each species being located within the Study Area. *Lepidium catapycnon* has previously been recorded approximately 12 km south east of the realignment.

Table 2.6 – Species Protected by the *EPBC Act* and *WC Act* Recorded in the Pilbara Region

| ***EPBC Act* Listing** | **Family** | **Taxa** | **Preferred Habitat** | **Known Distribution** | **Likelihood of Occurrence in the Study Area** |
|---|---|---|---|---|---|
| Vulnerable | Brassicaceae | *Lepidium catapycnon* | Skeletal soils on hillsides | Newman, Karijini, Hamersley Range, Wittenoom | Possible but unlikely based on landform |
| Vulnerable | Myrtaceae | *Thryptomene wittweri* | Skeletal red stony soils, breakaways and stony creek beds | Carnarvon Range, Mount Meharry, Karijini National Park, Mount Augustus | Unlikely based on landform |

### 2.4.6 Priority Flora with Potential to Occur in the Study Area

The DEC maintains a list of Priority Flora taxa, which are considered poorly known, uncommon or under threat but for which there is insufficient justification, based on known distribution and population sizes, for inclusion on the DRF schedule. One of four priority categories (Atkins 2011) as defined in Appendix A is assigned to these taxa.

Currently, 155 Priority Flora taxa occurring within the Pilbara region (FloraBase, September 2011) are listed.

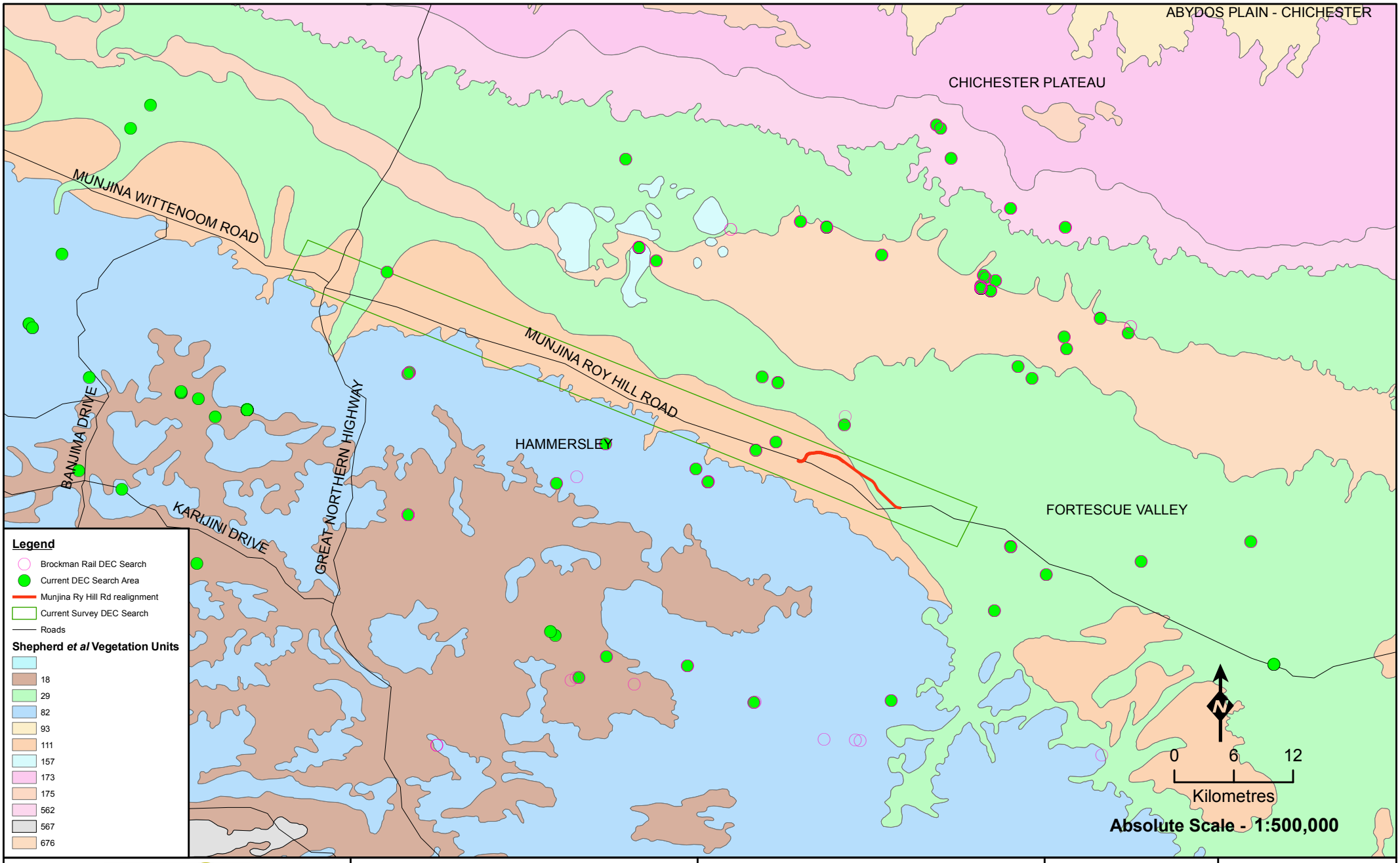
Database searches indicate that 34 Priority Flora occur within a 35 km buffer of the search area, as detailed in Table 2.7 and Figure 2.7. No Priority Flora have previously been recorded within the Study Area, however 6 taxa have been recorded within 15 km of the Study Area (Figure 2.8), two of which have preferred habitats consistent with the landforms and soil of the Study Area.

Table 2.7 – Priority Flora Recorded within a 35 km buffer of the DEC search area

| **Taxon** | **Cons Code** | **Preferred habitat based on previous records** | ***Flw. period** | **Likelihood of Occurrence in the Study Area** |
|---|---|---|---|---|
| *Barbula ehrenbergii* | 1 | Shaded moist environment on rock face | Not spec. | Unlikely |
| *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) | 1 | Mulga woodland or grasslands on clay loam or cracking clay plains | Jul-Sept. | Possible |
| *Eremophila spongiocarpa* | 1 | Saline flats and plains on clay loam | May-Sept | Unlikely |
| *Nicotiana heterantha* | 1 | Seasonally moist soils, plains and watercourses | Mar-Jun/Sept | Possible |
| *Tecticornia globulifera* | 1 | Saline flats clayey sand | Not spec. | Unlikely |
| *Adiantum capillus-veneris* | 2 | Moist, sheltered sites in gorges and on cliff walls. | n/a | Unlikely |
| *Aristida lazaridis* | 2 | Varied | Apr | Possible |
| *Cladium procerum* | 2 | Freshwater channels | Nov | Possible |

| Taxon | Cons Code | Preferred habitat based on previous records | *Flw. period | Likelihood of Occurrence in the Study Area |
|---|---|---|---|---|
| *Dicladanthera glabra* | 2 | Along watercourses, near rock pools | Apr, Aug, Oct | Possible |
| *Eremophila forrestii* subsp. Pingandy (M.E. Trudgen 2662) | 2 | Plains, thin, rocky soils | May-Jul | Possible |
| *Isotropis parviflora* | 2 | Valley slope of ironstone plateau | Mar | Possible |
| *Spartothamnella puberula* | 2 | Rocky loam, sandy or skeletal soils, clay. Sandplains, hills. | Sep-Nov | Possible |
| *Stylidium weeliwolli* | 2 | Gritty sand soil, sandy clay. Edge of watercourses | Aug-Sep | Possible |
| *Acacia subtiliformis* | 3 | On rocky calcrete plateau | Jun | Unlikely |
| *Ampelopteris prolifera* | 3 | Near water or in wet ground | N/A | Possible |
| *Atriplex flabelliformis* | 3 | Clay loam, loam. Saline flats or marshes | Jun | Unlikely |
| *Calotis latiuscula* | 3 | Sand, loam. Rocky hillsides, floodplains, rocky creeks or river beds | Jun-Oct | Possible |
| *Dampiera metallorum* | 3 | Red-brown, gravelly soil over banded ironstone. Steep slopes, summits of hills | Apr-Oct | Possible |
| *Euphorbia stevenii* | 3 | Red or black clays, disturbed soil | Not spec. | Unlikely |
| *Fimbristylis sieberiana* | 3 | Mud, skeletal soil pockets. Pool edges, sandstone cliffs | May-Jun | Possible |
| *Glycine falcata* | 3 | Black clayey sand. Along drainage depressions in crabhole plains on river floodplains | May-Jul | Unlikely |
| *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) | 3 | Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains | Aug | Possible |
| *Indigofera gilesii* subsp. *gilesii* | 3 | Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains | Aug. | Possible |
| *Iotasperma sessilifolium* | 3 | Cracking clay, black loam. Edges of waterholes, plains | Jul-Sept. | Unlikely |
| *Phragmites karka* | 3 | Edge of freshwater creeks and lakes | Not spec. | Possible |
| *Rostellularia adscendens* var. *latifolia* | 3 | Ironstone soils. Near creeks, rocky hills | Apr-May | Possible |
| *Sida* sp. Barlee Range (S. van Leeuwen 1642) | 3 | Skeletal red soils pockets. Steep slope | Aug | Unlikely |
| *Tecticornia medusa* | 3 | Saline sandy soils (shoreline, marshes) | | Unlikely |
| *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) | 3 | Red clay. Clay pan, grass plain | Aug | Possible |
| *Acacia bromilowiana* | 4 | Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds | Jul-Aug | Possible |
| *Eremophila magnifica* subsp. *magnifica* | 4 | Skeletal soils over ironstone. Rocky screes | Aug-Nov | Unlikely |
| *Eremophila youngii* subsp. *lepidota* | 4 | Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats | Jan–Mar/Jun–Sep | Possible |
| *Goodenia nuda* | 4 | Plains, floodplains, drainage lines. Clay and sandy loams | Apr-Aug | Possible |
| *Rhynchosia bungarensis* | 4 | Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall | May-Nov | Unlikely |

Indicates taxa recorded within 15 km of the Study Area.

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# Search Results of DEC/WA Herbarium Database Search

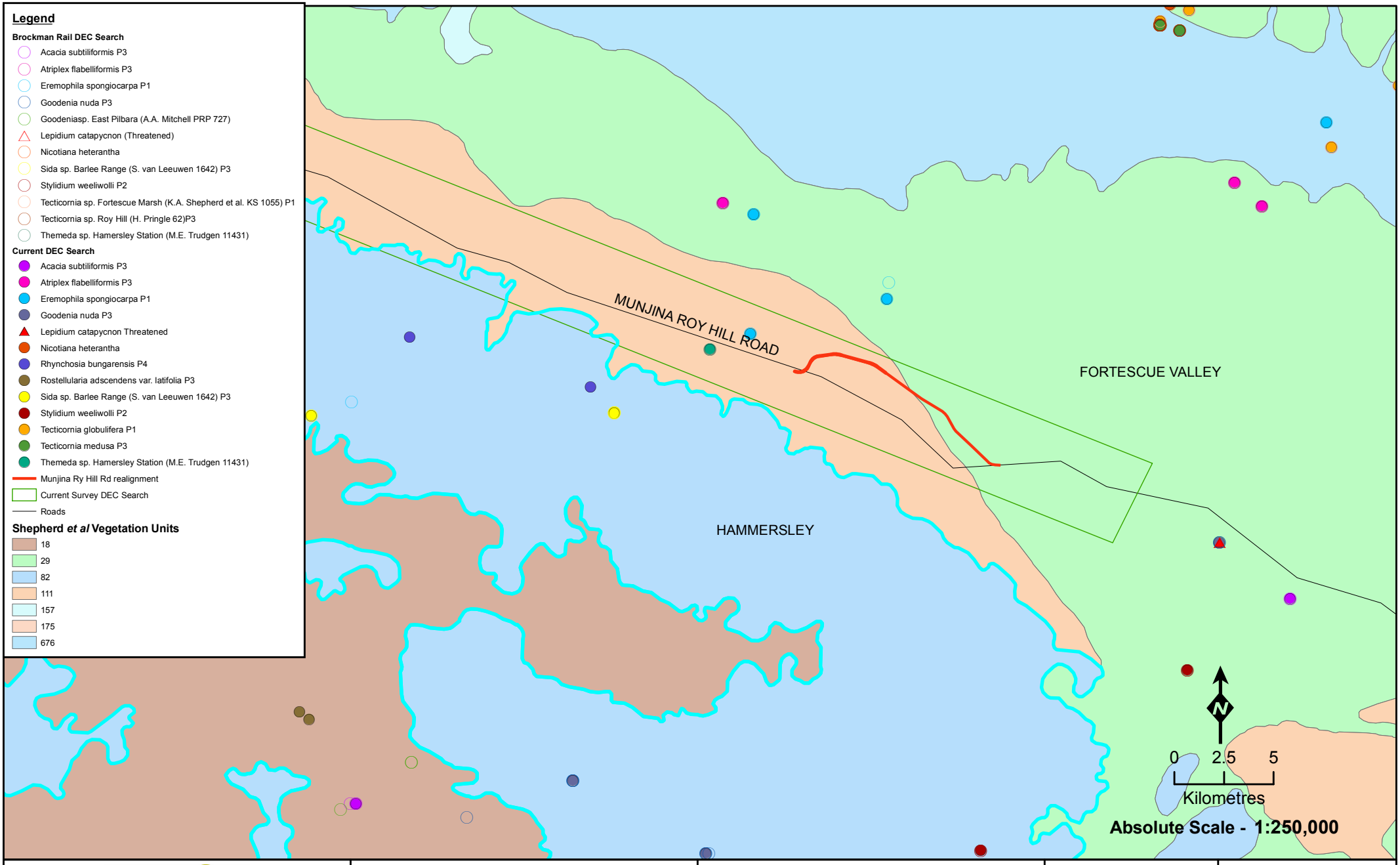
**Figure: 2.7**
**Project: 1363**

**Drawn:CM016**
**Date: 25/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM022

**A4**

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# Threatened and Priority Flora in the vicinity of the Study Area

**Figure: 2.8**
**Project: 1363**

**Drawn:CM016**
**Date: 25/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM023

**A4**

## 2.5 LAND USE HISTORY

The BHP rail line and access track intersect the study area which lies within an active pastoral lease. The alignment adjoins the existing Munjina – Roy Hill Road.

## 2.6 PREVIOUS BIOLOGICAL SURVEYS

No biological surveys of the Study Area were located during the literature review. However a number of unpublished flora and vegetation assessments have been undertaken in the areas surrounding the Study Area, including:

- Surveys at Koodaideri (*ecologia*, 2008a, Biota, 2009) to the north east;
- Upper Marillana exploration lease (*ecologia* 2005a)
- The proposed Brockman Service Corridor from Marillana to Newman (ecologia (2010);
- Brockman Mining Lease (*ecologia,* 2009)
- FMG rail corridor from Port Hedland to the Mindy Mindy mine site to the north and east of the Study Area (Biota 2004b, 2004c).
- Proposed Brockman Rail Corridor to the north east and south east (ecologia, 2011); and
- Surveys along the BHP Billiton Rail Line including
    - Yandi to Kurrajurra Siding (*ecologia*, 2008c),
    - Chichester Deviation Rail Line (*ecologia*, 2008f); and
    - Jimblebar Junction to Yandi Junction Railway Reserve (ENV, 2008).
    - Cowra Camp Site and rail line from Kurrajurra to Cowra Siding (*ecologia*, 2007b) and
    - Redmont Camp Extension (ecologia, 2008e).

# 3 SURVEY METHODOLOGY

## 3.1 VEGETATION AND FLORA ASSESSMENT

The survey was conducted by two botanists in June 2011. The equivalent of four person days was expended. A total of 9, 2,500 $m^2$ quadrats were surveyed to characterise the vegetation structure and the area was searched using a series of transects distanced 50 metres apart.

### 3.1.1 Floristic Quadrats

Quadrat locations were selected to represent the range of vegetation present and located as detailed in Figure 3.1. The following information was recorded at each quadrat and is provided in Appendix B.

1. Location details, including GPS coordinates;
2. Photograph of vegetation structure;
3. Topography, surface soil composition and colour, and surface lithology;
4. Structural information describing the vegetation community; including the height, foliage canopy cover, form and dominant species;
5. Height ranges and foliage canopy cover for each species recorded within the quadrat;
6. Vegetation condition and the nature of disturbance; and
7. The estimated time since the last fire at each site.

Plant specimens were collected for later identification and verification by a qualified plant taxonomist. Vegetation type, life-form strata and percentage cover for each stratum were recorded using the National Vegetation Information System (NVIS) level 6 vegetation classifications (DEH, 2003), as described in Appendix C. Nomenclature and taxonomy follow the conventions currently adopted by the Western Australian Herbarium (FloraBase, 2011).

### 3.1.2 Opportunistic Collections

The area was also searched using a series of transects separated by 50 metres, during which opportunistic collections were made of taxa not already located within the quadrats, noting the local abundance or canopy cover.

### 3.1.3 Vegetation Condition

Vegetation condition was assessed at each quadrat using the rankings and criteria detailed in Table 3.1

Table 3.1 **–** Vegetation Condition Assessment

| Vegetation Condition | Criteria |
|---|---|
| Excellent | Pristine or nearly so, no obvious sign of damage caused by European man. |
| Very good | Some relatively slight signs of damage caused by the activities of European man. E.g. damage to tree trunks by repeated fires, the presence of some relatively non-aggressive weeds or occasional vehicle tracks. |
| Good | More obvious signs of damage caused by the activities of European man, including some obvious impact to vegetation structure such as caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones. |

| Vegetation Condition | Criteria |
|---|---|
| Poor | Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of European man such as grazing or partial clearing or very frequent fires. Presence of some more aggressive weeds. |
| Very poor | Severely impacted by grazing, fire, 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 weeds species including aggressive species. |
| Completely Degraded | Areas that are completely or almost completely without native vegetation e.g. areas that are cleared or parkland cleared with their flora comprising weed or crop species with isolated native trees or shrubs. |

### Fauna assessment

A total of two person-days were expended in the Study Area. Fauna assessment consisted of opportunistic observations at twelve designated locations (Figure 3.1), which were selected to represent the range of habitats present. Habitat descriptions are described in Appendix E. Opportunistic avian and herpetological records were made at each location with a focus on conservation significant fauna. The duration of observations at each location is listed in Table 3.2

Table 3.2 – Survey Duration at Fauna Sites

| Site name | Duration of terrestrial survey(min) |
|---|---|
| FA1 | 20 |
| FA 2 | 20 |
| FA 3 | 20 |
| FA 4 | 20 |
| FA 5 | 20 |
| FA 6 | 20 |
| FA 7 | 20 |
| FA 8 | 40 |
| FA 9 | 20 |
| FA 10 | 20 |
| FA 11 | 20 |
| FA 12 | 20 |

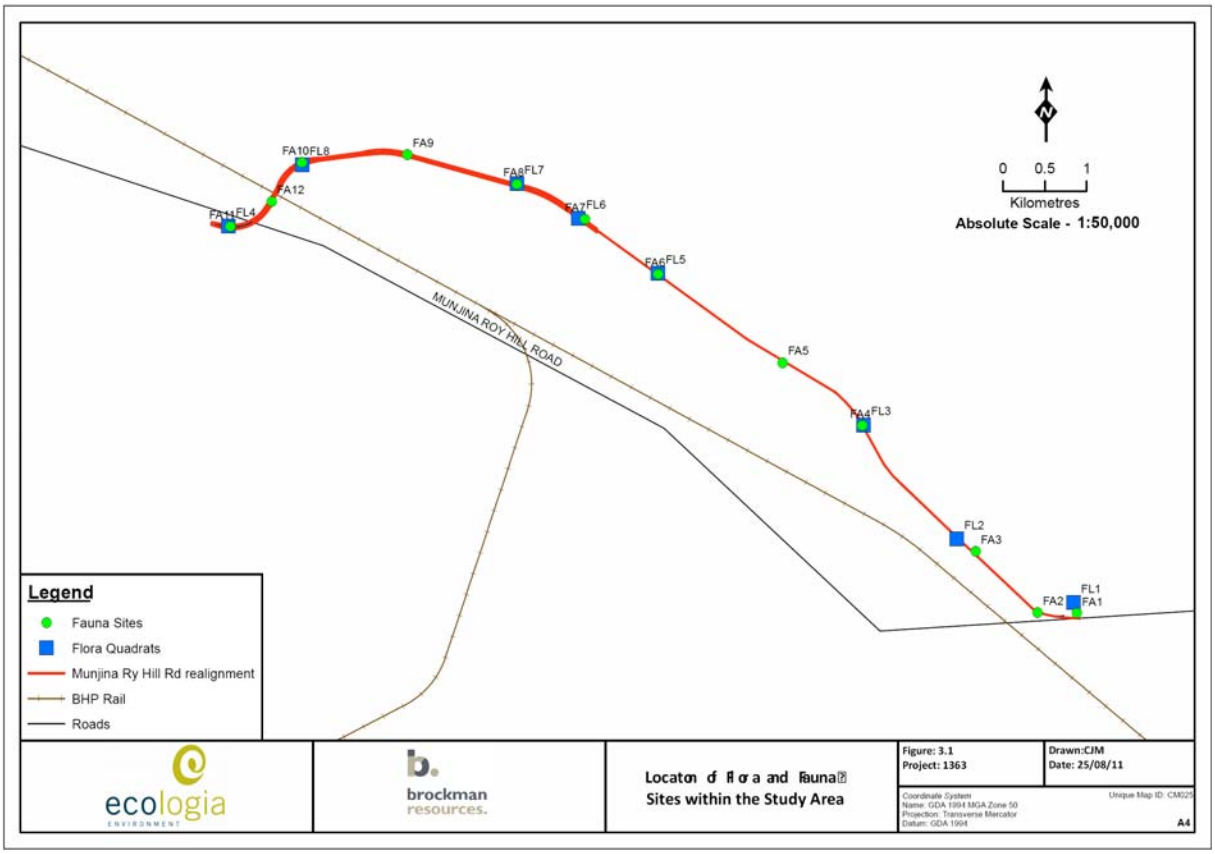



Figure 3.1 – Location of Flora and Fauna Sites within the Study Area

# 4 SURVEY RESULTS

## 4.1 VEGETATION CONDITION OF THE STUDY AREA

Vegetation condition within the Study Area ranged from excellent to poor. The western portion of the alignment bounded to the south by the existing Roy Hill-Munjina Road and to the north by the BHP rail line has been unburnt for an extended period and shows very minor evidence of grazing. Similarly the portion of the alignment immediate north of the BHP rail is dominated by *Triodia* species at ground level with a more recent burn history but little impact from grazing. Further to the east the portion within the Fortescue Plains land system contains species more palatable to cattle and hence the condition ranges from good to poor. The spiny shrub *Acacia synchronicia,* often an increaser species in areas under grazing pressure due to its unpalatability is dominant in some areas. At its eastern edge the alignment intersects the floodplain and bed of a moderately sized creek bed. The flood banks have been significantly disturbed during previous earthworks for the existing road, are heavily grazed with an understorey dominated by **Cenchrus ciliaris* with few shrubs in the middle stratum.

Plate 7: Bed and bank of eastern creek line showing ground disturbance and dominance of **Cenchrus ciliaris*

Plate 6: Plains immediately north west of creek line showing dominance of **Cenchrus ciliaris* at ground level and sparsity of shrub stratum

Plate 8: Hardpan plain dominated by *Acacia synchronicia*

Plate 9: Temporary pools in lowlands with *Acacia aneura* overstory and *Acacia synchronicia* dominated shrub stratum. Note cattle disturbance.

Plate 10: *Triodia basedowii* grasslands south west of BHP rail line showing with little distrurbance evident.

## 4.2 VEGETATION COMMUNITIES OF THE STUDY AREA

The vegetation within the Study Area is considerably more varied than the broad scale mapping of Beard as *Acacia aneura*, trees in groves or patches or *Eucalyptus gamophylla* sparse shrubs over *Triodia basedowii* open hummock grassland. The land system units identified in Table 2.3 provide a more accurate summary of the units present and their representation elsewhere within the Pilbara.

The vegetation structure at each of the nine quadrats, representing the range of vegetation communities present, is detailed in Appendix B and summarised below:

- Open woodland of *Acacia aneura* var. *conifera* over isolated shrubs over *Cenchrus ciliaris* grassland.
- Woodland of *Acacia aneura* var. *conifera, Hakea lorea, Amyema hilliana* over isolated shrubs of *Acacia synchronicia, A. sclerosperma* over *Rhagodia eremaea* over *Cenchrus ciliaris* open grassland.
- Open to sparse woodland of *Acacia aneura* var. *conifera* over open shrubland of *A. citrinoviridis, A. synchronicia* over open *Maireana platycarpa* over sparse grassland of *Cenchrus ciliaris*
- Woodland of *Acacia aneura* var. *conifera, Eucalyptus xerothermica* and *Eremophila longifolia* over open shrubland of *Acacia tetragonophylla*, *Acacia victoriae* over *Maireana platycarpa* over sparse grassland of *Cenchrus ciliaris, Chrysopogon fallax, Eragrostis tenellula* and *Paraceterach muelleri.*
- Open shrubland of *Acacia synchronicia* over *Rhagodia eremaea, Salsola tragus* subsp. *tragus, Sclerolaena cuneata* and *Senna artemisioides* subsp. *helmsii* over sparse to open grassland of *Sporobolus australasicus, Cenchrus ciliaris* and *Brachyachne prostrata.*
- Open woodland *Eucalyptus socialis* subsp. *eucentrica, Atalaya hemiglauca, Eucalyptus odontocarpa* over *Acacia citrinoviridis* over *Cenchrus ciliaris* grassland.
- Isolated *Corymbia terminalis* over open shrubland of *Acacia inaequilatera, Acacia adsurgens, and Senna artemisioides* subsp. *oligophylla, Senna glutinosa* subsp. x *luerssenii* over isolated clumps of *Corchorus walcottii, Dicrastylis cordifolia,* and *Pilotus obovatus over Triodia basedowii* hummock grassland.
- Open mallee woodland of *Eucalyptus gamophylla* over open to sparse shrubland of *Acacia sclerosperma* over sparse low shrubs over hummock grassland of *Triodia basedowii*

# 5 FLORA

A total of 181 taxa were recorded in the Study Area, including subspecies, varieties and hybrids. Two collections could not be identified to genus level and a further four to species level due to a lack of reproductive material.

The total diversity of the flora is summarised in Table 5.1. A complete list of the flora recorded in the Study Area and Proposal Area is included as Appendix E.

Table 5.1 – Diversity of the Flora of the Study Area

| Number Taxa Recorded | Number Families | Number Genera | Number Families Represented by a Single Taxon | Number Genera Represented by a Single Taxon |
|---|---|---|---|---|
| 181 | 37 | 84 | 14 | 48 |

The families and genera represented by the greatest number of taxa are listed in Table 5.2.

Table 5.2 – Most Represnted Families and Genera in the Study Area

| Most Represented Families | Most Represented Genera |
|---|---|
| Fabaceae (37 taxa)<br>Poaceae (31 taxa)<br>Malvaceae (18 taxa)<br>Amaranthaceae (17 taxa) | *Acacia* ( 23 taxa)<br>*Ptilotus* (13 taxa)<br>*Senna* (6 taxa)<br>*Aristida* (5 taxa) |

The overall diversity of flora species in the Study Area s considered comparable with the biodiversity of areas of similar vegetation surveyed elsewhere in the Pilbara. Quadrats in areas assessed as in very good to good condition were of moderate species richness, whereas the species richness of vegetation at the eastern edge of the alignment, assessed as in poor condition, was low.

## 5.1 FLORA OF CONSERVATION SIGNIFICANCE

### 5.1.1 Environment Protection and Biodiversity Conservation Act 1999

Flora species are protected at a National level under the Commonwealth *EPBC Act*. The *EPBC Act* contains a list of species that are considered either 'Critically Endangered', 'Endangered', 'Vulnerable', 'Conservation Dependent', 'Extinct' or 'Extinct in the Wild' (Appendix F).

No *EPBC Act* listed species were recorded in the Study Area.

### 5.1.2 Wildlife Conservation Act 1950

Conservation significance in Western Australia is determined under the *WC Act* protected under the *Western Australian Wildlife Conservation (Rare Flora) Notice 2008(2)* of the *WC Act* are known as Threatened taxa, which are further classified as Critically Endangered, Endangered or Vulnerable. This notice lists flora taxa that are extant and considered likely to become extinct or rare. They are defined as "taxa which have been adequately searched for and deemed to be either rare, in danger of extinction, or otherwise in need of special protection in the wild". These taxa are legally protected and their removal or impact to their surroundings cannot be conducted without Ministerial approval, obtained specifically on each occasion for each population (refer to Appendix A for category definitions).

No Threatened taxa were recorded in the Study Area.

### 5.1.3 Priority Flora with Potential to Occur in the Study Area

The DEC maintains a list of Priority Flora taxa, which are considered poorly known, uncommon or under threat but for which there is insufficient justification, based on known distribution and population sizes, for inclusion on the DRF schedule. A Priority Flora taxon is assigned to one of four priority categories (Atkins 2008) as defined in Appendix A.

The Priority 3 taxon *Rhagodia* sp. Hamersley (M. Trudgen 17794) was recorded at two locations within Mulga woodlands within the Study Area.

*Rhagodia* sp. Hamersley is a perennial shrub growing up to 60cm high with ovate leaves and a striate stem (Plate 4-1). It superficially resembles in form the widespread species *Rhagodia eremaea* and can be mistaken for this taxon if seasonal conditions are not conducive to the collection of reproductive material.

Ten plants were counted in the immediate vicinity of one location and it is considered likely that the taxon has a scattered distribution in this habitat outside the boundaries of the Study Area. Large numbers of this taxon have also been recently recorded to the north of Roy Hill Station and it is considered unlikely that the proposal will impact the viability of this taxon either locally or regionally.

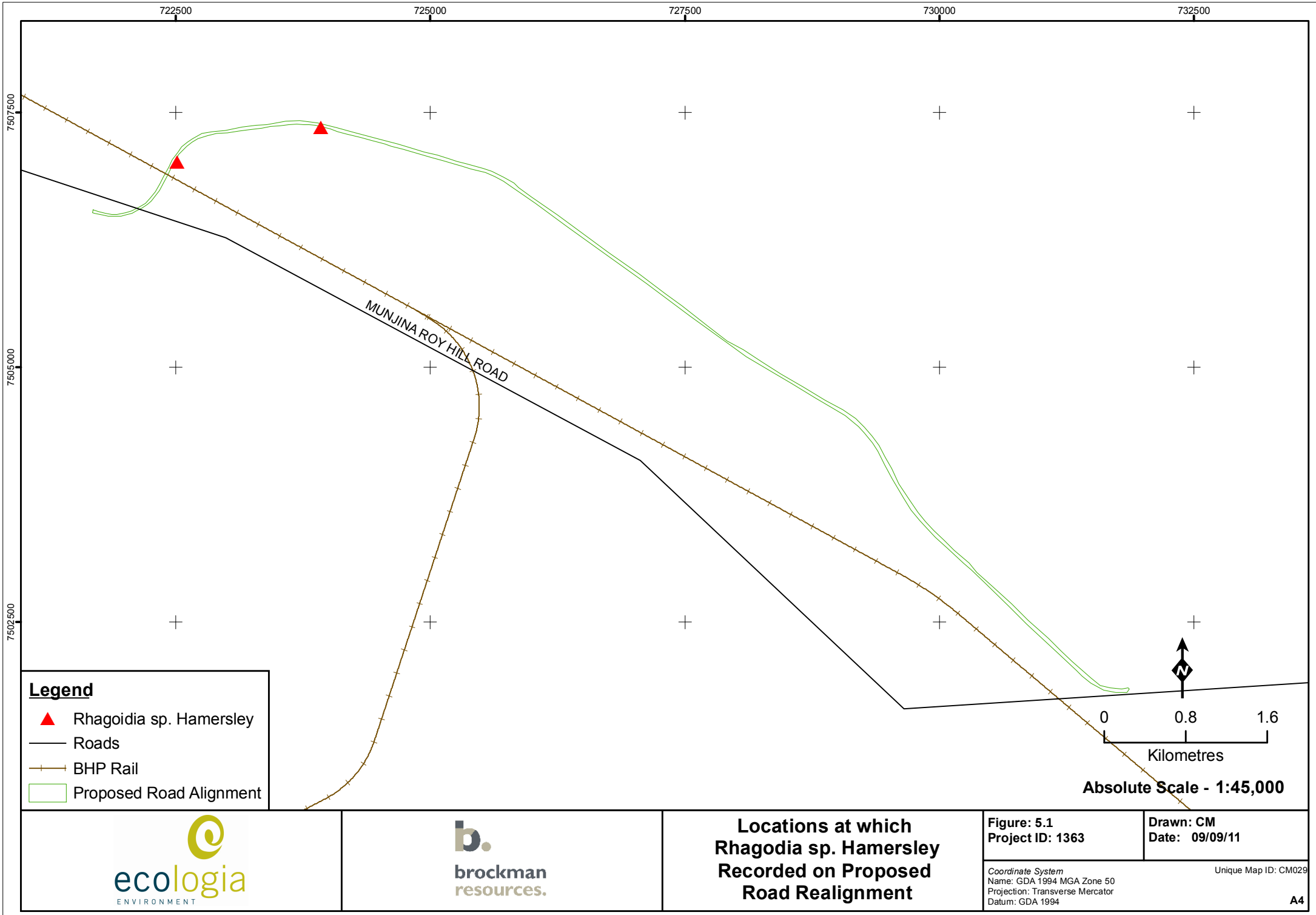
Table 5.3 – Locations at which *Rhagodia* sp. Hamersley (M. Trudgen 17794) was recorded within the Study Area.

| Record | Easting | Northing | Local Abundance |
|---|---|---|---|
| *Rhagodia* sp. Hamersley (M. Trudgen 17794) | 722510.6 | 7507021 | Approx. 10 plants, scattered |
| *Rhagodia* sp. Hamersley (M. Trudgen 17794) | 723926 | 7507358 | < 0.25% cover. |

Datum: WSG 84, Zone: 50K

Plate 11: Form of *Rhagodia* sp. Hamersley (M. Trudgen 17794) (ecologia,2009)

Plate 12: Leaf, stem and fruiting body of *Rhagodia* sp. Hamersley (M. Trudgen 17794) (ecologia,2009)

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# Locations at which Rhagodia sp. Hamersley Recorded on Proposed Road Realignment

**Figure: 5.1**
**Project ID: 1363**

**Drawn: CM**
**Date: 09/09/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CM029

**A4**

## 5.2 INTRODUCED FLORA

### 5.2.1 Declared Plants

Weeds that are, or have the potential to become, pests to agriculture can be declared formally under the *Agriculture and Related Resources Protection Act 1976* (ARRPAct 1976) as declared plants. Weeds listed under this Act are listed with Standard Control Codes that outline the requirements for their control. Five priority groupings exist (P1, P2, P3, P4 or P5) and more than one priority may be assigned to a weed species, and different municipal districts can use different priority levels. Details of these codes are included in Appendix I. Landholders having declared plants on their property are obliged to control them at their own expense, and are encouraged to follow the standard control codes. Information regarding the status of Declared Plants can be viewed at the Department of Agriculture and Food's (DAF) website:

http://www.agric.wa.gov.au/PC_93088.html?s=1819924203,Topic=PC_93079

No declared plants were recorded in the Study Area.

### 5.2.2 Environmental Weeds

A second and much more extensive categorisation of weeds has been developed by the Department of Environment and Conservation (DEC), formerly the Department of Conservation and Land Management (CALM) in an Environmental Weed Strategy (CALM, 1999). Species considered to adversely affect the communities they invade are evaluated based on the following criteria:

- Invasiveness; ability to invade bushland in good to excellent condition or ability to invade waterways (scored as yes or no)
- Distribution; wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world (scored as yes or no)
- Environmental impacts; ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community (scored as yes or no).

Weeds listed as Environmental Weeds are ranked into four categories using the above criteria and the scoring system:

- High; a species which scores as yes to all three of the above criteria. A rating of high indicates a species that should be prioritised for control and/or research.
- Moderate; a species which scores yes for two of the above criteria. A rating of moderate indicates a species which should be monitored. Control or research should be directed to it if funds are available.
- Mild; a species which scores yes to one of the criteria. A mild rating indicates monitoring or control if appropriate.
- Low; a species which does not score yes for any of the criteria. A low rating indicates a low requirement for monitoring.

Six alien species categorised as Environmental Weeds, *Aerva javanica, Vachellia farnesiana, Malvastrum americanum, Cenchrus ciliaris, Cenchrus setiger* and *Cynodon dactylon* were recorded. By far the most widespread is *Cenchrus ciliaris* (Buffel grass) which is common to dominant in the understory of much of the Mulga woodlands and shrublands present in the eastern portion of the alignment. *Malvastrum americanum* (Spiked malvastrum) and *Vachellia farnesiana* (Mimosa bush) are also widespread at low density. It is considered likely that *Bidens bipinnata* (Beggars ticks) is also present given records in the vicinity during the previous survey of the Brockman rail corridor,

however its detection may have been precluded by the survey timing as it has a relatively short cycle and is difficult to detect when desiccated.

Although each of these species has the potential to be invasive when promoted by grazing or disturbance, the proposed development is unlikely to result in the spread of these species beyond the margins of clearing provided appropriate vehicle hygiene methods are used. The movements of cattle throughout the area will continue to promote the spread of these species locally. The focus of vehicle hygiene procedures should be to prevent the spread of seeds beyond the alignment to previously uncontaminated areas.

# 6 FAUNA RESULTS

In total, 34 species of native mammal, four species of introduced mammal, 116 species of bird and 95 species of reptile and three species of amphibian potentially occur within the study area. Two species of mammal, 26 species of bird and six species of reptiles were recorded during this survey (Appendix F). No species of amphibian was observed within the study area.

Three fauna species of conservation significance were recorded during the survey: Australian Bustard (*Ardeotis australis*), Bush Stone-curlew (*Burhinus grallarius*) and Rainbow Bee-eater (*Merops ornatus*) (Figure 6.2). Australian Bustards and Bush Stone-curlews are listed by the DEC as Priority 4. The Rainbow Bee-eater is listed as Migratory under the EPBC Act and as Schedule 3 under the WC Act. Definitions of categories relevant to these fauna species are provided in Appendix D.

In addition, potential habitat for the Brush-tailed Mulgara (*Dasycercus blythi* - EPBC Act Vulnerable) was recorded from fauna sites brn1, brn2 and br9. However, due to the lack of previous records in the vicinity and the small width of the proposed corridor the project is not anticipated to impact this species on a local or regional scale.

**Australian Bustard (*Ardeotis australis*)**

**Conservation Status:** DEC Priority 4

**Distribution and Habitat:** The Australian Bustard occurs Australia-wide and utilises a number of open habitats, including open or lightly wooded grasslands, chenopod flats, plains and heathlands (Johnstone and Storr 1998).

**Ecology:** It is a nomadic species, ranging over very large areas and its abundance varies locally and seasonally from scarce to common, largely dependent on rainfall and food availability. The bustard has an omnivorous diet, feeding on grasses, seeds, fruit, insects and small vertebrates.

Although the population size is still substantial, there has been a large historical decline in abundance, particularly south of the tropics, but also across northern Australia (Garnett and Crowley 2000). This is a result of hunting, degradation of its grassland habitat by sheep and rabbits and predation by foxes and cats (Frith 1976; Garnett and Crowley 2000). Bustards readily desert nests in response to disturbance by humans, sheep or cattle (Garnett and Crowley 2000).

**Likelihood of Occurrence:** One individual Australian Bustard was recorded from within 110m of the proposed road alignment and numerous tracks were observed inside and at surrounding areas (see Figure 6.2, Table 6.1).

Table 6.1 Locations at which Australian Bustards were recorded

| Record | Easting | Northing |
|---|---|---|
| Australian Bustard (individual) | 729484 | 7503770 |
| Australian Bustard (tracks) | 723815 | 7507394 |
| Australian Bustard (tracks) | 723397 | 7507364 |
| Australian Bustard (tracks) | 728954 | 7504622 |
| Australian Bustard (tracks) | 730376 | 7502753 |
| Australian Bustard (tracks) | 726878 | 7505673 |

| Record | Easting | Northing |
|---|---|---|
| Australian Bustard (tracks) | 729486 | 7504006 |
| Australian Bustard (tracks) | 725305 | 7507005 |
| Australian Bustard (tracks) | 725305 | 7507005 |

Datum: WSG 84
Zone: 50K

**Potential Impacts:** Despite the lack of previous records in the area (Appendix F) the Australian Bustard is a widespread species. Suitable foraging habitat is common and continuous inside and outside the project area and the species is able to move away from areas of disturbance. Therefore the impact on this species is anticipated to be low on a local and regional scale.

**Bush Stone-curlew (*Burhinus grallarius*)**

**Conservation Status:** DEC Priority 4

**Distribution and Habitat:** The Bush Stone-curlew occurs across much of Australia, except the arid interior and central south coast, preferring lightly wooded country near thickets or long grass that acts as daytime shelter (Johnstone and Storr 1998). The Bush Stone-curlew inhabits woodlands, dry and open grasslands and croplands with cover nearby (NSW National Parks and Wildlife Service 1999a).

**Ecology:** The species is insectivorous, preying primarily upon beetles, although they will also eat seeds and shoots, frogs, lizards and snakes (Marchant and Higgins 1993; NSW National Parks and Wildlife Service 1999a). They are usually seen in pairs, although may occasionally flock together during the breeding season (August to January) and are generally nocturnal, especially on moonlight nights (NSW National Parks and Wildlife Service 1999a). Historically, this species was widely distributed throughout much of WA, but it is now considered rare, with an estimated Australian population of 15,000 individuals (Garnett and Crowley 2000). Since Bush Stone-curlews are a ground dwelling and non-migratory species they are quite susceptible to local disturbances by humans and to predation by cats and foxes (Frith 1976; Johnstone and Storr 1998). They are most common where land disturbance is minimal and generally become rare or extinct around human settlements (Johnstone and Storr 1998).

**Likelihood of Occurrence:** During the current survey several tracks of the Bush Stone-curlew were recorded from within the proposed road alignment.

Plate 13: Bush Stone-curlew tracks recorded during the survey

**Potential Impacts:** Suitable habitat for the Bush Stone-curlew is widespread in the surrounding area and due to the small width of the proposed road corridor the impact of the proposed project is anticipated to be low on the local population.

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

**Conservation Status:** EPBC Act Migratory

**Distribution and Habitat:** The Rainbow Bee-eater is scarce to common throughout much of Western Australia, except for the arid interior, preferring lightly wooded, preferably sandy, country near water (Johnstone and Storr 1998).

**Ecology:** In Western Australia the Rainbow Bee-eater can occur as a resident, breeding visitor, post-nuptial nomad, passage migrant or winter visitor. It nests in burrows usually dug at a slight angle on flat ground, sandy banks or cuttings, and often at the margins of roads or tracks (Simpson and Day 2004). Eggs are laid at the end of the metre long tunnel from August to January (Boland 2004). Bee-eaters are most susceptible to predation during breeding.

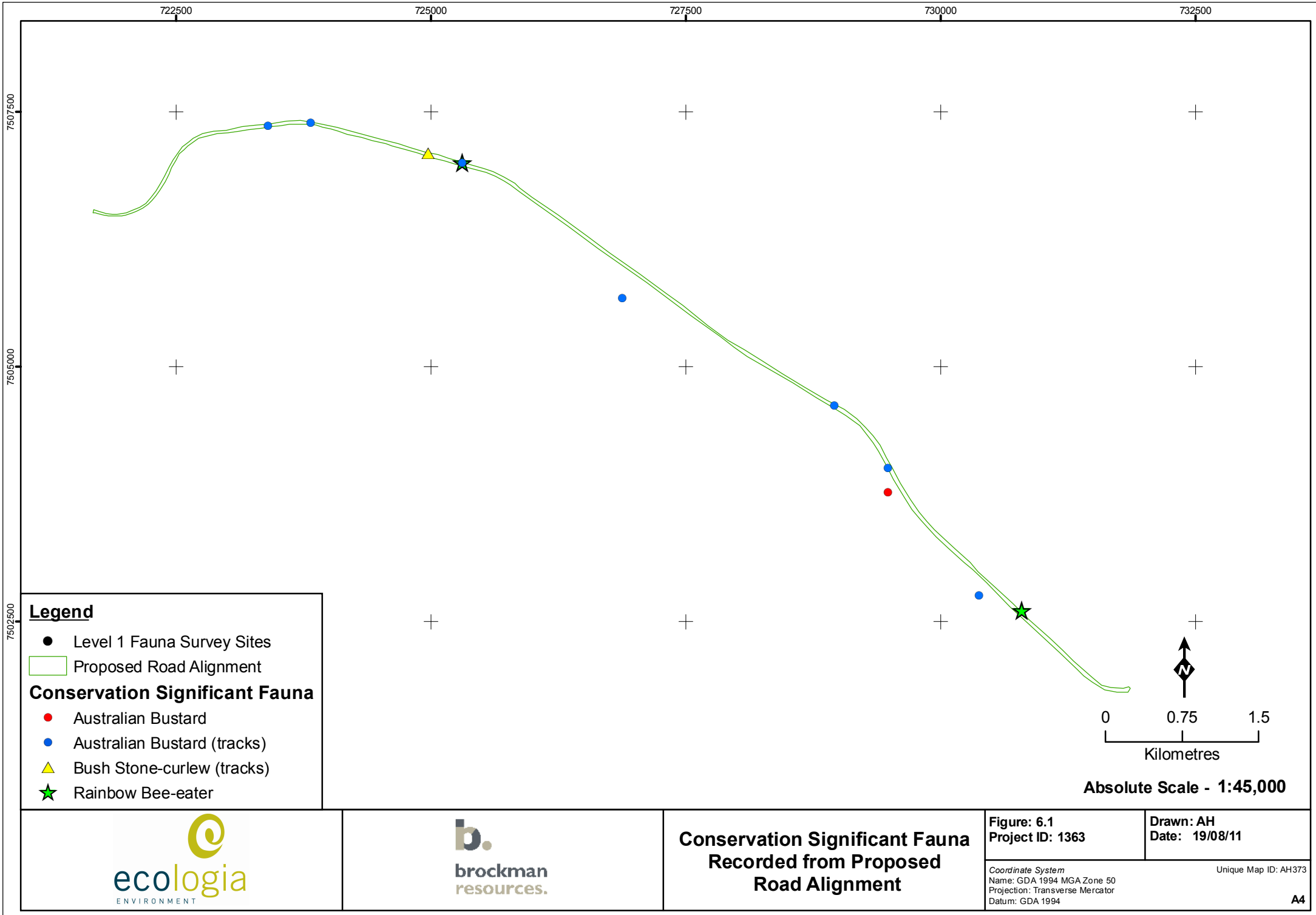
**Likelihood of Occurrence:** Two individuals Rainbow Bee-eater were recorded during this survey. One individual was observed foraging within mulga woodland whilst another was recorded near a large water pool.

Table 6.1 **–** Locations at which Rainbow Bee-eater were recorded

| Record | Easting | Northing |
|---|---|---|
| Rainbow Bee-eater (individual) | 730795 | 7502608 |
| Rainbow Bee-eater (individual) | 725305 | 7507004 |

Datum: WSG 84
Zone: 50K

**Potential Impacts:** Suitable habitat for the Rainbow Bee-eater is widespread and common in the surrounding area and due to the small width of the study area the impact on this species is thought to be low on a local and regional scale.

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# Conservation Significant Fauna Recorded from Proposed Road Alignment

**Figure: 6.1**
**Project ID: 1363**

**Drawn: AH**
**Date: 19/08/11**

*Coordinate System*
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: AH373

**A4**

# 7 ASSESSMENT OF THE STUDY AREA AGAINST THE 10 CLEARING PRINCIPLES

Table 7.1 Assessment of the Study Area against the 10 Clearing Principles

| Principle | Comment |
|---|---|
| 1. Native vegetation should not be cleared if it comprises a high level of biological diversity. | The floristic biodiversity of the vegetation is considered comparable with that in areas of similar vegetation surveyed elsewhere in the Pilbara. Quadrats in areas assessed as in very good to good condition were of moderate species richness, whereas the species richness of vegetation at the eastern edge of the alignment, assessed as in poor condition, was low. The fauna habitats of the area are also considered to be common within the Pilbara. |
| 2. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia. | No vegetation type present is anticipated to be of significance to the native fauna in the Pilbara region. Although three avian species of conservation species were recorded, the Bush Bustard, Stone Curlew and Rainbow Bee Eater, the relatively narrow corridor of clearance is unlikely to impact the survival of local populations, due to their mobility. |
| 3. Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora. | The Priority 3 taxon *Rhagodia* sp. Hamersley was recorded at two locations within the Study Area. This taxon typically has a scattered distribution underneath Mulga trees or large shrubs and is likely to occur widely at low density in this vegetation both inside and outside the proposed corridor. Recent surveys to the north of Roy Hill Station have recorded very large number of this taxon in similar habitat and given its abundance and the very low number of plants likely to be cleared by the proposed realignment, the impact is considered to have negligible impact on the viability of the taxon locally or regionally. |
| 4. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community. | Although the Study Area lies within the buffer zone of the Priority 1 PEC Fortescue Marsh and the Priority 3 Fortescue Sand Dunes, the vegetation present is not representative of either of these PEC's. The alignment passes within approximately 250 m of the Sand Dunes at its nearest location however no direct or indirect impacts to this community are expected. |
| 5. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared. | The area surrounding the Study Area has not been extensively cleared. |
| 6. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland. | A portion of Weeli Wolli creek line is present at the eastern end of the alignment. This area is already heavily disturbed by the existing Munjina-Roy Hill Road and cattle. The disturbance created by the proposed alignment is considered unlikely to cause a significant deterioration in vegetation which is already in poor condition locally. |

| Principle | Comment |
|---|---|
| 7. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation. | The proposed alignment runs for a portion of its extent through low lying topography in which temporary pools are present and weakly defined drainage channels which support shrublands in which mulga is common and at some locations dominant. The design of the road will need to incorporate features such as culverting and dispersal structures to prevent changes to sheet flow which may be deleterious to Mulga. |
| 8. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area. | No conservation estate is in close proximity. |
| 9. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water. | The construction has the potential to result in localise alteration of surface flows and impacts to vulnerable species (Mulga) but the impacts can be mitigated with appropriate design. |
| 10. Native vegetation should not be cleared the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding | The small amount of clearing proposed should have no impact on the incidence or intensity of flooding. |

# 8 STUDY TEAM

The vegetation and flora assessment described in this document was planned, coordinated and executed by:

| **Project Staff and Qualifications** | | |
|---|---|---|
| Carol Macpherson | BSc. (Hons) | Project Manager, Principal Botanist |
| Michelle Holmes | Dip. Hort. | Botanist |
| Astrid Heidrich | M.Sc. | Zoologist |
| Dr. Udani Sirisena | PhD | Taxonomist |

| **Licences - "Licence to Take Flora for Scientific Purposes"** | | |
|---|---|---|
| The vegetation and flora assessment described in this report was conducted under the authorisation of the following licences issued by the DEC: | | |
| | **Permit Number** | **Valid Until** |
| Carol Macpherson | SL009445 | 30th April, 2012 |
| Michelle Holmes | SL009547 | 30th April, 2012 |

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# APPENDIX A CONSERVATION CODES FOR THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

**Table A.1 – Definition of codes for Threatened Ecological Communities**

| Code | Definition |
|---|---|
| PD: Presumed Totally Destroyed | 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 |
| CR: Critically Endangered | 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. |
| EN: Endangered | 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. |
| VU: Vulnerable | 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. |

**Table A.2 – Definition of codes for Priority Ecological Communities**

| Code | Definition |
|---|---|
| P1: Priority One | 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. |
| P2: Priority Two | 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. |
| P3: Priority Three | (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:<br>(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;<br>(iii) Communities made up of large, and/or widespread occurrences that may or 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.<br>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. |
| P4: 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.<br>(a) 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.<br>(b) 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.<br>(c) Ecological communities that have been removed from the list of threatened communities during the past five years.<br>P5: Priority Five 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. |
| P5: Priority Five | 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 B VEGETATION DESCRIPTIONS AT QUADRATS AT THE PROPOSED REALIGNMENT

## Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 02 |
| **Botanist** | MH |
| **Date** | 21/06/2011 |
| **Size** | 50 × 50 m |
| **Location (WGS) Zone** | 50K 0731967 7501993 ± 1.0 |
| **Habitat** | Creekline with a steep slope |
| **Soil** | Red-orange sandy-clay |
| **Rock Type** | Common distribution (10-30%) of gravel/ pebbles and some stones of ironstone |
| **Vegetation** | Open woodland *Eucalyptus socialis* subsp. *eucentrica, Atalaya hemiglauca, Eucalyptus odontocarpa* over *Acacia citrinoviridis* over *Cenchrus ciliaris* grassland. |
| **Condition** | Poor with weeds, animal track, grazing and faeces from cattle |
| **Fire** | 2-5 years |

**Species List**

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees 10-30m | <20% | *Atalaya hemiglauca, Eucalyptus odontocarpa, Eucalyptus socialis* subsp. *eucentrica* |
| Trees <10 m | <5% | *Acacia citrinoviridis* |
| Other grasses | 50-80% | *Cenchrus ciliaris* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 03 |
| **Botanist** | MH |
| **Date** | 21/06/2011 |
| **Size** | 50 × 50 m |
| **Location (WGS) Zone** | 50K 0730540 7502831 ± 1.1 |
| **Habitat** | Plain negligible slope |
| **Soil** | Red-orange sandy-clay |
| **Rock Type** | No rocks |
| **Vegetation** | Open woodland of *Acacia aneura* var. *conifera* over isolated shrubs over *Cenchrus ciliaris* grassland. |
| **Condition** | Poor with weeds, animal track, grazing and faeces from cattle and some vegetation clearing |
| **Fire** | 1-2 years |

**Species List**

| Stratum | Cover | *Species* |
|---|---|---|
| Trees <10 m | <20% | *Acacia aneura* var. *conifera* |
| Shrubs >2m | <1% | *Acacia aneura* var. *conifera* |
| Shrubs 1- 2m | <1% | *Acacia synchronicia* |
| Shrubs 0.5-1m | <1% | *Acacia sclerosperma, Acacia victoriae* |
| Shrubs <0.5m | <1% | *Acacia victoriae, Senna artemisioides* subsp. *oligophylla, Senna notabilis* |
| Other grasses | 50-80% | *Cenchrus ciliaris* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 04 |
| **Botanist** | MH |
| **Date** | 21/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0730569 7502757 ± 1.0 |
| **Habitat** | Plain negligible slope |
| **Soil** | Red-orange-brown sandy-clay |
| **Rock Type** | No rocks |
| **Vegetation** | Woodland of *Acacia aneura* var. *conifera, Hakea lorea, Amyema hilliana* over isolated shrubs of *Acacia synchronicia, A. sclerosperma* over *Rhagodia eremaea* over *Cenchrus ciliaris* open grassland |
| **Condition** | Poor with weeds, animal track, grazing and faeces from cattle |
| **Fire** | 1-2 years |

**Species List**

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees <10 m | 20-50% | *Acacia aneura* var. *conifera, Hakea lorea* |
| Shrubs >2m | <1% | *Acacia synchronicia* |
| Shrubs 1- 2m | <1%j | *Acacia sclerosperma* |
| Shrubs <0.5m | <1% | *Rhagodia eremaea* |
| Other grasses | 20-50% | *Cenchrus ciliaris* |
| Herbs | <1% | *Pterocaulon serrulatum* |
| Epiphytes and climbers | <1% | *Ipomoea muelleri, Amyema hilliana* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 05 |
| **Botanist** | MH |
| **Date** | 21/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0721944 7506514 ± 1.1 |
| **Habitat** | Plain negligible slope |
| **Soil** | Red, dark red and orange sand |
| **Rock Type** | Few (<10%) stones of ironstone |
| **Vegetation** | Isolated *Corymbia terminalis* over open shrubland of *Acacia inaequilatera, Acacia adsurgens, Senna artemisioides* subsp. *oligophylla, Senna glutinosa* subsp. x *luerssenii* over isolated clumps of *Corchorus walcottii, Dicrastylis cordifolia, Pilotus obovatus* over *Triodia basedowii* hummock grassland. |
| **Condition** | Excellent |
| **Fire** | >5 years |

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees <10 m | <5% | *Corymbia terminalis* |
| Shrubs >2m | <5% | *Acacia inaequilatera* |
| Shrubs 1- 2m | <20% | *Acacia adsurgens, Acacia ancistrocarpa, Senna artemisioides* subsp. *oligophylla, Senna glutinosa* subsp. *x luerssenii* |
| Shrubs 0.5-1m | <1% | *Indigofera monophylla* |
| Shrubs <0.5m | <5% | *Corchorus walcottii, Dicrastylis cordifolia, Hakea chordophylla, Ptilotus obovatus, Ptilotus obovatus, Solanum lasiophyllum* |
| Hummock grasses | 50-80% | *Triodia basedowii* |
| Other grasses | <1% | *Aristida latifolia, Eriachne aristidea* |
| Herbs | <1% | *Dysphania kalpari, Goodenia microptera, Ptilotus calostachyus, Scaevola parvifolia* subsp. *pilbarae* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 06 |
| **Botanist** | MH |
| **Date** | 22/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0726999 7505937 ± 1.1 |
| **Habitat** | Gentle sloping Gully |
| **Soil** | Red-orange sandy-clay |
| **Rock Type** | No Rocks |
| **Vegetation** | Open to sparse woodland of *Acacia aneura* var. *conifera* over open shrubland of *A. citrinoviridis, A. synchronicia* over open *Maireana platycarpa* over sparse grassland of *Cenchrus ciliaris* |
| **Condition** | Poor with weeds, animal tracks, faeces and grazing from cattle |
| **Fire** | 1-2 years |

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees <10m | <5% | *Acacia aneura* var. *conifera,* |
| Shrubs >2m | <20% | *Acacia aneura* var. *conifera, Acacia citrinoviridis, Acacia synchronicia, Carissa lanceolata* |
| Shrubs 1-2m | <20% | *Acacia pyrifolia, Acacia synchronicia, Maireana platycarpa* |
| Shrubs 0.5-1m | <1% | *Acacia pyrifolia* |
| Shrubs <0.5m | <1% | *Euphorbia boophthona,* |
| Other grasses | <20% | *Cenchrus ciliariss* |
| Herbs | <0.25% | *Portulaca oleracea* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 07 |
| **Botanist** | MH |
| **Date** | 22/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0725984 7506642 ± 1.0 |
| **Habitat** | Gentle sloping floodplain |
| **Soil** | Red-orange sand |
| **Rock Type** | Many (30-70%) pebbles and stones of ironstone |
| **Vegetation** | Open shrubland of *Acacia synchronicia* over *Rhagodia eremaea, Salsola tragus* subsp. *tragus, Sclerolaena cuneata* and *Senna artemisioides* subsp. *helmsii* over sparse to open grassland of *Sporobolus australasicus, Cenchrus ciliaris* and *Brachyachne prostrata.* |
| **Condition** | Good with some animal tracks, faeces and grazing from cattle |
| **Fire** | 2-5 years |

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Shrubs 1- 2m | <20% | *Acacia synchronicia* |
| Shrubs 0.5-1m | < 5% | *Rhagodia eremaea* |
| Shrubs <0.5m | <20% | *Salsola tragus* subsp. *tragus, Senna artemisioides* subsp. *helmsii* |
| Other grasses | 20-50% | *Brachyachne prostrata, Cenchrus ciliaris, Sporobolus australasicus* |
| Herbs | <1% | *Enchylaena tomentosa* var. *tomentosa, Portulaca oleracea, Sclerolaena cuneata,Trianthema triquetra* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 08 |
| **Botanist** | MH |
| **Date** | 22/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0725242 7507056 ± 1.0 |
| **Habitat** | Plain with a Negligible slope |
| **Soil** | Red-orange clay |
| **Rock Type** | No Rocks |
| **Vegetation** | Woodland of *Acacia aneura* var. *conifera, Eucalyptus xerothermica* and *Eremophila longifolia* over open shrubland of *Acacia tetragonophylla*, *Acacia victoriae* over *Maireana platycarpa* over sparse grassland of *Cenchrus ciliaris, Chrysopogon fallax, Eragrostis tenellula* and *Paraceterach muelleri* |
| **Condition** | Good with some grazing, animal tracks and faeces from cattle |
| **Fire** | >5 years |

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees <10 m | 20-50% | *Acacia aneura* var. *conifera, Eremophila longifolia, Eucalyptus xerothermica* |
| Shrubs >2m | <20% | *Acacia tetragonophylla, Eremophila longifolia* |
| Shrubs 1- 2m | <20% | *Acacia victoriae, Rhagodia eremaea* |
| Shrubs 0.5-1m | <20% | *Acacia tetragonophylla, Enchylaena tomentosa* var. *tomentosa, Malvastrum americanum* |
| Shrubs <0.5m | <20% | *Maireana platycarpa* |
| Other grasses | <5% | *Cenchrus ciliaris, Chrysopogon fallax, Eragrostis* sp., *Eragrostis tenellula, Paraceterach muelleri* |
| Herbs | <1% | *Abutilon fraseri* subsp. *fraseri, Centipeda minima* subsp. *macrocephala, Marsilea hirsuta, Polymeria ambigua, Polymeria ambigua, Pterocaulon serrulatum, Ptilotus macrocephalus, Ptilotus polystachyus, Vittadinia eremaea* |

**Photo**

Brockman Munjina Road Realignment VCP

| | |
|---|---|
| **Quadrat** | 09 |
| **Botanist** | MH |
| **Date** | 22/06/2011 |
| **Size** | 35 × 75 m |
| **Location (WGS) Zone** | 50K 0723926 7507358 ± 1.2 |
| **Habitat** | Plain with a Negligible slope |
| **Soil** | Red-orange sandy-clay |
| **Rock Type** | No Rocks |
| **Vegetation** | Open malle woodland of *Eucalyptus gamophylla* over open shrubland of *Acacia sclerosperma* over sparse low shrubs over hummock grassland of *Triodia basedowii* |
| **Condition** | Very good with slight disturbance of animal tracks and faeces from cattle |
| **Fire** | No evidence |

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Mallees <10% | <20% | *Eucalyptus gamophylla* |
| Shrubs >2m | <20% | *Acacia sclerosperma* |
| Shrubs 1- 2m | <5% | *Acacia sclerosperma,* |
| Shrubs 0.5-1m | <5% | *Indigofera monophylla, Petalostylis cassioides, Senna notabilis* |
| Shrubs <0.5m | <5% | *Bonamia rosea, Corchorus walcottii, Ptilotus astrolasius, Sida* sp. Pilbara (A.A. Mitchell PRP 1543) |
| Hummock grasses | 50-80% | *Triodia basedowii* |
| Herbs | <1% | *Trianthema pilosa, Ptilotus polystachyus,* |

**Photo**

Brockman Munjina Road Realignment VCP

**Quadrat** 10

**Botanist** MH

**Date** 22/06/2011

**Size** 35 × 75 m

**Location (WGS) Zone** 50K 0722716 7507271 ± 0.9

**Habitat** Plain with a Negligible slope

**Soil** Red-orange sandy-clay

**Rock Type** No Rocks

**Vegetation** Open mallee woodland of *Eucalyptus gamophylla* over sparse shrubland of *Acacia ancistrocarpa*, *Acacia sclerosperma* over open hummock grassland of *Triodia basedowii*

**Condition** Good with some disturbance of animal tracks, grazing and faeces from cattle

**Fire** 2-5 years

| **Stratum** | **Cover** | ***Species*** |
|---|---|---|
| Trees <10 m | <5% | *Eucalyptus gamophylla, Hakea lorea* |
| Shrubs 1- 2m | <1% | *Acacia ancistrocarpa, Acacia sclerosperma* |
| Shrubs 0.5-1m | <5% | *Acacia sclerosperma, Acacia sclerosperma, Bonamia erecta, Petalostylis cassioides* |
| Shrubs <0.5m | <1% | *Dicrastylis cordifolia, Indigofera monophylla, Ptilotus calostachyus, Scaevola parvifolia* subsp. *pilbarae* |
| Hummock grasses | 20=50% | *Triodia basedowii* |
| Other grasses | <5% | *Cenchrus ciliaris, Eragrostis eriopoda* |
| Herbs | <1% | *Ptilotus exaltatus, Ptilotus polystachyus* |

**Photo**

# APPENDIX C NATIONAL VEGETATION INFORMATION SYSTEM (NVIS) VEGETATION CLASSIFICATIONS

## NVIS Structural Formation Classes Used For Vegetation Classification

| Height Range (m) | Tree | Shrub | Mallee | Grass |
|---|---|---|---|---|
| >30 | tall | - | - | - |
| 10-30 | mid | - | tall | - |
| <10 | low | - | mid | - |
| <3 | - | - | low | - |
| >2 | - | tall | - | tall |
| 1-2 | - | mid | - | tall |
| 0.5-1 | - | low | - | mid |
| <0.5 | - | low | - | low |

| Growth Form | Height (m) | Structural Formation Classes | | | | | |
|---|---|---|---|---|---|---|---|
| **Foliage cover % (cover #)** | | **70-100% (5)** | **30-70% (4)** | **10-30% (3)** | **<10% (2)** | **0-5% (1)** | **≈0% (N)** |
| **Tree** | **<10,10-30, >30** | closed forest | open forest | woodland | isolated clumps of trees | isolated trees | isolated clumps of trees |
| **Tree mallee** | **<3, <10, 10-30** | closed mallee forest | open mallee forest | mallee woodland | isolated clumps of mallee trees | isolated mallee trees | isolated clumps of mallee trees |
| **Shrub** | **<1,1-2,>2** | closed shrubland | shrubland | open shrubland | isolated clumps of shrubs | isolated shrubs | isolated clumps of shrubs |
| **Mallee shrub** | **<3, <10, 10-30** | closed mallee shrubland | mallee shrubland | open mallee shrubland | isolated clumps of mallee shrubs | isolated mallee shrubs | isolated clumps of mallee shrubs |
| **Heath shrub** | **<1,1-2,>2** | closed heathland | heathland | open heathland | isolated clumps of heath shrubs | isolated heath shrubs | isolated clumps of heath shrubs |
| **Chenopod shrub** | **<1,1-2,>2** | closed chenopod shrubland | chenopod shrubland | open chenopod shrubland | isolated clumps of chenopod shrubs | isolated chenopod shrubs | isolated clumps of chenopod shrubs |
| **Samphire shrub** | **<0.5,>0.5** | closed samphire shrubland | samphire shrubland | open samphire shrubland | isolated clumps of samphire shrubs | isolated samphire shrubs | isolated clumps of samphire shrubs |
| **Hummock grass** | **<2,>2** | closed hummock grassland | hummock grassland | open hummock grassland | isolated clumps of hummock grasses | isolated hummock grasses | isolated clumps of hummock grasses |
| **Tussock grass** | **<0.5,>0.5** | closed tussock grassland | tussock grassland | open tussock grassland | isolated clumps of tussock grasses | isolated tussock grasses | isolated clumps of tussock grasses |
| **Sedge** | **<0.5,>0.5** | closed sedgeland | sedgeland | open sedgeland | isolated clumps of sedges | isolated sedges | isolated clumps of sedges |
| **Rush** | **<0.5,>0.5** | closed rushland | rushland | open rushland | isolated clumps of rushes | isolated rushes | isolated clumps of rushes |

Source: Department of Environment and Heritage, 2003.

# APPENDIX D FLORA SPECIES LIST RECORDED IN THE STUDY AREA

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| AIZOACEAE | *Trianthema pilosa* | | |
| | *Trianthema triquetra* | | |
| AMARANTHACEAE | *Aerva javanica* | | * |
| | *Dysphania kalpari* | | |
| | *Gomphrena canescens* | | |
| | *Maireana platycarpa* | | |
| | *Ptilotus aervoides* | | |
| | *Ptilotus astrolasius* | | |
| | *Ptilotus calostachyus* | | |
| | *Ptilotus calostachyus* | | |
| | *Ptilotus clementii* | | |
| | *Ptilotus exaltatus* | | |
| | *Ptilotus helichrysoides* | | |
| | *Ptilotus helipteroides* | | |
| | *Ptilotus macrocephalus* | | |
| | *Ptilotus obovatus* | | |
| | *Ptilotus polystachyus* | | |
| | *Ptilotus rotundifolius* | | |
| | *Ptilotus sp.* | | |
| APOCYNACEAE | *Carissa lanceolata* | | |
| ASTERACEAE | *Centipeda minima* subsp. *macrocephala* | | |
| | *Pluchea dentex* | | |
| | *Pterocaulon serrulatum* | | |
| | *Vittadinia eremaea* | | |
| BORAGINACEAE | *Heliotropium chrysocarpum* | | |
| | *Trichodesma zeylanicum* | | |
| | *Trichodesma zeylanicum* var. *latisepalum* | | |
| CAESALPINIACEAE | *Senna artemisioides* subsp. *helmsii* | | |
| | *Senna artemisioides* subsp. *oligophylla* | | |
| | *Senna glutinosa* subsp. *x luerssenii* | | |
| | *Senna notabilis* | | |

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| CARYOPHYLLACEAE | *Polycarpaea corymbosa* | | |
| | *Polycarpaea holtzei* | | |
| CELASTRACEAE | *Maytenus* sp. Mt Windell (S. van Leeuwen 846) | | |
| CHENOPODIACEAE | *Dysphania kalpari* | | |
| | *Dysphania rhadinostachya* subsp. *rhadinostachya* | | |
| | *Enchylaena tomentosa* var. *tomentosa* | | |
| | *Maireana platycarpa* | | |
| | *Maireana villosa* | | |
| CHENOPODIACEAE | *Rhagodia eremaea* | | |
| | *Salsola tragus* subsp. *tragus* | | |
| | *Sclerolaena cornishiana* | | |
| | *Sclerolaena cuneata* | | |
| | *Sclerolaena densiflora* | | |
| CONVOLVULACEAE | *Bonamia erecta* | | |
| | *Bonamia pannosa* | | |
| | *Bonamia rosea* | | |
| | *Duperreya commixta* | | |
| | *Duperreya sericea* | | |
| | *Ipomoea muelleri* | | |
| | *Polymeria ambigua* | | |
| CYPERACEAE | *Bulbostylis barbata* | | |
| EUPHORBIACEAE | *Euphorbia australis* | | |
| | *Euphorbia biconvexa* | | |
| | *Euphorbia boophthona* | | |
| | *Euphorbia drummondii* | | |
| | *Euphorbia schultzii* | | |
| FABACEAE | *Acacia adsurgens* | | |
| | *Acacia ancistrocarpa* | | |
| | *Acacia aneura* var. *conifera* | | |
| | *Acacia aneura* var. *microcarpa* | | |
| | *Acacia bivenosa* | | |
| | *Acacia citrinoviridis* | | |

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| | *Acacia coriacea* | | |
| | *Acacia cowleana* | | |
| | *Acacia dictyophleba* | | |
| | *Acacia inaequilatera* | | |
| | *Acacia macraneura* | | |
| | *Acacia pruinocarpa* | | |
| | *Acacia pyrifolia* | | |
| | *Acacia sclerosperma* | | |
| | *Acacia spondylophylla* | | |
| | *Acacia synchronicia* | | |
| | *Acacia synchronicia* | | |
| | *Acacia tetragonophylla* | | |
| | *Acacia trachycarpa* | | |
| | *Acacia tumida* var. *pilbarensis* | | |
| | *Acacia tumida* var. *tumida* | | |
| | *Acacia victoriae* | | |
| FABACEAE | *Acacia xiphophylla* | | |
| | *Cullen stipulaceum* | | |
| | *Indigofera monophylla* | | |
| | *Isotropis atropurpurea* | | |
| | *Petalostylis cassioides* | | |
| | *Senna artemisioides* subsp. *helmsii* | | |
| | *Senna artemisioides* subsp. *oligophylla* | | |
| | *Senna glutinosa* subsp. *glutinosa* | | |
| | *Senna glutinosa* subsp. *pruinosa* | | |
| | *Senna glutinosa* subsp. *x luerssenii* | | |
| | *Senna notabilis* | | |
| | *Tephrosia rosea* | | |
| | *Tephrosia rosea* var. *clementii* | | |
| | *Tephrosia sp.* | | |
| | *Vachellia farnesiana* | | * |
| GOODENIACEAE | *Goodenia armitiana* | | |

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| | *Goodenia microptera* | | |
| | *Goodenia muelleriana* | | |
| | *Goodenia prostrata* | | |
| | *Goodenia scaevolina* | | |
| | *Scaevola parvifolia* subsp. *pilbarae* | | |
| | *Scaevola spinescens* | | |
| HALORAGACEAE | *Haloragis gossei* | | |
| LAMIACEAE | *Dicrastylis cordifolia* | | |
| LAURACEAE | *Cassytha capillaris* | | |
| LORANTHACEAE | *Amyema hilliana* | | |
| MALVACEAE | *Abutilon fraseri* subsp. *fraseri* | | |
| | *Abutilon lepidum* | | |
| | *Corchorus lasiocarpus* subsp. *lasiocarpus* | | |
| | *Corchorus sidoides* subsp. *sidoides* | | |
| | *Corchorus tridens* | | |
| | *Corchorus walcottii* | | |
| | *Gossypium robinsonii* | | |
| | *Gossypium sturtianum* | | |
| | *Hibiscus coatesii* | | |
| | *Hibiscus sturtii* | | |
| | *Hibiscus sturtii* var. *campylochlamys* | | |
| | *Keraudrenia nephrosperma* | | |
| | *Malvastrum americanum* | | * |
| | *Rulingia luteiflora* | | |
| | *Sida calyxhymenia* | | |
| MALVACEAE | *Sida clementii* | | |
| | *Sida* sp. articulation below (A.A. Mitchell PRP 1605) | | |
| | *Sida* sp. Pilbara (A.A. Mitchell PRP 1543) | | |
| MARSILEACEAE | *Marsilea hirsuta* | | |
| MOLLUGINACEAE | *Mollugo molluginea* | | |
| MYRTACEAE | *Corymbia hamersleyana* | | |
| | *Corymbia terminalis* | | |

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| | *Eucalyptus gamophylla* | | |
| | *Eucalyptus leucophloia* | | |
| | *Eucalyptus odontocarpa* | | |
| | *Eucalyptus socialis* subsp. *eucentrica* | | |
| | *Eucalyptus xerothermica* | | |
| NYCTAGINACEAE | *Boerhavia coccinea* | | |
| OLEACEAE | *Jasminum didymum* subsp. *lineare* | | |
| POACEAE | *Aristida contorta* | | |
| | *Aristida holathera* var. *holathera* | | |
| | *Aristida hygrometrica* | | |
| | *Aristida inaequiglumis* | | |
| | *Aristida latifolia* | | |
| | *Aristida sp.* | | |
| | *Brachyachne prostrata* | | |
| | *Cenchrus ciliaris* | | * |
| | *Cenchrus setiger* | | * |
| | *Chrysopogon fallax* | | |
| | *Cymbopogon ambiguus* | | |
| | *Cymbopogon obtectus* | | |
| | *Cynodon dactylon* | | * |
| | *Dactyloctenium radulans* | | |
| | *Enneapogon caerulescens* | | |
| | *Enneapogon polyphyllus* | | |
| | *Eragrostis eriopoda* | | |
| | *Eragrostis pergracilis* | | |
| | *Eragrostis sp.* | | |
| | *Eragrostis tenellula* | | |
| | *Eremophila longifolia* | | |
| | *Eriachne aristidea* | | |
| | *Eriachne mucronata* | | |
| | *Eriachne pulchella* subsp. *pulchella* | | |
| | *Eulalia aurea* | | |

**Appendix C: Species list for the Proposed Realignment**

| Family | Taxa | Cons. Code | Weed |
|---|---|---|---|
| | *Paraneurachne muelleri* | | |
| | *Poaceae sp.* | | |
| POACEAE | *Sporobolus australasicus* | | |
| | *Themeda triandra* | | |
| | *Triodia basedowii* | | |
| | *Triodia pungens* | | |
| | *Triodia wiseana* | | |
| PORTULACACEAE | *Portulaca oleracea* | | |
| PROTEACEAE | *Grevillea wickhamii* | | |
| | *Grevillea wickhamii* subsp. *hispidula* | | |
| | *Hakea chordophylla* | | |
| | *Hakea lorea* | | |
| PTERIDACEAE | *Paraceterach muelleri* | | |
| SANTALACEAE | *Exocarpos aphyllus* | | |
| | *Exocarpos sparteus* | | |
| SAPINDACEAE | *Atalaya hemiglauca* | | |
| | *Diplopeltis stuartii* var. *stuartii* | | |
| | *Dodonaea lanceolata* var. *lanceolata* | | |
| SCROPHULARIACEAE | *Eremophila forrestii* subsp. *forrestii* | | |
| | *Eremophila lanceolata* | | |
| | *Eremophila longifolia* | | |
| SOLANACEAE | *Solanum lasiophyllum* | | |
| | *Solanum phlomoides* | | |
| VIOLACEAE | *Hybanthus aurantiacus* | | |
| ZYGOPHYLLACEAE | *Tribulus hirsutus* | | |
| | *Tribulus macrocarpus* | | |
| | *Tribulus suberosus* | | |

# APPENDIX E FAUNA SITE DESCRIPTIONS

| Site description | Site Photo |
|---|---|
| FA1<br><br>Acacia shrubland. *Acacia* spp, *Grevillea wickhami*, *Senna* spp, *Indigofera monophylla*, *Salsala australis* over *Triodia basedowii* on reddish –brown loam with pebbles. Sparse wood litter and leaf litter present.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 673813e 7525514n |  |
| FA2<br><br>Open mixed shrubland with open *Corymbia* ?hamersleyana. over mixed Acacia spp., *G wickhami* and *Ptilotus exoltatus* over *Triodia basedowii* on loam-clay with many pebbles.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 673634e 7525336n |  |

| | |
|---|---|
| FA3<br><br>Patches of moderately closed Acacia shrubland with *Acacia tumida* var. *pilbarensis*, *Solanum lasiphyllum*, *Senna* spp., *Ptilotus exoltatus*, *G. wickhami* over spinifex on reddish-brown loam-clay with pebbles. No wood litter or leaf litter present.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 673640e 7525539n |  |
| FA4<br><br>Open mixed shrubland of *Acacia* sp., *Grevillea* sp., over spinifex on red-brown loam-clay with pebbles. No wood litter and leaf litter present.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 673398e 7525378n |  |

| | |
|---|---|
| FA5<br><br>Recently burnt shrubland with occassional early regenerated eucalypt trees over mixed acacia shrubs and *G. wickhami* over spinifex on firm red-brown loam with few pebbles. Sparse wood litter and no leaf litter present.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 673262e 7525586n |  |
| FA6<br><br>Patches of very dense acacia shrubland. *Acacia tumida* var. *pilbarensis* over occasional *G. wickhami* over occasional Senna sp. and spinifex on soft loam with occasional pebbles. Moderate wood litter, plenty of leaf litter.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 672330e 7526318n |  |

| | |
|---|---|
| FA7<br><br>Moderately open acacia shrubland with occasional *Eucalyptus gamophylla* mallees over *Acacia tumida* var. *pilbarensis* shrubs, *G. wickhami* and *Senna* sp. over spinifex on firm loam-clay with many pebbles.<br><br>Sparse wood litter and sparse leaf litter.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 672689e 7526101n |  |
| FA8<br><br>Mulga shrubland with moderate layer of *Acacia aneura* and occasional *Acacia pruinocarpa*. No understorey. Firm reddish-brown loam. No wood litter or leaf litter present.<br><br>Habitat type: Mulga shrubland<br><br>Coordinates: 673334e 7525824n |  |

| | |
|---|---|
| FA9<br><br>Open mixed acacia shrubland over *Grevillea* sp. and *Senna* sp. shrubs over spinifex on hard clay with continuous layer of pebbles. No wood litter and sparse leaf litter present.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 672935e 7525954n |  |
| FA10<br><br>Very open woodland of *Eucalyptus gamophylla* over recently burnt mixed shrubs over very open spinifex and mixed herbs. Scattered wood litter and sparse leaf litter on firm loam with scattered pebbles.<br><br>Habitat type: Acacia shrubland<br><br>Coordinates: 674007e 7525319n |  |

# APPENDIX F REGIONAL FAUNA RECORDS AND SPECIES RECORDED DURING THE SURVEY

Appendix E1 Mammals

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| **DASYURIDAE** | | | | | | | | | | |
| *Dasykaluta rosamondae* | Little Red Kaluta | | | | ✓ | ✓ | | ✓ | | |
| *Dasyurus hallucatus* | Northern Quoll | **EN** | **S1** | | ✓ | | | | ✓ | |
| *Ningaui timealeyi* | Pilbara Ningaui | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Planigale* sp. | Common Planigale | | | | ✓ | ✓ | | ✓ | | |
| *Pseudantechinus macdonnellensis* | Fat-tailed Antechinus | | | | | | | ✓ | | |
| *Pseudantechinus woolleyae* | Woolley's False Antechinus | | | | ✓ | | | | | |
| *Sminthopsis macroura* | Stripe-faced Dunnart | | | | ✓ | ✓ | | ✓ | | |
| *Sminthopsis youngsoni* | Lesser Hairy-footed Dunnart | | | | ✓ | | | | | |
| **EMBALLONURIDAE** | | | | | | | | | | |
| *Saccolaimus flaviventris* | Yellow-bellied Sheath-tail Bat | | | | ✓ | ✓ | | ✓ | | |
| *Taphozous georgianus* | Common Sheath-tail Bat | | | | | | | ✓ | | |
| *Taphozous hilli* | Hill's Sheath-tail Bat | | | | | | | ✓ | | |
| **HIPPOSIDERIDAE** | | | | | | | | | | |
| *Rhinonicteris aurantia* | Pilbara Leaf-nosed bat | **VU** | **S1** | | | | | | | |
| **MACROPODIDAE** | | | | | | | | | | |
| *Macropus robustus* | Euro | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Macropus rufus* | Red Kangaroo | | | | | ✓ | | ✓ | | |
| *Petrogale rothschildi* | Rothschild's Rock-wallaby | | | | | ✓ | | ✓ | | |
| **MEGADERMATIDAE** | | | | | | | | | | |
| *Macroderma gigas* | Ghost Bat | | | **P4** | | | | | | |

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| **MOLOSSIDAE** | | | | | | | | | | |
| *Chaerephon jobensis* | Northern Mastiff-bat | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Mormopterus beccarii* | Beccari's Freetail-bat | | | | ✓ | ✓ | | ✓ | | |
| *Mormopterus planiceps* | Little Mastiff-bat | | | | | | | ✓ | | |
| *Tadarida australis* | White-striped Mastiff-bat | | | | | | ✓ | ✓ | | |
| **MURIDAE** | | | | | | | | | | |
| *Leggadina lakedownensis* | Northern Short-tailed Mouse | | | **P4** | | | | | ✓ | |
| *Notomys alexis* | Spinifex Hopping-mouse | | | | ✓ | ✓ | | ✓ | | |
| *Pseudomys chapmani* | Western Pebble-mouse | | | **P4** | ✓ | ✓ | ✓ | ✓ | ✓ | |
| *Pseudomys desertor* | Desert Mouse | | | | ✓ | | | ✓ | | |
| *Pseudomys hermannsburgensis* | Sandy Inland Mouse | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Zyzomys argurus* | Common Rock-rat | | | | ✓ | | | ✓ | | |
| **THYLACOMYIDAE** | | | | | | | | | | |
| *Macrotis lagotis* | Bilby | **VU** | **S1** | | | | | | ✓ | |
| **VESPERTILIONIDAE** | | | | | | | | | | |
| *Chalinolobus gouldii* | Gould's Wattled Bat | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Chalinolobus morio* | Chocolate Wattled Bat | | | | ✓ | | | | | |
| *Nyctophilus bifax* | Eastern Long-eared Bat | | | | ✓ | | | ✓ | | |
| *Nyctophilus geoffroyi* | Lesser Long-eared Bat | | | | ✓ | ✓ | | ✓ | | |
| *Nyctophilus major* | Greater Long-eared Bat | | | | | ✓ | | | | |
| *Scotorepens greyii* | Little Broad-nosed Bat | | | | ✓ | ✓ | | ✓ | | |
| *Vespadelus finlaysoni* | Finlayson's Cave Bat | | | | ✓ | ✓ | | | | |
| **INTRODUCED MAMMALS** | | | | | | | | | | |
| *Bos taurus* | Cow | | | | | | ✓ | ✓ | | |

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| *Camelus dromedarius* | Camel | | | | | ✓ | | | | |
| *Canis familiaris* | Dog/Dingo | | | | | | | ✓ | | ✓ |
| *Felis catus* | Cat | | | | | ✓ | | ✓ | | |
| *Mus musculus* | House Mouse | | | | ✓ | ✓ | ✓ | ✓ | | |

Appendix E2 Birds

| Scientific Name | Common Name | Conservation Status | | | WAM | Birdata | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| **CASUARIIDAE** | | | | | | | | | | | |
| *Dromaius novaehollandiae* | Emu | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **ANATIDAE** | | | | | | | | | | | |
| *Anas gracilis* | Grey Teal | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Anas superciliosa* | Pacific Black Duck | | | | | ✓ | ✓ | ✓ | ✓ | | |

| Scientific Name | Common Name | Conservation Status | | | WAM | Birdata | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Cygnus atratus* | Black Swan | | | | | | ✓ | | | | |
| **COLUMBIDAE** | | | | | | | | | | | |
| *Geopelia cuneata* | Diamond Dove | | | | | ✓ | ✓ | | ✓ | | |
| *Geopelia striata* | Peaceful Dove | | | | | ✓ | | | ✓ | | |
| *Geophaps plumifera* | Spinifex Pigeon | | | | | ✓ | ✓ | | ✓ | | ✓ |
| *Ocyphaps lophotes* | Crested Pigeon | | | | | ✓ | ✓ | | ✓ | | ✓ |
| *Phaps chalcoptera* | Common Bronzewing | | | | | ✓ | ✓ | | ✓ | | |
| **PODARGIDAE** | | | | | | | | | | | |
| *Podargus strigoides* | Tawny Frogmouth | | | | | ✓ | | ✓ | ✓ | | |
| **EUROSTOPODIDAE** | | | | | | | | | | | |
| *Eurostopodus argus* | Spotted Nightjar | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **AEGOTHELIDAE** | | | | | | | | | | | |
| *Aegotheles cristatus* | Australian Owlet-Nightjar | | | | | ✓ | | | ✓ | | |
| **APODIDAE** | | | | | | | | | | | |
| *Apus pacificus* | Fork-tailed Swift | **M** | **S3** | | | | | | ✓ | | |
| **PHALACROCORIDAE** | | | | | | | | | | | |
| *Phalacrocorax melanoleucos* | Little Pied Cormorant | | | | | ✓ | ✓ | ✓ | | | |
| *Phalacrocorax sulcirostris* | Little Black Cormorant | | | | | ✓ | ✓ | | ✓ | | |
| **PELECANIDAE** | | | | | | | | | | | |
| *Pelecanus conspicillatus* | Australian Pelican | | | | | | ✓ | | | | |
| **ARDEIDAE** | | | | | | | | | | | |

| Scientific Name | Common Name | Conservation Status | | | WAM | Birdata | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | This survey |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Ardea ibis* | Cattle Egret | **M** | **S3** | | | ✓ | | | | | |
| *Ardea modesta* | Eastern Great Egret | **M** | **S3** | | | ✓ | ✓ | | | | |
| *Ardea pacifica* | White-necked Heron | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Egretta novaehollandiae* | White-faced Heron | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Nycticorax caledonicus* | Nankeen Night-Heron | | | | | | | | ✓ | | |
| **ACCIPITRIDAE** | | | | | | | | | | | |
| *Accipiter cirrhocephalus* | Collared Sparrowhawk | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Accipiter fasciatus* | Brown Goshawk | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Aquila audax* | Wedge-tailed Eagle | | | | | ✓ | ✓ | | ✓ | | |
| *Circus assimilis* | Spotted Harrier | | | | | | ✓ | ✓ | ✓ | | |
| *Elanus axillaris* | Black-shouldered Kite | | | | | | ✓ | | ✓ | | |
| *Haliastur sphenurus* | Whistling Kite | | | | | ✓ | ✓ | | ✓ | | ✓ |
| *Hamirostra melanosternon* | Black-breasted Buzzard | | | | | | | | ✓ | | |
| *Hieraaetus morphnoides* | Little Eagle | | | | | ✓ | | ✓ | ✓ | | |
| *Lophoictinia isura* | Square-tailed Kite | | | | | ✓ | | | ✓ | | |
| *Milvus migrans* | Black Kite | | | | | ✓ | ✓ | | ✓ | | |
| **FALCONIDAE** | | | | | | | | | | | |
| *Falco berigora* | Brown Falcon | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Falco cenchroides* | Nankeen Kestrel | | | | | ✓ | ✓ | | ✓ | | |
| *Falco hypoleucos* | Grey Falcon | | | **P4** | | | ✓ | | | | |
| *Falco longipennis* | Australian Hobby | | | | | ✓ | ✓ | ✓ | ✓ | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Falco peregrinus* | Peregrine Falcon | | **S4** | | | ✓ | | | ✓ | ✓ | |
| **OTIDIDAE** | | | | | | | | | | | |
| *Ardeotis australis* | Australian Bustard | | | **P4** | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| **BURHINIDAE** | | | | | | | | | | | |
| *Burhinus grallarius* | Bush Stone-curlew | | | **P4** | | | | | | | |
| **RECURVIROSTRIDAE** | | | | | | | | | | | |
| *Himantops himantops* | Black-winged Stilt | | | | | | ✓ | | | | |
| **CHARADRIIDAE** | | | | | | | | | | | |
| *Elseyornis melanops* | Black-fronted Dotterel | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **TURNICIDAE** | | | | | | | | | | | |
| *Turnix velox* | Little Button-quail | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| **CACATUIDAE** | | | | | | | | | | | |
| *Cacatua sanguinea* | Little Corella | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Eolophus roseicapillus* | Galah | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Nymphicus hollandicus* | Cockatiel | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **PSITTACIDAE** | | | | | | | | | | | |
| *Barnardius zonarius* | Australian Ringneck | | | | | ✓ | ✓ | | ✓ | | |
| *Melopsittacus undulatus* | Budgerigar | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Neopsephotus bourkii* | Bourke's Parrot | | | | | | ✓ | | | | |
| *Pezoporus occidentalis* | Night Parrot | **CR/ M** | **S4** | | | | | | ✓ | ✓ | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Psephotus varius* | Mulga Parrot | | | | | | | | | | |
| **CUCULIDAE** | | | | | | | | | | | |
| *Cacomantis pallidus* | Pallid Cuckoo | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Chalcites basalis* | Horsfield's Bronze-Cuckoo | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Chalcites osculans* | Black-eared Cuckoo | | | | | | | | ✓ | | |
| **STRIGIDAE** | | | | | | | | | | | |
| *Ninox novaeseelandiae* | Southern Boobook | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| **TYTONIDAE** | | | | | | | | | | | |
| *Tyto javanica* | Eastern Barn Owl | | | | | ✓ | | | ✓ | | |
| **HALCYONIDAE** | | | | | | | | | | | |
| *Dacelo leachii* | Blue-winged Kookaburra | | | | | ✓ | | ✓ | ✓ | | |
| *Todirhamphus pyrrhopygia* | Red-backed Kingfisher | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Todirhamphus sanctus* | Sacred Kingfisher | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **MEROPIDAE** | | | | | | | | | | | |
| *Merops ornatus* | Rainbow Bee-eater | **M** | **S3** | | | ✓ | ✓ | ✓ | ✓ | | |
| **CLIMACTERIDAE** | | | | | | | | | | | |
| *Climacteris melanura* | Black-tailed Treecreeper | | | | | | ✓ | ✓ | ✓ | | |
| **PTILONORHYNCHIDAE** | | | | | | | | | | | |
| *Chlamydera guttata* | Western Bowerbird | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| **MALURIDAE** | | | | | | | | | | | |
| *Amytornis striatus* | Striated Grasswren | | | | | ✓ | | ✓ | ✓ | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Malurus lamberti* | Variegated Fairy-wren | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Malurus leucopterus* | White-winged Fairy-wren | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Stipiturus ruficeps* | Rufous-crowned Emu-wren | | | | | | | | ✓ | | |
| **ACANTHIZIDAE** | | | | | | | | | | | |
| *Acanthiza apicalis* | Inland Thornbill | | | | | ✓ | | | ✓ | | |
| *Acanthiza robustirostris* | Slaty-backed Thornbill | | | | | | | | ✓ | | |
| *Acanthiza uropygialis* | Chestnut-rumped Thornbill | | | | | ✓ | ✓ | | ✓ | | |
| *Gerygone fusca* | Western Gerygone | | | | | ✓ | | | ✓ | | |
| *Smicrornis brevirostris* | Weebill | | | | | ✓ | ✓ | | ✓ | | |
| **PARDALOTIDAE** | | | | | | | | | | | |
| *Pardalotus rubricatus* | Red-browed Pardalote | | | | | ✓ | | ✓ | ✓ | | ✓ |
| *Pardalotus striatus* | Striated Pardalote | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **MELIPHAGIDAE** | | | | | | | | | | | |
| *Acanthagenys rufogularis* | Spiny-cheeked Honeyeater | | | | | ✓ | ✓ | | ✓ | | |
| *Certhionyx variegatus* | Pied Honeyeater | | | | | | | ✓ | ✓ | | ✓ |
| *Epthianura tricolor* | Crimson Chat | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Lichenostomus keartlandi* | Grey-headed Honeyeater | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Lichenostomus penicillatus* | White-plumed Honeyeater | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Lichenostomus virescens* | Singing Honeyeater | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Lichmera indistincta* | Brown Honeyeater | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Manorina flavigula* | Yellow-throated Miner | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Melithreptus gularis* | Black-chinned Honeyeater | | | | | | ✓ | | ✓ | | |
| *Purnella albifrons* | White-fronted Honeyeater | | | | | | | | ✓ | | |
| *Sugomel niger* | Black Honeyeater | | | | | | ✓ | ✓ | ✓ | | ✓ |
| **POMATOSTOMIDAE** | | | | | | | | | | | |
| *Pomatostomus superciliosus* | White-browed Babbler | | | | | ✓ | ✓ | | ✓ | | |
| *Pomatostomus temporalis* | Grey-crowned Babbler | | | | | ✓ | ✓ | ✓ | ✓ | | |
| **NEOSITTIDAE** | | | | | | | | | | | |
| *Daphoenositta chrysoptera* | Varied Sittella | | | | | | | | ✓ | | |
| **CAMPEPHAGIDAE** | | | | | | | | | | | |
| *Coracina maxima* | Ground Cuckoo-shrike | | | | | | | | ✓ | | |
| *Coracina novaehollandiae* | Black-faced Cuckoo-shrike | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Lalage sueurii* | White-winged Triller | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **PACHYCEPHALIDAE** | | | | | | | | | | | |
| *Colluricincla harmonica* | Grey Shrike-thrush | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Oreoica gutturalis* | Crested Bellbird | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Pachycephala rufiventris* | Rufous Whistler | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **ARTAMIDAE** | | | | | | | | | | | |
| *Artamus cinereus* | Black-faced Woodswallow | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| *Artamus minor* | Little Woodswallow | | | | | ✓ | ✓ | | ✓ | | |
| *Artamus personatus* | Masked Woodswallow | | | | | ✓ | | | ✓ | | ✓ |
| *Cracticus nigrogularis* | Pied Butcherbird | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Cracticus tibicen* | Australian Magpie | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Cracticus torquatus* | Grey Butcherbird | | | | | ✓ | ✓ | | ✓ | | |
| **RHIPIDURIDAE** | | | | | | | | | | | |
| *Rhipidura leucophrys* | Willie Wagtail | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **CORVIDAE** | | | | | | | | | | | |
| *Corvus bennetti* | Little Crow | | | | | ✓ | ✓ | | ✓ | | |
| *Corvus orru* | Torresian Crow | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **MONARCHIDAE** | | | | | | | | | | | |
| *Grallina cyanoleuca* | Magpie-lark | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **PETROICIDAE** | | | | | | | | | | | |
| *Melanodryas cucullata* | Hooded Robin | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Petroica goodenovii* | Red-capped Robin | | | | | ✓ | ✓ | | ✓ | | |
| **ALAUDIDAE** | | | | | | | | | | | |
| *Mirafra javanica* | Horsfield's Bushlark | | | | | ✓ | | | ✓ | | |
| **ACROCEPHALIDAE** | | | | | | | | | | | |
| *Acrocephalus australis* | Australian Reed-Warbler | | | | | | | | | | |
| **MEGALURIDAE** | | | | | | | | | | | |
| *Cinclorhamphus cruralis* | Brown Songlark | | | | | ✓ | | ✓ | ✓ | | |
| *Cinclorhamphus mathewsi* | Rufous Songlark | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Eremiornis carteri* | Spinifexbird | | | | | | ✓ | ✓ | ✓ | | |
| **HIRUNDINIDAE** | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | | |
| *Cheramoeca leucosternus* | White-backed Swallow | | | | | | ✓ | | | | |
| *Petrochelidon ariel* | Fairy Martin | | | | | ✓ | | ✓ | ✓ | | |
| *Petrochelidon nigricans* | Tree Martin | | | | | ✓ | | ✓ | ✓ | | |
| **NECTARINIIDAE** | | | | | | | | | | | |
| *Dicaeum hirundinaceum* | Mistletoebird | | | | | ✓ | | | ✓ | | |
| **ESTRILDIDAE** | | | | | | | | | | | |
| *Emblema pictum* | Painted Finch | | | | | ✓ | ✓ | ✓ | ✓ | | |
| *Neochima ruficauda subclarescens* | Star Finch | | | **P4** | | | | | | ✓ | |
| *Taeniopygia guttata* | Zebra Finch | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **MOTACILLIDAE** | | | | | | | | | | | |
| *Anthus novaeseelandiae* | Australasian Pipit | | | | | ✓ | ✓ | ✓ | ✓ | | |

Appendix E3 Reptiles

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | Airstrip |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| **CHELUIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Chelodina steindachneri* | Steindachner's Turtle | | | | ▪ | ✓ | ▪ | S | | |
| **GEKKONIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Crenadactylus ocellatus* | Clawless Gecko | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Diplodactylus conspicillatus* | Fat-tailed Gecko | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Diplodactylus pulcher* | | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Diplodactylus savagei* | | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Gehyra pilbara* | | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Gehyra punctata* | | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Gehyra purpurascens* | | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Gehyra variegata* | | | | | ✓ | ▪ | ✓ | ✓ | ▪ | ▪ |
| *Heteronotia binoei* | Bynoe's Gecko | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Heteronotia spelea* | Desert Cave Gecko | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Lucasium stenodactylum* | Sand-plain Gecko | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Lucasium wombeyi* | | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Nephrurus wheeleri* | Banded Knob-tailed Gecko | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Oedura marmorata* | Marbled Velvet Gecko | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Rhynchoedura ornata* | Beaked Gecko | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Strophurus ciliaris* | Northern Spiny-tailed Gecko | | | | ▪ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Strophurus elderi* | Jewelled Gecko | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Strophurus jeanae* | | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Strophurus wellingtonae* | | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| **PYGOPODIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | Airstrip |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| *Delma elegans* | | | | | · | · | · | ✓ | · | · |
| *Delma haroldi* | | | | | ✓ | · | · | · | · | · |
| *Delma nasuta* | | | | | ✓ | ✓ | · | ✓ | · | · |
| *Delma pax* | | | | | ✓ | ✓ | · | ✓ | · | · |
| *Delma tincta* | | | | | ✓ | ✓ | · | ✓ | · | · |
| *Lialis burtonis* | Burton's Snake-Lizard | | | | ✓ | ✓ | ✓ | ✓ | · | · |
| **SCINCIDAE** | | | | | · | · | · | · | · | · |
| *Carlia munda* | | | | | ✓ | ✓ | ✓ | ✓ | · | · |
| *Cryptoblepharus ustulatus* | | | | | ✓ | ✓ | · | ✓ | | |
| *Ctenotus ariadnae* | | | | | ✓ | · | · | · | · | · |
| *Ctenotus duricola* | | | | | ✓ | ✓ | ✓ | ✓ | · | · |
| *Ctenotus grandis* | | | | | ✓ | · | · | ✓ | · | · |
| *Ctenotus hanloni* | | | | | ✓ | · | · | ✓ | · | · |
| *Ctenotus helenae* | | | | | ✓ | ✓ | · | ✓ | · | · |
| *Ctenotus leonhardii* | | | | | · | · | · | ✓ | · | · |
| *Ctenotus pantherinus* | Leopard Ctenotus | | | | ✓ | ✓ | ✓ | ✓ | · | · |
| *Ctenotus piankai* | | | | | · | · | · | ✓ | · | · |
| *Ctenotus rubicundus* | | | | | ✓ | · | · | ✓ | · | · |
| *Ctenotus rutilans* | | | | | ✓ | · | · | ✓ | · | · |
| *Ctenotus saxatilis* | Rock Ctenotus | | | | ✓ | ✓ | · | ✓ | · | · |
| *Ctenotus serventyi* | | | | | ✓ | ✓ | ✓ | ✓ | · | · |
| *Ctenotus uber* | | | | | ✓ | · | · | · | · | · |
| *Ctenotus uber Johnstonei* | | | | **P2** | · | · | · | · | ✓ | · |
| *Cyclodomorphus branchialis* | Gilled Slender Blue-tongue | | **S1** | | · | · | · | ✓ | · | · |
| *Cyclodomorphus melanops* | Spinifex Slender Blue-tongue | | | | ✓ | ✓ | ✓ | ✓ | · | · |

| Scientific Name | Common Name | Conservation Status | | | WAM | Yandicoogina (IES, 1981) | Marillana Creek (HGM, 1999) | *ecologia* internal database | DEC Priority fauna search | Airstrip |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| *Egernia depressa* | Pygmy Spiny-tailed Skink | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Egernia formosa* | | | | | ▪ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Egernia pilbarensis* | | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Lerista bipes* | | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Lerista labialis* | | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Lerista muelleri* | | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Lerista neander* | | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Lerista zietzi* | | | | | ✓ | ▪ | ✓ | ✓ | ▪ | ▪ |
| *Menetia greyii* | | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Menetia surda* | | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Morethia ruficauda* | | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Notoscincus ornatus* | | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Proablepharus reginae* | | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Tiliqua multifasciata* | Centralian Blue-tongue | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| **AGAMIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Amphibolurus longirostris* | Long-nosed Dragon | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Caimanops amphiboluroides* | Mulga Dragon | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Ctenophorus caudicinctus* | Ring-tailed Dragon | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ✓ |
| *Ctenophorus isolepis* | Central Military Dragon | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ✓ |
| *Ctenophorus nuchalis* | Central Netted Dragon | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Ctenophorus reticulatus* | Western Netted Dragon | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Pogona minor* | Dwarf Bearded Dragon | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| **VARANIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Varanus acanthurus* | Spiny-tailed Monitor | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Varanus brevicauda* | Short-tailed Pygmy Monitor | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| *Varanus bushi* | | | | | ▪ | ▪ | ✓ | ✓ | ▪ | ▪ |
| *Varanus caudolineatus* | Stripe-tailed Monitor | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Varanus eremius* | Pygmy Desert Monitor | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Varanus giganteus* | Perentie | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Varanus gouldii* | Sand Goanna | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Varanus panoptes* | Yellow-spotted Monitor | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Varanus pilbarensis* | Pilbara Rock Monitor | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Varanus tristis* | Black-headed Monitor | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| **TYPHLOPIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Ramphotyphlops ammodytes* | | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Ramphotyphlops grypus* | Beaked Blind Snake | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Ramphotyphlops hamatus* | | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Ramphotyphlops waitii* | | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |
| **PYTHONIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Antaresia perthensis* | Pygmy Python | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Antaresia stimsoni* | Stimson's Python | | | | ▪ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Aspidites melanocephalus* | Black-headed python | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Liasis olivaceus barroni* | Pilbara Olive Python | **VU** | **S1** | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| **ELAPIDAE** | | | | | ▪ | ▪ | ▪ | ▪ | ▪ | ▪ |
| *Acanthophis pyrrhus* | Desert Death Adder | | | | ▪ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Acanthophis wellsi* | Pilbara Death Adder | | | | ✓ | ▪ | ▪ | ✓ | ▪ | ▪ |
| *Brachyurophis approximans* | North-western Shovel-nosed Snake | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Demansia psammophis* | Yellow-faced Whipsnake | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Demansia rufescens* | Rufous Whipsnake | | | | ▪ | ▪ | ✓ | ✓ | ▪ | ▪ |
| *Furina ornata* | Moon Snake | | | | ▪ | ▪ | ▪ | ✓ | ▪ | ▪ |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | WCA | DEC | | | | | | |
| *Parasuta monachus* | Monk Snake | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Pseudechis australis* | Mulga Snake | | | | ✓ | ✓ | ✓ | ✓ | ▪ | ▪ |
| *Pseudonaja modesta* | Ringed Brown Snake | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Pseudonaja nuchalis* | Gwardar | | | | ✓ | ✓ | ▪ | ✓ | ▪ | ▪ |
| *Suta fasciata* | Rosen's Snake | | | | ✓ | ✓ | ▪ | ▪ | ▪ | ▪ |
| *Suta punctata* | Little Spotted Snake | | | | ✓ | ▪ | ▪ | ▪ | ▪ | ▪ |

**Table G.1 - Control codes for Declared Plants in Western Australia**

| Priority | Requirements |
|---|---|
| P1<br>Prohibits movement | The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder. |
| P2<br>Aim is to eradicate infestation | Treat all plants to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery. |
| P3<br>Aims to control infestation by reducing area and/or density of infestation | The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.<br>Treat to destroy and prevent seed set for all plants:-<br>- Within 100 metres inside of the boundaries of the infestation.<br>- Within 50 metres of roads and high-water mark on waterways.<br>- Within 50 metres of sheds, stock yards and houses. |

| Priority | Requirements |
|---|---|
| | Treatment must be done prior to seed set each year.<br>Of the remaining infested area:-<br>- Where plant density is 1-10 per hectare treat 100% of infestation.<br>- Where plant density is 11-100 per hectare treat 50% of infestation.<br>- Where plant density is 101-1000 per hectare treat 10% of infestation.<br>Properties with less than 2 hectares of infestation must treat the entire infestation.<br>Additional areas may be ordered to be treated. |
| P4<br>Aims to prevent infestation spreading beyond existing boundaries of infestation | The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.<br>Treat to destroy and prevent seed s*et al.* l plants:-<br>- Within 100 metres inside of the boundaries of the infested property<br>- Within 50 metres of roads and high-water mark on waterways<br>- Within 50 metres of sheds, stock yards and houses<br>Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation.<br>Additional areas may be ordered to be treated.<br>Special considerations<br>In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas. |
| P5 | Infestations on public lands must be controlled. |