

17 July 2009



## Roy Hill Iron Ore Project Proposed Roy Hill Borefield Desktop Fauna Survey



*Providing sustainable environmental strategies,  
management and monitoring solutions  
to industry and government.*



  
**ecologia**  
ENVIRONMENT

# **ROY HILL IRON ORE PROJECT**

## **PROPOSED BOREFIELD DESKTOP SURVEY**



**17 July 2009**

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## Table of Contents

<b>1.0</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	PROJECT OVERVIEW .....	1
1.2	LEGISLATIVE FRAMEWORK.....	1
1.3	SURVEY OBJECTIVES .....	2
<b>2.0</b>	<b>BIOPHYSICAL ENVIRONMENT</b> .....	<b>4</b>
2.1	CLIMATE .....	4
2.2	VEGETATION .....	4
2.3	LAND SYSTEMS.....	5
2.4	BIOGEOGRAPHY .....	5
<b>3.0</b>	<b>METHODS</b> .....	<b>8</b>
<b>4.0</b>	<b>FAUNA</b> .....	<b>9</b>
4.1	FAUNA OF THE PROJECT AREA.....	9
4.2	FAUNA OF CONSERVATION SIGNIFICANCE .....	9
4.2.1	Statutory Framework.....	9
4.2.2	Conservation significant fauna potentially occurring with the project area.....	9
4.2.3	Mammals .....	12
4.2.4	Birds .....	12
<b>5.0</b>	<b>CONCLUSIONS</b> .....	<b>16</b>
<b>6.0</b>	<b>REFERENCES</b> .....	<b>17</b>

## Tables

Table 3.1	Previous Fauna Surveys Conducted within 50 km of Project Area .....	8
Table 4.1	Conservation Significant Fauna Potentially Occurring in the Project Area... 10	

## Figures

Figure 1.1	Location of Proposed Borefield .....	3
Figure 2.1	Monthly climatic data for Newman (BOM records 1965 – 1997).....	4
Figure 2.2	Land Systems of the Project Area.....	6
Figure 2.3	Biogeographic Regions of the Project Area .....	7

## Appendices

Appendix A	Fauna Recorded in the Region .....	19
Appendix B	Explanation of Conservation Codes .....	33
Appendix C	Species of Conservation Significance with a Low Likelihood of Occurrence within the Project Area .....	36

## Executive Summary

Hancock Prospecting Pty Ltd plans to create a borefield to supply water for mining operations at Roy Hill. This report outlines a desktop survey of an area to the south of Roy Hill, undertaken to gather information for project referral documentation.

*ecologia* Environment undertook a review of all fauna records from the project area and surroundings based on previous surveys in the area and in consultation with several government databases. Based on Western Australian Museum and Department of Environment and Conservation records, and surveys previously undertaken in the area, 28 native and nine introduced mammal, 139 bird, 82 reptile and four amphibian species may occur in the project area.

Twenty-two species of conservation significance have the potential to occur in the project area. However, of these species only seven have a high or medium likelihood of occurrence (Table S.1).

**Table S.1** Conservation significant species with a high potential to occur in the project area

Common Name	Scientific Name	EPBC Act	WC Act	DEC
Brush-tailed Mulgara	<i>Dasyercus blythi</i>			Priority 4
Northern Short-tailed Mouse	<i>Leggadina lakedownensis</i>			Priority 4
Grey Falcon	<i>Falco hypoleucos</i>			Priority 4
Australian Bustard	<i>Ardeotis australis</i>			Priority 4
Bush Stone-curlew	<i>Burhinus grallarius</i>			Priority 4
Eastern Great Egret	<i>Ardea alba</i>	Migratory		
Rainbow Bee-eater	<i>Merops ornatus</i>	Migratory		

**Table S.2** Conformance of Project to Relevant EPA Position Statement No. 3

Requirement	Relevance to Project	Project Compliance
Impact on Biodiversity	Where impact on biodiversity cannot be avoided, the proponent must demonstrate that the impact will not result in unacceptable loss.	Potential impacts to conservation significant fauna are discussed in Section 4.2. No significant impacts to conservation significant species are anticipated.
State, National and International Agreements, Legislation and Policy on Biodiversity	Information gathered for environmental impact assessment in Western Australia meets State, National and International Agreements, Legislation and Policy in regard to biodiversity conservation.	State, national and international laws and agreements were referred to in the production of this report and conservation significant fauna listed under these are identified (Section 4.2).
EPA Standards, Requirements and Protocols	The quality of information and scope of field surveys meets the standards, requirements and protocols as determined and published by the EPA.	The current survey consists of a desktop review.
Biodiversity Conservation and Ecological Function Values	Sufficient information is provided to address biodiversity conservation and ecological function values.	The results of previous surveys and databases relevant to the region were used to provide a regional context to the information collected and environmental risks assessed.
State Biological Databases	Terrestrial biological surveys will be made publicly available and will contribute to the bank of data available for the region.	No survey data was collected.

## 1.0 INTRODUCTION

### 1.1 PROJECT OVERVIEW

Hancock Prospecting Pty Ltd (HPPL) is investigating the construction of a borefield to supply water for mining operations at Roy Hill. Roy Hill is situated approximately 100 km north of Newman in the east Pilbara region of Western Australia. The proposed borefield is located approximately 30 km south of Roy Hill mining areas, and lies predominantly within tenements E47/1609, E47/1610 and E46/685 (Figure 1.1).

### 1.2 LEGISLATIVE FRAMEWORK

The *Environmental Protection Act 1986* is “an Act to provide for an Environmental Protection Authority, for the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.” Section 4a of this Act outlines five principles that are required to be addressed to ensure that the objectives of the Act are addressed. Three of these principles are relevant to native fauna and flora:

- *The Precautionary Principle*

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

- *The Principles of Intergenerational Equity*

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

- *The Principle of the Conservation of Biological Diversity and Ecological Integrity*

Conservation of biological diversity and ecological integrity should be a fundamental consideration.

In addition to these principles, projects undertaken as part of the Environmental Impact Assessment (EIA) process are required to address guidelines produced by the Environmental Protection Authority (EPA), in this case Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004), and principles outlined in EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002).

Native flora and fauna in Western Australia are protected at a federal level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and at a state level under the *Wildlife Conservation Act 1950* (WC 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 (and in particular 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 EPBC Act, Section 3a of the EPBC Act includes a 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 flora and fauna within Western



Australia is protected; however, the Minister may, via a notice published in the *Government Gazette*, declare a list of fauna taxa identified as likely to become extinct, or is rare, or otherwise in need of special protection. The current listing was gazetted in August 2008.

### 1.3 SURVEY OBJECTIVES

Hancock Prospecting Pty Ltd (HPPL) commissioned *ecologia* Environment (*ecologia*) to undertake a desktop fauna survey of the vertebrate fauna of the Roy Hill proposed borefield project area as part of the environmental impact assessment for the project.

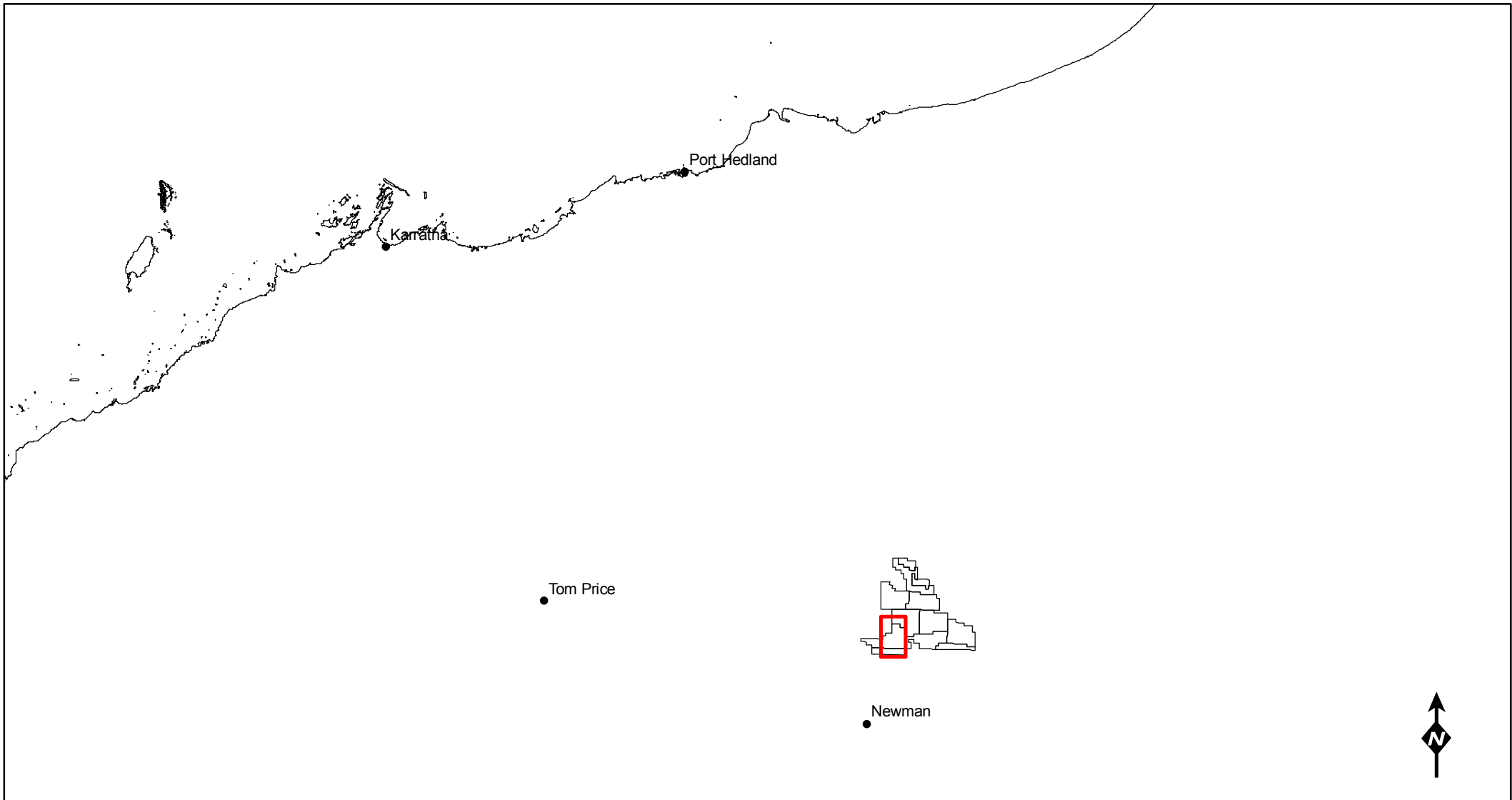
The EPA's objectives with regards to fauna management are to:

- maintain the abundance, species diversity and geographical distribution of terrestrial fauna; and
- protect Specially Protected (Threatened) fauna, consistent with the provisions of the WC Act.

The aim of this study was to provide sufficient information to the EPA to assess the impact of the project on the vertebrate fauna of the area, thereby ensuring that these objectives will be upheld.

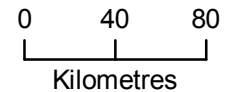
This report satisfies the requirements documented in EPA Guidance Statement No. 56 and Position Statement No. 3, by providing:

- A review of background information (including literature and database searches).
- An inventory of vertebrate fauna species occurring in the project area, incorporating recent published and unpublished records.
- An inventory of species of biological and conservation significance likely to occur within the project area and surrounds.
- A detailed description of fauna habitats occurring in the project area.
- A description of the characteristics of the faunal assemblage.
- An appraisal of the current knowledge base for the area, including a review of previous surveys conducted in the area that are relevant to the current study.
- A review of regional and biogeographical significance, including the conservation status of species recorded in the project area.



**Legend**

- Borefield
- Roy Hill tenements



**Absolute Scale - 1:3,312,737**



**HANCOCK PROSPECTING PTY LTD**

**Location of Proposed Borefield**

**Figure: 1.1**  
**Project ID: 1165**

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

**Drawn: EF**  
**Date: 07/07/09**

Unique Map ID: MXXX

**A4**

## 2.0 BIOPHYSICAL ENVIRONMENT

### 2.1 CLIMATE

The proposed borefield is located in the Pilbara biogeographic region of Western Australia where the climate is semi-arid to arid with two distinct seasons, a hot summer from October to April and a milder winter from May to September. Rainfall in the Pilbara generally occurs between the months of January to March but can be unpredictable due to cyclonic activity bringing heavy sporadic rainfall events.

The closest recording Bureau of Meteorology (BOM) weather station is located at Newman (23°22'S, 119°44'E), approximately 45 km to the south of the proposed borefield, providing climatic conditions similar to those within the project area. The average annual rainfall is 310.2 mm. Over 63% of the total annual precipitation occurs during the summer period between December and March due to cyclone and thunderstorm activity while a smaller peak follows from May to June due to cold fronts from the south-west. February is the wettest summer month with 80.1 mm, while June is the wettest winter month with 25 mm (Figure 2.1).

Mean annual maximum and minimum temperatures for Newman are 31.4°C and 17.3°C respectively. Mean monthly maxima range from 22.3°C in July to 39°C during January, while mean monthly minima range from 8.1°C in July to 25.3°C in January (Figure 2.1).

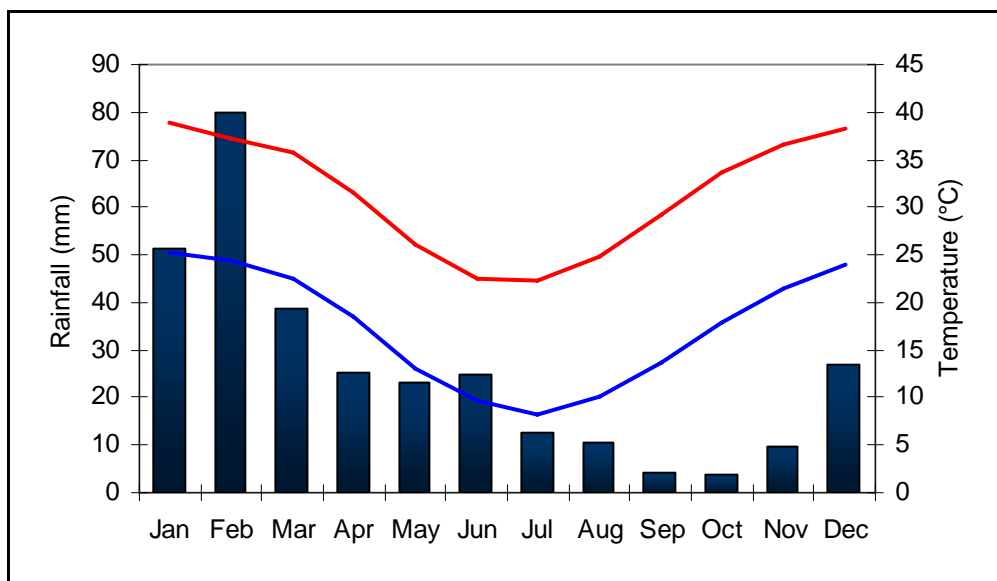


Figure 2.1 Monthly climatic data for Newman (BOM records 1965 – 1997)

### 2.2 VEGETATION

According to the vegetation mapping by Beard (1975) the borefield area lies in an area of shrub steppe on sandplains in the Fortescue Valley. The predominant vegetation is low mulga (*Acacia aneura*) woodland with trees in groves or patches. There are also patches of *Eucalyptus gamophylla* over spinifex (*Triodia basedowii*) towards the north. This area is further north than mulga is normally found, presumably due to the favourable soils and moisture available from run-on. Most of the mulga is irregular and in bad condition and there are frequent treeless open patches. Shrubs of *Eremophila cuneifolia* and *Senna* spp. form a sparse understorey (Beard 1975).

## 2.3 LAND SYSTEMS

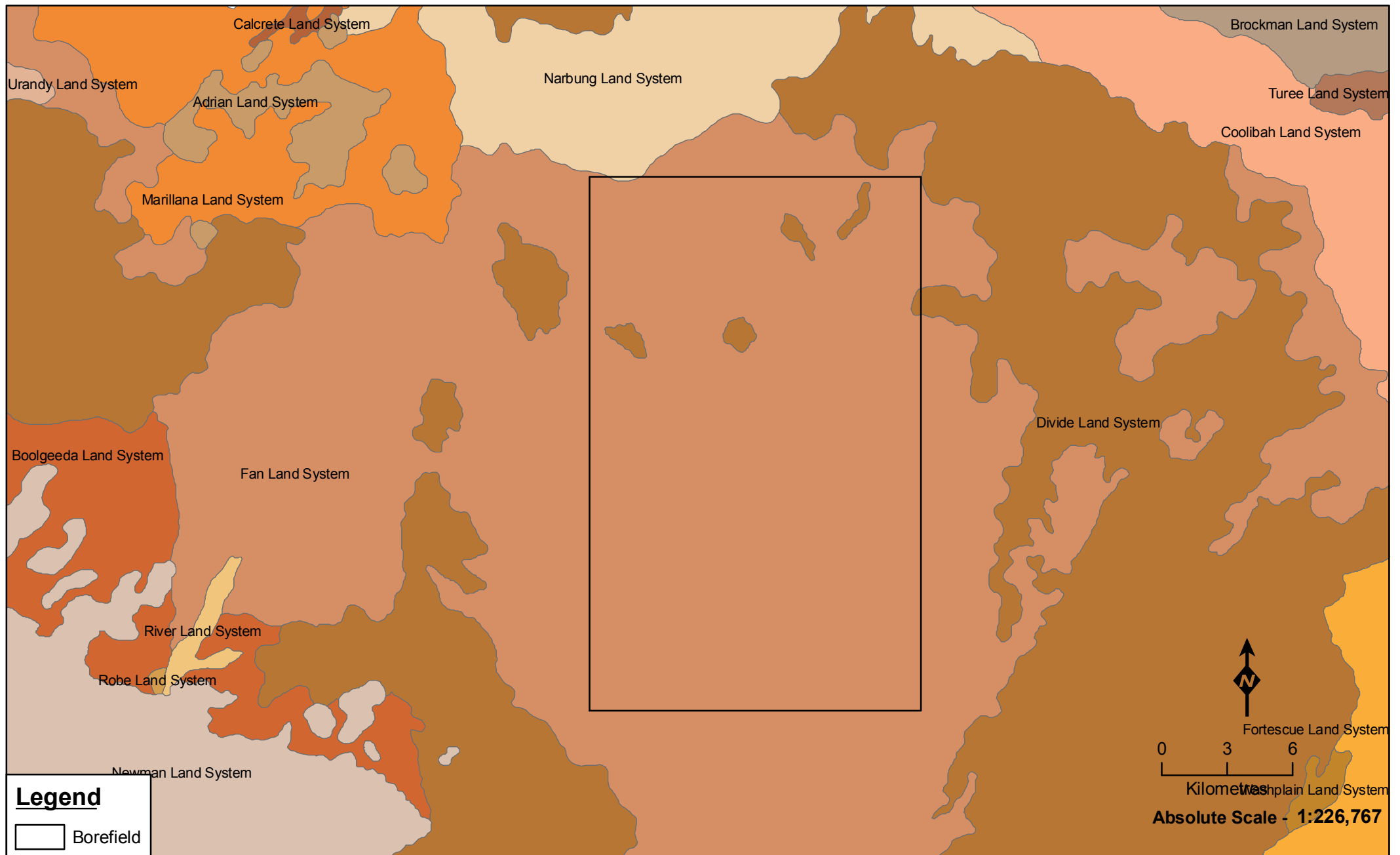
An inventory of the land systems occurring in the Pilbara was completed by Van Vreeswyk *et al.* (2004). The survey aimed to provide a comprehensive description and mapping of the biophysical resources of the region, as well as an evaluation of the condition of soils and vegetation throughout. Each land system is classified into a particular land type defined by the landforms and vegetation it contains.

The proposed borefield area at Roy Hill includes three land systems. It predominantly consists of the Fan land system, with small patches of Divide land system in the northern half, and a small amount of Narbung land system along the northern edge (Figure 2.2). The Fan land system is described as washplains and gilgai plains supporting grove mulga shrublands and minor tussock grasslands. The total area of this land system within the Pilbara is 1,482 km<sup>2</sup>. The Divide land system is described as sandplains and occasional dunes supporting shrubby hard spinifex grasslands, with a total area of 5,293 km<sup>2</sup>. The northern border of the borefield lies on the edge of the Narbung land system. The Narbung land system is a small area (159 km<sup>2</sup>) of alluvial washplains with prominent internal drainage foci supporting snakewood and mulga shrublands with halophytic low shrubs (van Vreeswyk *et al.* 2004).

## 2.4 BIOGEOGRAPHY

A biogeographic regionalisation of Australia has been developed collaboratively in which bioregions (broad-scale regionalisations) are formally recognised and mapped. It is called the Interim Biogeographic Regionalisation for Australia (IBRA), currently version 6.1 (Thackway and Cresswell 1995). IBRA v6.1 represents a landscape based approach to classifying the land surface of Australia. Biogeographic regions each reflect a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment across Australia. Subregions are more localised and homogeneous geomorphological units in each bioregion.

The Pilbara biogeographic region comprises four subregions: Hamersley, Fortescue Plains, Chichester and Roebourne. The borefield area lies within the Fortescue Plains sub-region (Figure 2.3). Characteristic features of the Fortescue Plains sub-region are alluvial plains and river frontages, with salt-marsh, mulga-bunch grass and short grass communities on alluvial plains. River Gum woodlands fringe the drainage lines. An extensive calcrete aquifer feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of river gum and cadjeput woodlands (DEC 2003). The Fortescue Plains sub-region occupies an area of 2.04 million ha, with the dominant uses being grazing native pastures, UCL and Crown reserves, conservation and Aboriginal land.



**Legend**

□ Borefield

0 3 6  
Kilometres  
**Absolute Scale - 1:226,767**



**HANCOCK PROSPECTING PTY LTD**

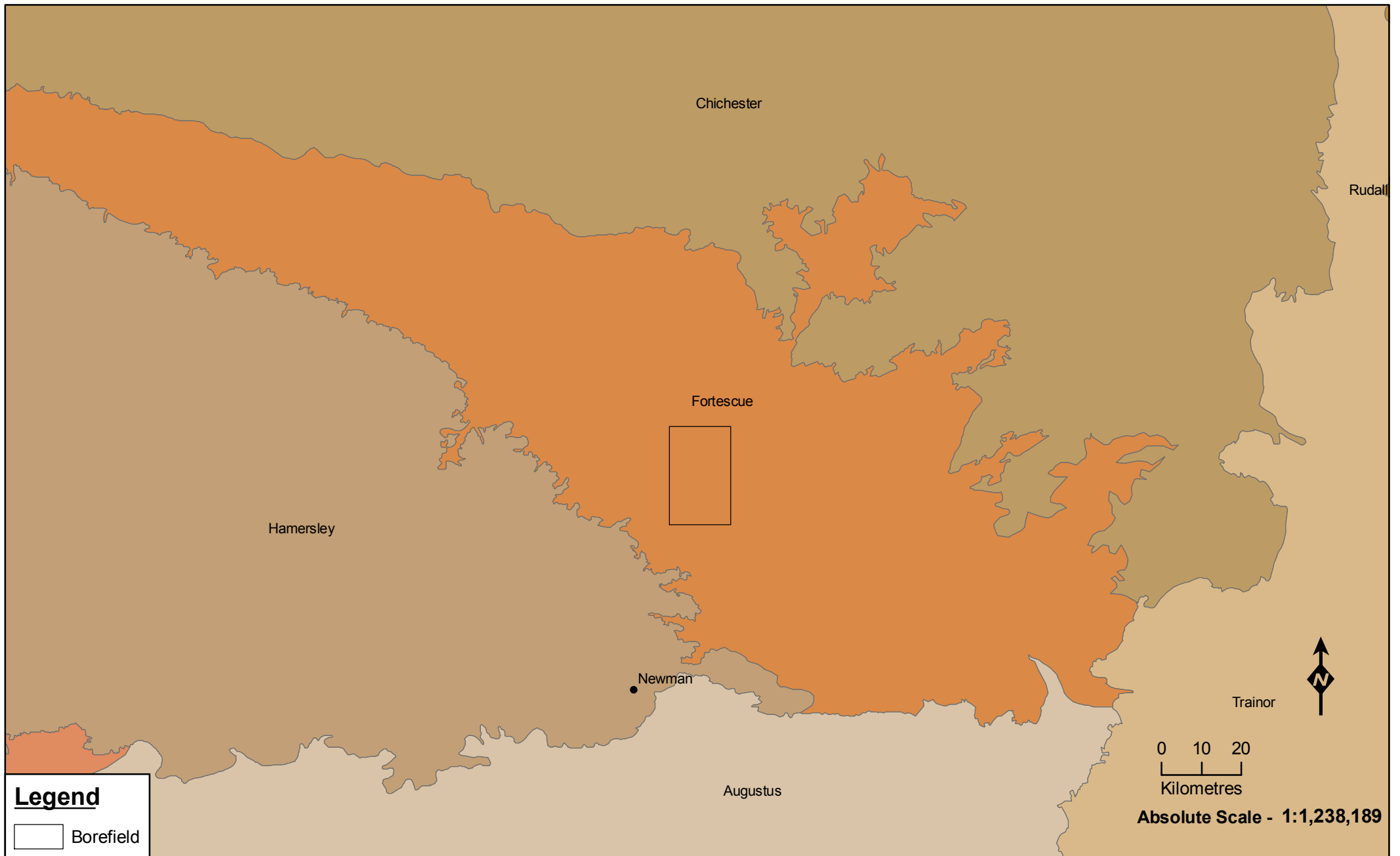
**Land Systems of the Project Area**

**Figure: 2.2**  
**Project ID: 1165**

**Drawn: EF**  
**Date: 07/07/09**

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

Unique Map ID: MXXX



**Legend**

 Borefield



**HANCOCK PROSPECTING PTY LTD**

**Biogeographic Regions of the Project Area**

**Figure: 2.3**  
Project ID: 1165

**Drawn: EF**  
Date: 07/07/09

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

Unique Map ID: MXXX

### 3.0 METHODS

A desktop assessment of the recorded fauna of the borefield and surrounding areas was undertaken by *ecologia* in July 2009. This assessment comprised a review of available published and unpublished reports and documents, formal and informal searches of government databases, and liaison with regional regulatory bodies. Desktop searches of databases were conducted through the:

- Department of Environment and Conservation (DEC) Threatened Fauna Database.
- DEC NatureMap.
- Department of Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Database.
- Birds Australia Birdata.

An additional literature search of information pertaining to the area included general scientific publications, unpublished reports and field guides. Nine previous reports from within 50 km of the project area were consulted. Their approximate distances to the proposed borefield are given in Table 3.1. In common with the project area, all nine surveys predominantly occur within the Fortescue Plains subregion, although the FMG Stage B Rail Corridor and Jimblebar Rail Siding also cross through the rocky ranges of the Chichester and Hamersley subregions respectively.

The conservation status of recorded fauna was categorised under:

- Environment Protection and Biodiversity Conservation Act 1999 (National)
- Wildlife Conservation Act 1950 (State)
- Department of Environment and Conservation Priority Fauna List (State)

**Table 3.1** Previous Fauna Surveys Conducted within 50 km of Project Area

Survey	Survey Date	Approx. Distance to Borefield (km)
Jimblebar to Yandi Railway (ENV Australia 2008)	2008	5 - 70
Roy Hill Southern Rail Spur ( <i>ecologia</i> 2009a)	2008	10 - 70
Mindy–Coondiner ( <i>ecologia</i> 2005)	2005	20 - 40
Roy Hill Borefield ( <i>ecologia</i> 2009a)	2008	20
Jimblebar Rail Siding ( <i>ecologia</i> 1996)	1996	25 - 40
Roy Hill Infrastructure (Level 2; <i>ecologia</i> 2009b)	2006	30
Roy Hill Infrastructure (Level 1; <i>ecologia</i> 2009a)	2008	30
Roy Hill Infrastructure (Level 2; <i>ecologia</i> 2009c)	2009	30
FMG Stage B Rail Corridor (Biota 2005)	2005	30 - 100

## **4.0 FAUNA**

### **4.1 FAUNA OF THE PROJECT AREA**

Thirty-seven mammal (including nine introduced), 139 bird, 82 reptile, and four amphibian species have been previously recorded within 50 km of the project area (Appendix A). Of these, eight mammal, 12 bird, and two reptile species are of conservation significance.

### **4.2 FAUNA OF CONSERVATION SIGNIFICANCE**

#### **4.2.1 STATUTORY FRAMEWORK**

Fauna species that have been formally recognised as rare, threatened with extinction, or as having high conservation value are protected by law under Commonwealth and state legislation. At the national level, fauna are protected under the EPBC Act. Within WA, rare fauna are listed under the WC Act. International Agreements include the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA).

Schedule 1 of the Commonwealth EPBC Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent. Definitions of categories relevant to fauna occurring or potentially occurring in the project area are provided in Appendix B.

Classification of rare and endangered fauna under the WC Act recognises four distinct schedules, as listed in Appendix B. In addition, DEC maintains a Priority Fauna list which includes those removed from the WC Act and other species known from only a few populations or in need of monitoring. Five 'Priority' codes are recognised, as detailed in Appendix B.

#### **4.2.2 CONSERVATION SIGNIFICANT FAUNA POTENTIALLY OCCURRING WITH THE PROJECT AREA**

Twenty-two species of conservation significance have been recorded within 100 km of the borefield area. However, many of these species only occur in the rocky ranges of the Chichester and Hamersley subregion and therefore are not expected to occur within the project area. Based on the habitats likely to be present within the proposed borefield, only seven species of conservation significance have a high or medium likelihood of occurrence. These seven species are summarised in Table 4.1 and discussed in greater detail in the following sections. The remaining 15 species with a low likelihood of occurrence are listed in Appendix C.



**Table 4.1** Conservation Significant Fauna Potentially Occurring in the Project Area

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE AND STATUS IF PRESENT
	EPBC	WCA	DEC			
<b>Mammals</b>						
Northern Short-tailed Mouse ( <i>Leggadina lakedownensis</i> )			P4	Spinifex and tussock grassland, acacia shrubland, samphire, woodlands, stony ranges	Previously recorded at Christmas Creek, Kondy Creek and Kulkinbah Creek (Biota 2005)	<b>MEDIUM – RESIDENT</b> Several nearby records and suitable habitat is present
Brush-tailed Mulgara ( <i>Dasyercus blythi</i> )			P4	Sandy areas with moderately dense spinifex with 'runways' between clumps	Previously recorded in the FMG Stage B Rail Corridor, near Mt Nicholas (2005)	<b>MEDIUM – RESIDENT</b> Few local records but suitable habitat is present
<b>Birds</b>						
Bush Stone-curlew ( <i>Burhinus grallarius</i> )			P4	Lightly wooded country next to daytime shelter of thickets or long grass	Recorded at Roy Hill (2006), 30 km east of project area (NatureMap), Newman and Nullagine (DEC records)	<b>HIGH – RESIDENT</b> Suitable habitat exists and recorded nearby.
Australian Bustard ( <i>Ardeotis australis</i> )			P4	Open grasslands, chenopod flats and low heathland	Recorded from all surveys within 50 km of project area	<b>HIGH – NOMADIC</b> Commonly recorded from area. Likely to be a nomadic visitor and may breed in the project area
Rainbow Bee-eater ( <i>Merops ornatus</i> )	M			Open country, most vegetation types, dunes, banks.	Recorded from all surveys within 50 km of the project area	<b>HIGH – BREEDING MIGRANT</b> Suitable habitat present

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE AND STATUS IF PRESENT
	EPBC	WCA	DEC			
Grey Falcon ( <i>Falco hypoleucos</i> )			P4	Lightly wooded coastal and riverine plains.	Recorded from Roy Hill (2006)	<b>MEDIUM – HUNTING VISITOR</b> Nearby record and suitable habitat suggest area will occasionally be used for hunting by the species. No suitable breeding habitat.
Eastern Great Egret ( <i>Ardea alba</i> )	M			Freshwater and marine shallow water bodies	Records from and Roy Hill (2006), the Roy Hill southern rail spur (2008), Christmas Creek (2005), and several nearby records from the Fortescue River.	<b>MEDIUM – NOMADIC</b> May visit area to hunt when surface water present

Notes: Description of conservation significance codes provided in Appendix B.

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

WCA = *Wildlife Conservation Act 1950 (Specially Protected Fauna) Notice 2008*

DEC = Department of Environment and Conservation Priority Fauna list

## 4.2.3 MAMMALS

### 4.2.3.1 Northern Short-tailed Mouse (*Leggadina lakedownensis*) – DEC Priority 4

Populations of this small, secretive rodent are distributed across northern Australia but records have been sporadic (Moro and Kutt 2008). They occupy a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, acacia shrublands, tropical eucalypt and melaleuca woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils (Moro and Kutt 2008).

Their diet consists primarily of invertebrates, with plant material supplementing their water requirements (Moro and Kutt 2008). Populations fluctuate greatly in response to rainfall, sometimes reaching plague proportions. The species is nocturnal and solitary, spending the day in simple, single-chambered burrows (Moro and Kutt 2008). Studies of this species in Queensland suggest that grazing pressure from pastoral and feral animals can threaten populations of *L. lakedownensis*. However, a population can re-establish itself after the grazing pressure has been reduced (Kutt and Kemp 2005).

Several individuals of this species were recorded on the FMG Stage B Rail Corridor in the vicinity of Kondy Creek, Kulkinbah Creek and Christmas Creek. They were recorded most commonly from tussock grasslands on cracking clay, but also from creeklines and mulga woodland, both of which occur throughout the project area. Little impact on this species is expected as a result of the proposed project due to the presence of similar habitat surrounding the project area.

### 4.2.3.2 Brush-tailed Mulgara (*Dasyercus blythi*) – DEC Priority 4

Brush-tailed Mulgara are medium-sized dasyurids (60-110g) with a short, thick tail which is clothed in black hairs for much of its length (Woolley 2008). They occur in spinifex grasslands throughout much of the arid zone, digging burrows in flats between low sand dunes (Woolley 2008).

Believed to be generally solitary, Brush-tailed Mulgara construct several single entranced, multi-tunnelled burrows within their home range (Woolley 2008). According to Koertner et al. (2007), home ranges and burrows encompass both mature spinifex and open regrowth areas and Brush-tailed Mulgara do not prefer one of either habitat type, but this might increase the risk of predation, especially following fire.

Brush-tailed Mulgara are nocturnal hunters, feeding on arthropods and small vertebrates. Breeding is believed to occur in late winter to spring (Woolley 2008).

There are few local records of this species, but suitable habitat is present, in particular in the Divide land system. Evidence of recent Mulgara activity was recorded along the FMG Stage B Rail Corridor at Mt Nicholas, approximately 60 km east of the proposed borefield area (Biota 2005). Impacts to this species are expected to be low due to the small amount of suitable habitat and the presence of similar habitat surrounding the project area.

## 4.2.4 BIRDS

### 4.2.4.1 Bush Stone-curlew (*Burhinus grallarius*) – DEC Priority 4

The Bush Stone-curlew is a large bird with long legs, large yellow eyes and grey-streaked upper body (Kirkwood 2008). It occurs across much of Australia, except the arid interior and central south coast, preferring lightly wooded country near thickets or long grass that act as daytime shelter (Johnstone and Storr 1998).

The Bush Stone-curlew is a wader-like bird inhabiting woodlands, dry and open grasslands and croplands with cover nearby (NSW National Parks and Wildlife Service 1999). 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 1999). 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 1999). 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). Additional threats are altered fire regimes, degradation of habitat due to overgrazing by domestic stock as well as poisoning by eating pollard baits laid to control rabbits (NSW National Parks and Wildlife Service 1999). They are most common where land disturbance is minimal and generally become rare or extinct around human settlements (Johnstone and Storr 1998).

Bush Stone-curlews are likely to be sparsely distributed throughout the region, particularly near creeklines. With suitable habitat present within the project area and several previous records within 50 km, there is a high likelihood of this species being resident within the borefield area. There is the potential for disturbance to this species due to human presence; however no significant impacts to this species are expected due to their ability to move into the similar habitat that surrounds the project area.

#### **4.2.4.2 Australian Bustard (*Ardeotis australis*) – DEC Priority 4**

The Australian Bustard is a large ground-dwelling bird that 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).

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).

The Australian Bustard is common in the region and is highly likely to forage and potentially breed within the borefield area. They have been recorded at Roy Hill and on numerous surveys in the surrounding area and suitable habitat is present within the project area. Although there is the potential for nest desertion if construction begins during the breeding season, this is a wide-ranging nomadic species and no significant impacts are expected due to the presence of similar habitats surrounding the project area.

#### **4.2.4.3 Rainbow Bee-eater (*Merops ornatus*) – EPBC Act Migratory**

The Rainbow Bee-eater is a striking, colourful bird that lives almost anywhere suitable for hawking insects, principally bees, flies, dragonflies and grasshoppers. It migrates between Australia and Indonesia, moving south over summer and breeding in Australia (Johnstone and Storr 1998). In Western Australia, this species can occur as a resident, breeding visitor, postnuptial nomad, passage migrant or winter visitor. They are 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). It nests in burrows dug

usually 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 and the young fledge after approximately 30 days.

Rainbow Bee-eaters are found in most habitats throughout the Pilbara during the summer breeding season. They have been found on numerous local surveys and are highly likely to hunt and breed within the proposed borefield. Although there is the potential for nest destruction if construction of the borefield begins during the breeding season, this is a wide-ranging migratory species and no significant impacts are expected due to the presence of similar habitats surrounding the project area.

#### **4.2.4.4 Grey Falcon (*Falco hypoleucos*) – DEC Priority 4**

Grey Falcons are a rare, nomadic raptor species. They are sparsely distributed across much of arid and semi-arid Australia. In Western Australia, they are restricted to the northern half, occurring in a variety of habitats ranging from wooded drainage systems through to open spinifex plains. Grey Falcons once occurred across much of Western Australia, with sightings as far south as York and New Norcia during colonial times. However, the current distribution is now thought to be restricted to north of 26°S (Johnstone and Storr 1998). Because the distribution of this species is very scarce over an extremely large area, sightings of this species are very uncommon.

Grey Falcons occur in a wide variety of arid habitats including open woodlands and open acacia shrubland, hummock and tussock grasslands, low shrublands and may also be seen around swamps and waterholes that attract prey (Ehmann and Watson 2008). Like other falcons this species preys primarily on birds, such as parrots and pigeons, although reptiles and mammals are also taken (Ehmann and Watson 2008). Two to three eggs are laid in winter in the nests of other birds of prey and ravens, typically in tall eucalypt trees near water (Garnett and Crowley 2000; Ehmann and Watson 2008). It is mostly nomadic when not breeding but may also become a longer term resident in coastal and moister inland refuge areas. The breeding season is from July to October. They generally occur where Peregrine Falcons are scarce or absent. (Olsen and Olsen 1985).

Clearing and grazing of arid zone habitat, destruction of raptors because they were thought to prey on domestic poultry, and the use of pesticides have had an adverse effect on this species (Venn 2003).

Grey Falcons were recorded hunting at Roy Hill near the Fortescue River, 20 km north of the proposed borefield. Although no suitable breeding habitat exists within the borefield, Grey Falcons may occasionally use this area for hunting. No significant impacts to this species are expected due to the presence of similar habitats surrounding the project area.

#### **4.2.4.5 Eastern Great Egret (*Ardea modesta*) – EPBC Act Migratory**

Eastern Great Egrets mainly inhabit shallow water bodies; both fresh (lakes, lagoons, swamps and floodwaters) and saline (mangrove creeks, estuaries and tidal pools) (Johnstone and Storr 1998). They occur across a large part of Western Australia, including the south-west, Kimberley and Pilbara (Johnstone and Storr 1998). The Great Egret is common to very common in the well-watered Kimberley flatlands, and scarce to moderately common elsewhere within its range (Johnstone and Storr 1998).

This species' diet consists predominantly of small fish and crustaceans. They breed colonially in trees standing in water around wooded swamps and river pools, 4-13 m above water (Morcombe 2000). The nest is build as a rough, loose, shallow platform. Four eggs are laid in summer in the Kimberley and during the spring in regions further south (Johnstone and Storr 1998).

Numerous records from the Fortescue River and surrounding creeklines indicate that this species is moderately common in the region surrounding the proposed borefield. Hence it

may occasionally visit the area to forage when surface water is present. No significant impacts to this species are expected due to the small amount of suitable habitat found inside the project area and the presence of similar habitats surrounding the project area.

## 5.0 CONCLUSIONS

As discussed in the previous sections, results from surveys carried out in areas surrounding the proposed Roy Hill borefield have demonstrated that a large number of conservation significant fauna have the potential to occur within the project area. However, based on the vegetation and land systems thought to occur within the project area, only seven of these species have a high or medium likelihood of occurrence. Additional on-ground reconnaissance of the area would be required to confirm whether these species occur or are likely to occur in the area, and whether they may be impacted by the proposed project.

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## APPENDIX A      FAUNA RECORDED IN THE REGION

## Appendix A1 Mammals

Family and Species	Common name	Conservation Status			Previous Fauna Surveys Within 50km	NatureMap & DEC Threatened Fauna Database
		EPBC	WCA	DEC		
<b>TACHYGLOSSIDAE</b>						
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna				✓	
<b>DASYURIDAE</b>						
<i>Dasyercus blythi</i>	Brush-tailed Mulgara			P4	✓	
<i>Dasykaluta rosamondae</i>	Kaluta				✓	
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	S1		✓	✓
<i>Ningauai timealeyi</i>	Pilbara Ningauai				✓	
<i>Planigale sp.</i>					✓	
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart			P3	✓	
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart				✓	
<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart				✓	✓
<b>MACROPODIDAE</b>						
<i>Macropus robustus</i>	Euro				✓	
<i>Macropus rufus</i>	Red Kangaroo				✓	✓
<i>Petrogale lateralis lateralis</i>	Black-flanked Rock-wallaby	VU	S1			✓
<i>Petrogale rothschildi</i>	Rothschild's Rock-wallaby				✓	✓
<b>MEGADERMATIDAE</b>						
<i>Macroderma gigas</i>	Ghost Bat			P4	✓	✓
<b>HIPPOSIDERIDAE</b>						
<i>Rhinonictis aurantia</i>	Pilbara Leaf-nosed Bat	VU	S1			✓
<b>EMBALLONURIDAE</b>						
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat				✓	
<i>Taphozous georgianus</i>	Common Sheath-tail Bat				✓	
<b>MOLOSSIDAE</b>						
<i>Chaerophon jobensis</i>	Northern Freetail Bat				✓	
<b>VESPERTILIONIDAE</b>						
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat				✓	✓
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat				✓	
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat				✓	
<i>Scotorepens greyii</i>	Little Broad-nosed Bat				✓	✓
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat				✓	
<b>MURIDAE</b>						
<i>Notomys alexis</i>	Spinifex Hopping-mouse				✓	
<i>Leggadina lakedownensis</i>	Northern Short-tailed Mouse			P4	✓	
<i>Pseudomys chapmani</i>	Western Pebble-mouse			P4	✓	✓
<i>Pseudomys desertor</i>	Desert Mouse				✓	✓
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse				✓	
<b>INTRODUCED MAMMALS</b>						
* <i>Mus musculus</i>	House Mouse				✓	✓
* <i>Canis lupus familiaris</i>	Dog				✓	
* <i>Vulpes vulpes</i>	Red Fox				✓	

Family and Species	Common name	Conservation Status			Previous Fauna Surveys Within 50km	NatureMap & DEC Threatened Fauna Database
		EPBC	WCA	DEC		
* <i>Felis catus</i>	Cat				✓	
* <i>Oryctolagus cuniculus</i>	European Rabbit				✓	
* <i>Equus asinus</i>	Donkey				✓	
* <i>Equus caballus</i>	Horse				✓	
* <i>Camelus dromedarius</i>	One-humped Camel				✓	
* <i>Bos taurus</i>	Cow				✓	

## Appendix A2 Birds

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birddata
		EPBC	WCA	DEC			
<b>CASUARIIDAE</b>							
<i>Dromaius novaehollandiae</i>	Emu				✓		✓
<b>PHASIANIDAE</b>							
<i>Coturnix pectoralis</i>	Stubble Quail				✓		
<b>ANATIDAE</b>							
<i>Dendrocygna eytoni</i>	Plumed Whistling-duck						✓
<i>Tadorna tadornoides</i>	Australian Shelduck				✓		✓
<i>Chenonetta jubata</i>	Australian Wood Duck						✓
<i>Anas gracilis</i>	Grey Teal						✓
<i>Anas superciliosa</i>	Pacific Black Duck						✓
<i>Aythya australis</i>	Hardhead				✓		✓
<b>PODICIPEDIDAE</b>							
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe						✓
<b>COLUMBIDAE</b>							
<i>Phaps chalcoptera</i>	Common Bronzewing				✓		✓
<i>Ocyphaps lophotes</i>	Crested Pigeon				✓		✓
<i>Geophaps plumifera</i>	Spinifex Pigeon				✓		✓
<i>Geopelia cuneata</i>	Diamond Dove				✓		✓
<i>Geopelia striata</i>	Peaceful Dove				✓	✓	✓
<b>PODARGIDAE</b>							
<i>Podargus strigoides</i>	Tawny Frogmouth				✓		✓
<b>EUROSTOPODIDAE</b>							
<i>Eurostopodus argus</i>	Spotted Nightjar				✓		✓

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birdata
		EPBC	WCA	DEC			
<b>AEGOTHELIDAE</b>							
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar				✓		✓
<b>APODIDAE</b>							
<i>Apus pacificus</i>	Fork-tailed Swift	M			✓		
<b>ANHINGIDAE</b>							
<i>Anhinga novaehollandiae</i>	Australasian Darter						✓
<b>PHALACROCORACIDAE</b>							
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant				✓		✓
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						✓
<b>PELECANIDAE</b>							
<i>Pelecanus conspicillatus</i>	Australian Pelican				✓		
<b>CICONIIDAE</b>							
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork						✓
<b>ARDEIDAE</b>							
<i>Ardea pacifica</i>	White-necked Heron				✓		✓
<i>Ardea modesta</i>	Eastern Great Egret	M			✓		✓
<i>Egretta novaehollandiae</i>	White-faced Heron				✓		✓
<i>Ardea ibis</i>	Cattle Egret	M					✓
<i>Egretta garzetta</i>	Little Egret						✓
<b>THRESKIORNITHIDAE</b>							
<i>Threskiornis spinicollis</i>	Straw-necked Ibis				✓		✓
<i>Platalea regia</i>	Royal Spoonbill				✓		✓
<i>Platalea flavipes</i>	Yellow-billed Spoonbill						✓
<b>ACCIPITRIDAE</b>							
<i>Elanus axillaris</i>	Black-shouldered Kite				✓		

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birdata
		EPBC	WCA	DEC			
<i>Lophoictinia isura</i>	Square-tailed Kite						✓
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard				✓		
<i>Haliastur sphenurus</i>	Whistling Kite				✓		✓
<i>Milvus migrans</i>	Black Kite				✓		✓
<i>Accipiter fasciatus</i>	Brown Goshawk				✓		✓
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk				✓		✓
<i>Circus assimilis</i>	Spotted Harrier				✓	✓	
<i>Aquila audax</i>	Wedge-tailed Eagle				✓		✓
<i>Hieraaetus morphnoides</i>	Little Eagle				✓		✓
<b>FALCONIDAE</b>							
<i>Falco cenchroides</i>	Nankeen Kestrel				✓		✓
<i>Falco berigora</i>	Brown Falcon				✓		✓
<i>Falco longipennis</i>	Australian Hobby				✓		✓
<i>Falco hypoleucos</i>	Grey Falcon			P4	✓		
<i>Falco subniger</i>	Black Falcon				✓		
<i>Falco peregrinus</i>	Peregrine Falcon		S4		✓	✓	✓
<b>RALLIDAE</b>							
<i>Gallirallus philippensis</i>	Buff-banded Rail						✓
<b>OTIDIDAE</b>							
<i>Ardeotis australis</i>	Australian Bustard			P4	✓	✓	✓
<b>BURHINIDAE</b>							
<i>Burhinus grallarius</i>	Bush Stone-curlew			P4	✓	✓	
<b>CHARADRIIDAE</b>							
<i>Charadrius australis</i>	Inland Dotterel				✓		
<i>Euseyonis melanops</i>	Black-fronted Dotterel				✓		✓

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birddata
		EPBC	WCA	DEC			
<i>Erythrogonys cinctus</i>	Red-kneed Dotterel				✓		
<b>SCOLOPACIDAE</b>							
<i>Tringa glareola</i>	Wood Sandpiper	M			✓		
<b>TURNICIDAE</b>							
<i>Turnix velox</i>	Little Button-quail				✓	✓	✓
<b>GLAREOLIDAE</b>							
<i>Stiltia isabella</i>	Australian Pratincole				✓		
<b>CACATUIDAE</b>							
<i>Eolophus roseicapillus</i>	Galah				✓	✓	✓
<i>Cacatua sanguinea</i>	Little Corella				✓		✓
<i>Nymphicus hollandicus</i>	Cockatiel				✓		✓
<b>PSITTACIDAE</b>							
<i>Barnardius zonarius</i>	Australian Ringneck				✓	✓	✓
<i>Melopsittacus undulatus</i>	Budgerigar				✓		✓
<i>Neopsephotus bourkii</i>	Bourke's Parrot				✓		
<i>Neophema elegans</i>	Elegant Parrot				✓		
<i>Pezoporus occidentalis</i>	Night Parrot	EN, M	S1			✓	
<b>CUCULIDAE</b>							
<i>Centropus phasianinus</i>	Pheasant Coucal				✓		
<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo				✓		✓
<i>Chalcites osculans</i>	Black-eared Cuckoo				✓		
<i>Cacomantis pallidus</i>	Pallid Cuckoo				✓		✓
<b>STRIGIDAE</b>							
<i>Ninox novaeseelandiae</i>	Southern Boobook				✓		✓



Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birddata
		EPBC	WCA	DEC			
<b>TYTONIDAE</b>							
<i>Tyto javanica</i>	Eastern Barn Owl				✓		✓
<b>HALCYONIDAE</b>							
<i>Dacelo leachii</i>	Blue-winged Kookaburra				✓		✓
<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher				✓		✓
<i>Todiramphus sanctus</i>	Sacred Kingfisher				✓		✓
<b>MEROPIIDAE</b>							
<i>Merops ornatus</i>	Rainbow Bee-eater	M			✓		✓
<b>PTILINORHYNCHIDAE</b>							
<i>Ptilonorhynchus guttatus</i>	Western Bowerbird						✓
<b>MALURIDAE</b>							
<i>Malurus leucopterus</i>	White-winged Fairy-wren				✓		✓
<i>Malurus lamberti</i>	Variiegated Fairy-wren				✓		✓
<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren				✓		
<i>Amytornis striatus</i>	Striated Grasswren				✓		✓
<b>ACANTHIZIDAE</b>							
<i>Pyrrholaemus brunneus</i>	Redthroat				✓		✓
<i>Smicromis brevirostris</i>	Weebill				✓		✓
<i>Gerygone fusca</i>	Western Gerygone				✓		✓
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill				✓		
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				✓		✓
<i>Acanthiza apicalis</i>	Inland Thornbill				✓		✓
<i>Aphelocephala leucopsis</i>	Southern Whiteface				✓		
<b>PARDALOTIDAE</b>							
<i>Pardalotus rubricatus</i>	Red-browed Pardalote				✓	✓	✓

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birddata
		EPBC	WCA	DEC			
<i>Pardalotus striatus</i>	Striated Pardalote				✓		✓
<b>MELIPHAGIDAE</b>							
<i>Certhionyx variegatus</i>	Pied Honeyeater				✓		
<i>Lichenostomus virescens</i>	Singing Honeyeater				✓		✓
<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater				✓		✓
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater				✓	✓	✓
<i>Purnella albifrons</i>	White-fronted Honeyeater				✓		
<i>Manorina flavigula</i>	Yellow-throated Miner				✓		✓
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				✓		✓
<i>Conopophila whitei</i>	Grey Honeyeater				✓	✓	
<i>Epthianura tricolor</i>	Crimson Chat				✓	✓	✓
<i>Sugomel niger</i>	Black Honeyeater				✓		
<i>Lichmera indistincta</i>	Brown Honeyeater				✓		✓
<i>Melithreptus gularis</i>	Black-chinned Honeyeater				✓		
<b>POMATOSTOMIDAE</b>							
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler				✓	✓	✓
<i>Pomatostomus superciliosus</i>	White-browed Babbler				✓		✓
<b>PSOPHODIDAE</b>							
<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush				✓		
<i>Psophodes occidentalis</i>	Chiming Wedgebill						✓
<b>NEOSITTIDAE</b>							
<i>Daphoenositta chrysoptera</i>	Varied Sittella				✓		
<b>CAMPEPHAGIDAE</b>							
<i>Coracina maxima</i>	Ground Cuckoo-shrike				✓		
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				✓		✓

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birdata
		EPBC	WCA	DEC			
<i>Lalage sueurii</i>	White-winged Triller				✓		✓
<b>PACHYCEPHALIDAE</b>							
<i>Pachycephala rufiventris</i>	Rufous Whistler				✓		✓
<i>Colluricincla harmonica</i>	Grey Shrike-thrush				✓		✓
<i>Oreoica gutturalis</i>	Crested Bellbird			P4 <sup>†</sup>	✓	✓	✓
<b>ARTAMIDAE</b>							
<i>Artamus personatus</i>	Masked Woodswallow				✓	✓	✓
<i>Artamus cinereus</i>	Black-faced Woodswallow				✓		✓
<i>Artamus minor</i>	Little Woodswallow				✓		✓
<i>Cracticus torquatus</i>	Grey Butcherbird				✓		✓
<i>Cracticus nigrogularis</i>	Pied Butcherbird				✓		✓
<i>Cracticus tibicen</i>	Australian Magpie				✓		✓
<b>RHIPIDURIDAE</b>							
<i>Rhipidura albiscapa</i>	Grey Fantail				✓		
<i>Rhipidura leucophrys</i>	Willie Wagtail				✓		✓
<b>CORVIDAE</b>							
<i>Corvus bennetti</i>	Little Crow				✓		✓
<i>Corvus orru</i>	Torresian Crow				✓	✓	✓
<b>MONARCHIDAE</b>							
<i>Grallina cyanoleuca</i>	Magpie-lark				✓		✓
<b>PETROICIDAE</b>							
<i>Microeca fascinans</i>	Jacky Winter				✓		
<i>Petroica goodenovii</i>	Red-capped Robin				✓		✓
<i>Melanodryas cucullata</i>	Hooded Robin				✓		✓

Family and Species	Common name	Conservation Status			Previous Surveys Within 50km	NatureMap & DEC Threatened Fauna Database	Birddata
		EPBC	WCA	DEC			
<b>ALAUDIDAE</b>							
<i>Mirafra javanica</i>	Horsfield's Bushlark				✓		✓
<b>ACROCEPHALIDAE</b>							
<i>Acrocephalus australis</i>	Australian Reed-Warbler						✓
<b>MEGALURIDAE</b>							
<i>Cincloramphus mathewsi</i>	Rufous Songlark				✓		✓
<i>Cincloramphus cruralis</i>	Brown Songlark				✓		✓
<i>Eremiornis carteri</i>	Spinifexbird				✓		
<b>HIRUNDINIDAE</b>							
<i>Cheramoeca leucosternus</i>	White-backed Swallow				✓		
<i>Hirundo neoxena</i>	Welcome Swallow						✓
<i>Petrochelidon ariel</i>	Fairy Martin				✓		✓
<i>Petrochelidon nigricans</i>	Tree Martin				✓		✓
<b>NECTARINIIDAE</b>							
<i>Dicaeum hirundinaceum</i>	Mistletoebird				✓		✓
<b>ESTRILDIDAE</b>							
<i>Taeniopygia guttata</i>	Zebra Finch				✓		✓
<i>Neochmia ruficauda subclaescens</i>	Star Finch (western)			P4	✓	✓	
<i>Emblema pictum</i>	Painted Finch				✓		✓
<b>MOTACILLIDAE</b>							
<i>Anthus novaeseelandiae</i>	Australasian Pipit				✓		✓

† DEC Priority 4 status applied only to the southern subspecies *Oreoica gutturalis gutturalis*

**Appendix A3** Reptiles and Amphibians

Family and Species	Common name	Conservation Status			Previous Fauna Surveys Within 50km	NatureMap & DEC threatened Fauna Database
		EPBC	WCA	DEC		
<b>REPTILES</b>						
<b>CHELUIDAE</b>						
<i>Chelodina steindachneri</i>	Steindachner's Turtle				✓	✓
<b>GEKKONIDAE</b>						
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko				✓	✓
<i>Diplodactylus mitchelli</i>						✓
<i>Diplodactylus pulcher</i>	Beautiful Gecko				✓	
<i>Gehyra pilbara</i>	Pilbara Dtella				✓	
<i>Gehyra punctata</i>	Spotted Dtella				✓	
<i>Gehyra variegata</i>	Tree Dtella				✓	✓
<i>Heteronotia binoei</i>	Bynoe's Gecko				✓	✓
<i>Heteronotia spelea</i>	Desert Cave Gecko				✓	
<i>Lucasium stenodactylum</i>	Sandplain Gecko				✓	✓
<i>Lucasium wombeyi</i>	Pilbara Ground Gecko				✓	✓
<i>Nephrurus wheeleri</i>	Banded Knob-tailed Gecko				✓	✓
<i>Oedura marmorata</i>	Marbled Velvet Gecko				✓	
<i>Rhynchoedura ornata</i>	Beaked Gecko					✓
<i>Strophurus elderi</i>	Jeweled Gecko				✓	
<i>Strophurus wellingtonae</i>					✓	✓
<b>PYGOPODIDAE</b>						
<i>Delma butleri</i>	Un-banded Delma				✓	
<i>Delma elegans</i>					✓	
<i>Delma haroldi</i>					✓	✓
<i>Delma nasuta</i>	Long-nosed Delma				✓	
<i>Delma pax</i>					✓	✓
<i>Delma tincta</i>	Excitable Delma				✓	✓
<i>Lialis burtonis</i>	Burton's Snake-lizard				✓	✓
<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot				✓	✓
<b>SCINCIDAE</b>						
<i>Carlia munda</i>					✓	
<i>Carlia triacantha</i>	Desert Rainbow Skink					✓
<i>Cryptoblepharus plagiocephalus</i>	Fence Skink					✓
<i>Ctenotus ariadnae</i>					✓	
<i>Ctenotus duricola</i>					✓	✓
<i>Ctenotus hanloni</i>					✓	
<i>Ctenotus helenae</i>					✓	✓
<i>Ctenotus leonhardii</i>					✓	
<i>Ctenotus pantherinus</i>	Leopard Ctenotus				✓	✓
<i>Ctenotus piankai</i>					✓	

Family and Species	Common name	Conservation Status			Previous Fauna Surveys Within 50km	NatureMap & DEC threatened Fauna Database
		EPBC	WCA	DEC		
<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus				✓	
<i>Ctenotus rubicundus</i>					✓	
<i>Ctenotus rutilans</i>					✓	
<i>Ctenotus saxatilis</i>	Rock Ctenotus				✓	✓
<i>Ctenotus serventyi</i>					✓	
<i>Ctenotus uber</i>					✓	
<i>Cyclodomorphus melanops</i>	Spinifex Slender Blue-tongue				✓	
<i>Eremiascincus richardsonii</i>	Broad-banded Sand-swimmer				✓	✓
<i>Lerista amicorum</i>						✓
<i>Lerista flammicauda</i>					✓	
<i>Lerista labialis</i>						✓
<i>Lerista muelleri</i>					✓	
<i>Menetia greyii</i>	Common Dwarf Skink				✓	✓
<i>Menetia surda</i>					✓	✓
<i>Morethia ruficauda</i>	Three Striped Fire-tail				✓	✓
<i>Notoscincus ornatus</i>						✓
<i>Tiliqua multifasciata</i>	Centralian Blue-tongue					✓
<b>AGAMIDAE</b>						
<i>Amphibolurus longirostris</i>	Long-nosed Dragon				✓	✓
<i>Caimanops amphiboluroides</i>	Mulga Dragon				✓	✓
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon				✓	✓
<i>Ctenophorus isolepis</i>	Central Military Dragon				✓	✓
<i>Ctenophorus nuchalis</i>	Central Netted Dragon				✓	✓
<i>Ctenophorus reticulatus</i>	Western Netted Dragon				✓	✓
<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon				✓	
<i>Pogona minor</i>	Dwarf Bearded Dragon				✓	✓
<i>Tympanocryptis cephalus</i>	Pebble Dragon				✓	
<b>VARANIDAE</b>						
<i>Varanus acanthurus</i>	Spiny-tailed Monitor				✓	
<i>Varanus caudolineatus</i>	Stripe-tailed Monitor				✓	✓
<i>Varanus eremius</i>	Pygmy Desert Monitor				✓	
<i>Varanus giganteus</i>	Perentie				✓	
<i>Varanus panoptes</i>	Yellow-spotted Monitor				✓	
<i>Varanus tristis</i>	Black-headed Monitor				✓	
<b>TYPHLOPIDAE</b>						
<i>Ramphotyphlops ammodytes</i>					✓	✓
<i>Ramphotyphlops ganei</i>				P1	✓	✓
<i>Ramphotyphlops grypus</i>	Beaked Blind Snake				✓	✓
<i>Ramphotyphlops hamatus</i>					✓	✓
<i>Ramphotyphlops waitii</i>						✓

Family and Species	Common name	Conservation Status			Previous Fauna Surveys Within 50km	NatureMap & DEC threatened Fauna Database
		EPBC	WCA	DEC		
<b>PYTHONIDAE</b>						
<i>Antaresia perthensis</i>	Pygmy Python				✓	
<i>Antaresia stimsoni</i>	Stimson's Python					✓
<i>Aspidites melanocephalus</i>	Black-headed Python				✓	
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	S1		✓	✓
<b>ELAPIDAE</b>						
<i>Brachyuropsis approximans</i>	North-western Shovel-nosed Snake				✓	
<i>Demansia psammophis</i>	Yellow-faced Whipsnake				✓	✓
<i>Pseudechis australis</i>	Mulga Snake				✓	
<i>Pseudonaja modesta</i>	Ringed Brown Snake				✓	✓
<i>Pseudonaja nuchalis</i>	Gwardar				✓	✓
<i>Suta fasciata</i>	Rosen's Snake					✓
<i>Suta punctata</i>	Little Spotted Snake				✓	
<b>AMPHIBIANS</b>						
<b>HYLIDAE</b>						
<i>Cyclorana maini</i>	Main's Frog				✓	
<i>Cyclorana platycephala</i>	Water-Holding Frog				✓	
<i>Litoria rubella</i>	Desert Tree Frog				✓	✓
<b>MYOBATRACHIDAE</b>						
<i>Notaden nichollsi</i>	Desert Spadefoot				✓	

## APPENDIX B      EXPLANATION OF CONSERVATION CODES



**Appendix B1** Definitions of relevant categories under the *Environment Protection and Biodiversity Conservation Act*.

Category	Definition
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: <ul style="list-style-type: none"> <li>• the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state;</li> <li>• The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); or</li> <li>• The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).</li> </ul>

**Appendix B2** Definition of Schedules under the *Wildlife Conservation Act 1950*.

Schedule	Definition
Schedule 1 (S1)	Fauna which are Rare or likely to become extinct, are declared to be fauna that is in need of special protection.
Schedule 2 (S2)	Fauna which are presumed to be extinct, are declared to be fauna that is in need of special protection.
Schedule 3 (S3)	Birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection.
Schedule 4 (S4)	Declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned above.

**Appendix B3** Definition of Department of Environment and Conservation Priority Codes.

Priority	Definition
Priority One (P1)	<i>Taxa with few, poorly known populations on threatened lands.</i> Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	<i>Taxa with few, poorly known populations on conservation lands.</i> Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	<i>Taxa with several, poorly known populations, some on conservation lands.</i> Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (P4)	<i>Taxa in need of monitoring.</i> Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	<i>Taxa in need of monitoring (conservation dependent).</i> Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

APPENDIX C SPECIES OF CONSERVATION  
SIGNIFICANCE WITH A LOW  
LIKELIHOOD OF OCCURRENCE  
WITHIN THE PROJECT AREA

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE AND STATUS IF PRESENT
	EPBC	WCA	DEC			
<b>Mammals</b>						
Northern Quoll ( <i>Dasyurus hallucatus</i> )	EN	S1		Rocky areas, also eucalypt forest and woodland	Records of a single scat from Mt Nicholas, approx. 70 km east of project area (Biota 2005), and Nullagine (DEC records)	<b>LOW – RESIDENT</b> No suitable habitat
Black-flanked Rock Wallaby ( <i>Petrogale lateralis lateralis</i> )	VU	S1		Rocky areas with crevices and caves	Recorded from Newman in 1975 (DEC records)	<b>LOW – RESIDENT</b> No local records and no suitable habitat
Pilbara Leaf-nosed Bat ( <i>Rhinonictoris aurantia</i> )	VU	S1		Roosts in hot, humid caves	Single record from Newman in 2008 (DEC records)	<b>LOW – RESIDENT</b> No local records and no suitable roosting habitat nearby
Long-tailed Dunnart ( <i>Sminthopsis longicaudata</i> )			P3	Rocky habitat with spinifex or open habitat with a rocky mantle	One individual recorded from Mt Nicholas, approx. 70 km east of project area	<b>LOW – RESIDENT</b> No suitable habitat
Western Pebble-mouse ( <i>Pseudomys chapmani</i> )			P4	Spurs and rocky hills with many small pebbles vegetated by spinifex	Mounds were recorded on most surveys within 50 km of the project area, including Roy Hill and the Mt Lewin area. Individuals were recorded at Marillana, Wheelarra Hill, Hamersley Range and Ophthalmia Range (DEC records)	<b>LOW – RESIDENT</b> Species is a common resident in surrounding rocky country, but suitable habitat not present within project area
Ghost Bat ( <i>Macroderma gigas</i> )			P4	Caves, rockpiles and abandoned mines. Will travel 2 km from roost to hunt	Records from Roy Hill in 2008, Newman (2007, 2008; DEC records) and Ophthalmia Range (1967; DEC records)	<b>LOW – HUNTING VISITOR</b> With few suitable roosting sites nearby this species is unlikely to hunt in the area

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE AND STATUS IF PRESENT
	EPBC	WCA	DEC			
<b>Birds</b>						
Night Parrot ( <i>Pezoporus occidentalis</i> )	EN	S1		<i>Triodia</i> hummock grassland or chenopod shrublands. Thick unburnt vegetation most suitable	One record from Mulga Downs in 2005 (DEC records)	<b>LOW – RESIDENT</b> No local records, little suitable habitat.
Peregrine Falcon ( <i>Falco peregrinus</i> )		S4		Coastal cliffs, riverine gorges and wooded watercourses	Records from FMG rail corridor (2005), Roy Hill (2006, 2008), Newman and Mulga Downs (DEC records)	<b>LOW – HUNTING VISITOR</b> Records from around project area, but no suitable breeding or roosting habitat nearby. Unlikely to visit area for hunting
Star Finch (western subspecies) ( <i>Neochmia ruficauda subclarescens</i> )			P4	Vegetation around watercourses, particularly thick reedbeds.	Records from Roy Hill (2006, 2008, 2009) and Newman (DEC records)	<b>LOW – RESIDENT/VISITOR</b> No suitable habitat thought to occur in project area. However, surveying may be required to confirm this
Crested Bellbird (southern subspecies) ( <i>Oreoica gutturalis gutturalis</i> )			P4	Dry mallee woodland and heath	Single record from Newman (DEC records)	<b>LOW – RESIDENT</b> Outside typical range of subspecies. Few local records
Fork-tailed Swift ( <i>Apus pacificus</i> )	M			Almost entirely aerial, particularly associated with storm fronts	Present at Mindy Mindy in association with a storm front (2005)	<b>LOW – NOMADIC</b> Highly nomadic aerial species, may occasionally overfly project area but will not utilise it directly
Wood Sandpiper ( <i>Tringa glareola</i> )	M			Freshwater swamps, river pools, claypans, saltlakes	Previously recorded at Roy Hill (2006) on ephemeral water bodies	<b>LOW – NON-BREEDING MIGRANT</b> Uncommon in area, but may occasionally visit area when surface water present
Cattle Egret ( <i>Ardea ibis</i> )	M			Grassy habitats, shallow waterbodies and wetlands	Records from the Fortescue River (Birdata)	<b>LOW – VAGRANT</b> Few nearby records. May visit area to hunt when surface water present

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE AND STATUS IF PRESENT
	EPBC	WCA	DEC			
<b>Reptiles</b>						
Pilbara Olive Python ( <i>Liasis olivaceus barroni</i> )	VU	S1		Gorges and escarpments; areas of permanent water	Several records 30 – 50 km south west of the project area, within rocky ranges (NatureMap, DEC records)	<b>LOW – RESIDENT</b> No suitable habitat
<i>Ramphotyphlops ganei</i>			P1	Unknown. Possibly associated with moist gorges and gullies	Records from Roy Hill (2009), Newman, Mt Whaleback and Cathedral gorge (DEC records)	<b>LOW – RESIDENT</b> Few records and no suitable habitat