

MARCH 2011



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



**SINOSTEEL MIDWEST CORPORATION PTY LTD
WELD RANGE HAUL ROAD
VERTEBRATE FAUNA LEVEL 1 ASSESSMENT**

This page has been left blank intentionally

SINOSTEEL MIDWEST CORPORATION PTY LTD
WELD RANGE HAUL ROAD
LEVEL 1 FAUNA ASSESSMENT



Document Status						
Rev.	Author	Reviewer/s	Date	Approved for Issue		
				Name	Distributed To	Date
1	A Heidrich	E Fox	25/3/11	E Fox	W Ennor	25/3/11

ecologia Environment (2011). Reproduction of this report in whole or in part by electronic, mechanical or chemical means including photocopying, recording or by any information storage and retrieval system, in any language, is strictly prohibited without the express approval of Sinosteel Midwest Corporation Pty Ltd and/or *ecologia* Environment.

Restrictions on Use

This report has been prepared specifically for Sinosteel Midwest Corporation Pty Ltd. Neither the report nor its contents may be referred to or quoted in any statement, study, report, application, prospectus, loan, or other agreement document, without the express approval of Sinosteel Midwest Corporation Pty Ltd and/or *ecologia* Environment.

ecologia Environment
 1025 Wellington Street
 WEST PERTH WA 6005
 Phone: 08 9322 1944
 Fax: 08 9322 1599
 Email: admin@ecologia.com.au

TABLE OF CONTENTS

1	INTRODUCTION	3
1.1	PROJECT OVERVIEW	3
1.2	LEGISLATIVE FRAMEWORK	3
1.3	SURVEY OBJECTIVES.....	4
2	BIOPHYSICAL CLIMATE.....	7
2.1	CLIMATE	7
2.2	VEGETATION	7
2.3	LAND SYSTEMS.....	8
2.4	BIOGEOGRAPHY	9
3	SURVEY METHODS.....	15
3.1	DETERMINATION OF SURVEY SAMPLING DESIGN AND INTENSITY.....	15
3.2	LITERATURE REVIEW AND DATABASE SEARCHES	16
3.3	SURVEY TIMING	16
3.4	SITE SELECTION	17
3.5	SAMPLING METHODS.....	20
3.6	ANIMAL ETHICS.....	20
3.7	TAXONOMY AND NOMENCLATURE	20
3.8	SURVEY TEAM	21
4	RESULTS.....	23
4.1	FAUNA ASSEMBLAGES	23
4.2	FAUNA HABITATS	23
4.3	SURVEY LIMITATIONS.....	24
5	IMPACTS TO CONSERVATION SIGNIFICANT FAUNA	25
5.1	CONSERVATION SIGNIFICANT FAUNA POTENTIALLY OCCURRING IN PROJECT AREA	25
6	CONCLUSION	31
7	REFERENCES.....	33

TABLES

Table 2.1 – Vegetation Associations of the Haul Road project area (from Shepherd <i>et al.</i> 2002).....	8
Table 2.2 – Land Systems of the Project Area.	9
Table 3.1 – Factors Likely to Influence Survey Design (from EPA 2004)	15
Table 3.2 – Fauna Databases Searched to Determine the Potential Vertebrate Fauna Assemblage of the Project Area.	16
Table 3.3 – Previous Biological Survey Reports with 100 km of the Project Area.	16
Table 3.4 – Location of Survey Sites.	17
Table 3.5 – References used for Identification.....	20
Table 3.6 – Field Survey Personnel.....	21
Table 4.1 – Summary of Survey Limitations.	24
Table 5.1 – Conservation Significant Fauna Occurring or Potentially Occurring in the Project Area....	29

FIGURES

Figure 1.1 – Location of the Project Area.	5
Figure 2.1 Summary of Climatic Data for Meekatharra Airport (Bureau of Meteorology 2011)	7
Figure 2.2 – Vegetation association of the project area (from Shepherd <i>et al.</i> 2002).....	11
Figure 2.3 – Land Systems of the Project Area.....	12
Figure 2.4 – Biogeographic Regions of the Project Area.	13
Figure 3.1 – Location of Fauna Sites within the Project Area.....	19
Figure 5.1 – Records of <i>Lerista eupoda</i> during previous and current survey.....	28

APPENDICES

Appendix A Explanation of Conservation Codes	35
Appendix B Site Descriptions	39
Appendix C Fauna Recorded During Surveying and Regional Fauna Data.....	49

ACRONYMS

CAMBA	China-Australia Migratory Bird Agreement
DEC	Department of Environment and Conservation
DSEWPaC	Department of Sustainability, Environment, Water, Population and Community
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
JAMBA	Japan-Australian Migratory Bird Agreement
NHMRC	National Health and Medical Research Centre
SMC	Sinosteel Midwest Corporation
WC Act	<i>Wildlife Conservation Act 1950</i>

This page has been left blank intentionally

EXECUTIVE SUMMARY

Sinosteel Midwest Corporation Pty Ltd proposes to undertake a direct shipping iron ore project at Weld Range, situated 90 km south-west of Meekatharra and 60 km north-west of Cue. The target reserve is a minimum of 124 million tonnes from two deposits (Beebyn and Madoonga), with a planned shipment rate of 15 million tonnes minimum per year over 9 years. The Weld Range Project will utilise new rail infrastructure to transport ore from the Weld Range mine to the new port to be built at Oakajee north of Geraldton.

Sinosteel Midwest Corporation (SMC) is an incorporated entity, set up to conduct mineral exploration, engineering, environmental and economic studies into the feasibility of mining at Weld Range.

ecologia Environment has previously conducted fauna surveys of the tenements, mining and infrastructure areas at Weld Range. A newly proposed Haul Road and Infrastructure area required an additional Level 1 survey to provide a habitat assessment of the impact area. The new proposed Haul Road and Infrastructure area at Weld Range is expected to have a disturbance footprint of approximately 15.29 km².

The purpose of the Level 1 assessment includes a literature review and reconnaissance survey of the habitat of the proposed Haul Road and Infrastructure area, with special interest focussed on fauna species of conservation significance.

ecologia Environment undertook a review of all fauna records from the project area and surroundings based on previous surveys at Weld Range (*ecologia* 2009b) and in the area and in consultation with several databases. Based on Western Australian Museum records, Department of Environment and Conservation records and surveys previously undertaken in the area, 30 native mammal, nine introduced mammal, 164 bird, 89 reptile and five amphibian species have the potential to occur in the project area. The Level 1 reconnaissance survey of the proposed Haul Road and Infrastructure was conducted between the 7th March and 12th March 2011.

A total of five species of conservation significance were recorded during previous surveys at Weld Range or have a high likelihood to occur. Of these, one species was recorded during the current survey of the proposed Haul Road and Infrastructure: the skink *Lerista eupoda* (DEC Priority 1).

Of the 17 habitat types identified during previous surveys at Weld Range (*ecologia* 2009b) three were recorded within the proposed Haul Road and Infrastructure areas: Acacia shrubland on sand or clay, mulga woodland on rocky hillslope and eucalypt woodland. All three fauna habitat types are common and widespread in the region. One additional habitat type was recorded in a small extent in the south-west of the project area: Melaleuca shrubland. This unique habitat type was not recorded during previous surveys at Weld Range and is restricted to the edge of a samphire floodplain.

Due to the small size of the project area, less than 1.5% of all mapped land systems and vegetation units in the area will be impacted. Of the fauna habitats present, the majority are widespread in the area. The Melaleuca shrubland is the least common, occurring only on the edge of the samphire floodplain, however little of this area will be impacted by the Project. No significant impacts on either a local or regional scale are anticipated on the fauna or fauna habitats within the Project area, including conservation significant species.

This page has been left blank intentionally

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Sinosteel Midwest Corporation (SMC) is seeking approvals for the developments supporting their proposed Weld Range Mining Operation in the Midwest region of Western Australia. SMC intends to build a Haul Road approximately 20 km in length as part of the infrastructure developments at Weld Range (Figure 1.1).

SMC commissioned *ecologia* Environment (*ecologia*) to undertake a baseline Level 1 vertebrate fauna survey of the proposed area to assess potential impacts on conservation significant fauna and identify appropriate management strategies.

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), principles outlined in EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002) and *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2010).

Native flora and fauna in Western Australia that are formally recognised as rare, threatened with extinction, or as having high conservation value 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). International agreements include the Japan-Australian Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA).

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

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 identified as rare, likely to become extinct, or otherwise in need of special protection (Appendix A). The current listing was gazetted in August 2010.

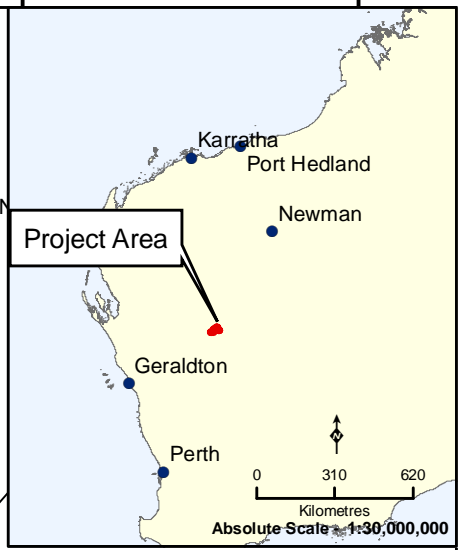
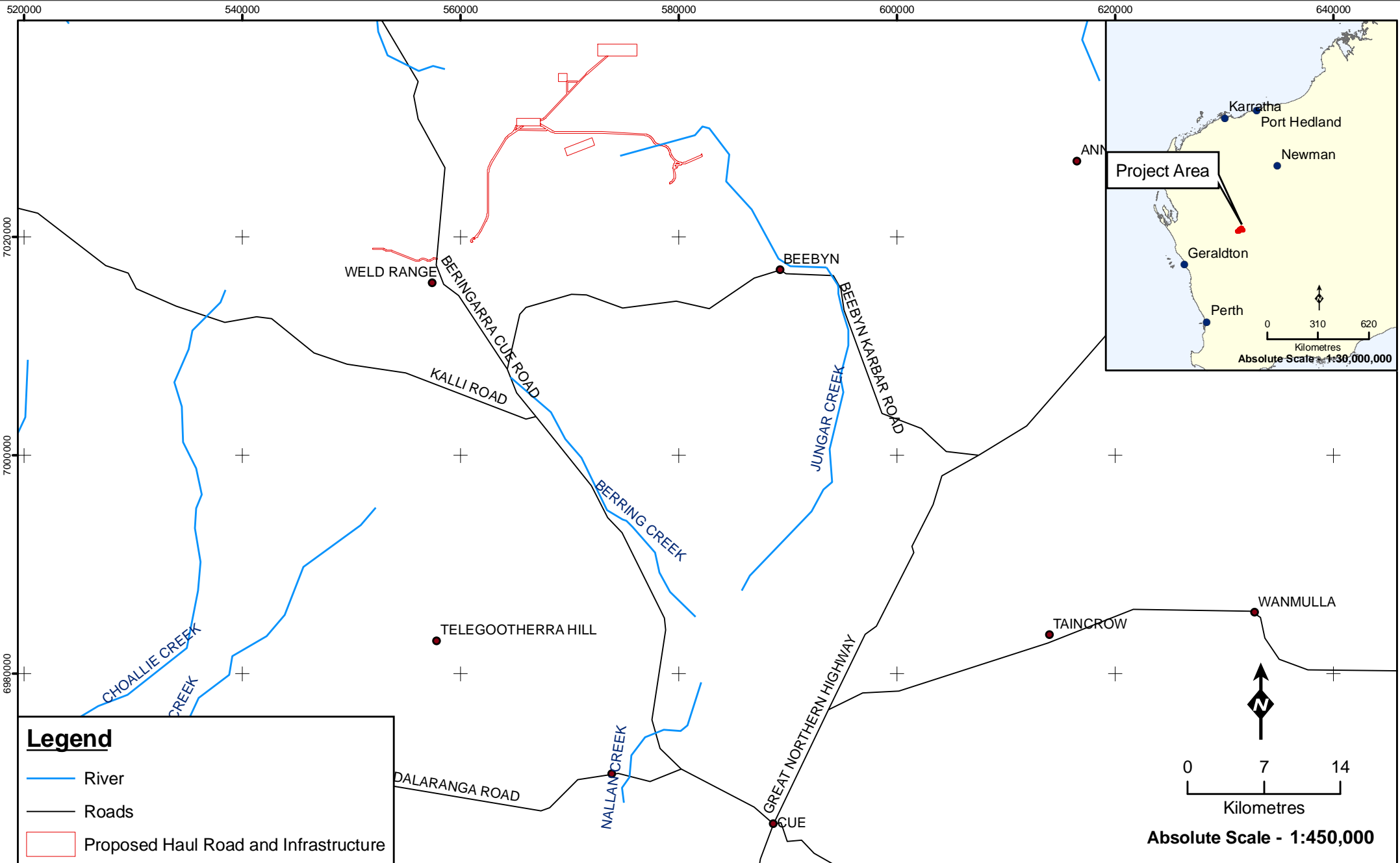
In addition, the Department of Environment and Conservation (DEC) maintains a Threatened and Priority Fauna list which includes species removed from the WC Act and other species known from only a few populations or in need of monitoring. Five Priority codes are recognised (Appendix A).

1.3 SURVEY OBJECTIVES

Sinosteel Midwest Corporation Pty Ltd commissioned *ecologia* Environment (*ecologia*) to undertake a baseline biological survey of the vertebrate fauna of the Weld Range Haul Road and Infrastructure project area as part of the environmental impact assessment for the project.

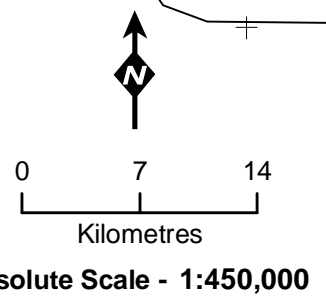
This report satisfies the requirements documented in EPA Guidance Statement No. 56 and Position Statement No. 3, by providing:

- 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 recorded or likely to occur within the project area and surrounds;
- a description of fauna habitats occurring in the project area;
- 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; and
- a review of regional and biogeographical significance, including the conservation status of species recorded in the project area.



Legend

- River
- Roads
- Proposed Haul Road and Infrastructure



中钢澳洲中西矿业公司
SINO STEEL MIDWEST CORPORATION LIMITED

Location of the Project Area

Figure: 1.1
Project ID: 1330

Drawn: AH
Date: 23/02/11

Unique Map ID: AH324

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

A4

This page has been left blank intentionally

2 BIOPHYSICAL CLIMATE

2.1 CLIMATE

The closest weather station to the project area is located at Meekatharra Airport (26°36'S, 118°32'E). This weather station is approximately 90 km north-east of Weld Range. Daily weather conditions recorded at Meekatharra were considered to be representative of those experienced in the project area during previous surveys and the current survey (*ecologia* 2009b).

Average annual rainfall, based on historical data recorded at Meekatharra airport, is 237 mm falling over an average of 46 days; however, there is considerable annual variation. The majority of rainfall occurs in late summer through to winter, with over 80% of the annual rainfall occurring between January and July. The average maximum summer temperatures range from 34 °C to 49 °C, and the average maximum winter temperatures from 22 °C to 31 °C (Figure 2.1).

For most of the year, a subtropical ridge is located to the south, and east to south-easterly winds prevail. Occasionally during the cooler months the ridge moves far enough to the north that cold fronts are able to pass over the region. While most fronts bring little rain, sometimes they are linked to tropical cloud bands which deliver the most reliable rain from May to July (Bureau of Meteorology 2011). Summer rainfall, which peaks in January and February, is influenced by cyclonic activity off the northern coast of Western Australia. Cyclones that cross the coast dissipate and develop into rain bearing depressions which may bring rain to the region.

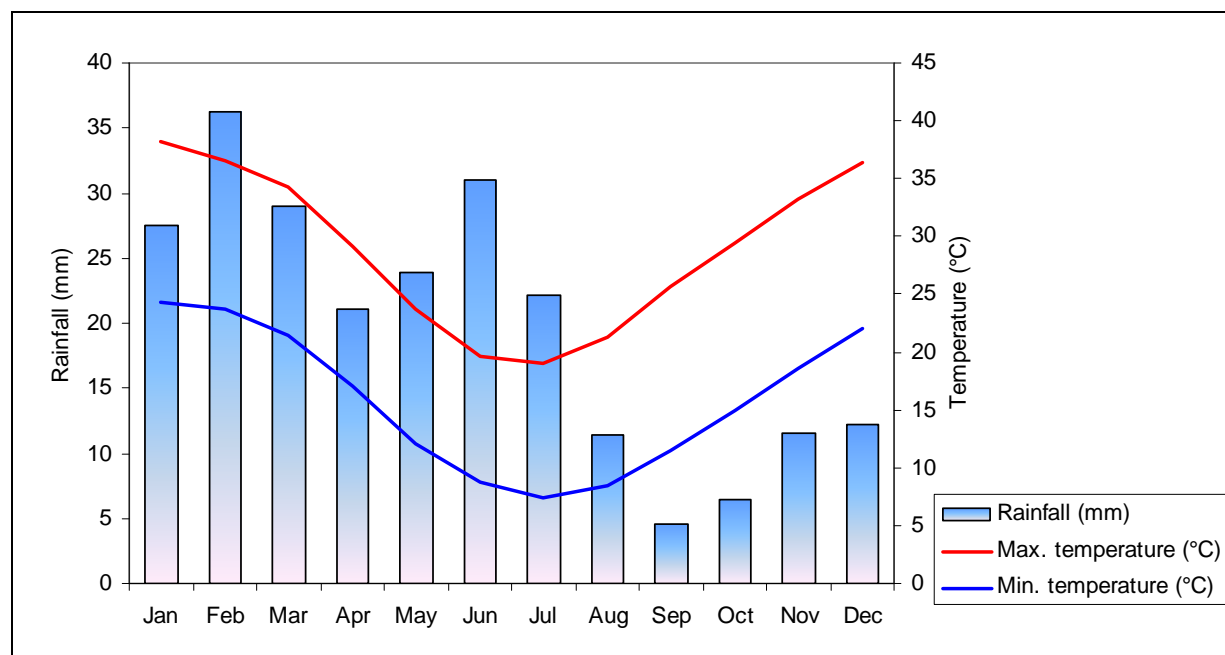


Figure 2.1 Summary of Climatic Data for Meekatharra Airport (Bureau of Meteorology 2011)

2.2 VEGETATION

The vegetation of Weld Range has previously been mapped on a broad scale by Beard (1976) and Speck (1963). The vegetation mapping by Beard and Speck was subsequently reinterpreted and

updated to reflect the National Vegetation Information System (NVIS) standards (Shepherd *et al.* 2002), as described in Table 2.1 and mapped in Figure 2.2.

Table 2.1 – Vegetation Associations of the Haul Road project area (from Shepherd *et al.* 2002)

Vegetation Association	Vegetation Type	Total Area in Western Australia (km ²)	Area in project area (km ²)	Percent of Total Vegetation Type (%)
18	Low mulga woodland with <i>A. aneura</i> , <i>A. pruinocarpa</i> , sparse <i>Eremophila fraseri</i> , <i>Eremophila freelingii</i> , <i>E. maitlandii</i> and <i>Ptilotus obovatus</i> shrubs	246,591	5.70	0.002
39	Open mulga shrubland with <i>A. aneura</i> , <i>A. quadrimarginae</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila spathulata</i> , <i>Eremophila</i> sp. aff <i>compacta</i> and <i>Ptilotus obovatus</i>	53,807	0.60	0.001
182	Low acacia woodland with <i>A. aneura</i> and <i>A. ramulosa</i> .	1,058	4.90	0.46
202	Mulga shrubland with <i>A. aneura</i> , <i>A. quadrimarginae</i> , <i>A. tetraogonophylla</i> , open <i>Hakea lorea</i> , <i>Eremophila</i> sp., <i>Senna</i> sp. and <i>Solanum</i> sp.	4,055	0.56	0.01
204	Succulent Steppe with open <i>Atriplex</i> sp. shrubs, scattered <i>A. aneura</i> , <i>A. sclerosperma</i> over saltbush and bluebush.	2,329	0.25	0.01
2081	Acacia open shrubland (<i>A. aneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>A. coolgardiensis</i> subsp. <i>effusa</i>) with <i>Eremophila</i> mixed open heath. <i>Eremophila forrestii</i> , <i>Thryptomene johnsonii</i> , <i>Solanum lasiophyllum</i> and <i>Maireana convexa</i> .	14,718	3.29	0.02

2.3 LAND SYSTEMS

Curry *et al.* (1994) undertook a regional inventory of the Murchison River catchment and surrounds to document the land systems present and the condition of each. The survey area covered 88,360 km² and was situated between Meekatharra and Mt Magnet to the east, and the catchments of the Greenough and Wooramel Rivers in the west.

The project area is located primarily in the Kalli land system, with large areas occupied by the Yarrameedie and Weld land systems (Figure 2.3). Smaller areas of the Sherwood, Violet, Jundee, Yanganoo and Mileura land systems also occur within the project area. A summary description of each of these land systems and the land types is provided in Table 2.2.

The Kalli land system is described as sandplains and occasional dunes with grassy acacia shrublands (Curry *et al.* 1994). It is 11,159 km² in area and is distributed throughout most of the Midwest region. The other three major land systems in the project area, the Yarrameedie, Violet and Weld land systems are described as undulating stony interfluves, drainage floors or pediment (foothill) plains sometimes below major ranges of crystalline rocks (mainly Weld land system) supporting sparse acacia shrublands.

The Jundee and Yanganoo land system are associated with wash plains on hard pans supporting acacia shrubland and grasses. These land system are located in the south-east of the project area and occupy less than 0.01% of the area.

The Mileura land system is unique in the project area as it consists of seasonally inundated claypans supporting halophytic shrublands. These shrublands form unique habitats, with species such as Slender-billed Thornbill and White-winged Fairy-wren restricted to these habitat types.

Table 2.2 – Land Systems of the Project Area.

Land System	Description	Total Area in WA (km ²)	Area in Project Area (km ²)	Percent of Total Land System (%)
Land type 1				
Weld land system	Hills and ranges with acacia shrubland.	372	1.30	0.34
Land type 5				
Sherwood land system	Mesas, breakaways and stony plains with acacia or eucalypt woodlands and halophytic shrublands.	15,796	0.11	<0.001
Land type 16				
Yarrameedie land system	Stony plain with acacia shrublands.	683	2.60	1.38
Land type 17				
Violet land system	Stony plains with acacia shrublands and halophytic shrublands.	5,840	0.11	0.002
Land type 25				
Kalli land system	Sandplains and occasional dunes with grassy acacia shrublands.	11,159	9.31	0.08
Land type 31				
Jundee land system	Wash plains on hardpan with mulga shrublands.	6,602	0.98	0.01
Land type 32				
Yanganoo land system	Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex.	20,199	0.81	0.004
Land type 36				
Mileura land system	Alluvial plains with halophytic shrublands.	2,612	0.09	0.004

2.4 BIOGEOGRAPHY

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into 85 biogeographic regions on the basis of climate, geology, landforms, vegetation and fauna (Thackway and Cresswell 1995). The project area is situated in the Western Murchison (MUR-2) subregion of the Murchison Biogeographic Region (Bioregion) (Figure 2.4).

The Western Murchison subregion is characterised by low mulga woodlands rich in ephemerals and bunch grasses on granitic outcrops and extensive hardpan washplains. It contains the headwaters of the Murchison and Wooramel Rivers. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on sandplains, saltbush shrublands on calcareous soils, and *Halosarcia* sp. low shrublands on saline alluvia. The climate is arid with bimodal rainfall that usually

falls in winter. The Western Murchison subregion occupies an area of about 7.85 million hectares with grazing of native pastures as the dominant land use.

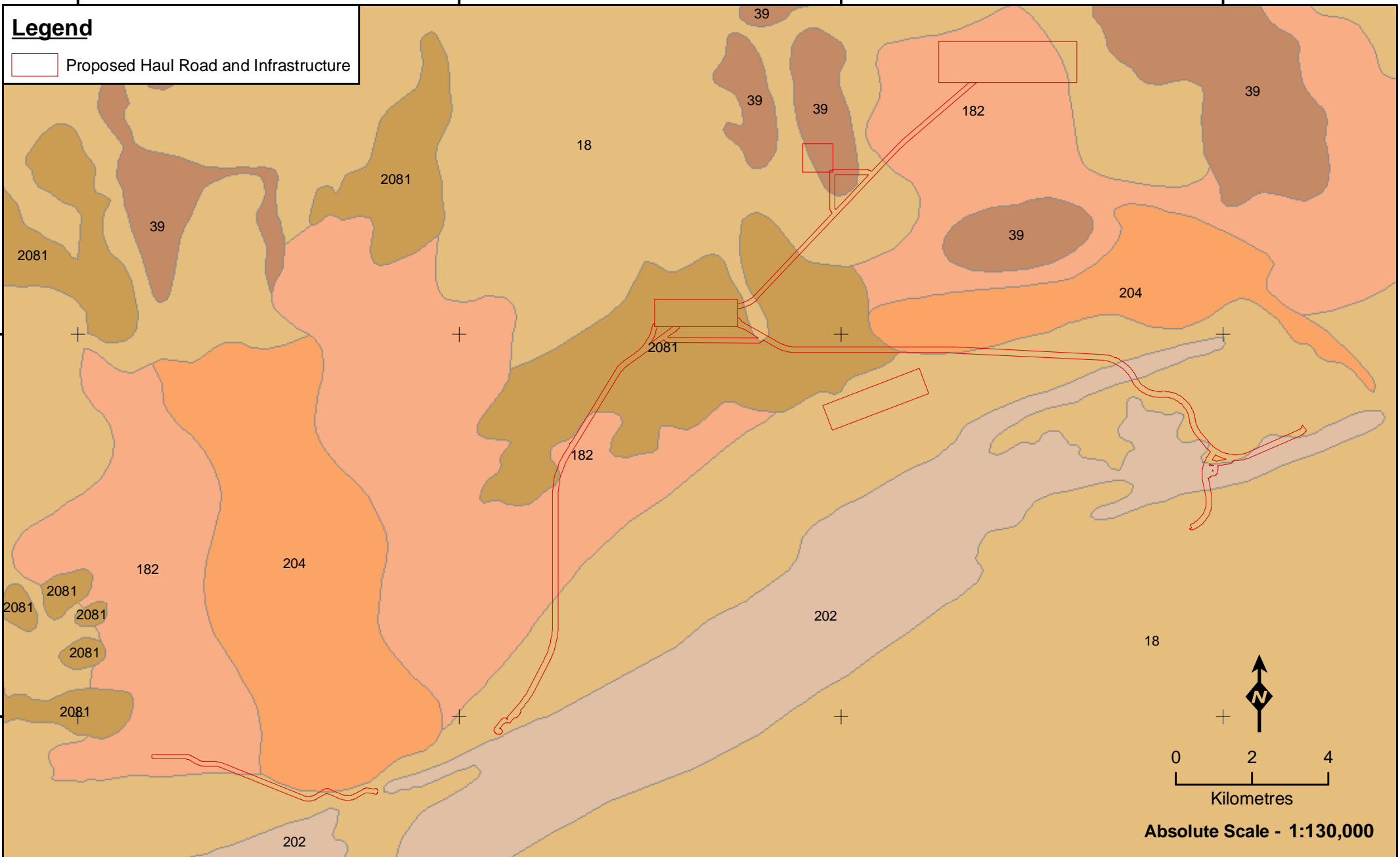
550000 560000 570000 580000

Legend

 Proposed Haul Road and Infrastructure

7030000

7020000



Absolute Scale - 1:130,000



Vegetation Associations of the Project Area

Figure: 2.2
Project ID: 1330


Drawn: AH
Date: 21/03/11

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

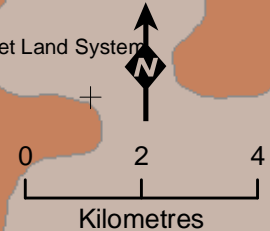
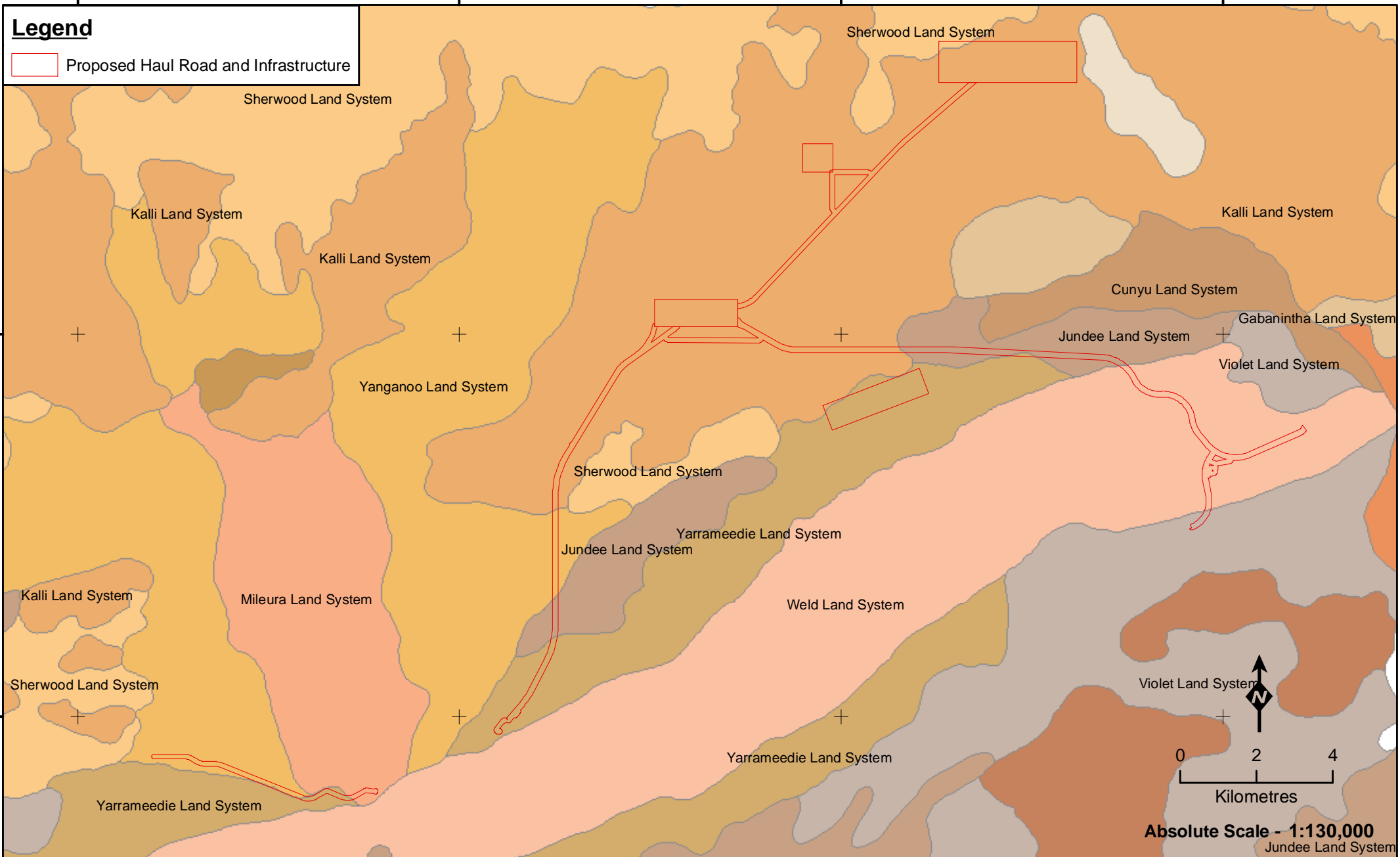
Unique Map ID: AH334

550000 560000 570000 580000

Legend

 Proposed Haul Road and Infrastructure

7030000
7020000



Absolute Scale - 1:130,000




中钢澳洲中西矿业公司
SINO STEEL MIDWEST CORPORATION LIMITED

Land Systems of the Project Area

Figure: 2.3
Project ID: 1330

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

Drawn: AH
Date: 21/03/11

Unique Map ID: AH335

A4


500000

550000

600000

650000

Legend

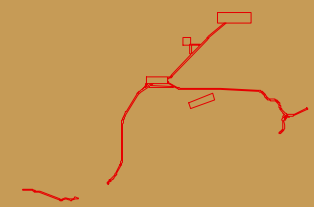
 Proposed Haul Road and Infrastructure

7050000

7000000



Western Murchison



Eastern Murchison



0 10 20
Kilometres

Absolute Scale - 1:800,000



**IBRA Bioregion
of the Project Area**

**Figure: 2.4
Project ID: 1330**

**Drawn: AH
Date: 21/03/11**

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

Unique Map ID: AH336

This page has been blank intentionally

3 SURVEY METHODS

The survey methods adopted by *ecologia* are aligned with the EPA's Guidance Statement No. 56 (EPA 2004), Position Statement No. 3 (EPA 2002) and Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010).

The project area occurs in the Murchison biogeographic region. A review of Guidance Statement No. 56 showed that based on the level of disturbance, a Level 1 survey was recommended, incorporating a desktop assessment and reconnaissance visit.

3.1 DETERMINATION OF SURVEY SAMPLING DESIGN AND INTENSITY

Prior to the development of survey methods, a review was undertaken of factors likely to influence survey design Table 3.2.

Table 3.1 – Factors Likely to Influence Survey Design (from EPA 2004)

Factor	Relevance	Comment
Bioregion – level of existing survey/ knowledge of the region and associated ability to predict accurately.	A four-phase Level 2 survey has been carried out at Weld Range which contains fauna habitats that are markedly different from those found in the surrounding area. However, the fauna assemblage and fauna habitat types at Weld Range are well surveyed.	A Level 1 fauna survey was considered adequate to determine the possible presence of conservation significant species in the proposed Haul Road and Infrastructure area.
Landform special characteristics/ specific fauna/ specific context of the landform characteristics and their distribution and rarity in the region.	Weld Range is an area of isolated relief, with rocky hills rising up to 250 m above the surrounding open, mulga dominated plains. The landform is unique in the region, however the proposed Haul Road and Infrastructure areas are not anticipated to impact these unique habitat types.	The survey was carried out along the proposed Haul Road and within the proposed Infrastructure.
Life forms, life cycles, types of assemblages and seasonality (e.g. migration) of species likely to be present.	The survey was conducted in Summer during warm temperatures and prior heavy rainfall.	Seasonality is irrelevant due to scope of the survey (Level 1).
Level of existing knowledge and results of previous regional sampling (e.g. species accumulation curves, species/ area curves).	A four-phase Level 2 survey has been conducted at Weld Range. An additional three surveys have been carried out within 100 km to the project area.	Previous fauna reports from the region were used as the basis for targeted conservation significant fauna searches. Regional and local knowledge of the area is sufficient, and given the scope of the project a Level 1 survey was deemed adequate.
Number of different habitats or degree of similarity between habitats within a project area.	Four habitat types were recorded from the project area with acacia sandplains and mulga shrubland as the most common ones.	Surveys were carried out within the project area to cover all habitat types and variants of each habitat type.
Climatic constraints (e.g. temperature or rainfall that precluded certain sampling methods).	The climate during the time of surveying was mostly sunny, dry and hot and changed to lower temperatures and heavy rains.	There were no constraints as a result of climate.

Factor	Relevance	Comment
Sensitivity of the environment to the proposed activities.	The majority of the impact from the proposed Haul Rd at Weld Range will be located within the Kalli land system. This land system is common in the Midwest region. The most sensitive habitats impacted by the project will be the eucalypt woodland along creeklines and Melaleuca shrubland which is restricted to the edge of sapphire floodplain north-west of the project area.	Most of the project area is already degraded from overgrazing. The eucalypt woodland along creeklines and Melaleuca shrubland are the most sensitive habitat within the project area. Eucalypt woodland will take the longest time to regrow whereas Melaleuca is present in only a small extent in the area.
Size, shape, and location of the proposed activities.	The total disturbance area of the project covers 15.29 km ² .	The survey sites were selected to focus on proposed Haul Road and Infrastructure locations.
Scale and impact of the proposal.	The impact of the proposed project will be minimal due to large areas of undisturbed habitat in the surrounding region.	The location and scale of the project warrants a Level 1 fauna survey, in accordance with EPA Guidance Statement No. 56.

3.2 LITERATURE REVIEW AND DATABASE SEARCHES

Several databases were consulted in the preparation of potential fauna (and conservation significant fauna) lists (Table 3.2).

In addition, four publications reporting on vertebrate fauna surveys conducted within 100 km of the project area were consulted (Table 3.3). The results of all database searches and previous surveys are presented in Appendix C.

Table 3.2 – Fauna Databases Searched to Determine the Potential Vertebrate Fauna Assemblage of the Project Area.

Database	Search Details
Department of Environment and Conservation (DEC) Threatened Fauna Database	Records within 100 km of the project area
DEC NatureMap	Records within 40 km of the project area
Birds Australia Birdata	Records within 50 km of the project area
Department of Sustainability, Environment, Water, Population and Community (DSEWPaC) protected matters database	Records within 40 km of the project area

Table 3.3 – Previous Biological Survey Reports with 100 km of the Project Area.

Survey Location and Author(s)	Distance to Project Area (km)	Comments
Weld Range (ecologia 2009)	0	Level 2 vertebrate fauna survey
Cue to Nannine (Ninox 1990)	50-60	Level 1 vertebrate fauna survey
Jack Hills (ecologia 2008)	100	Level 2 vertebrate fauna survey
Jack Hills (MBS 2005)	100	Level 2 vertebrate fauna survey

3.3 SURVEY TIMING

The survey was conducted in late summer between the 7th March and 12th March 2011.

3.4 SITE SELECTION

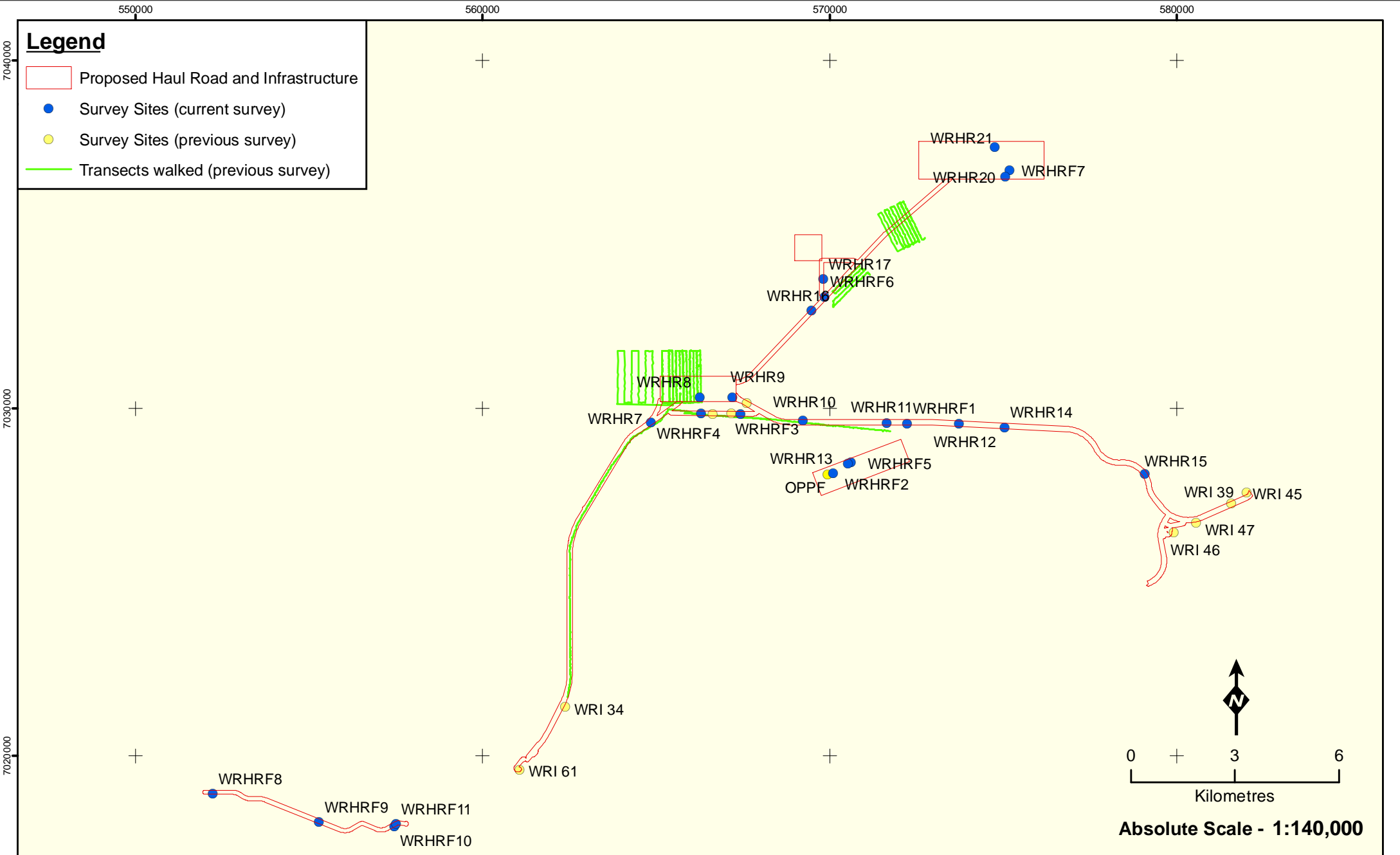
A total of 20 sites were visited within the proposed Haul Road and Infrastructure area during the current survey. Locations of survey sites selected during the current and previous surveys within the project area are listed in Table 3.4 and mapped in Figure 3.1. Site descriptions and photographs of all survey sites established during the current survey are given in Appendix B. Habitat photos, site descriptions and location of all previous survey sites are listed in *ecologia* (2010).

Table 3.4 – Location of Survey Sites.

Site	Location		Land System	Vegetation Community
	Easting	Northing		
WRHR7	564847	7029608	Kalli	2081
WRHR8	566257	7030325	Kalli	2081
WRHR9	567191	7030314	Kalli	2081
WRHR10	569223	7029666	Kalli	2081
WRHR11	571650	7029595	Jundee	204
WRHR12	573732	7029572	Jundee	18
WRHR13	570104	7028131	Yarrameedie	18
WRHR14	575046	7029450	Jundee	18
WRHR15	579080	7028107	Weld	18
WRHR16	569472	7032820	Kalli	18
WRHR17	569812	7033724	Kalli	39
WRHR20	575193	7036852	Kalli	182
WRHR21	574761	7037511	Kalli	182
WRHRF1	572227	7029566	Jundee	204
WRHRF2	570609	7028448	Yarrameedie	18
WRHRF3	567433	7029836	Kalli	2081
WRHRF4	566289	7029849	Kalli	2081
WRHRF5	570519	7028411	Yarrameedie	18
WRHRF6	569850	7033207	Kalli	18
WRHRF7	575053	7036662	Kalli	182
WRHRF8	552229	7018912	Yanganoo	182
WRHRF9	555280	7018100	Yanganoo	18
WRHRF10	557456	7017970	Mileura	18
WRHRF11	557499	7018044	Mileura	1

Site	Location		Land System	Vegetation Community
Previous survey sites				
WRI11	567158	7029847	Kalli	2081
WRI12	566626	7029842	Kalli	2081
WRI14	567611	7030153	Kalli	2081
WRI34	562380	7021430	Yarrameedie	18
WRI39	581574	7027264	Weld	202
WRI47	579907	7026446	Weld	202
WRI61	561060	7019609	Yarrameedie	18
OPPF	569942	7028089	Yarrameedie	18

Datum: WGS84
 Zone: 50K



Fauna Sites of previous and current survey within the Project Area

Figure: 3.1
Project ID: 1330

Drawn: AH
Date: 21/03/11

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

Unique Map ID: AH337

3.5 SAMPLING METHODS

The survey was undertaken using the opportunistic sampling methods outlined in the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2010).

3.5.1 Diurnal Searching

Each site was actively searched for cryptic species, which comprised searching beneath the bark of dead trees, breaking open old logs, stumps and dead free-standing trees, investigating burrows and over-turning logs and stones.

3.6 ANIMAL ETHICS

Surveying was conducted as per *ecologia's* Animal Ethics Code of Practice, which conforms to Section 5 of the *Australian code of practice for the care and use of animals for scientific purposes* (NHMRC 2004).

3.7 TAXONOMY AND NOMENCLATURE

Nomenclature for mammals, reptiles and amphibians within this report is as per *Western Australian Museum Checklist of the Vertebrates of Western Australia*, birds according to Christidis and Boles (2008). References used for fauna identification are listed in Table 3.5.

Table 3.5 – References used for Identification.

Fauna Group	Field Guide
Mammals	Menkhorst and Knight (2009), Van Dyck and Strahan (2008)
Bats	Churchill (1998), Menkhorst and Knight (2009)
Birds	Simpson and Day (2004)
Reptiles	Cogger (2000), Wilson and Swan (2008)
Geckos	Storr et al. (1990), Wilson and Swan (2008)
Skinks	Storr et al. (1999), Wilson and Swan (2008)
Dragons	Storr et al. (1983), Wilson and Swan (2008)
Varanids	Storr et al. (1983), Wilson and Swan (2008)
Legless Lizards	Storr et al. (1990), Wilson and Swan (2008)
Snakes	Storr et al. (2002), Wilson and Swan (2008)
Amphibians	Tyler and Doughty (2009), Cogger (2000)

3.8 SURVEY TEAM

The survey was planned and executed by:



1025 Wellington Street

WEST PERTH WA 6005

Phone: (08) 9322 1944

Fax: (08) 9322 1599

Field survey team members are listed in Table 3.6.

Table 3.6 – Field Survey Personnel.

Survey Member	Expertise	Qualification	Experience
Astrid Heidrich	Herpetology	MSc	6 years

This page has been blank intentionally

4 RESULTS

4.1 FAUNA ASSEMBLAGES

Based on current species distributions, information from database searches and previous records, 30 native mammal species (and nine introduced species), 164 bird species, 89 reptile species and five amphibian species potentially occur in the project area (Appendix C). Of these, sixteen native mammal species, seven introduced mammal species, 80 bird species, 44 reptile species and one amphibian species were recorded during the four-phase survey previously carried out at Weld Range (ecologia 2009b). Due to the focus on habitat assessments and species of conservation significance during the current survey only a limited number of species were recorded.

4.2 FAUNA HABITATS

Ten main fauna habitat types and seven additional fauna habitat types, occurring in small areas, have been previously identified at Weld Range. Of these, three habitat types were recorded within the proposed Haul Road and Infrastructure areas. One additional fauna habitat type, melaleuca shrubland, was recorded during the current survey but was not recorded during previous surveys. All four habitat types are listed and described below:

4.2.1 Acacia shrubland on sand or clay

Acacia shrubland on sand or clay consisted of flat *Acacia pruinocarpa* low trees and/or *A. aneura* (mulga) high shrubs, with or without scattered eucalypts, over medium to low mixed shrubs, over sparse grasses, on a sandy to lightly rocky clay loam. This habitat type comprised thirteen survey sites during the current and previous surveys (WRHR7-10, WRHR17, WRHR20-21, WRHRF3-4, WRHRF7, WRI11-12, WRI14). Four species of conservation significance have the potential to occur within this habitat type: Malleefowl (*Leipoa ocellata*, EPBC Vulnerable), the skink *Lerista eupoda* (DEC Priority 1), Bush Stone-curlew (*Burhinus grallarius*, DEC Priority 4) and Australian Bustard (*Ardeotis australis*, DEC Priority4).

4.2.2 Mulga woodland on Rocky Hillslope

This habitat type comprises open *Acacia pruinocarpa* low trees over *Acacia aneura* high shrubs, over mixed medium shrubs, sometimes over open grasses and herbs on a stony clay or loam. Previous survey site Opp7 was established in this habitat. No conservation significant species is anticipated to occur in the proposed project area.

4.2.3 Eucalypt woodland

Eucalypt woodland is an uncommon habitat type in the proposed Haul Road and Infrastructure area. It consists of tall eucalypt trees along creeklines with dense understorey of mixed shrubs on rocky sections. Sites WRI39 was located in this habitat type. Australian Bustards (DEC Priority 4) have the potential to occur in this habitat.

4.2.4 Melaleuca shrubland

This fauna habitat type is usually unique to moist substrate such as watercourses, floodplains or rivers and was recorded in small extent from the south-west of the project area. It consisted of one

survey site (WRHRF11) and comprised *Melaleuca stereophila* over *Solanum* sp. and *Senna* sp. over a herbaceous layer of *Goodenia* sp. and grasses on red sandy soil. This habitat type is likely to support suitable foraging habitat for the Australian Bustard (DEC Priority 4).

4.3 SURVEY LIMITATIONS

Limitations of the current survey are summarised in Table 4.1 below. Given the few limitations encountered, it can be confirmed that an adequate level of survey has been undertaken.

Table 4.1 – Summary of Survey Limitations.

Constraint	Relevant (yes/no)	Comment
Competency/ experience of the consultant carrying out the survey.	No	All members of the survey team have appropriate training, experience and mentoring in fauna identification and fauna surveys.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	No	Fauna species records were a negligible section of this Level 1 survey which was focused on habitat assessment and likelihood of conservation significant species.
Proportion of fauna identified, recorded and/ or collected.	No	Due to the scope of this survey no trapping was conducted.
Sources of information (previously available information as distinct from new data).	No	A number of previous Level 2 and Level 1 surveys have been conducted at Weld Range (<i>ecologia</i> 2009b).
The proportion of the task achieved and further work which might be needed.	No	No additional work is required.
Timing/ weather/ season/ cycle.	No	Weather and activity of fauna species is negligible for the current Level 1 survey.
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	No	No disturbances occurred.
Intensity (in retrospect was the intensity adequate).	No	The survey was developed following the guidelines for terrestrial surveys (EPA 2010).
Completeness (e.g. was relevant area fully surveyed).	No	Survey is complete.
Resources (e.g. degree of expertise available in animal identification to taxon level).	No	There were no resource constraints.
Remoteness and/ or access problems.	No	Areas to be disturbed by the development were mainly accessible by tracks and on foot.
Availability of contextual (e.g. biogeographic) information on the region).	No	Sufficient contextual information was available on the Midwest region and the project area.
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	No	The survey methods employed were effective to assess habitats within the project area.

5 IMPACTS TO CONSERVATION SIGNIFICANT FAUNA

5.1 CONSERVATION SIGNIFICANT FAUNA POTENTIALLY OCCURRING IN PROJECT AREA

According to previous surveys at Weld Range, Jack Hills and Cue to Nannine (Ninox 1990; MBS 2005; *ecologia* 2009b) a total of 22 species of conservation significance have the potential to occur at the project area. Of these, seven species were recorded during previous surveys or have a high likelihood to occur at Weld Range (*ecologia* 2009b). During the current survey five species of conservation significance were identified to be present at the proposed Haul Road and Infrastructure or have a high likelihood of occurrence. These species are listed in Table 5.1 and described in greater detail in the following sections. An additional 15 species of conservation significance have a low likelihood of occurrence and will not be discussed in detail in this report. Impacts on these species are discussed in the vertebrate fauna assessment report (*ecologia* 2009b).

5.1.1 Birds

5.1.2 Peregrine Falcon (*Falco peregrinus*)

Conservation Status: WC Act Schedule 4

Distribution and Habitat: This nomadic or sedentary falcon is widespread in many parts of Australia and some of its continental islands, but absent from most deserts and the Nullarbor Plain. The Peregrine Falcon occurs most commonly near cliffs along coasts, rivers and ranges and around wooded watercourses and lakes. The species is considered to be moderately common in the Stirling Range, uncommon in the Kimberley, Hamersley and Darling Ranges, and rare or scarce elsewhere (Johnstone and Storr 1998).

Ecology: Peregrines feed almost entirely on birds, especially parrots and pigeons. Peregrines primarily nest on ledges in cliffs, granite outcrops and in quarries, but may also nest in tree hollows around wetlands. Eggs are predominantly laid in September (Johnstone and Storr 1998; Olsen *et al.* 2006). Limiting factors and threats on this species include human disturbance at nest sides, decline of prey caused by introducing mammal predators and reproductive failure following exposure of pesticides (Cooper and Beauchesne 2007).

Likelihood of Occurrence: Peregrine Falcons were not recorded during this survey but the species was recorded at Weld Range during previous surveys and they are likely to utilise the proposed Haul Road and Infrastructure area as foraging ground. However, Peregrine Falcons are highly unlikely to breed within the project area due to the lack of suitable breeding habitat.

Potential Impacts: Some potential hunting habitat will be impacted by the proposed Haul Road and Infrastructure areas at Weld Range but the surrounding areas provide similar habitat that may be utilized by the Peregrine Falcon. The project is not anticipated to impact this species on a regional or local scale.

5.1.3 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 act as daytime shelter (Johnstone and Storr 1998). 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).

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 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). 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).

Likelihood of Occurrence: Bush Stone-curlews were not recorded during the current survey but the species was observed during previous surveys at Weld Range (*ecologia* 2009b). One individual was sighted within 50 m to the proposed Haul Road (50K 565781e 7029976n) in the centre of the project area. Some suitable breeding and foraging habitat is present within the project area and the species is likely to permanently inhabit the proposed Haul Road and Infrastructure area.

Potential Impacts: Large areas of similar habitat are present in surrounding areas and the species is able to move away from disturbances during the development of the project. The project area is of small width and therefore the impact of the proposed Haul Road on this species is anticipated to be low.

5.1.4 Australian Bustard (*Ardeotis australis*)

Conservation Status: DEC Priority 4

Distribution and Habitat: 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.

Ecology: 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: Australian Bustard were not recorded during the current or previous surveys but there are records from surrounding stations (Meka, Mileura, Wanarie) (DEC rare fauna, birdata). The species is likely to occasionally occur and breed at the project area.

Potential Impacts: Some potential hunting and breeding habitat is present within the proposed Haul Road and Infrastructure area and similar habitat is present in surrounding areas. Australian Bustards are able to avoid areas of disturbance and the development of the proposed project is expected to have a low impact on this species.

5.1.5 Rainbow Bee-eater (*Merops ornatus*)

Conservation Status: EPBC Act Migratory, WC Act Schedule 3

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.

Likelihood of Occurrence: This species was not recorded during the current survey or previous surveys at Weld Range but is likely to occur within the project area. There is very limited breeding habitat within the proposed Haul Road and Infrastructure areas but the species is anticipated to be a regular visitor.

Potential Impacts: The project is anticipated to have very low impact on the Rainbow Bee-eater due to the limited extent of breeding and foraging habitat within the project area. The species is able to move away from disturbance and similar habitat is present in surrounding areas.

5.1.6 Reptiles

5.1.7 *Lerista eupoda*

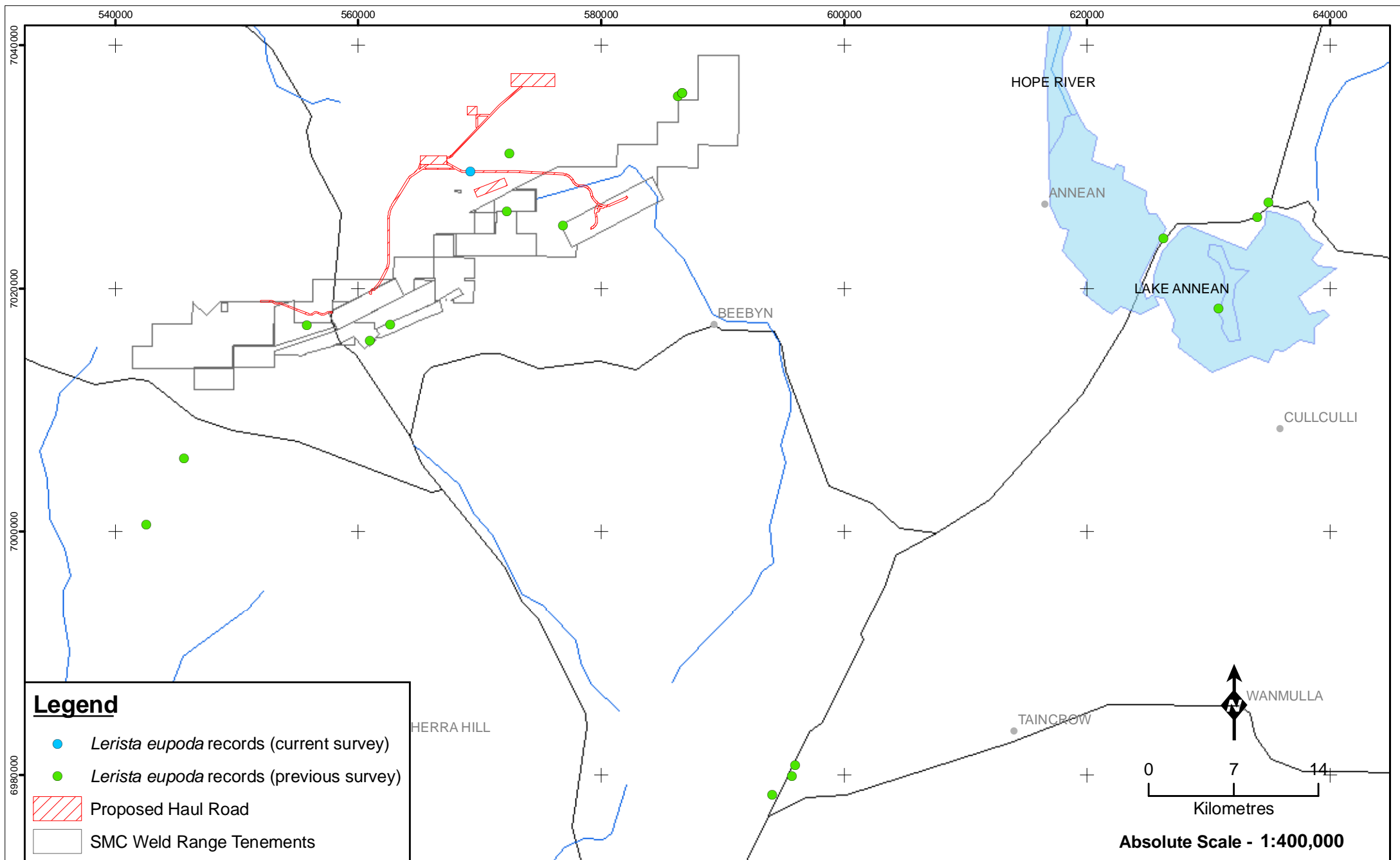
Conservation Status: DEC Priority 1

Distribution and Habitat: *Lerista eupoda* is confined to arid interior of Western Australia between Meekatharra and Cue, with a total area of extent less than 10,000 km² (Figure 5.1). Under current IUCN (the International Union for Conservation of Nature) guidelines, species with a range of fewer than 20,000 km² are considered vulnerable. It inhabits open mulga areas on loamy soils (Wilson and Swan 2008).

Ecology: Little is known about the ecology of this species. *Lerista eupoda* is a moderately large species (17 cm) of the genus *Lerista* possessing two fingers, three toes, a moveable eyelid and a bold vertebral stripe (Storr *et al.* 1999). This species can be distinguished from the similar looking *Lerista nicholli*, which lacks forelimbs and moveable eyelids.

Likelihood of Occurrence: Fourteen individuals of this species were recorded from Weld Range during the previous surveys (*ecologia* 2009b). During the current survey one additional individual was recorded during foraging within leaf litter under a tall eucalypt tree (*Corymbia lenziana*). *Lerista eupoda* appears to be locally common and occurs in a variety of habitats at Weld Range.

Potential Impacts: This skink can be found in leaf litter in a variety of habitats around Weld Range. Clearing during the development of the Haul Road and Infrastructure will result in a small loss of habitat for this species but similar habitat is present in adjacent areas. Due to the small extent of the project area the regional impact of the project on this species is anticipated to be low.



Legend

- *Lerista eupoda* records (current survey)
- *Lerista eupoda* records (previous survey)
- Proposed Haul Road
- SMC Weld Range Tenements

Figure: 5.1
Project ID: 1330
 Coordinate System
 Name: GDA 1994 MGA Zone 50
 Projection: Transverse Mercator
 Datum: GDA 1994

Drawn: AH
Date: 23/02/11
 Unique Map ID: AH322
 A4



**Location of
Lerista eupoda records**

Table 5.1 – Conservation Significant Fauna Occurring or Potentially Occurring in the Project Area.

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence	Regional Impacts
	EPBC Act	WC Act	DEC				
Birds							
Peregrine Falcon <i>Falcon peregrinus</i>		S4		Coastal cliffs, riverine gorges and wooded watercourses	Recorded during previous survey at Weld Range (<i>ecologia</i> 2009b).	HIGH Previously recorded in surrounding area.. Suitable foraging habitat present within project area.	LOW No breeding habitat within proposed Haul Road and Infrastructure. Foraging habitat extends into surrounding areas.
Bush Stone-curlew <i>Burhinus grallarius</i>			P4	Lightly wooded country next to daytime shelter of thickets or long grass	Recorded during previous survey at Weld Range (<i>ecologia</i> 2009b).	HIGH Suitable habitat present. Previously recorded in adjacent areas	LOW Suitable habitat present in surrounding areas.
Australian Bustard <i>Ardeotis australis</i>			P4	Open grasslands, chenopod flats and low heathland	Recorded from surrounding areas (Mika, Mileura, Wanarie) (DEC rare fauna)	HIGH Several records from surrounding area. Suitable habitat present.	LOW Species can move away from disturbance. Suitable habitat present
Rainbow Bee-eater <i>Merops ornatus</i>	M	S3		Open country, most vegetation types, dunes, banks.	Recorded from surrounding areas (Ninox 1990) and birddata records	HIGH Recorded from the region. Suitable habitat present along creeklines with eucalypt woodland	LOW Little suitable habitat will be impacted by the project.
Reptiles							
<i>Lerista eupoda</i>			P1	Open mulga areas on loamy soils.	Recorded during current and previous survey.	RECORDED Recorded during current and previous surveys	LOW Small width of proposed corridor. Suitable habitat will be lost but similar habitat is present in surrounding areas.

Note: Description of conservation significant codes provided in Appendix A.

This page has been left blank intentionally

6 CONCLUSION

The proposed Haul Road and Infrastructure areas lie in the vicinity of the Weld Range mining tenements leading from the north east of the Range west towards proposed additional Infrastructure areas. The majority of the project area is dominated by acacia shrubland on sandy clay or firm clay with sparse understorey. Some patches of this habitat type which comprise plenty of leaf litter support *Lerista eupoda* and have the potential to provide suitable habitat for the Malleefowl. Mulga woodland on rocky hillslope and eucalypt woodland along creekline are present in small extent in the east of the proposed Haul Road. Creeklines with eucalypt woodland provide suitable habitat for the Rainbow Bee-eater, Bush Stone-curlew and *Lerista eupoda*. Another habitat in small extent is present in the south-west section of the project area: Melaleuca shrubland. This habitat type supports one species of conservation significance: the Australian Bustard.

The majority of the habitat types are common in the region. Acacia shrubland on sandy clay or firm clay is supported by Kalli land system which is widespread in the area. Mulga woodland on rocky hillslope is common along Weld Range south of the proposed Haul Road and Infrastructure. Eucalypt woodland along creekline and Melaleuca shrubland are present in small patches and are of limited extent in the area and therefore the most sensitive habitat types within the project area.

The skink *Lerista eupoda* has a limited distribution with Weld Range as the most northern extent. This species was recorded from the project area and its surroundings during previous and the current survey. The development of the Haul Road and proposed Infrastructure areas is anticipated to result in a small loss of suitable habitat and possibly some individuals. However, the small extent of the project area and the presence of suitable habitat in adjacent areas results in the project having a low impact on this species on a regional scale.

This page has been left blank intentionally

7 REFERENCES

- Beard, J. S. 1976. Murchison. Explanatory note to Sheet 6 of vegetation survey of Western Australia. University of Western Australia Press, Nedlands.
- Boland, C. R. J. 2004. Breeding biology of Rainbow Bee-eaters (*Merops ornatus*): a migratory, colonial, cooperative bird. *The Auk*. 121 (3):811-823.
- Bureau of Meteorology. 2011. Accessed <http://www.bom.gov.au>.
- Christidis, L. and Boles, W. E. 2008. Systematics and Taxonomy of Australian Birds. CSIRO Publishing, Collingwood.
- Churchill, S. 1998. Australian Bats. Reed New Holland, Sydney.
- Cogger, H. G. 2000. Reptiles and Amphibians of Australia. Reed New Holland, Sydney.
- Cooper, J.M., Beauchesne, S.M. 2007. COSEWIC status report on Peregrine Falcon *Falco peregrinus*.
- Curry, P. J., Payne, A. L., Leighton, K. A., Hennig, P., and Blood, D. A. 1994. Technical Bulletin No. 84. An inventory and condition survey of the Murchison River catchment and surrounds, Western Australia.
- ecologia Environment. 2009a. Jack Hills Expansion Project Vertebrate Fauna Assessment. Unpublished Report for Crosslands Resources Ltd.
- ecologia Environment. 2009b. Weld Range Vertebrate Fauna Assessment. Unpublished Report for Sinosteel-Midwest Management.
- ecologia Environment. 2010. Weld Range Vertebrate Fauna Survey. Unpublished Report for Sinosteel Midwest Corporation.
- Environmental Protection Authority. 2002. Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.
- Environmental Protection Authority. 2004. Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.
- Environmental Protection Authority and the Department of Environment and Conservation. 2010. Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. Technical report for the Environmental Protection Authority and the Department of Environment and Conservation.
- Frith, A. J. 1976. Readers Digest Complete Birds of Australia. Readers Digest, Sydney.
- Garnett, S. T. and Crowley, G. M. 2000. The Action Plan for Australian Birds. Environment Australia, Canberra.
- Johnstone, R. E. and Storr, G. M. 1998. Handbook of Western Australian Birds, Volume I - Non-Passerines (Emu to Dollarbird). Western Australian Museum, Perth.
- Marchant, S. and Higgins, P. J. 1993. Handbook of Australian, New Zealand and Antarctic Birds. Oxford University Press, Melbourne.
- MBS Environmental. 2005. Jack Hills Iron Ore Project, Murchison Region, Western Australia: Vegetation and Fauna Assessment. Unpublished report for Murchison Metals Limited.
- Menkhorst, P. and Knight, F. 2009. A Field Guide to the Mammals of Australia. Oxford University Press, Melbourne.

- National Health and Medical Research Council. 2004. Australian code of practice for the care and use of animals for scientific purposes.
- Ninox Wildlife Consulting. 1990. Biological Survey - Great Northern Highway Cue to Nannine Section. Unpublished report for Halpern Glick Maunsell.
- NSW National Parks and Wildlife Service. 1999. Bush Stone-curlew *Burhinus grallarius* (Latham, 1801). NSW National Parks and Wildlife Service, Hurstville, NSW www.npws.nsw.gov.au.
- Olsen, J., Fuentes, E., Dykstra, R., and Rose, A. B. 2006. Male Peregrine Falcon *Falco peregrinus* fledged from a cliff-nest found breeding in a stick-nest. Australian Field Ornithology. 23:8-14.
- Shepherd, D. P., Beeston, G. R., and Hopkins, A. J. M. 2002. Native Vegetation in Western Australia: extent, type and status. Technical Report 249. Department of Agriculture, South Perth.
- Simpson, K. and Day, N. 2004. Field Guide to the Birds of Australia. Penguin Group, Camberwell.
- Speck, N. H. 1963. Vegetation of the Wiluna-Meekatharra area. pp. 143-161. General Report on Lands of the Wiluna-Meekatharra area, Western Australia, 1958, Land Research Series No 7. CSIRO, Melbourne.
- Storr, G. M., Smith, L. A., and Johnstone, R. E. 1983. Lizards of Western Australia II: Dragons and Monitors. Western Australian Museum, Perth.
- Storr, G. M., Smith, L. A., and Johnstone, R. E. 1990. Lizards of Western Australia III: Geckos and Pygopods. Western Australian Museum, Perth.
- Storr, G. M., Smith, L. A., and Johnstone, R. E. 1999. Lizards of Western Australia I: Skinks. Western Australian Museum, Perth.
- Storr, G. M., Smith, L. A., and Johnstone, R. E. 2002. Snakes of Western Australia. Western Australian Museum, Perth.
- Thackway, R. and Cresswell, I. D. 1995. An Interim Biogeographic Regionalisation for Australia: a Framework for Establishing the National System of Reserves. Version 4.0.
- Tyler, M. J. and Doughty, P. 2009. Field Guide to Frogs of Western Australia. Western Australian Museum, Perth.
- Van Dyck, S. and Strahan, R. 2008. *The Mammals of Australia*. Reed New Holland, Sydney.
- Wilson, S. and Swan, G. 2008. *A Complete Guide to Reptiles of Australia*. New Holland Publishers, Sydney.

APPENDIX A EXPLANATION OF CONSERVATION CODES

Appendix A1 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"> the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; the agreement between the Government of Australian and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their environment (CAMBA); or 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).

Appendix A2 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 species 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 species protection.
Schedule 4 (S4)	Declared to be fauna that is in need of species protection, otherwise than for the reasons mentioned above.




Appendix A3 Definition of Department of Environment and Conservation Priority Codes.




Priority	Definition
Priority 1 (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 2 (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 3 (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 4 (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 5 (P5)	<i>Taxa in need of monitoring.</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.




This page has been left blank intentionally




APPENDIX B SITE DESCRIPTIONS



Habitat Description	Habitat Photo
<p>WRHRF1</p> <p>Mulga shrubland on plain with <i>A. aneura</i> and occasional <i>Grevillea</i> sp., no understorey, brown clay with scattered pebbles. Sparse leaf litter and sparse wood litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF2</p> <p>Mulga shrubland with open to moderately open <i>A. aneura</i> on plain, with occasional <i>A. pruinocarpa</i> over <i>Eremophila forrestii</i> and <i>Eremophila simulans</i> var <i>simulans</i> shrubs. Sparse grasses on brown clay with very sparse leaf litter and sparse wood litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF3</p> <p>Mulga shrubland with moderate layer of <i>A. aneura</i> and moderately open to moderately dense <i>Eremophila simulans</i> var. <i>simulans</i> over moderately open mixed grazed grasses. Some leaf litter under shrubs and wood litter on red sandy substrate.</p> <p>Habitat type: Acacia shrubland on sand</p>	

Habitat Description	Habitat Photo
<p>WRHRF4</p> <p>Mulga shrubland on plain, moderate layer of <i>A. aneura</i> shrubs and open layer of <i>Eremophila simulans</i> var. <i>simulans</i> over open mixed grasses. Moderate leaf litter and moderate wood litter on sandy clay.</p> <p>Habitat type: Acacia shrubland on sandy clay</p>	
<p>WRHRF5</p> <p>Mulga shrubland with moderately open to moderately closed <i>A. aneura</i>, occasional <i>A. pruinocarpa</i>, <i>Psyrax latifolium</i> and <i>Eremophila forrestii</i> on firm clay. Few leaf litter under shrubs and scattered wood litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF6</p> <p>Open mulga shrubland on plain, open <i>Eremophila forrestii</i>, heavily grazed. Sparse leaf litter and very sparse wood litter on brown clay.</p> <p>Habitat type: Acacia shrubland on clay</p>	




Habitat Description	Habitat Photo
<p>WRHRF7</p> <p>Mulga shrubland with moderately open <i>A. aneura</i> over occasional <i>Eremophila simulans</i> var. <i>simulans</i> over moderately-open grasses, no evidence of grazing. Moderate leaf litter under shrubs, sparse wood litter on red clay and sand.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF8</p> <p>Open low <i>Acacia aneura</i> woodland over moderately dense <i>Solanum</i> sp. and mixed <i>Eremophila</i> sp. Herbaceous layer of <i>Goodenia</i> sp. and grasses.</p> <p>Hard red clay soils, with no stones or rocks. Some wood litter and <i>Acacia</i> leaf litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF9</p> <p>Open low <i>Acacia aneura</i> woodland over moderately dense <i>Solanum</i> sp. and mixed <i>Eremophila</i> sp. Herbaceous layer of <i>Goodenia</i> sp. and grasses.</p> <p>Hard red clay soils, with no stones or rocks. Some wood litter and <i>Acacia</i> leaf litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	



Habitat Description	Habitat Photo
<p>WRHRF10</p> <p>Open low <i>Acacia aneura</i> woodland over <i>Acacia stenostachya</i>, <i>Acacia</i> sp and <i>Eremophila</i> sp. Herbaceous layer of <i>Goodenia</i> sp. and grasses. Site was a waterlogged area on the edge of a temporary marsh. Ground cover of <i>Marsilea</i> sp. and grasses with few wood litter and no leaf litter or rocks on red-brown clays.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHRF11</p> <p><i>Melaleuca stereophila</i> open shrubland with <i>Solanum</i> sp. and <i>Senna</i> sp. understory. Herbaceous layer of <i>Goodenia</i> sp. and grasses. Red-brown sandy soils with no rocks.</p> <p>Habitat type: <i>Melaleuca</i> shrubland</p>	
<p>WRHR7</p> <p>Mulga shrubland with moderate open <i>A. aneura</i> shrubs and moderate open to moderate dense <i>Eremophila simulans</i> var. <i>simulans</i>, <i>Eremophila forrestii</i> and open grasses (<i>Eriachne</i> sp.), heavily grazed. Moderate leaf litter under shrubs and moderate wood litter.</p> <p>Habitat type: Acacia shrubland on sandy clay</p>	

Habitat Description	Habitat Photo
<p>WRHR8</p> <p>Mulga shrubland. <i>Acacia aneura</i> high shrubs over open layer of <i>Eremophila simulans</i> var. <i>simulans</i>. Plenty of leaf litter under shrubs, scattered wood litter on sandy soil.</p> <p>Habitat type: Acacia shrubland on sandy clay</p>	
<p>WRHR9</p> <p><i>Acacia aneura</i> shrubs on plain, moderate layer of <i>A. aneura</i> shrubs and open layer of <i>Eremophila simulans</i> var. <i>simulans</i> over open layer of grasses. Sparse leaf litter and occasional wood litter on sandy clay.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHR10</p> <p>Mulga shrubland with moderately open <i>A. aneura</i>, occasional <i>A. pruinocarpa</i>, occasional tall <i>Corymbia lenziana</i>, <i>Acacia ramulosa</i>, <i>Eremophila simulans</i> var. <i>simulans</i>, over sparse grasses. Moderate leaf litter and moderate wood litter on sandy clay.</p> <p>Habitat type: Acacia shrubland on clay</p>	

Habitat Description	Habitat Photo
<p>WRHR11</p> <p>Mulga shrubland with moderately dense <i>Acacia aneura</i> and moderately open <i>A. pruinocarpa</i> over <i>Eremophila forrestii</i> and occasional <i>Solanum lasiophyllum</i> and moderately open <i>Maireana</i> sp., occasional <i>Psyrax latifolium</i> and <i>Eremophila fraseri</i> over <i>Eriachne</i> sp. Sparse wood litter and moderate leaf litter under shrubs on brown clay with thin sandy mantle.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHR12</p> <p>Mulga shrubland with moderately closed <i>A. aneura</i> and moderate <i>Acacia pruinocarpa</i> tall trees, occasional <i>Eremophila forrestii</i>.</p> <p>Habitat type: Acacia shrubland on clay</p>	

Habitat Description	Habitat Photo
<p>WRHR13</p> <p>Mulga shrubland moderately open to moderately dense <i>A. aneura</i>, occasional <i>A. pruinocarpa</i> and <i>A. tetragonophylla</i>, <i>Psyrax latifolium</i>, <i>Eremophila forrestii</i>, and <i>Eremophila phyllopoda</i> var. <i>phyllopoda</i>. Patches of leaf litter under shrubs and sparse wood litter on firm brown clay.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHR14</p> <p>Mulga shrubland with moderately open <i>A. aneura</i> over open layer of <i>Eremophila forrestii</i>. Sparse leaf and sparse wood litter on brown clay.</p> <p>Habitat type: Acacia shrubland on clay</p>	

Habitat Description	Habitat Photo
<p>WRHR15</p> <p>Plain with adjacent creekline. Mulga/ mixed acacia shrubland with <i>Acacia aneura</i> over <i>Acacia</i> sp over <i>Eremophila forrestii</i> over occasional <i>Senna</i> sp. over <i>Acacia tetragonophylla</i>, occasional <i>Acacia</i> sp. open grazed grasses on red clay with few pebbles. Sparse leaf and sparse wood litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHR16</p> <p>Mulga tall shrubland with patches of moderately dense <i>A. aneura</i>, sparse <i>Maireana</i> sp. Open vegetation, heavily grazed and in poor condition. Sparse leaf litter and sparse wood litter.</p> <p>Habitat type: Acacia shrubland on clay</p>	
<p>WRHR17</p> <p>Plain with high Mulga shrubland/low woodland with patches of dense <i>A. aneura</i>. Patches of understorey of <i>Eremophila forrestii</i>, with occasional mixed shrubs over grazed mixed grasses. Leaf litter present under shrubs, moderate wood litter. Brown sandy clay.</p> <p>Habitat type: Acacia shrubland on sand</p>	

Habitat Description	Habitat Photo
<p>WRHR20</p> <p>Mulga shrubland with open <i>A. aneura</i> shrubs, occasional to open <i>Eremophila</i> sp. and <i>Eremophila simulans</i> var. <i>simulans</i>, open layer of grazed grasses. Plenty of leaf litter under shrubs and sparse wood litter on red sandy loam.</p> <p>Habitat type: Acacia shrubland on sandy clay</p>	
<p>WRHR21</p> <p>Mulga shrubland with moderately open <i>Acacia minyura</i> and <i>A. aneura</i> over occasional <i>Eremophila simulans</i> var. <i>simulans</i>, <i>Eremophila forrestii</i>, <i>Eremophila phyllopoda</i> subsp. <i>phyllopoda</i>, over occasional grazed grasses. Leaf litter present under shrubs, moderate wood litter on sandy loam.</p> <p>Habitat type: Acacia shrubland on sandy clay</p>	

APPENDIX C FAUNA RECORDED DURING SURVEYING AND REGIONAL FAUNA DATA

Appendix C1 Mammals

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannina (Ninox 1990)	Weld Range (ecologia 2009b)	van Dyck and Strahan (2008)
		EPBC Act	WC Act	DEC							
TACHYGLOSSIDAE											
<i>Tachyglossus aculeatus</i>	Echidna						•	•		•	•
DASYURIDAE											
<i>Antechinomys laniger</i>	Kultarr				•					•	•
<i>Dasyercus blythi</i>	Brush-tailed Mulgara			P4	•	•					
<i>Ningaui ridei</i>	Wongai Ningau										•
<i>Pseudantechinus woolleyae</i>	Wooleys False Antechinus						•	•		•	•
<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart				•					•	•
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart			P3			•	•		•	•
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart						•	•		•	•
THYLACOMIDAE											
<i>Macrotis lagotis</i>	Greater Bilby	VU	S1		•	•					
PHALANGERIDAE											
<i>Trichosurus vulpecula</i>	Common Brushtail Possum				•						
MACROPODIDAE											
<i>Macropus robustus</i>	Euro				•		•	•	•	•	•
<i>Macropus rufus</i>	Red Kangaroo				•		•	•	•	•	•
<i>Petrogale lateralis lateralis</i>	Black-footed Rock-wallaby	VU	S1		•	•					•
MEGADERMATIDAE											
<i>Macroderma gigas</i>	Ghost Bat			P4	•	•					
EMBALLONURIDAE											
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat										•
<i>Taphozous georgianus</i>	Common Sheath-tailed Bat				•						•
<i>Taphozous hilli</i>	Hill's Sheath-tailed Bat				•					•	•

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannina (Ninox 1990)	Weld Range (ecologia 2009b)	van Dyck and Strahan (2008)
		EPBC Act	WC Act	DEC							
MOLOSSIDAE											
<i>Tadarida australis</i>	White-striped Free-tailed Bat						•	•		•	•
VESPERTILIONIDAE											
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat				•			•		•	•
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat									•	•
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat							•		•	•
<i>Scotorepens greyii</i>	Little Broad-nosed Bat							•			
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat				•			•		•	•
MURIDAE											
<i>Leporillus apicalis</i>	Lesser Stick-nest Rat				•						
<i>Notomys alexis</i>	Spinifex Hopping-mouse				•		•	•		•	•
<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse										•
<i>Pseudomys chapmani</i>	Western Pebble-mouse			P4		•					
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse				•		•	•		•	•
<i>Pseudomys fieldi</i>	Shark Bay Mouse	VU	S1		•	•					
CANIDAE											
<i>Canis lupus dingo</i>	Dingo										•
INTRODUCED MAMMALS											
* <i>Bos taurus</i>	Cow									•	•
* <i>Canis lupus familiaris</i>	Dog									•	•
* <i>Capra hircus</i>	Goat							•	•	•	•
* <i>Ovis aries</i>	Sheep										
* <i>Equus caballus</i>	Horse										•
* <i>Felis catus</i>	Cat									•	•
* <i>Mus musculus</i>	House Mouse						•			•	•
* <i>Oryctolagus cuniculus</i>	Rabbit							•		•	•

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (<i>ecologia</i> 2009a)	Cue to Nannina (Ninox 1990)	Weld Range (<i>ecologia</i> 2009b)	van Dyck and Strahan (2008)
		EPBC Act	WC Act	DEC							
* <i>Vulpes vulpes</i>	Fox								•	•	•

Appendix C2 Birds

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (<i>ecologia</i> 2009a)	Cue to Nannina (Ninox 1990)	Weld Range (<i>ecologia</i> 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
CASUARIIDAE												
<i>Dromaius novaehollandiae</i>	Emu				•	•	•	•	•	•	•	•
MEGAPODIIDAE												
<i>Leipoa ocellata</i>	Malleefowl	VU, M	S1							S		•
ANATIDAE												
<i>Dendrocygna eytoni</i>	Plumed Whistling Duck					•						•
<i>Stictonetta naevosa</i>	Freckled Duck											•
<i>Cygnus atratus</i>	Black Swan				•	•			•			•
<i>Tadorna tadornoides</i>	Australian Shelduck				•	•			•			•
<i>Chenonetta jubata</i>	Australian Wood Duck				•	•			•			•
<i>Malacorhynchus membranaceus</i>	Pink-eared Duck				•	•			•			•
<i>Anas rhynchotis</i>	Australasian Shoveler								•			
<i>Anas gracilis</i>	Grey Teal				•	•			•			•
<i>Anas superciliosa</i>	Pacific Black Duck				•	•			•			•
<i>Aythya australis</i>	Hardhead								•			
<i>Oxyura australis</i>	Blue-billed Duck											•
PODICIPEDIDAE												
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe				•	•						•
<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe				•	•			•			•

Family and Species	Common Name	Conservation Status			NatureMap	Birdata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Podiceps cristatus</i>	Great Crested Grebe				•							
COLUMBIDAE												
<i>Geopelia cuneata</i>	Diamond Dove				•	•	•	•			•	•
<i>Geopelia striata</i>	Peaceful Dove											•
<i>Geophaps plumifera</i>	Spinifex Pigeon											•
<i>Ocyphaps lophotes</i>	Crested Pigeon				•	•	•	•	•	•	•	•
<i>Phaps chalcoptera</i>	Common Bronzewing				•	•	•	•	•	•	•	•
PODARGIDAE												
<i>Podargus strigoides</i>	Tawny Frogmouth				•	•			•		•	•
APODIDAE												
<i>Apus pacificus</i>	Fork-tailed Swift	M	S3									•
EUROSTOPODIDAE												
<i>Eurostopodus argus</i>	Spotted Nightjar				•	•	•	•			•	•
AEGOTHELIDAE												
<i>Aegotheles cristatus</i>	Australian Owlet-Nightjar				•	•	•	•			•	•
TRESKIORNITHIDAE												
<i>Platalea flavipes</i>	Yellow-billed Spoonbill				•	•					•	•
<i>Threskiornis spinicollis</i>	Straw-necked Ibis				•	•			•			•
ANHINGIDAE												
<i>Anhinga novaehollandiae</i>	Australasian Darter					•						•
PHALACROCORACIDAE												
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant					•						•
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant				•	•						•
PELCANIDAE												
<i>Pelecanus conspicillatus</i>	Australian Pelican				•	•						•
ARDEIDAE												
<i>Egretta novaehollandiae</i>	White-faced Heron				•	•						•
<i>Ardea ibis</i>	Cattle Egret	M	S3									•
<i>Ardea modesta</i>	Eastern Great Egret	M	S3		•	•						•

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Ardea pacifica</i>	White-necked Heron				•	•						•
<i>Nycticorax caledonicus</i>	Nankeen Night-Heron					•						•
ACCIPITRIDAE												
<i>Accipiter cirrhocephalus</i>	Collared Sparrowhawk				•	•			•		•	•
<i>Accipiter fasciatus</i>	Brown Goshawk					•	•	•	•	•	•	•
<i>Aquila audax</i>	Wedge-tailed Eagle				•	•	•	•	•	•	•	•
<i>Circus assimilis</i>	Spotted Harrier					•						•
<i>Elanus axillaris</i>	Black-shouldered Kite					•		•				•
<i>Haliastur sphenurus</i>	Whistling Kite				•	•	•	•		•		•
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard				•	•	•	•		•		•
<i>Hieraaetus morphnoides</i>	Little Eagle				•	•						•
<i>Lophoictinia isura</i>	Square-tailed Kite				•							•
<i>Milvus migrans</i>	Black Kite				•							•
FALCONIDAE												
<i>Falco berigora</i>	Brown Falcon				•	•	•	•	•	•	•	•
<i>Falco cenchroides</i>	Nankeen Kestrel				•	•	•	•	•	•	•	•
<i>Falco hypoleucos</i>	Grey Falcon			P4								•
<i>Falco longipennis</i>	Australian Hobby				•	•	•				•	•
<i>Falco peregrinus</i>	Peregrine Falcon		S4		•	•	•			•		•
RALLIDAE												
<i>Fulica atra</i>	Eurasian Coot				•	•			•			•
<i>Tribonyx ventralis</i>	Black-tailed Native-hen				•	•						•
OTIDIDAE												
<i>Ardeotis australis</i>	Australian Bustard			P4		•	•					•
BURHINIDAE												
<i>Burhinus grallarius</i>	Bush-Stone Curlew			P4	•	•	•	•			•	•
RECURVIROSTRIDAE												
<i>Himantopus himantopus</i>	Black-winged Stilt				•	•			•			•
<i>Cladorhynchus leucocephalus</i>	Banded Stilt											•

Family and Species	Common Name	Conservation Status			NatureMap	Birdata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet											•
CHARADRIIDAE												
<i>Charadrius australis</i>	Inland Dotterel											•
<i>Charadrius ruficapillus</i>	Red-capped Plover				•	•				•		•
<i>Charadrius veredus</i>	Oriental Plover	M	S3									•
<i>Elsyornis melanops</i>	Black-fronted Dotterel				•	•						•
<i>Erythrogonys cinctus</i>	Red-kneed Dotterel				•	•						•
<i>Thinornis rubricollis tregellasi</i>	Hooded Plover (Western ssp.)			P4			•					
<i>Vanellus tricolor</i>	Banded Lapwing				•	•						•
SCOLOPACIDAE												
<i>Actitis hypoleucos</i>	Common Sandpiper									•		
<i>Tringa nebularia</i>	Common Greenshank									•		
<i>Tringa glareola</i>	Wood Sandpiper	M	S3							•		•
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	S3									•
TURNICIDAE												
<i>Turnix velox</i>	Little Button-quail					•			•		•	•
LARIDAE												
<i>Larus novaehollandiae</i>	Silver Gull											•
<i>Chlidonias leucopterus</i>	White-winged Black Tern	M	S3									•
<i>Chlidonias hybrida</i>	Whiskered Tern					•						•
<i>Gelochelidon nilotica</i>	Gull-billed Tern					•						•
CACATUIDAE												
<i>Eolophus roseicapillus</i>	Galah				•	•		•	•	•	•	•
<i>Calyptorhynchus banksii</i>	Red-tailed Black-Cockatoo					•						•
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo		S4			•	•					•
<i>Cacatua sanguinea</i>	Little Corella					•						•
<i>Nymphicus hollandicus</i>	Cockatiel				•	•		•	•	•	•	•
PSITTACIDAE												

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Barnardius zonarius</i>	Australian Ringneck				•	•		•	•	•	•	•
<i>Melopsittacus undulatus</i>	Budgerigar				•	•		•	•	•	•	•
<i>Neophema elegans</i>	Elegant Parrot				•					•	•	
<i>Neopsephotus bourkii</i>	Bourke's Parrot				•	•				•	•	•
<i>Psephotus varius</i>	Mulga Parrot				•	•		•	•	•	•	•
<i>Pezoporus occidentalis</i>	Night Parrot	EN, M	S1				•					
CUCULIDAE												
<i>Chalcites basalis</i>	Horsfield's Bronze Cuckoo				•	•		•	•		•	•
<i>Chalcites osculans</i>	Black-eared Cuckoo				•	•				•	•	•
<i>Cacomantis pallidus</i>	Pallid Cuckoo				•	•		•		•	•	•
STRIGIDAE												
<i>Ninox connivens</i>	Barking Owl				•							
<i>Ninox novaeseelandiae</i>	Southern Boobook				•	•					•	•
TYTONIDAE												
<i>Tyto javanica</i>	Easter Barn Owl					•						•
HALCYONIDAE												
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher				•	•		•	•			•
<i>Todiramphus sanctus</i>	Sacred Kingfisher				•	•						•
MEROPIIDAE												
<i>Merops ornatus</i>	Rainbow Bee-eater	M	S3			•			•			•
CLIMACTERIDAE												
<i>Climacteris affinis</i>	White-browed Treecreeper				•	•						•
PTILONORHYNCHIDAE												
<i>Ptilonorhynchus guttatus</i>	Western Bowerbird				•	•			•	•	•	•
MALURIDAE												
<i>Malurus lamberti</i>	Variegated Fairy-wren				•	•			•	•	•	•
<i>Malurus leucopterus</i>	White-winged Fairy-wren				•	•			•	•	•	•
<i>Malurus splendens</i>	Splendid Fairy-wren					•		•	•	•	•	•

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
PARDALOTIDAE												
<i>Pardalotus rubricatus</i>	Red-browed Pardalote											•
<i>Pardalotus striatus</i>	Striated Pardalote						•					•
ACANTHIZIDAE												
<i>Pyrholaemus brunneus</i>	Redthroat				•	•		•	•	•	•	•
<i>Smicrornis brevirostris</i>	Weebill				•	•					•	•
<i>Gerygone fusca</i>	Western Gerygone				•	•		•	•		•	•
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill				•	•			•		•	•
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				•	•		•	•	•	•	•
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				•	•		•	•	•	•	•
<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp.)	VU									•	•
<i>Acanthiza apicalis</i>	Inland Thornbill				•	•		•	•		•	•
<i>Aphelocephala leucopsis</i>	Southern Whiteface				•	•		•	•		•	•
<i>Aphelocephala nigricincta</i>	Banded Whiteface								•			•
<i>Calamanthus campestris</i>	Rufous Fieldwren				•		•					•
MELIPHAGIDAE												
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				•	•		•	•	•	•	•
<i>Certhionyx variegatus</i>	Pied Honeyeater				•	•						•
<i>Conopophila whitei</i>	Grey Honeyeater				•						•	•
<i>Epthianura albifrons</i>	White-fronted Chat											•
<i>Epthianura aurifrons</i>	Orange Chat				•						•	•
<i>Epthianura tricolor</i>	Crimson Chat				•	•		•	•		•	•
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater				•	•			•		•	•
<i>Lichenostomus virescens</i>	Singing Honeyeater				•	•		•	•	•	•	•
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater											•
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater				•							

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Lichmera indistincta</i>	Brown Honeyeater				•	•		•				•
<i>Manorina flavigula</i>	Yellow-throated Miner				•	•		•	•	•	•	•
<i>Purnella albifrons</i>	White-fronted Honeyeater					•			•			•
<i>Sugomel niger</i>	Black Honeyeater					•						•
POMATOSTOMIDAE												
<i>Pomatostomus superciliosus</i>	White-browed Babbler				•	•		•	•	•	•	•
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler				•	•		•	•	•	•	•
PSOPHODIDAE												
<i>Psophodes occidentalis</i>	Chiming Wedgebill				•	•		•	•	•		•
<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush				•	•		•	•		•	•
NEOSITTIDAE												
<i>Daphoenositta chrysoptera</i>	Varied Sittella							•	•			•
CAMPEPHAGIDAE												
<i>Coracina maxima</i>	Ground Cuckoo-shrike				•	•			•		•	•
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				•	•		•	•		•	•
<i>Lalage sueurii</i>	White-winged Triller				•	•		•	•		•	•
PACHYCEPHALIDAE												
<i>Colluricincla harmonica</i>	Grey Shrike-thrush				•	•		•	•	•	•	•
<i>Oreoica gutturalis</i>	Crested Bellbird				•	•		•	•	•	•	•
<i>Pachycephala pectoralis</i>	Golden Whistler											•
<i>Pachycephala rufiventris</i>	Rufous Whistler				•	•		•	•	•	•	•
ARTAMIDAE												
<i>Artamus personatus</i>	Masked Woodswallow				•	•					•	•
<i>Artamus cinereus</i>	Black-faced Woodswallow				•	•		•	•	•	•	•
<i>Artamus minor</i>	Little Woodswallow				•	•		•	•		•	•
<i>Cracticus nigrogularis</i>	Pied Butcherbird				•	•		•	•	•	•	•
<i>Cracticus torquatus</i>	Grey Butcherbird				•	•		•	•	•	•	•
<i>Cracticus tibicen</i>	Australian Magpie				•	•		•	•		•	•

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Streptera visicolor</i>	Grey Currawong				•							
RHIPIDURIDAE												
<i>Rhipidura albiscapa</i>	Grey Fantail				•	•					•	•
<i>Rhipidura leucophrys</i>	Willie Wagtail				•	•	•	•	•	•	•	•
CORVIDAE												
<i>Corvus bennetti</i>	Little Crow				•	•	•	•	•	•	•	•
<i>Corvus orru</i>	Torresian Crow				•	•	•	•	•	•	•	•
MONARCHIDAE												
<i>Grallina cyanoleuca</i>	Magpie-Lark				•	•		•	•	•	•	•
PETROICIDAE												
<i>Microeca fascinans</i>	Jacky Winter					•	•					•
<i>Petroica goodenovii</i>	Red-capped Robin				•	•	•	•	•	•	•	•
<i>Melanodryas cucullata</i>	Hooded Robin				•	•		•			•	•
ACROCEPHALIDAE												
<i>Acrocephalus australis</i>	Australian Reed-Warbler											•
MEGALURIDAE												
<i>Cinclorhamphus mathewsi</i>	Rufous Songlark					•	•	•	•		•	•
<i>Cinclorhamphus cruralis</i>	Brown Songlark				•	•						•
HIRUNDINIDAE												
<i>Cheramoeca leucosterna</i>	White-backed Swallow				•	•	•		•	•	•	•
<i>Hirundo neoxena</i>	Welcome Swallow				•	•			•	•	•	•
<i>Petrochelidon ariel</i>	Fairy Martin					•			S	•	•	•
<i>Petrochelidon nigricans</i>	Tree Martin				•	•	•					•
NECTARINIDAE												
<i>Dicaeum hirundinaceum</i>	Mistletoebird				•	•					•	•
ESTRILDIDAE												
<i>Emblema pictum</i>	Painted Finch							•				•
<i>Taeniopygia guttata</i>	Zebra Finch				•	•	•	•	•	•	•	•
MOTACILLIDAE												

Family and Species	Common Name	Conservation Status			NatureMap	Birddata	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (<i>ecologia</i> 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (<i>ecologia</i> 2009b)	Simpson and Day (2004)
		EPBC Act	WC Act	DEC								
<i>Anthus novaeseelandiae</i>	Australian Pipit				•	•		•	•		•	•

S Secondary evidence

Appendix C3 Amphibians and Reptiles

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Wilson and Swan (2008)
		EPBC Act	WC Act	DEC							
AMPHIBIA											
HYLIDAE											
<i>Cyclorana platycephala</i>	Water-holding Frog				•		•	•			•
<i>Litoria rubella</i>	Desert Tree Frog				•		•		•		•
<i>Cyclorana maini</i>	Main's Frog						•	•			•
MYOBATRACHIDAE											
<i>Neobatrachus wilsmorei</i>	Plonking Frog										•
<i>Platyplectrum spenceri</i>	Centralian Burrowing Frog						•	•			•
REPTILIA											
CHELIDAE											
<i>Chelodina steindachneri</i>	Steindachner's Turtle								•		•
GEKKONIDAE											
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko						•				•
<i>Diplodactylus granariensis</i>	Western Stone Gecko										•
<i>Diplodactylus pulcher</i>	Beautiful Gecko						•		•		•
<i>Gehyra punctata</i>	Spotted Dtella				•		•	•	•		•
<i>Gehyra purpurascens</i>	Purple Arid Dtella										•
<i>Gehyra variegata</i>	Tree Dtella				•		•	•	•		•
<i>Heteronotia binoei</i>	Bynoe's Gecko						•	•	•		•
<i>Lucasium squarrosum</i>	Mottled Ground Gecko								•		•
<i>Lucasium stenodactylum</i>	Sandplain Gecko						•	•			
<i>Nephrurus wheeleri</i>	Banded Knob-tailed Gecko				•						•
<i>Nephrurus vertebralis</i>	Midline Knob-tailed Gecko								•		•
<i>Oedura marmorata</i>	Marbled Velvet Gecko						•	•	•		•

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Wilson and Swan (2008)
		EPBC Act	WC Act	DEC							
<i>Rhynchoedura ornata</i>	Beaked Gecko				•		•	•			•
<i>Strophurus elderi</i>	Jewelled Gecko										•
<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko						•				•
<i>Strophurus wellingtonae</i>									•		•
<i>Underwoodisaurus milii</i>	Barking Gecko										•
PYGOPODIDAE											
<i>Delma australis</i>					•					•	•
<i>Delma butleri</i>	Un-banded Delma						•				•
<i>Delma fraseri</i>	Fraser's Delma										•
<i>Delma nasuta</i>	Long-nosed Delma										•
<i>Delma tincta</i>											•
<i>Lialis burtonis</i>	Burton's Snake Lizard										•
<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot							•	•		•
SCINCIDAE											
<i>Cryptoblepharus carnabyi</i>										•	•
<i>Cryptoblepharus plagiocephalus</i>	Fence Skink										•
<i>Ctenotus helenae</i>											•
<i>Ctenotus leonhardii</i>					•		•	•	•		•
<i>Ctenotus mimetes</i>								•			•
<i>Ctenotus pantherinus</i>	Leopard Skink										•
<i>Ctenotus saxatilis</i>	Rock Ctenotus										•
<i>Ctenotus schomburgkii</i>							•		•		•
<i>Ctenotus severus</i>					•		•	•	•	•	•
<i>Ctenotus uber</i>					•				•		•
<i>Cyclodomorphus branchialis</i>	Gilled Slender Blue-tongue		S1			•					•
<i>Cyclodomorphus melanops</i>	Spinifex Slender Blue-tongue						•	•			

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Wilson and Swan (2008)
		EPBC Act	WC Act	DEC							
<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink						•	•	•	•	•
<i>Egernia inornata</i>	Desert Skink										•
<i>Egernia stokesii badia</i>	Western Spiny-tailed Skink	EN	S1			•					•
<i>Eremiascincus richardsonii</i>	Broad-banded Sandswimmer				•		•		•		•
<i>Lerista bipes</i>											•
<i>Lerista eupoda</i>				P1		•				•	
<i>Lerista macropisthopus fusciceps</i>								•			•
<i>Lerista muelleri</i>								•			
<i>Lerista nichollsi</i>								•		•	•
<i>Lerista rhodonoides</i>							•	•		•	•
<i>Lerista uniduo</i>											•
<i>Lersita gerrardii</i>								•			•
<i>Menetia greyii</i>	Common Dwarf Skink				•		•	•	•		•
<i>Menetia surda</i>											•
<i>Morethia butleri</i>											•
<i>Morethia obscura</i>											•
<i>Tiliqua occipitalis</i>	Western Blue-tongue										•
AGAMIDAE											
<i>Amphibolurus longirostris</i>	Long-nosed Dragon						•		•	•	•
<i>Caimanops amphiboluroides</i>	Mulga Dragon						•	•			•
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon						•	•	•		•
<i>Ctenophorus isolepis</i>	Military Dragon										•
<i>Ctenophorus nuchalis</i>	Central Netted Dragon						•	•	•		•
<i>Ctenotus ornatus</i>	Ornate Dragon										•
<i>Ctenophorus reticulatus</i>	Western Netted Dragon						•		•		•
<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon						•		•		•

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Wilson and Swan (2008)
		EPBC Act	WC Act	DEC							
<i>Moloch horridus</i>	Thorny Devil				•				•	•	
<i>Pogona minor</i>	Western Bearded Dragon					•	•		•	•	
<i>Tympanocryptis cephalus</i>	Pebble Dragon				•	•			•	•	
VARANIDAE											
<i>Varanus brevicauda</i>										•	
<i>Varanus caudolineatus</i>	Stripe-tailed Monitor					•			•	•	
<i>Varanus giganteus</i>	Perentie						•	•	•	•	
<i>Varanus gouldii</i>	Gould's Monitor						•	•	•	•	
<i>Varanus panoptes</i>	Yellow-spotted Monitor					•	•	•	•	•	
<i>Varanus tristis</i>	Black-headed Monitor					•			•	•	
TYPHLOPIDAE											
<i>Ramphotyphlops grypus</i>										•	
<i>Ramphotyphlops hamatus</i>						•	•		•	•	
<i>Ramphotyphlops waitii</i>										•	
BOIDAE											
<i>Antaresia perthensis</i>	Pygmy Python					•	•		•	•	
<i>Antaresia stimsoni</i>	Stimson's Python									•	
<i>Aspidites ramsayi</i>	Woma									•	
ELAPIDAE											
<i>Acanthophis pyrrhus</i>	Desert Death Adder									•	
<i>Brachyuropis approximans</i>	NW Shovel-nosed Snake					•			•	•	
<i>Brachyuropis fasciolatus</i>	Narrow-banded Shovel-nosed Snake									•	
<i>Demansia psammophis</i>	Yellow-faced Whipsnake						•			•	
<i>Furina ornata</i>	Moon Snake								•	•	
<i>Parasuta monachus</i>	Monk Snake								•	•	

Family and Species	Common Name	Conservation Status			NatureMap	DEC rare fauna records	Jack Hills (MBS 2005)	Jack Hills (ecologia 2009a)	Cue to Nannine (Ninox 1990)	Weld Range (ecologia 2009b)	Wilson and Swan (2008)
		EPBC Act	WC Act	DEC							
<i>Pseudechis australis</i>	Mulga Snake										•
<i>Pseudechis butleri</i>	Spotted Mulga Snake									•	•
<i>Pseudonaja modesta</i>	Ringed Brown Snake				•					•	•
<i>Pseudonaja mengdeni</i>	Gwardar						•				•
<i>Simoselaps bertholdi</i>	Desert Banded Snake										•
<i>Suta fasciata</i>	Rosen's Snake									•	•