

Level 1 Fauna Risk Assessment for the Battler Project Area



Version 6 – April 2016

Prepared for:

Bioscope Environmental
PO Box 1256
East Victoria Park, WA, 6101

By:

Terrestrial Ecosystems
10 Houston Place
Mt Claremont
WA 6010



Record of Distribution

Format of report	Job number	Report Status	Date	Prepared for:	Initials
Electronic	2010-0031-002-gt-V1	Draft	3 January 2011	Southern Cross Goldfields	GT
	2010-0031-002-gt-V2	Draft	17 February 2011	Southern Cross Goldfields	GT
	2010-0031-002-gt-V3	Draft	28 February 2011	Southern Cross Goldfields	GT
	2010-0031-002-gt-V4	Draft	26 March 2011	Southern Cross Goldfields	GT
	2015-0052-002-gt-V5	Draft	10 March 2016	Bioscope Environmental	GT
	2015-0052-002-gt-V6	Final	8 April 2016	Bioscope Environmental	GT

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Front Cover: Western Pygmy Possum - *Cercartetus concinnus*



Executive Summary

IMD Goldmines is seeking to develop a gold mining operation at Battler. The Battler project area is approximately 14km south-south east of Southern Cross, Western Australia (WA). The purpose of this Level 1 fauna risk assessment was to provide information to the Department of Mines and Petroleum (DMP) on the potential impact to the vertebrate fauna assemblage in the project area from clearing the vegetation and developing a mine.

The assessed area that was approximately 148ha. The existing disturbance area is 8.5ha. It is proposed that an additional 27.6ha is disturbed, made up of 5ha for the pit, 17.7ha for the waste dump, 13.4ha for infrastructure making a total footprint of 36.1ha. The project area is mostly flat or gently undulating and vegetated with tall open Eucalypt woodland over an understorey of shrubs. The height and density of scattered shrubs varied. Some sections contained a ground cover of leaf litter, in other sections, the ground was mostly bare. The central area that had been previously mined contained almost no vegetation. This area contained a mining pit, waste dumps, access tracks and evidence of recent exploration activity. There are multiple tracks through the project area and evidence that the area is regularly used by trail bikes. A couple of sections have been used for the dumping of rubbish.

Clearing native vegetation is likely to result in the loss of small vertebrate fauna that are unable to move away during the clearing process. The few larger animals, such as kangaroos, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period of time until a balance is restored.

There is a possibility that the threatened Western Rosella (*Platycercus icterotis xanthogenys*) and Peregrine Falcon (*Falco peregrinus*) may infrequently be found in the vicinity of the project area. These birds will move to adjacent areas once vegetation clearing commences. There is a very low possibility that the project area supports a very low number of Chuditch (*Dasyurus geoffroii*), but this could only be confirmed by a trapping program, but that is not considered necessary. Given the size of the proposed disturbance, any Chuditch in the area will move to adjacent habitat and are unlikely to be impacted by the development, other than having a reduced area in which to forage.

Results from this assessment indicate that the risks of significantly impacting on native fauna, fauna assemblages and important fauna habitat are low when placed in a regional context, and if the recommended management strategies are implemented, then the risks will be further reduced. Clearing of an additional 27.6ha of vegetation is unlikely to significantly impact on any listed species of conservation significance.

It is recommended that:

- an induction program that includes a component on managing fauna to be mandatory for employment on the Battler Project;
- all areas disturbed during exploration or construction of the mine are to be rehabilitated immediately after they are no longer required;
- where possible, access routes are to be aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area;
- pets are not to be permitted on site;
- all waste and rubbish to be contained in bins and regularly removed from site or buried on-site;
- feeding of native fauna to be prohibited;
- a log of all on-site drill holes to be maintained detailing when they were capped, how and by whom;
- speed limits to be implemented and enforced on-site (travel speeds to be determined based on the quality and condition of the roads, but be a maximum of 80km/h);
- signage to be erected to indicate the maximum travelling speeds and the possible presence of wildlife crossing roads; and
- the impact of dust on adjacent vegetation and fauna habitat to be managed and monitored against appropriate key performance indicators.

Contents

1	Introduction	1
1.1	Background	1
1.2	Project Objectives and Scope of Works	1
2	Existing Environment	3
2.1	Survey Area	3
2.2	Climate	3
2.3	Land Use History	4
2.4	Previous Biological Surveys in the Region	4
3	Survey Methodology	4
3.1	Database Searches	4
3.2	Site Assessment	5
3.3	Carnaby's Black-Cockatoo tree assessment	5
3.4	Short Range Endemic Searches	5
3.5	Vouchering Specimens	5
3.6	Survey and Reporting Staff	5
3.7	Limitations	6
4	Results	7
4.1	Fauna Habitats	7
4.2	Short Range Endemic Invertebrates	7
4.3	Fauna Habitat Quality	7
4.4	Fauna Habitat Value	7
4.5	Bioregional Vertebrate Fauna	7
4.6	Vertebrate fauna potentially in the project area	9
4.7	Significant Fauna Species Recorded From or Predicted to Occur in the Project Area	13
4.7.1	Potential Impact on Species of Conservation Significance	17
5	Discussion	20
5.1	Adequacy of Available Vertebrate Fauna Data	20
5.2	Biodiversity Values	20
5.2.1	Condition of Fauna Habitat and Extent of Habitat Degradation	20
5.2.2	Ecological Linkages	20
5.2.3	Size and Scale of the Proposed Disturbance and Potential Impacts	20
5.2.4	Abundance and Distribution of Similar Habitat in the Adjacent Areas and the Bioregion	21
5.2.5	Ecological Functional Value of the Site	21
5.2.6	Short Range Endemic Invertebrates	21
5.2.7	Ecological Functional Value of the Project Area	21
5.2.8	Maintenance of Threatened Ecological Communities	21
5.3	Potential Impacts of the Proposed Development on the Vertebrate Fauna in the Battler Project Area	21
5.3.1	Direct Impacts	21
5.3.2	Secondary Impacts	22
5.3.3	Anthropogenic Activity	22
5.3.4	Construction and Upgrading of Access Roads	22
5.3.5	Rehabilitation of Cleared Areas	22
5.3.6	Potential Impacts on Ecosystem Function	22
5.3.7	Potential Impacts on Conservation Significant Species and Ecosystems	23
5.3.8	Loss or Degradation of Fauna Habitat	23
5.3.9	Mining Voids	23
5.3.10	Habitat Fragmentation	23
5.3.11	Altered Fire Regimes	23
5.3.12	Feral Fauna	23
5.3.13	Dust	24
5.3.14	Uncapped Drill Holes	24
5.3.15	Noise, Lighting and Vibration	24
5.3.16	Road Fauna Deaths	24
5.4	Risk Assessment	24
5.5	Native Vegetation Clearing Principles	28
5.6	A Summary of the Fauna Risk Assessment	28
5.7	Management Issues and Recommendations	28

5.7.1	Induction and Awareness	29
5.7.2	Minimising Habitat Fragmentation	29
5.7.3	Minimising Secondary Impacts	29
5.7.4	Uncapped Drill Holes	29
5.7.5	Road Fauna Deaths	29
5.7.6	Dust	30
6	References	31

Plates

1. Mean monthly maximum and minimum temperatures and rainfall for Southern Cross
- 2a-f. Fauna habitat types
- 3a-b. Spider burrows

Tables

1. Fauna assessment limitations and constraints
2. Mygalomorph spiders identified in the project area
3. Amphibians potential found in the project area
4. Reptiles potential found in the project area
5. Birds potential found in the project area
6. Mammals potential found in the project area
7. Species that are potentially found in the vicinity of the project area and that are listed as being of conservation significance under state or commonwealth government legislation or with DPaW.
8. Fauna impact risk assessment descriptors
9. Levels of acceptable risk
10. A risk assessment of the impact of ground disturbance activity on vertebrate fauna
11. Assessment of impact using the Native Vegetation Clearing Principles

Figures

1. Regional Location
2. Locality Plan

Appendices

- A. Vertebrate Fauna Recorded in Biological Surveys in the Region
- C. Results of the *EPBC Act* Protected Matters Search

1 INTRODUCTION

1.1 Background

IMD Goldmines is seeking to develop its gold mining operations at Battler. The Battler project area is approximately 14km south-south east of Southern Cross (Figure 1). The development of a new mine at Battler will require the clearing of an additional 27.6ha of native vegetation and the construction of mining infrastructure (Figure 2). Terrestrial Ecosystems was originally commissioned by Southern Cross Goldfields Ltd to undertake a Level 1 fauna risk assessment to support a native vegetation clearing permit application. In 2016, Bioscope Environmental requested that the 2010 report be updated. This is the updated report.

1.2 Project Objectives and Scope of Works

The purpose of this Level 1 fauna risk assessment was to provide information to the Department of Mines and Petroleum (DMP) to enable it to assess the potential impact of mining on the vertebrate fauna assemblage in the project area. The methodology broadly follows that described in the Environmental Protection Authority (EPA) Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002), Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004) and the EPA/Department of Environment and Conservation (DEC) Technical Guide – *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA / DEC 2010).

A Level 1 fauna risk assessment involves undertaking a desktop review of the available information and a site inspection. The objectives of this fauna risk assessment were to:

- provide an indication of the vertebrate fauna assemblage (reptile, small mammal, amphibians and bird) on and in the vicinity of the project area so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- provide a preliminary indication of any short range endemic invertebrate fauna of interest to the DMP, Department of Parks and Wildlife (DPaW) and the Environmental Protection Authority (EPA) in the project area so that potential impacts on these fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impacting on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the fauna assemblage;
- determine if any additional surveys are required to assess the potential impact on fauna assemblages in the project area, in particular, impacts on species of conservation significance; and
- make recommendations that avoid, mitigate or minimise potential impacts on resident fauna.

To achieve these objectives, Terrestrial Ecosystems has:

- reviewed Terrestrial Ecosystems fauna survey database [includes Western Australian Museum (WAM), Atlas of Living Australia and DPaW records] to identify potential vertebrate fauna within the area;
- reviewed DPaW listed Threatened and Priority species as recorded in NatureMap that are likely to be in the area;
- searched the Commonwealth government's on-line database to identify fauna species of national environmental significance that are protected under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)* potentially occurring in the area ;
- reviewed previous fauna surveys conducted in the vicinity of the project area;
- undertaken a one-day site investigation to identify available fauna habitat types and condition;
- undertaken a follow up Black-Cockatoo tree and habitat assessment;
- undertaken a preliminary site investigation for short range endemic invertebrates;

- undertaken an assessment of the potential risks to the fauna associated with clearing additional areas of native vegetation;
- provided a discussion of the likelihood of *EPBC Act 1999* and Western Australian (WA) *Wildlife Conservation Act 1950* listed species being present in the project area; and
- provided management recommendations to avoid, mitigate and minimise potential impacts on the fauna in the project area.

2 EXISTING ENVIRONMENT

2.1 Survey Area

The Battler project area is approximately 14km south of Southern Cross. The project area is in the Shire of Yilgarn and is approximately 370km east of Perth. The assessed area that was approximately 148ha and is shown in Figure 2. The existing disturbance area is 8.5ha. It is proposed that an additional 27.6ha is disturbed, made up of 5ha for the pit, 17.7ha for the waste dump, 13.4ha for infrastructure making a total footprint of 36.1ha. (Figure 2). The proposed expansion will result in approximately 9ha of native vegetation being cleared. The proposed mine is in the area that has already been disturbed by previous mining activity. The whole area was assessed to cover any possible future mine expansions within existing tenements.

The proposed Battler mine is located in the Coolgardie (COO2 – Southern Cross) IBRA subregion. The Coolgardie IBRA Southern Cross subregion consists of gently undulating uplands dissected by broad valleys with bands of low greenstone (Cowan et al. 2002). The bioregion supports diverse Eucalypt woodlands (*Eucalyptus salmonophloia*, *E. salubris*, *E. transcontinentalis*, *E. longicornis*) that are rich in endemics. The subregion contains many playa salt lakes that only contain water after major rainfall events. Salt lakes are mostly surrounded by a shrubland of low samphire. Mallees (*Eucalyptus leptopoda*, *E. platycarpus*, *E. scyphocalyx*) are often found on the small rises and upland areas.

2.2 Climate

Plate 1 shows the average mean monthly maximum and minimum temperatures and rainfall for Southern Cross, the closest weather station. Temperatures are highest in December – February. Most rain comes in mid winter. Winter rain is the result of low pressure cells that move in an easterly direction from the south-west of the state, whereas, summer rain is often from thunderstorms that move in from either the west or the north-west.

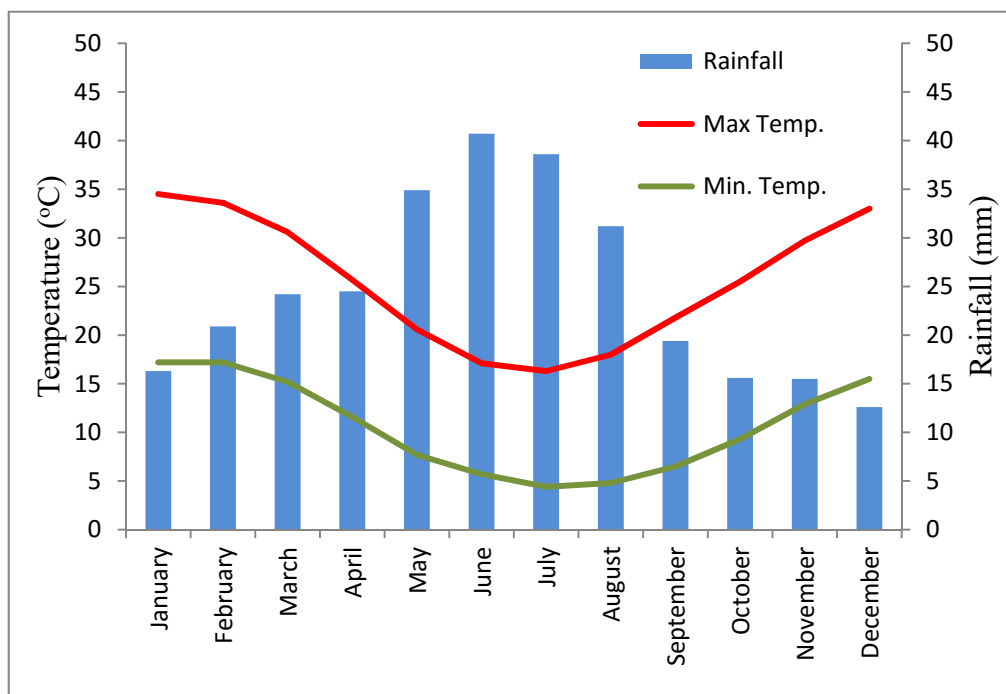


PLATE 1. MEAN MONTHLY MAXIMUM AND MINIMUM TEMPERATURES AND RAINFALL FOR SOUTHERN CROSS

2.3 Land Use History

The dominant land uses in this bioregion are cereal cropping, grazing, crown reserves and mining. Mining is evident in many areas around Southern Cross, with numerous small abandoned mines and open shafts dotting the Yilgarn landscape. Many of the larger trees in the bioregion were removed decades ago to support the mining and power generation industries and these trees have often not been replaced.

The project area has been subject to previous mining activity with an area of approximately 9ha cleared of most vegetation (Figure 2).

2.4 Previous Biological Surveys in the Region

The frogs, reptiles, mammals and birds in the Southern Cross IBRA subregion have been previously surveyed. Surveys in the vicinity of the project area which have been reviewed as part of this assessment include:

- Bell et al (2007) Winter bird assemblages across an arid gradient in south-west Western Australia. *Journal of the Royal Society of Western Australia*, 90, 219-227.
- How, R.A., Dell, J., Muir, B.G. (1988) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia, Part 4 Lake Johnstone - Hyden Study Area. *Records of the Western Australian Museum Supplement No 30*, 44-91.
- KLA (2010) *Parker Range Iron Ore Project Fauna Assessment*. Unpublished report for Cazaly Resources Ltd, Perth.
- McKenzie NL and Rolfe JK (1995) Vertebrate fauna. In: The Biological Surveys of the Eastern Goldfields of Western Australia. Part 11 Boorabbin-Southern Cross Study Area. *Records of the Western Australian Museum Supplement No. 49*, 31-65.
- Western Wildlife (2006) *St Barbara Southern Cross: Nevoria Area - Fauna Assessment*. Unpublished report for St Barbara Mining.
- Western Wildlife (2008) *St Barbara Limited, Southern Cross Operations, Baseline Fauna Survey; Spring 2007 and Autumn 2008*. Unpublished report for St Barbara Ltd, Perth.

In addition, there are individual records for fauna contained in the WAM collection, Atlas of Living Australia and in NatureMap's records.

The Western Australian Museum (WAM) survey of the Lake Johnstone - Hyden area was part of the WAM biological survey of the eastern Goldfields. Only the most westerly sites of this survey are relevant to the Battler project area. The WAM survey of the Boorabbin-Southern Cross area is particularly relevant as it includes habitat similar to that on the Battler project area. Surveys of the St Barbara mine are for a similar habitat type to the south of the project area.

3 SURVEY METHODOLOGY

The assessment methodology adopted is aligned with the EPA's Guidance Statement No. 56 (EPA 2004), Position Statement No. 3 (EPA 2002) and the Technical Guide on terrestrial fauna assessments (EPA/DEC 2010). A review of Guidance Statement No. 56 showed that based on the amount of existing information and proposed level of disturbance, a Level 1 fauna risk assessment was appropriate for the project area.

3.1 Database Searches

A search of Terrestrial Ecosystems' Fauna Survey database was undertaken for an area within a radius of 25km of the project area to develop a list of bird, reptile, mammal and amphibians that have been recorded in the vicinity of the project area.

A search of the DPaW's Threatened Fauna database was undertaken via accessing information in NatureMap. A search of the Department of Environment's *EPBC Act 1999* online database using a 25km radius around a coordinate of 31.3467°S and 119.39142° E was also undertaken to identify species of national conservation interest.

Other more general texts were also used to provide supplementary information on vertebrates in the bioregion, including Tyler *et al.* (2000) for frogs; Storr *et al.* (1983, 1990, 1999, 2002) and Thompson and Thompson (2006) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals. In addition, a number of published and unpublished reports for fauna surveys have been used to provide a regional context for the small vertebrate assemblages sampled in the survey area.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader bioregion. It should be noted that these lists will include species that have been recorded in the general region but are possibly vagrants or are found in the region but not in the project area due to a lack of suitable habitat (e.g. water birds). Vagrants can be recorded almost anywhere. Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the project area due to a lack of suitable habitat. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the survey area. As a consequence many species will be included in the lists produced from database searches but will not be present in the actual project area.

3.2 Site Assessment

A field assessment was undertaken on 17 December 2010. Conditions were suitable for the assessment as the weather was fine, although it was mostly overcast. All sections of the project area were visited. The risk of impacting on conservation significant fauna was determined by the presence of suitable habitat types, taking into account its condition, vegetation structure, soil types, time since fire, landform, and the biological and ecological knowledge for each species.

3.3 Carnaby's Black-Cockatoo tree assessment

At the time of the original assessment of the proposed Battler mine site, the available information indicated that the EPBC listed endangered Carnaby's Black-Cockatoo's geographic range include the Battler project area. As a consequence, in September 2011 a Carnaby's Black-Cockatoo tree and habitat assessment was undertaken for the Battler project area and a report prepared for Southern Cross Goldfield Mines Ltd (Terrestrial Ecosystems 2011). New EPBC referral guidelines for Carnaby's Black-Cockatoo (Department of Sustainability Environment Water Population and Communities 2012) indicated that the geographic range of Carnaby's Black-Cockatoo no longer includes the Battler project area, so the tree hollow assessment is no longer relevant or applicable and is not discussed in this report.

3.4 Short Range Endemic Searches

A meeting with Dr Mark Harvey from the Western Australian Museum (WAM) indicated that short range endemic (SRE) invertebrates of interest in the Goldfields area included mygalomorph spiders, scorpions, terrestrial snails, millipedes and pseudoscorpions. During the site visit, time was allocated to search different habitats and areas for these SRE invertebrates. This was a preliminary search of the project area.

3.5 Vouchering Specimens

Two burrowing spiders dug from burrows were vouchered with the Western Australian Museum.

3.6 Survey and Reporting Staff

The field assessment was undertaken by Dr Graham Thompson and Dr Tony Pusey and the report was written by Dr G. Thompson. Drs Scott Thompson and Tony Pusey undertook the Carnaby's Black-Cockatoo tree and habitat assessment. Dr Scott Thompson reviewed this report.

The lead scientist for this assessment has appropriate post-graduate qualifications and numerous years of relevant field experience and is therefore appropriately trained and experienced for this task.

3.7 Limitations

This terrestrial fauna assessment of the survey area is based on a site visit, information contained in the Commonwealth Government database and other published and unpublished fauna survey data for the bioregion. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in the project area; however, in this circumstance it is Terrestrial Ecosystems' opinion that adequate data were available to assess the potential impact of the proposed development on the terrestrial vertebrate fauna.

The Guidance for Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (2004) suggests that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 1.

TABLE 1. FAUNA ASSESSMENT LIMITATIONS AND CONSTRAINTS

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Competency and experience of the consultant carrying out the survey	No	The scientists who prepared this report and conducted the field assessment are familiar with terrestrial fauna in the region and terrestrial fauna risk assessments.
Scope	No	All aspects of the scope of works have been addressed.
Proportion of fauna identified, recorded and/or collected	No	Not applicable.
Accuracy of previous survey work	Yes, negligible	Terrestrial Ecosystems' has reported fauna survey data recorded by various authors, but is not in a position to vouch for the accuracy of this information. It is acknowledged that the taxonomy of Western Australian vertebrates is continually being revised and the nomenclature of some of the species listed in the appendices may have changed since publication by the authors.
Sources of information	Yes, negligible	Vertebrate fauna information was available from an on-line database and unpublished and published reports of surveys conducted in the bioregion in a variety of habitat types. Many of these surveys employed a low level of trapping effort which significantly impacts on the capacity of these data to represent the fauna assemblages in the areas surveyed.
Proportion of the task achieved	No	All tasks completed.
Timing/weather/season/ cycle	No	Weather was fine.
Disturbances which affected results of the survey	No	Sections of the project area have been mined and disturbed over many years. This disturbance has been factored into the assessment.
Intensity of survey effort	No	The intensity of the on-ground assessment was proportional to the potential scale of impact in a degraded area and knowledge of fauna and fauna assemblages in the area.
Completeness	No	All areas were adequately investigated.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	No	Access was not a problem.
Availability of contextual information on the region	No	Terrestrial Ecosystems fauna database, <i>EPBC Act 1999</i> database, Atlas of Living Australia and other surveys in the broader region were available. NatureMap had no conservation significant species recorded for the Southern Cross IBRA subregion which is clearly an error.

4 RESULTS

4.1 Fauna Habitats

Plates 2a-f provide a visual indication of the varying fauna habitat types found in the project area. The project area was mostly flat (Plates 2c-d) or gently undulating and the area was mostly vegetated with tall open Eucalypt woodland over an understorey of shrubs. The height and density of shrubs varied. Some sections contained a ground cover of leaf litter; in other sections the ground was mostly bare. The central area that had been previously mined (Plates 2a-b; Figure 2) was disturbed and contained almost no vegetation. This area contained a mining pit, waste dumps, access tracks and evidence of recent exploration activity.

There are multiple tracks through the project area and evidence that the area is regularly used by trail bikes (Plate 2e). A couple of sections have been used for the dumping of rubbish (Plate 2f).

4.2 Short Range Endemic Invertebrates

A preliminary search was undertaken for SRE invertebrates. Two spiders were located in burrows and these were dug up and vouchered with the WAM. Two spiders from the genus *Aname* were recorded (Table 2). One was a female and the other a juvenile so neither could be identified to species level.

TABLE 2. MYGALOMORPH SPIDERS IDENTIFIED IN THE PROJECT AREA

Order	Family	Genus	Species
Araneae	Nemesiidae	<i>Aname</i>	`sp. (female)(not MYG216)`
Araneae	Nemesiidae	<i>Aname</i>	`sp. (juv.)`

Plates 3a-b show one of the two burrows and the adjacent ground cover.

4.3 Fauna Habitat Quality

Fauna habitat in the previously mined areas has been extensively disturbed and is of little ecological value. Other areas that have been disturbed (e.g. trail bike riding, deposition of rubbish) are also of limited ecological value. However, much of the area is in good condition and is likely to support a fauna assemblage that is similar to that which existed in the bioregion prior to the general area being disturbed by farming and mining.

4.4 Fauna Habitat Value

The Battler project area is in a linear belt of remnant vegetation that runs along the eastern side of the Southern Cross to Marvel Loch Road. This remnant is approximately 25km by 3.5km. There is evidence of mining activity in the northern section, east of the Battler project area, along the south-eastern border and in the southern section. Similar fauna habitat exists to the east of this remnant, but is separated by crop farming. The relatively undisturbed areas of 'good fauna habitat' in the Battler project area are plentiful in adjacent areas. As a consequence, the Battler project area is not a high value fauna habitat, however, as much of this type of habitat has been cleared for farming over the last century any further loss should be minimised.

4.5 Bioregional Vertebrate Fauna

Appendix A provides a summary of the fauna survey data that are available in the vicinity of the project area and in the Southern Cross IBRA subregion. Although there are differences in the reptile, frog, mammal and avian assemblages at each survey site reported in Appendix A; overall there is a level of similarity when the data are aggregated for each survey. It is not anticipated that fauna found in the Battler project area would be significantly different to similar habitat in adjacent areas.



Plate 2a – Area disturbed by mining activity



Plate 2b - Area disturbed by mining activity



Plate 2c - Eucalypt woodlands over an understorey of chenopods



Plate 2d - Eucalypt woodlands over an understorey of chenopods



Plate 2e – Area disturbed by trail bike activity



Plate 2f - Rubbish



Plate 3a Spider burrow



Plate 3b Spider burrow

4.6 Vertebrate fauna potentially in the project area

Tables 3-6 provide a list of vertebrate fauna recorded in other surveys in the vicinity of the project area and which could be recorded in the project area.

TABLE 3. AMPHIBIANS POTENTIALLY FOUND IN THE PROJECT AREA

Family	Species	Common Name
Limnodynastidae	<i>Heleioporus albopunctatus</i>	Western Spotted Frog
	<i>Neobatrachus albipes</i>	White-footed Frog
	<i>Neobatrachus kunapalari</i>	Kunapalari Frog
	<i>Neobatrachus pelobatoides</i>	Humming Frog
	<i>Neobatrachus sutor</i>	Shoemaker Frog
Myobatrachidae	<i>Pseudophryne guentheri</i>	Gunther's Toadlet
	<i>Pseudophryne occidentalis</i>	Orange-crowned Toadlet

TABLE 4. REPTILES POTENTIALLY FOUND IN THE PROJECT AREA

Family	Species	Common Name
Agamidae	<i>Ctenophorus cristatus</i>	Crested Dragon
	<i>Ctenophorus isolepis</i>	
	<i>Ctenophorus maculatus</i>	Spotted Dragon
	<i>Ctenophorus ornatus</i>	Ornate Crevice Dragon
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon
	<i>Ctenophorus salinarum</i>	Saltpan Dragon
	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon
	<i>Moloch horridus</i>	Thorny Devil
	<i>Pogona minor</i>	Dwarf Bearded Dragon
	<i>Tympanocryptis cephalus</i>	Pebble Dragon
Boidae	<i>Aspidites ramsayi</i>	Woma
	<i>Morelia spilota imbricata</i>	Carpet Python
Carphodactylidae	<i>Nephurus stellatus</i>	Stellate Knob-tail
	<i>Underwoodisaurus milii</i>	Barking Gecko
Diplodactylidae	<i>Amalosia reticulata</i>	Reticulated Velvet Gecko
	<i>Crenadactylus ocellatus</i>	Clawless Gecko
	<i>Diplodactylus granariensis</i>	Wheat-belt Stone Gecko
	<i>Diplodactylus pulcher</i>	Fine-faced Gecko
	<i>Hesperoedura reticulata</i>	Reticulated Velvet Gecko
	<i>Lucasium maini</i>	Main's Ground Gecko

Family	Species	Common Name
	<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko
	<i>Strophurus spinigerus</i>	South-western Spiny-tailed Gecko
Elapidae	<i>Brachyuropsis semifasciata</i>	Half-girdlerd Snake
	<i>Parasuta gouldii</i>	Gould's Snake
	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja affinis</i>	Dugite
	<i>Pseudonaja mengdeni</i>	Gwardar
	<i>Pseudonaja modesta</i>	Ringed Brown Snake
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake
	<i>Suta fasciata</i>	Rosen's Snake
Gekkonidae	<i>Christinus marmoratus</i>	Marbled Gecko
	<i>Gehyra variegata</i>	Tree Dtella
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko
Pygopodidae	<i>Delma australis</i>	Marble-faced Delma
	<i>Delma butleri</i>	Unbanded Delma
	<i>Delma fraseri</i>	Fraser's Delma
	<i>Lialis burtonis</i>	Burton's Snake-lizard
	<i>Pygopus lepidopodus</i>	Common Scaly-foot
	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot
Scincidae	<i>Cryptoblepharus buechananii</i>	Buchanan's Snake-eyed Skink
	<i>Ctenotus atlas</i>	Southern Mallee Ctenotus
	<i>Ctenotus impar</i>	Odd-striped Ctenotus
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus
	<i>Ctenotus mimetes</i>	Checker-sided Ctenotus
	<i>Ctenotus pantherinus</i>	Leopard Skink
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus
	<i>Ctenotus uber</i>	Spotted Ctenotus
	<i>Ctenotus xenopleura</i>	Wide-striped Ctenotus
	<i>Cyclodomorphus branchialis</i>	Common Slender Bluetongue
	<i>Cyclodomorphus gerrardii</i>	Giant Slender Bluetongue
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue
	<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink
	<i>Egernia multiscutata</i>	Southern Sand-skink
	<i>Egernia richardi</i>	Bright Crevice-skink
	<i>Hemiergis initialis</i>	South-western Earless Skink
	<i>Lerista gerrardii</i>	Bold-striped Slider
	<i>Lerista kingi</i>	King's Slider
	<i>Liopholis inornata</i>	Desert Skink
	<i>Liopholis multiscutata</i>	Bull Skink
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia butleri</i>	Woodland Morethia Skink
	<i>Morethia obscura</i>	Shrubland Morethia Skink
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard
	<i>Tiliqua rugosa</i>	Bobtail
Typhlopidae	<i>Anilius australis</i>	Austral Blind Snake
	<i>Anilius bicolor</i>	Dark-spined Blind Snake
	<i>Anilius bituberculatus</i>	Prong-snouted Blind Snake
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna
	<i>Varanus tristis</i>	Black-headed Monitor

TABLE 5. BIRDS POTENTIALLY FOUND IN THE PROJECT AREA

Family	Species	Common Name
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu
Megapodiidae	<i>Leipoa ocellata</i>	Malleefowl
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing
	<i>Ocyphaps lophotes</i>	Crested Pigeon
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night Heron
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite
	<i>Elanus scriptus</i>	Letter-winged Kite
	<i>Lophoictinia isura</i>	Square-tailed Kite
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard
	<i>Haliastur sphenurus</i>	Whistling Kite
	<i>Accipiter fasciatus</i>	Brown Goshawk
	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Hieraaetus morphnoides</i>	Little Eagle
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel
	<i>Falco hypoleucos</i>	Grey Falcon
	<i>Falco peregrinus</i>	Peregrine Falcon
Cacatuidae	<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo
	<i>Eolophus roseicapillus</i>	Galah
Psittacidae	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet
	<i>Polytelis anthopeplus</i>	Regent Parrot
	<i>Platycercus icterotis</i>	Western Rosella
	<i>Barnardius zonarius</i>	Australian Ringneck
	<i>Neophema elegans</i>	Elegant Parrot
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo
	<i>Chalcites osculans</i>	Black-eared Cuckoo
	<i>Cacomantis pallidus</i>	Pallid Cuckoo
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater
Climacteridae	<i>Climacteris rufa</i>	Rufous Treecreeper
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren
	<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren
Acanthizidae	<i>Hylacola cauta</i>	Shy Heathwren
	<i>Pyrrholaemus brunneus</i>	Redthroat
	<i>Smicrornis brevirostris</i>	Weebill
	<i>Gerygone fusca</i>	Western Gerygone
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill
	<i>Acanthiza apicalis</i>	Inland Thornbill
	<i>Aphelocephala leucopsis</i>	Southern Whiteface
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote
	<i>Pardalotus striatus</i>	Striated Pardalote
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater
	<i>Lichenostomus virescens</i>	Singing Honeyeater
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater
	<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater
	<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater
	<i>Purnella albifrons</i>	White-fronted Honeyeater
	<i>Manorina flavigula</i>	Yellow-throated Miner

Family	Species	Common Name
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater
	<i>Anthochaera carunculata</i>	Red Wattlebird
	<i>Epthianura tricolor</i>	Crimson Chat
	<i>Epthianura albifrons</i>	White-fronted Chat
	<i>Sugomel niger</i>	Black Honeyeater
	<i>Glyciphila melanops</i>	Tawny-crowned Honeyeater
	<i>Gliciphila melanops</i>	Tawny-crowned Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler
Psophodidae	<i>Cinclosoma castanotum</i>	Chestnut 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>Pachycephala inornata</i>	Gilbert's Whistler
	<i>Pachycephala pectoralis</i>	Golden Whistler
	<i>Pachycephala rufiventris</i>	Rufous Whistler
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
	<i>Oreoica gutturalis</i>	Crested Bellbird
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow
	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus cyanopterus</i>	Dusky Woodswallow
	<i>Cracticus torquatus</i>	Grey Butcherbird
	<i>Cracticus nigrogularis</i>	Pied Butcherbird
	<i>Cracticus tibicen</i>	Australian Magpie
	<i>Strepera versicolor</i>	Grey Currawong
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
Corvidae	<i>Corvus coronoides</i>	Australian Raven
	<i>Corvus bennetti</i>	Little Crow
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter
	<i>Petroica boodang</i>	Scarlet Robin
	<i>Petroica goodenovii</i>	Red-capped Robin
	<i>Eopsaltria australis</i>	Eastern Yellow Robin
	<i>Eopsaltria griseogularis</i>	Western Yellow Robin
	<i>Drymodes brunneopygia</i>	Southern Scrub-robin
Timaliidae	<i>Zosterops lateralis</i>	Mauritius Olive White-eye
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow
	<i>Hirundo neoxena</i>	Welcome Swallow
	<i>Hirundo nigricans</i>	Tree Martin
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit

TABLE 6. MAMMALS POTENTIALLY FOUND IN THE PROJECT AREA

Family	Species	Common Name
Canidae	<i>Canis lupus</i>	Dingo
	<i>Vulpes vulpes</i>	Red Fox
Felidae	<i>Felis catus</i>	House Cat
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat
	<i>Ozimops planiceps</i>	Southern Free-tail Bat
	<i>Taphozous australis australis</i>	Coastal Sheath-tail Bat
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Nyctophilus major</i>	Greater Long-eared Bat
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat
	<i>Vespadelus regulus</i>	Southern Forest Bat
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr
	<i>Dasyurus geoffroyi</i>	Chuditch
	<i>Ningaui yvonneae</i>	Mallee Ningau
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart
	<i>Sminthopsis gilberti</i>	Gilbert's Dunnart
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo
	<i>Osphranter robustus</i>	Euro
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
Muridae	<i>Mus musculus</i>	House Mouse
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse
	<i>Pseudomys bolami</i>	Bolam's Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse

4.7 Significant Fauna Species Recorded From or Predicted to Occur in the Project Area

Conservation significant fauna are protected by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *Wildlife Conservation Act 1950*. The WA *Wildlife Conservation Act 1950* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, the Department of Parks and Wildlife (DPAW) maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *Wildlife Conservation Act 1950* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DPAW wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species.

The fauna species listed in Table 7 have special conservation status under State and/or Commonwealth government legislation. Each species has either been previously recorded or has been listed as having the potential to occur in the vicinity of the project area.

Four threatened species of fauna and six migratory species of birds identified under the *EPBC Act 1999* potentially occur in the project area. There are 10 Schedule species listed under the WA *Wildlife*

Conservation Act 1950 and three priority species listed on the DPaW's Priority Fauna List that potentially occur in the project area. The following is an assessment of the likelihood of each of the species listed in Table 7 being found in the project area.

TABLE 7. SPECIES THAT ARE POTENTIALLY FOUND IN THE VICINITY OF THE PROJECT AREA AND THAT ARE LISTED AS BEING OF CONSERVATION SIGNIFICANCE UNDER STATE OR COMMONWEALTH GOVERNMENT LEGISLATION OR WITH DPAW

Species	Status under the Wildlife Conservation Act / DPaW	Status under the EPBC Act	Comment on potential impact on conservation significant species
<i>Pezoporus occidentalis</i> Night Parrot	Schedule 1	Critically Endangered	Highly unlikely to be in the project area, as there are no recent records within many kilometres.
<i>Myrmecobius fasciatus</i> Numbat	Schedule 2	Endangered	It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it is unlikely to be in the area.
<i>Leipoa ocellata</i> Malleefowl	Schedule 3	Vulnerable	It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it is unlikely to be in the area.
<i>Dasyurus geoffroii</i> Chuditch	Schedule 3	Vulnerable	It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it is unlikely to be in the area.
<i>Motacilla cinerea</i> Grey Wagtail	Schedule 5	Migratory	Has not been recorded in the vicinity of the project area, and is therefore unlikely to be impacted by the proposed development.
<i>Merops ornatus</i> Rainbow Bee-eater	Schedule 5	Migratory	It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because they can easily move to adjacent undisturbed areas once clearing commences.
<i>Apus pacificus</i> Fork-tailed Swift	Schedule 5	Migratory	It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because they can easily move to adjacent undisturbed areas once clearing commences.
<i>Ardea modesta</i> Great Egret	Schedule 5	Migratory	Has not been recorded in the vicinity of the project area. The project area does not contain the preferred habitat of this species, and it is therefore unlikely to be impacted by the proposed development.
<i>Ardea ibis</i> Cattle Egret	Schedule 5	Migratory	Has not been recorded in the vicinity of the project area. The project area does not contain the preferred habitat of this species, and it is therefore unlikely to be impacted by the proposed development.
<i>Thinornis rubricollis</i> Hooded Plover	P4	Migratory	The project area does not contain the preferred habitat of this species, and it is therefore unlikely to be impacted by the proposed development.
<i>Platycercus icterotis xanthogeny</i> (Mallee) Western Rosella	P4		It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences and there are many suitable tree hollows in adjacent areas if individuals were nesting in the vicinity of the project area.

Species	Status under the Wildlife Conservation Act / DPaW	Status under the EPBC Act	Comment on potential impact on conservation significant species
<i>Falco peregrinus</i> Peregrine Falcon	Schedule 7		It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
<i>Aspidites ramsayi</i> Woma (southwestern)	P1		It is unlikely that vegetation clearing or the construction of the mine pit or associated infrastructure will significantly impact on this species because it is unlikely to be in the area.

4.7.1 Potential Impact on Species of Conservation Significance

Night Parrot (*Pezoporus occidentalis*) - Schedule 1 under the *Wildlife Conservation Act 1950* and Critically Endangered under the *EPBC Act 1999*

The Night Parrot appears to be a secretive, and probably nocturnal, ground dwelling species. Its geographical distribution is poorly understood, but it was probably distributed over much of the semi-arid and arid Australia (Garnett et al. 2011). Sightings in north-west Queensland in the early 1990s were in a broad cross section of the habitats available (Garnett et al. 1993). There have been recent sightings in the Pilbara in 1980 and 2005, central WA in 1979, north-eastern South Australia in 1979, western Queensland in 1980, 1990, 1993 and 2006 (Garnett et al. 2011). Garnett et al. (2011) suggested that there were between 50-250 mature individuals in less than 5% of its previous range. There is a recent confirmed record in western Queensland but the exact location is tightly controlled for protection of the species. There have been numerous, mostly futile, investigations to determine the existence and location of this little-known species in Western Australia (Davies et al. 1988, Garnett et al. 1993, Blyth et al. 1996, Blyth and Boles 1997).

Although the Night Parrot's pattern of movement is unknown, it is presumed to be nomadic. The Department of Sustainability, Environment, Water, Population and Community (DSEWPaC) Species Profile and Threats Database (SPRAT site (www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59350)) indicated that its preferred habitat is *Triodia* grasslands in stony or sandy environments, samphire and chenopod shrub lands. Wilson's (1937) summary of observations provided information on the Night Parrots preferred habitat and breeding sites. It seems to prefer spinifex, but has been recorded in samphire, comes to water after dark and builds its nest deep in spinifex tussocks. The nest has a runway and a tunnel entrance and clutches are two to four white eggs. Several reasons have been suggested for its decline, including habitat loss and degradation through clearing, grazing, altered fire regimes, reduced availability or quality of watering points and predation from feral species, in particular the cat (Garnett et al. 2011).

As there are no recent Night Parrot records in the vicinity of the project area, it is highly unlikely to be present in the area.

Numbat (*Myrmecobius fasciatus*) - Schedule 2 under the *Wildlife Conservation Act 1950* and Endangered under the *EPBC Act 1999*

Numbats were once present across southern semi-arid and arid Australia, including parts of NSW, SA and southern NT, as well as the south-west of Western Australia. In Western Australia, there are small residual populations at Dryandra and Perup, with recent translocations at Boyagin Nature Reserve, Tutanning Nature Reserve, Battalling block and Karroun Hill Nature Reserve. Numbats are essentially solitary, forage during the day in winter and in the early morning and late afternoon in summer.

There is a very old record of a Numbat being found to the east of Southern Cross, however, it is highly unlikely that they are in the Battler project area and would be impacted on by the exploration activity.

Peregrine Falcon (*Falco peregrinus*) – Schedule 7 *Wildlife Conservation Act 1950*.

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the project area. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years. Peregrine Falcons have been recorded during fauna surveys in the bioregion (Appendix A).

It is Terrestrial Ecosystems' assessment that the proposed vegetation clearing in the project area is unlikely to have a significant impact on this species as there is plenty of similar habitat in adjacent areas and it can easily move once clearing commencing.

Chuditch (*Dasyurus geoffroii*) - Schedule 3 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999*

The Chuditch is the largest carnivorous marsupial in Western Australia (WA). It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

They have been recorded in similar habitat around Forrestania (i.e. 100 plus km to the west), but there are no recent records in the vicinity of the project area. There is an old record for just north of Southern Cross. Based on the available data and a site inspection, Chuditch are unlikely to be in the project area and any impacts are therefore likely to be very low. If they were in the project area, then they would readily move into adjacent areas and again the impacts would be low.

Grey Wagtail (*Motacilla cinerea*) – Schedule 5 under the *Wildlife Conservation Act 1950* and Migratory under the *EPBC Act 1999*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects. The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area. It is highly unlikely to be seen in the project area due to a lack of suitable habitat.

Malleefowl (*Leipoa ocellata*) - Schedule 3 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999*.

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Recently their range has contracted due to fox predation and land clearance. Their abundance in the Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and, once breeding commences, they pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

The available habitat across the majority of the project area was unsuitable for Malleefowl, as there was generally insufficient understorey to provide the necessary protection for this species. There are records of Malleefowl and Malleefowl mounds in the general vicinity of the Battler project area [Appendix A; (McKenzie and Rolfe 1995, Biota Environmental Sciences 2006), and old mounds at a proposed mine-site inspected by Terrestrial Ecosystems ~ 50km south], however, most of these records are old as Malleefowl are now only found in scattered populations in the Goldfields, most in densely vegetated areas.

Malleefowl are unlikely to be found in the project area and it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Fork-tailed Swift (*Apus pacificus*) – Schedule 5 under the *Wildlife Conservation Act 1950* and Migratory under the *EPBC Act 1999*.

The Fork-tailed Swift breeds in north-east and mid-east Asia and winters in Australia and New Guinea. It arrives in the Kimberley in late September and in central and southern WA in November and leaves in late April. The Fork-tailed Swift may be an infrequent visitor to the area although it has not been recorded in previous surveys.

Given that the proposed land clearing represents a very small fraction of similar habitat in the general area and this is an aerial species which seldom roosts, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Rainbow Bee-eater (*Merops ornatus*) - Schedule 5 under the *Wildlife Conservation Act 1950* and Migratory under the *EPBC Act 1999*.

The Rainbow Bee-eater is widespread during late spring and summer in the southern section of WA, particularly in sandy areas that have access to water. This species was recorded in fauna surveys in the vicinity of the project area (Appendix A).

Given that the proposed land clearing represents a very small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species. This species will readily move to other areas if it is disturbed.

Western Rosella (*Platycercus icterotis xanthogenys*) – Priority 4 with DPaW.

The mallee form of the Western Rosella is found mostly in Eucalypt and Casuarina woodland and shrublands, especially Wandoo, Flooded Gums and Salmon Gums. This species was sighted by McKenzie and Rolfe (1995) during the Boorabbin-Southern Cross biological survey and in other surveys in the bioregion (Appendix A).

Given that the proposed clearing represents a very small fraction of similar habitat in the area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Hooded Plover (*Thinornis rubricollis*) – Priority 4 species with DPaW and Migratory under the *EPBC Act 1999*.

This species frequents the margins and shallows of salt lakes, and also along coastal beaches, where it forages for invertebrates. It is found along the southern coast and salt lakes north to Port Gregory, Three Springs, Mt Gibson, Lake Brown, Lake Barlee, Lake Cowan and Eyre. It is an uncommon to common resident on the southern sea beaches from Cape Naturaliste east to Eyre. It breeds in the samphire habitat along the boundary of some of the salt lakes in the bioregion.

The proposed disturbance area is not in habitat frequented by this species. Therefore, it is Terrestrial Ecosystems' assessment that the proposed vegetation clearing in the project area is unlikely to have a significant impact on this species.

Woma (southern form: *Aspidites ramsayi*) – Priority species 1 with DPaW.

This python was once common in a crescent shaped distribution from Shark Bay through the wheatbelt to Kitchener. The Western Australian Museum has records of them being caught in the vicinity of the Great Eastern Highway from around Southern Cross and east toward Coolgardie. It is now only found in one small population east of the wheatbelt, around Shark Bay and east of Kalgoorlie. It is mostly found in sand plain habitat which is not present in the project area.

Terrestrial Ecosystems' assessment is that the Woma is highly unlikely to be found in the project area due to a lack of suitable habitat and its scarcity in the general area.

Great Egret (*Ardea modesta*) – Schedule 5 and Migratory under the *EPBC Act (1999)*

The Great Egret is found in many parts of Western Australia excluding the arid interior. It mostly inhabits shallow freshwater (rivers, pools, lakes, lagoons, swamps) and estuarine areas (mangroves, tidal pools), but is rarely found in dry pastures. This species was listed in the search of the *EPBC Act* database for the area, but Terrestrial Ecosystems' view is that it is unlikely to be seen in potential impact areas due to a lack of suitable habitat.

Cattle Egret (*Ardea ibis*) – Schedule 5 and Migratory under the *EPBC Act* (1999)

The Cattle Egret is found in the better watered parts of Western Australia. It is most often seen foraging in short grassed pastures and wetland, often in the company of cattle. This species was listed in the search of the *EPBC Act* database for the area, but Terrestrial Ecosystems' view is that it is unlikely to be seen in potential impact areas due to a lack of suitable habitat.

5 DISCUSSION

5.1 Adequacy of Available Vertebrate Fauna Data

The EPA *Terrestrial Biological Surveys as an Element of Biodiversity Protection*: Position Statement No. 3 (EPA 2002), *Guidance Statement for Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56* (EPA 2004) and the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA / DEC 2010) are the three relevant documents to assess the adequacy of the available information and reporting for vertebrate fauna surveys in Western Australia. They indicate that for small scale developments with a low potential for a significant impact on the environment, a Level 1 fauna risk assessment of the terrestrial fauna is adequate.

No fauna trapping surveys have been undertaken for the project area. However, nearby mining developments in similar habitat (e.g. St Barbara) was surveyed in the mid-2000s and there are other fauna survey data in the IBRA subregion to the north, south and east in similar habitat. As previously indicated, it is unlikely that the project area contains a vertebrate fauna assemblage that is significantly different to the areas surveyed. These survey data are therefore considered adequate as the basis for an informed assessment of the potential impacts on the fauna assemblage in the project area.

5.2 Biodiversity Values

The EPA's Position Statement No. 3 indicates an ecological assessment of a site must consider its biodiversity value at the genetic, species and ecosystem levels, and its ecological functional value at the ecosystem level (EPA 2002).

From a fauna perspective, much of the vegetation in the project area could be described as in good condition; however, there are some areas that have been degraded by exploration and earlier mining activity. All vertebrate species potentially present in the project area are wide-ranging and have been recorded in various other surveys in the bioregion (Appendix A).

5.2.1 Condition of Fauna Habitat and Extent of Habitat Degradation

As a consequence of previous mining activity the central section of the project area is highly degraded. Other sections of the project area have been degraded by exploration tracks, deposition of rubbish and trail bike riding. However, the majority of the site is still in reasonably good condition and the fauna assemblages are likely to be similar to those in adjacent areas that have been undisturbed.

5.2.2 Ecological Linkages

The project area currently does not provide any important ecological linkage or fauna movement corridor. Although various exploration and mine tracks dissect the project, most are relatively narrow and are unlikely to provide a barrier that would inhibit the movement of fauna within the general area.

5.2.3 Size and Scale of the Proposed Disturbance and Potential Impacts

The project area is about 148ha, but the proposed mine is only intending to impact on an area of about 17ha (Figure 2), of which approximately 8ha has already been significantly disturbed. Given the extent of existing disturbance and habitat degradation, additional vegetation clearing is unlikely to significantly impact on the

fauna in a landscape or bioregional context. Effective rehabilitation of disturbed areas, once they are no longer required, is likely to provide habitat of similar quality to that which currently exists.

5.2.4 Abundance and Distribution of Similar Habitat in the Adjacent Areas and the Bioregion

The project area represents a small fraction of similar habitat in the bioregion and in adjacent areas. Clearing sections of the remaining vegetation is unlikely to result in a significant loss of important fauna habitat.

5.2.5 Ecological Functional Value of the Site

The Battler project area is part of elongated vegetation remnant in the eastern part of the wheatbelt, and all vegetation remnants in the eastern wheatbelt have ecological value given the extent of vegetation clearing over the last century. Some of the project area is highly disturbed and other sections provide good quality fauna habitat. The proximity of the project area to Southern Cross is probably the reason for the dumping of rubbish and trail bike usage in the area. Given the abundance of similar habitat to the east of the project area, the Battler project area is not rated as having high ecological value.

5.2.6 Short Range Endemic Invertebrates

We were advised by the Western Australian Museum that *Aname* sp. were present and relatively abundant in the vicinity of the project area, and although this species was unable to be identified as only a female and a juvenile were caught, it was unlikely to be a short range endemic species.

5.2.7 Ecological Functional Value of the Project Area

Sections of the project area have been disturbed by previous mining activity (i.e. 8.5ha). The proposed mining operation (~36.1ha) is largely an expansion (i.e. 27.6ha additional clearing) of an existing pit and waste dumps (see Figure 2). Because some of this area has already been disturbed, the area of proposed impact has a low ecological functional value.

5.2.8 Maintenance of Threatened Ecological Communities

No threatened ecological communities were identified in the Battler project area or immediate surrounds.

5.3 Potential Impacts of the Proposed Development on the Vertebrate Fauna in the Battler Project Area

Clearing of vegetation will potentially affect vertebrate fauna in a number of ways, including:

- death/injury of fauna during clearing, grading and impacts with vehicles;
- loss of habitat;
- fragmentation of habitat;
- increase in feral fauna around the mining development; and
- disturbance of fauna in nearby areas from light, noise and dust.

Although some short term impacts on fauna are anticipated, the clearing of vegetation is considered unlikely to result in significant long term impacts on fauna habitat and fauna assemblages. The overall impact on fauna species and species of conservation significance will be minimal provided the recommended management procedures are effectively implemented.

5.3.1 Direct Impacts

Clearing vegetation and activities associated with the mining development will result in the loss of small fauna that retreat to burrows, such as reptiles and mammals. Nocturnal species are unlikely to be active when most of the land clearing and construction work is taking place which may result in these individuals being

adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact when considered in a bioregional context.

Clearing of vegetation can have an equally significant or greater impact due to 'edge effects'. Edge effects can lead to the disruption of ecological processes such as predation and dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will extend beyond the area cleared.

5.3.2 Secondary Impacts

Increased human activity is often associated with an altered fire regime, increased dust or fauna deaths on access tracks, which lead to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as a number of small mammal and bird species rely on long unburnt vegetation. Provided that fire management strategies are implemented, fires are unlikely to be a significant threat to native fauna species in the vicinity of the project area.

Introduced plant species can successfully and rapidly invade areas cleared of native vegetation or otherwise disturbed by humans. Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Major changes to the structure of vegetation will alter the fauna habitat and consequently may influence fauna species composition. Preparing and implementing a weed management plan will largely reduce their threat to native fauna species.

5.3.3 Anthropogenic Activity

Unnatural noise, vibration, artificial lighting, and vehicle and human movement in an area may be sufficient to force individuals or fauna species to move from adjacent areas, or alter their activity periods. This form of disturbance is likely to occur during the vegetation clearing and when mining activity commences. The overall impact is likely to be confined to a relatively small proportion of habitat represented elsewhere in the bioregion.

5.3.4 Construction and Upgrading of Access Roads

Construction and use of heavy vehicles and machinery will temporarily impact on the fauna in the area. The consequence will be that some fauna will be lost and others will shift into neighbouring areas. Migrants increase competition for resources, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

5.3.5 Rehabilitation of Cleared Areas

To minimise the long term potential impact, rehabilitation programs should be progressively implemented and evaluated. An emphasis should be placed on the establishment of near-natural, self-sustaining, functional ecosystems in rehabilitation planning, and this should be one of the focal criteria for assessing the success of rehabilitation programs.

There are numerous potential threats associated with vegetation clearing, mining activity and the development of infrastructure that could have a significant impact on the vertebrate fauna in the project area. These are discussed below.

5.3.6 Potential Impacts on Ecosystem Function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on site that are unable to move away during the clearing process. The few larger animals, such as kangaroos, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period of time until a balance is restored. Impacts associated with clearing vegetation in the

project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is small relative to the quantity of similar habitat in the bioregion.

5.3.7 Potential Impacts on Conservation Significant Species and Ecosystems

Clearing of native vegetation in the project area is unlikely to have a significant impact on conservation significant fauna. There is a possibility that Western Rosellas (*Platycercus icterotis xanthogenys*) and Peregrine Falcons (*Falco peregrinus*) may infrequently occur in the vicinity of the project area. It is more probable that the Rainbow Bee-eater (*Merops ornatus*) will be seen in the area during late spring and summer. These birds will move to adjacent areas once vegetation clearing commences. This might result in a period of instability in these assemblages until new territories are resolved for the sedentary species. There is a low possibility that Chuditch are in the remnant woodland, If present they would quickly move from the project area once vegetation clearing commenced and therefore unlikely to be significantly impacted by the proposed development.

5.3.8 Loss or Degradation of Fauna Habitat

The most significant environmental impact arising from the proposed mining activity will be the clearing of native vegetation and consequent loss and alteration of fauna habitat. Besides the initial mortality of fauna during the clearing process there will also be an ongoing indirect impact, largely consisting of the loss and degradation of foraging and shelter sites for fauna in neighbouring areas. Habitat degradation may also occur through factors associated with the exploration and mining processes (e.g. noise, vibration, dust, etc) or the increased level of human activity (e.g. feral animals, fires, etc.). These potential impacts are discussed in more detail below.

5.3.9 Mining Voids

Steep sided mining voids that are partially filled with water can attract and trap large animals such as kangaroos and emus. Physically limiting access to these areas, supplemented by effective strategies to deal with animal entrapment should such occur, would adequately obviate this risk.

5.3.10 Habitat Fragmentation

In addition to clearing for mining pits, waste dumps and supporting infrastructure, linear clearing for haul roads, power lines or conveyors often associated with mining developments have the potential to fragment habitat. This can result in the isolating of fauna in pockets of vegetation, making them more vulnerable to impacts of fire and local extinction because of low population numbers. This impact can be minimised by co-locating infrastructure, by utilising existing infrastructure corridors (e.g. old mining tracks), planning the clearing of vegetation to facilitate the movement of species out of the disturbance areas into suitable adjacent habitat and maintaining as much connectivity between undisturbed areas as possible.

5.3.11 Altered Fire Regimes

A change in fire regimes is often associated with increased human activity, leading to degradation of natural ecosystems. Generally, the impact of fire is more severe due to increased frequency of burning in disturbed areas as opposed to natural areas. The risk of fire may be higher around mine sites if not effectively managed. Given the sparseness of the vegetation in the project area, fire is unlikely to be an important potential impact.

5.3.12 Feral Fauna

An increase in human activity is often associated with an increase in the abundance of feral species such as the house mouse (*Mus musculus*) and feral cat (*Felis catus*). This increase may be due to a decline in habitat health, increased road kills and poor waste disposal practices.

The house mouse and cat were recorded in other fauna surveys in the general area. The cat is a particularly damaging predator on native fauna and any increase in their numbers could have a detrimental effect on local native fauna (Kinnear 1993, Bamford 1995); hence it is important to ensure that populations of the feral predators, such as cats are kept under control.

Minimising road kills, removing carcasses and good rubbish management practices around areas of exploration activity and the mine sites will assist in reducing these problems.

5.3.13 Dust

Dust generated from blasting, cleared areas, waste dumps and vehicle traffic can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on vegetation and therefore fauna in areas adjacent to the mine.

5.3.14 Uncapped Drill Holes

An ongoing potential risk to terrestrial fauna is the presence of uncapped drill holes within the project area. Small animals, particularly lizards and mammals, can become trapped in the drill holes and eventually die. Therefore drill holes that are open for periods of months or years can be particularly detrimental to small animal populations (Malnic 1997).

5.3.15 Noise, Lighting and Vibration

Noise, light spill and vibration associated with mining activity can impact on nearby resident fauna. The noise and vibrations associated with blasting and drilling may force some animals to move from the area. Continuous operations mean that much of the site will be lit at night. Artificial lighting can attract species that forage nocturnally on invertebrates that are attracted to the light and force other species to move away from the area. Both of these outcomes may alter the local fauna assemblages.

5.3.16 Road Fauna Deaths

Roads and tracks inevitably bisect home ranges for numerous individuals. An increase in road fauna deaths is likely to occur with increased vehicle traffic; in particular impacting on kangaroos and nocturnal birds. This can be minimised by limiting speeds and education of staff.

5.4 Risk Assessment

Fauna surveys to support ecological impact assessments (EcIAs) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity of a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Tables 8-10 summaries of the risk assessment associated with clearing additional native vegetation in the project area.

Results from this assessment indicate that the risks of significantly impacting on native fauna, fauna assemblages and fauna habitat are low when placed in a regional context, and if the recommended management strategies are implemented, the risks will be further reduced.

TABLE 8. FAUNA IMPACT RISK ASSESSMENT DESCRIPTORS

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 10.

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur or one or more conservation significant species could be present at sometime.
C	Moderate	The environmental event should occur or one or more conservation significant species should be present at sometime.
D	Likely	The environmental event will probably occur or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur or one or more conservation significant species is expected to be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as ‘vulnerable’ or ‘endangered’ under the <i>EPBC Act (1999)</i> at a regional scale.
Acceptability of Risk		
Level of risk	Management Action Required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. Will require a referral to the Commonwealth under the <i>EPBC Act 1999</i> .	
Extreme	Unacceptable, project should be redesigned or not proceed.	

TABLE 9. LEVELS OF ACCEPTABLE RISK

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequences	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

TABLE 10. A RISK ASSESSMENT OF THE IMPACT OF GROUND DISTURBANCE ACTIVITY ON FAUNA

		Before Management				With Management		
Factor	Potential Impact	Inherent Risk			Risk Controls / Management	Residual Risk		
		Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Inadequate fauna survey data.	Unknown loss of fauna, fauna of conservation significance, fauna assemblage(s) in the project area.	B	2	Low				
Inadequate knowledge of potential impacts.	Unknown or poorly assessed impact(s) on the fauna assemblage and conservation significant species.	B	2	Low				
Inadequate bioregional data for contextual purposes.	Incomplete analysis of data and appreciation of impacts on biodiversity values in a regional context.	B	2	Low				
Removal of habitat – site scale.	Almost complete loss of terrestrial fauna in cleared areas, severe impact on local fauna assemblage.	E	2	Moderate				
Significant reduction of habitats – local scale.	Loss of fauna and fauna habitat and impacts on the local fauna assemblage (excluding conservation significant species).	B	2	Low				
Significant reduction of habitats – landscape scale.	Loss of fauna and fauna habitat and impacts on fauna in a landscape context (excluding conservation significant species).	B	1	Low				
Significant reduction of habitats – regional scale.	Loss of fauna and fauna habitat and impacts on fauna in a bioregional context (excluding conservation significant species).	B	1	Low				
Impact on resident conservation significant terrestrial species.	Death of conservation significant species.	B	1	Low				
Impact on Malleefowl	Death of Malleefowl	A	3	Low				
Resident avian species.	Loss of conservation significant species.	B	3	Low				
Migratory avian species.	Loss of conservation significant species.	B	1	Low				
Habitat fragmentation.	Isolation of fauna assemblages.	C	2	Low	Avoid creation of isolated vegetation remnants by retaining movement corridors to adjacent vegetation areas.			

5.5 Native Vegetation Clearing Principles

The *Environmental Protection Act (1986)* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals. Native vegetation should not be cleared if any of the following principles are comprised.

TABLE 11. ASSESSMENT OF IMPACT USING THE NATIVE VEGETATION CLEARING PRINCIPLES

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not compromise a high level of biodiversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Clearing the vegetation will not result in the loss of significant habitat for indigenous fauna.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a significant remnant as the area is toward the eastern margin of the land cleared for cereal cropping.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The area does not contain a wetland.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of vegetation is unlikely to impact on the environmental values of the bioregion.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

5.6 A Summary of the Fauna Risk Assessment

Clearing of an additional approximately 27.6ha around an existing disturbance of 8.5ha is likely to have a low impact on the vertebrate fauna assemblage in the bioregion. It is unlikely that any threatened fauna will be significantly impacted by the proposed vegetation clearing.

5.7 Management Issues and Recommendations

The EPA objective for terrestrial fauna is to maintain its abundance, species diversity and geographic distribution of terrestrial fauna and protect specially protected (i.e. threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950*. If management procedures proposed below are adopted the potential impact on terrestrial fauna and the effect on the conservation status of specially protected and significant species will be minimised.

5.7.1 Induction and Awareness

All contractors and people involved in exploration, construction or operation of the mine should be made aware of IMD Goldmines' policy to protect fauna and minimise disturbance effects. Protection of fauna should be a publicly stated policy and incorporated into all staff induction programs.

Recommendation 1: An induction program that includes a component on managing fauna to be mandatory for employment on the Battler Project.

5.7.2 Minimising Habitat Fragmentation

Loss of vegetation and habitat may contribute to the decline in the number of fauna within and in the vicinity of project area. Where possible, access routes should be aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area to minimise the impact on the terrestrial fauna, which are often dependent upon specific habitat types. Clearing should be minimised consistent with operational requirements and remnant vegetation fragmentation should be avoided wherever practical. Once areas are no longer required then they should be rehabilitated.

Recommendation 2: All areas disturbed during exploration or construction of the mine are to be rehabilitated immediately after they are no longer required.

Recommendation 3: Where possible, access routes are to be aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area.

5.7.3 Minimising Secondary Impacts

Pets and feral animals have the potential to impact on vertebrate fauna in adjacent areas. Pets should not be permitted on site and feral animal numbers should be monitored and controlled. All rubbish likely to attract animals should be suitably contained and disposed of so as not to encourage the feeding of fauna around the site.

Recommendation 4: Pets are not to be permitted on site.

Recommendation 5: All waste and rubbish to be contained in bins and regularly removed from site or buried on-site.

Recommendation 6: Feeding of native fauna to be prohibited.

5.7.4 Uncapped Drill Holes

Uncapped drill holes can pose a serious threat to small animals, including ground dwelling reptiles, frogs and small mammals. A log of all on-site drill holes should be maintained detailing when they were capped, how and by whom. All drill holes should be temporarily capped on completion of drilling and permanently capped or closed as soon as possible after exploration activities have ceased.

Recommendation 7: A log of all on-site drill holes to be maintained detailing when they were capped, how and by whom.

5.7.5 Road Fauna Deaths

Increased activity will result in increased traffic and a consequential increase in the fauna deaths on tracks. Limiting vehicle speed on mine roads can reduce collisions with fauna, particularly larger animals such as kangaroos and emus. Dead animals on the road also have the propensity to attract raptors, goannas and even cattle, which are then likely to be killed.

Recommendation 8: Speed limits to be implemented and enforced on-site (travel speeds to be determined based on the quality and condition of the roads, to a maximum of 80km/h).

Recommendation 9: Signage to be erected to indicate the maximum travel speeds and the possible presence of wildlife crossing roads.

5.7.6 Dust

Dust generated from mining activity and in particular vehicles can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas will potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on fauna in areas adjacent to the mine.

Recommendation 10: The impact of dust on adjacent vegetation and fauna habitat to be managed and monitored against appropriate key performance indicators.

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**TERRESTRIAL
ECOSYSTEMS**

Drawn: G. Thompson

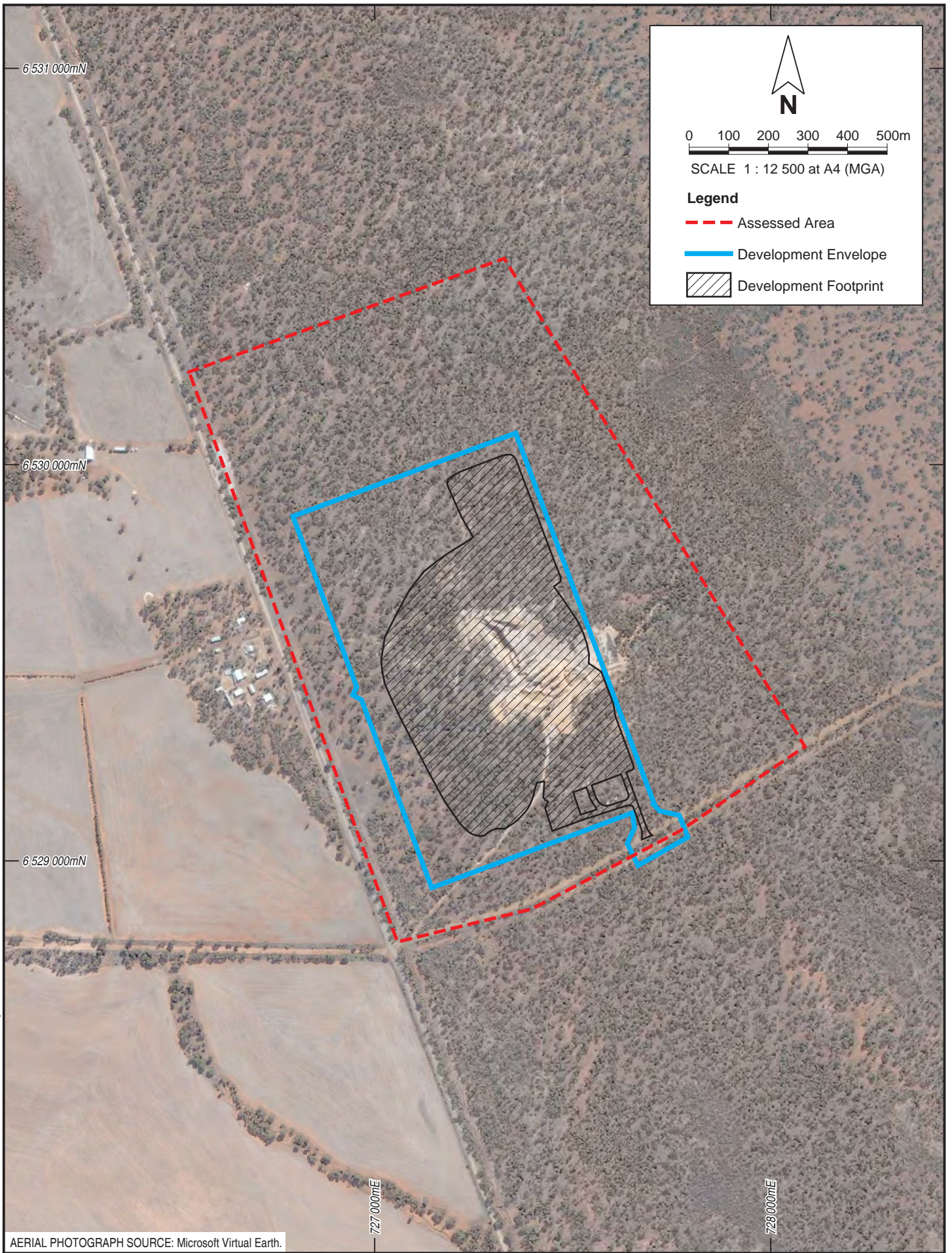
Date: 16 Mar 2016

Bioscope Environmental
FAUNA ASSESSMENT
BATTLER

REGIONAL LOCATION

Figure 1

Job: 2015-0052



Bioscope Environmental
FAUNA ASSESSMENT
BATTLER

SITE MAP

Drawn: G. Thompson

Date: 17 Apr 2016

Job: 2015-0052

Appendix A
Vertebrate Fauna Recorded in Biological
Surveys in the Region
Vertebrate Fauna Assessment – Battler Project

Appendix A(1). Vertebrate fauna recorded in biological surveys in the vicinity of the project area

		Survey	A	B				C																				
Family	Genus	Common Name	Unknown	Unknown	Yellowline	Bob Bullen	Site 12	Site 10	Site 2	Site 5	Site 3	Site 11	Site 14	Site 7	Site 13	Site 9	Site 1	Site 4	Site 6	Site 8	Nevoria	Edwards	Cornishman	Transvaal	Burbidge			
Amphibians																												
Limnodynastidae	Heleioporus albopunctatus	Western Spotted Frog	11	3	8																							
	Neobatrachus albipes	White-footed Frog	2	2			4	1	2	1	1	2																
	Neobatrachus kunapalari	Kunapalari Frog	21	13	8																							
	Neobatrachus pelobatoides	Humming Frog	2		2																							
	Neobatrachus sp.						24	7					11	5	1	9	15											
Myobatrachidae	Pseudophryne guentheri	Gunther's Toadlet	17	4	13																							
	Pseudophryne occidentalis	Orange-crowned Toadlet	23	15	8		1							1		2												
Reptiles																												
Agamidae	Ctenophorus cristatus	Crested Dragon	21	20			1	1	1	1	2			1			2											
	Ctenophorus isolepis		1	1																								
	Ctenophorus maculatus	Spotted Dragon	11	11																								
	Ctenophorus ornatus	Ornate Crevice Dragon	28	24	4																							
	Ctenophorus reticulatus	Western Netted Dragon	8	8																								
	Ctenophorus salinarum	Saltpan Dragon	6	6			1																					
	Ctenophorus scutulatus	Lozenge-marked Dragon	14	14																								
	Moloch horridus	Thorny Devil	8	6								1																
	Pogona minor	Dwarf Bearded Dragon	12	11									1		3			1										
	Tympanocryptis cephalus	Pebble Dragon		2																								
Boidae	Aspidites ramsayi	Woma	6																									
	Morelia spilota imbricata	Carpet Python	2																									
Carphodactylidae	Nephruroides stellatus	Stellate Knob-tail	2	2																								
	Underwoodisaurus milii	Barking Gecko	25	16	5											3												
Diplodactylidae	Amalosia reticulata	Reticulated Velvet Gecko	13	13													1		1									
	Crenadactylus ocellatus	Clawless Gecko	21	15	6				1	1				1				2										
	Diplodactylus granariensis	Wheat-belt Stone Gecko	4	4					1	6	2						3			1								
	Diplodactylus pulcher	Fine-faced Gecko	2	2						3	4			1	2	1	1											
	Lucasium maini	Main's Ground Gecko	13	13										1					2									
	Strophurus assimilis	Goldfields Spiny-tailed Gecko	4	4																								
Elapidae	Brachyuropsis semifasciata	Half-girdlerd Snake	3	2	1		1						1															
	Parasuta gouldii	Gould's Snake	4	4						1																		
	Pseudechis australis	Mulga Snake	4	4																								
	Pseudonaja affinis	Dugite	2	2										1		1				2								
	Pseudonaja mengdeni	Gwardar	12	12												1												
	Pseudonaja modesta	Ringed Brown Snake	7	6	1																							
	Simoselaps bertholdi	Jan's Banded Snake	2	2					1						1			1	1	3								

		Survey	A	B				C																			
Family	Genus	Common Name	Unknown	Unknown	Yellowline	Bob Bullen	Site 12	Site 10	Site 2	Site 5	Site 3	Site 11	Site 14	Site 7	Site 13	Site 9	Site 1	Site 4	Site 6	Site 8	Nevoria	Edwards	Cornishman	Transvaal	Bur-bidge		
	<i>Suta fasciata</i>	Rosen's Snake	5	4	1																						
Gekkonidae	<i>Gehyra variegata</i>	Tree Dtella	53	45	6		1		3	3	2		1		1		3		1	1							
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	37	23	12																						
Pygopodidae	<i>Delma australis</i>	Marble-faced Delma	1	1																							
	<i>Delma butleri</i>	Unbanded Delma	1	1																							
	<i>Delma fraseri</i>	Fraser's Delma	3	2					1				1		1	1	1										
	<i>Lialis burtonis</i>	Burton's Snake-lizard	1	1																							
	<i>Pygopus lepidopodus</i>	Common Scaly-foot	4	2	2		1						1														
Scincidae	<i>Cryptoblepharus buechananii</i>	Buchanan's Snake-eyed Skink	4	3	1									2				2		2							
	<i>Ctenotus atlas</i>	Southern Mallee Ctenotus	1		1																						
	<i>Ctenotus impar</i>	Odd-striped Ctenotus	1	1																							
	<i>Ctenotus mimetes</i>	Checker-sided Ctenotus	2	2																							
	<i>Ctenotus pantherinus</i>	Leopard Skink	4	4																							
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus	8	8																							
	<i>Ctenotus uber</i>	Spotted Ctenotus	7	7					1																		
	<i>Ctenotus xenopleura</i>	Wide-striped Ctenotus	3	3																							
	<i>Cyclodomorphus melanops</i>	Spinifex Slender Bluetongue	5	5																							
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink	1																								
	<i>Egernia multiscutata</i>	Southern Sand-skink	3	3								1				4											
	<i>Egernia richardi</i>	Bright Crevice-skink	28	27																							
	<i>Hemiergis initialis</i>	South-western Earless Skink	9	9				1	1				1		1		1	1									
	<i>Lerista gerrardii</i>	Bold-striped Slider	6	5	1				2		1							1		4							
	<i>Lerista kingi</i>	King's Slider		5																							
	<i>Lerista muelleri</i>	Wood Mulch-slider	5				2	1	3	3	1	1	3	9	2		1	7	6	1							
	<i>Liopholis inornata</i>	Desert Skink	3	2	1																						
	<i>Menetia greyii</i>	Common Dwarf Skink	4	3	1		1	4			1	1		1													
	<i>Morethia butleri</i>	Woodland Morethia Skink	3	3				3		2				3			2	3	1	2							
	<i>Morethia obscura</i>	Shrubland Morethia Skink	3	3																							
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	3	3					1			1			2												
	<i>Tiliqua rugosa</i>	Bobtail	3	2						1		2	1		3			1									
Typhlopidae	<i>Anilios australis</i>	Austral Blind Snake	1	2					1		1			1		2											
	<i>Anilios bicolor</i>	Dark-spined Blind Snake															1										
	<i>Anilios bituberculatus</i>	Prong-snouted Blind Snake	2	2																							
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna	3	3																							
	<i>Varanus tristis</i>	Black-headed Monitor	1	1				1										1									
Birds																											
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu																			1						

		Survey	A	B				C																					
Family	Genus	Common Name	Unknown	Unknown	Yellowline	Bob Bullen	Site 12	Site 10	Site 2	Site 5	Site 3	Site 11	Site 14	Site 7	Site 13	Site 9	Site 1	Site 4	Site 6	Site 8	Nevoria	Edwards	Cornishman	Transvaal	Bur-bidge				
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing																					1	1					
	<i>Ocyphaps lophotes</i>	Crested Pigeon																					1	1	1				
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night Heron		1																									
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite		1	1																								
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard		1	1																								
	<i>Haliastur sphenurus</i>	Whistling Kite			1																								
	<i>Accipiter fasciatus</i>	Brown Goshawk		1																				1	1				
	<i>Aquila audax</i>	Wedge-tailed Eagle																				1							
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel																					1		1				
	<i>Falco peregrinus</i>	Peregrine Falcon																						1					
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah																					1	1	1				
Psittacidae	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet																						1	1	1			
	<i>Barnardius zonarius</i>	Australian Ringneck		2																			1		1				
	<i>Neophema elegans</i>	Elegant Parrot																						1					
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo																						1					
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo																								1			
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater																				1							
Climacteridae	<i>Climacteris rufa</i>	Rufous Treecreeper		2																				1	1				
Maluridae	<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren		1																		1		1					
Acanthizidae	<i>Hylacola cauta</i>	Shy Heathwren		2																									
	<i>Pyrrholaemus brunneus</i>	Redthroat		1																		1							
	<i>Smicromis brevirostris</i>	Weebill																				1	1	1	1	1			
	<i>Gerygone fusca</i>	Western Gerygone																						1	1				
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill																					1		1				
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill		1																						1			
	<i>Acanthiza apicalis</i>	Inland Thornbill																				1		1		1			
	<i>Aphelocephala leucopsis</i>	Southern Whiteface		1																									
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote		1																		1	1	1	1	1			
Meliphagidae	<i>Lichenostomus leucotis</i>	White-eared Honeyeater																				1	1	1	1	1			
	<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater		2																				1	1	1			
	<i>Manorina flavigula</i>	Yellow-throated Miner																					1	1	1				
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater																							1	1			
	<i>Anthochaera carunculata</i>	Red Wattlebird																					1	1	1	1			
	<i>Epthianura albifrons</i>	White-fronted Chat																					1						
	<i>Lichmera indistincta</i>	Brown Honeyeater																					1	1		1			
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater																					1	1	1				
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler		3																			1		1				

		Survey	A	B				C																					
Family	Genus	Common Name	Unknown	Unknown	Yellowline	Bob Bullen	Site 12	Site 10	Site 2	Site 5	Site 3	Site 11	Site 14	Site 7	Site 13	Site 9	Site 1	Site 4	Site 6	Site 8	Nevoria	Edwards	Cornishman	Transvaal	Bur-bidge				
Psophodidae	<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush		5																									
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella																							1				
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike																							1				
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		1																			1	1	1				
	<i>Lalage sueurii</i>	White-winged Triller																						1					
Pachycephalidae	<i>Pachycephala inornata</i>	Gilbert's Whistler		2																									
	<i>Pachycephala pectoralis</i>	Golden Whistler		1																									
	<i>Pachycephala rufiventris</i>	Rufous Whistler																											
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush		1																		1		1	1	1			
	<i>Oreoica gutturalis</i>	Crested Bellbird																					1	1	1				
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow																				1							
	<i>Artamus cyanopterus</i>	Dusky Woodswallow																						1	1				
	<i>Cracticus torquatus</i>	Grey Butcherbird																						1	1				
	<i>Cracticus nigrogularis</i>	Pied Butcherbird																					1		1				
	<i>Cracticus tibicen</i>	Australian Magpie																					1		1				
	<i>Strepera versicolor</i>	Grey Currawong																				1		1					
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail																				1	1						
Corvidae	<i>Corvus coronoides</i>	Australian Raven																					1	1	1				
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark																					1		1				
Petroicidae	<i>Microeca fascians</i>	Jacky Winter		1																				1	1				
	<i>Petroica goodenovii</i>	Red-capped Robin																				1			1				
	<i>Eopsaltria australis</i>	Eastern Yellow Robin		3																									
	<i>Drymodes brunneopygia</i>	Southern Scrub-robin																				1							
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow																				1							
	<i>Hirundo nigricans</i>	Tree Martin																					1	1	1	1			
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit																							1				
Mammals																													
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat	10	1																				1	1				
	<i>Ozimops planiceps</i>	Southern Free-tail Bat	4			1																							
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	18	1																				1	1				
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	1																					1	1				
	<i>Mormopterus sp.</i>	Free-tail Bat Sp.																						1	1				
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	2																										
	<i>Nyctophilus major</i>	Greater Long-eared Bat	1																										
	<i>Nyctophilus sp.</i>	Long-eared Bat Sp.																						1	1				
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat																						1	1				
	<i>Vespadelus regulus</i>	Southern Forest Bat	12	1																				1	1				

		Survey	A	B				C																			
Family	Genus	Common Name	Unknown	Unknown	Yellowdine	Bob Bullen	Site 12	Site 10	Site 2	Site 5	Site 3	Site 11	Site 14	Site 7	Site 13	Site 9	Site 1	Site 4	Site 6	Site 8	Nevoria	Edwards	Cornishman	Transvaal	Burbidge		
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr	2																								
	<i>Dasyurus geoffroii</i>	Chuditch	1																								
	<i>Ningau yvonneae</i>	Mallee Ningau	2																								
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart													1												
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart	6																								
	<i>Sminthopsis gilberti</i>	Gilbert's Dunnart	1																								
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart	3	1																							
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat	1																								
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum		2				1	3																		
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo	1	1																							
	<i>Osphranter robustus</i>	Euro	1	1																							
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby	1																								
Muridae	<i>Mus musculus</i>	House Mouse	2	1						1																	
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse	3				3			2		19	2			4											
	<i>Pseudomys bolami</i>	Bolam's Mouse	2	1																							
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	1																								

- A Western Australian Museum collection
B NatureMap
C Atlas of Living Australia
D St Barbara Southern Cross Western Wildlife 2008

Appendix A(2). Vertebrate fauna recorded in biological surveys in the vicinity of the project area

[illegible]

			A																			B	C
Family	Genus	Common Name	Site 7W03	Site 7W02	Site 7W	Site 7W01	Site 7W05	Site 7W04	Site 7W06	West 1.9km 7W03	West 2.9km 7W03	West 4.0km 7W03	West 2.9km 7W04	West 4.0km 7W04	West 1.9km 7W04	West 2.9km 7W05	West 2.9km 7W06	West 1.9km 7W05	West 4.0km 7W05	West 2.9km 7W07	Unknown	Nevoria	
	<i>Eolophus roseicapillus</i>	Galah																				1	
Psittacidae	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet				25	12															1	
	<i>Polytelis anthopeplus</i>	Regent Parrot	3																			1	
	<i>Platycercus icterotis</i>	Western Rosella				1	1																
	<i>Barnardius zonarius</i>	Australian Ringneck		3		3	5														1	1	
	<i>Neophema elegans</i>	Elegant Parrot																				1	
Cuculidae	<i>Chalcites basal</i>	Horsfield's Bronze-cuckoo		1																		1	
	<i>Chalcites osculans</i>	Black-eared Cuckoo		2																		1	
	<i>Cacomantis pallidus</i>	Pallid Cuckoo				1																	
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo																				1	
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook			1																		
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher				1																	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		7		1	2															1	
Climacteridae	<i>Climacteris rufa</i>	Rufous Treecreeper				18																1	
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren																					
	<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren	14	1		2	2															1	
Acanthizidae	<i>Hylacola cauta</i>	Shy Heathwren																			4		
	<i>Pyrrholaemus brunneus</i>	Redthroat		8		1		1													2	1	
	<i>Smicromis brevirostris</i>	Weebill	26	87		54	52	8														1	
	<i>Gerygone fusca</i>	Western Gerygone																				1	
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	1	94		13	5															5	
	<i>Acanthiza apicalis</i>	Inland Thornbill	22	14		2	16	18														1	
	<i>Aphelocephala leucopsis</i>	Southern Whiteface			1																		
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote																				1	
	<i>Pardalotus striatus</i>	Striated Pardalote		20		19	19															1	
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater			1																		
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater	4	3		2	5	1													4	1	
	<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater		3		55															4	1	
	<i>Purnella albifrons</i>	White-fronted Honeyeater	27	5		18	5	10															
	<i>Manorina flavigula</i>	Yellow-throated Miner																				1	
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		4		9	4															1	
	<i>Anthochaera carunculata</i>	Red Wattlebird		3		4	2														1	1	
	<i>Epthianura tricolor</i>	Crimson Chat			1																		
	<i>Epthianura albifrons</i>	White-fronted Chat			1																		

			A																	B	C	
Family	Genus	Common Name	Site 7W03	Site 7W02	Site 7W	Site 7W01	Site 7W05	Site 7W04	Site 7W06	West 1.9km 7W03	West 2.9km 7W03	West 4.0km 7W03	West 2.9km 7W04	West 4.0km 7W04	West 1.9km 7W04	West 2.9km 7W05	West 2.9km 7W06	West 1.9km 7W05	West 4.0km 7W05	West 2.9km 7W07	Unknown	Nevoria
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	1																			1
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit			1																	1
Mammals																						
Canidae	<i>Vulpes vulpes</i>	Red Fox																				1
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat	1			2	6	2	1	1	1	1										
	<i>Ozimops planiceps</i>	Southern Free-tail Bat					5															
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	4				10		1				1	1	1							
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat														1						
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	1				1										1					
	<i>Nyctophilus major</i>	Greater Long-eared Bat			1																	
	<i>Vespadelus regulus</i>	Southern Forest Bat	1	1			5											1	1	1		
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr	2						1													
	<i>Ningaui yvonneae</i>	Mallee Ningau							2													
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart	1	1		2	3	2	2												1	
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart	2						6													
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum				1															7	
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo	1																			1
	<i>Osphranter robustus</i>	Euro																				1
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit		1		1	1															1
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		1		1	1															1
Muridae	<i>Mus musculus</i>	House Mouse						1													11	
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse	1					1	2												1	
	<i>Pseudomys bolami</i>	Bolam's Mouse				2																
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse		1																		

- A Boorabbin - Southern Cross WAM (1995)
B Nature Map
C St Barbara Nevoria Western Wildlife (2007)

Appendix A(3). Vertebrate fauna recorded in biological surveys in the vicinity of the project area

[illegible]

[illegible]

		Survey	A														B	C	D
Family	Genus	Common Name	Site 8	Site 9	Site 11	Site 12	Site 10c	Site 4	Site 5	Site 6	Site 10b	Site 10a	Site 1	Site 3	Site 2	Site 7	Unknown	Yellowline	Unknown
	<i>Lichmera indistincta</i>	Brown Honeyeater		4	7	3	4				1	5			1		X	1	
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater															X		
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater		3	1							1	1		1		X	1	
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler						2				2	12	1			X		
Psophodidae	<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush															X		
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella													2	2	X	1	
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	3			1	1	1						3			X		
	<i>Lalage sueurii</i>	White-winged Triller															X		
Pachycephalidae	<i>Pachycephala inornata</i>	Gilbert's Whistler															X		
	<i>Pachycephala pectoralis</i>	Golden Whistler			2							1					X		
	<i>Pachycephala rufiventris</i>	Rufous Whistler							1					1	2	1	X		
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	2	1	2	1		3	1		1	1	2		2	3	X	1	
	<i>Oreoica gutturalis</i>	Crested Bellbird														2	X		
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow															X		
	<i>Artamus cyanopterus</i>	Dusky Woodswallow															X		
	<i>Cracticus torquatus</i>	Grey Butcherbird															X	1	
	<i>Cracticus nigrogularis</i>	Pied Butcherbird							1					1	1	1	X	1	
	<i>Cracticus tibicen</i>	Australian Magpie															X	1	
	<i>Strepera versicolor</i>	Grey Currawong	3	2		3	3	3	4	6		1	4	5	6	3	X	1	
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail								1							X	1	
	<i>Rhipidura leucophrys</i>	Willie Wagtail															X	1	
Corvidae	<i>Corvus coronoides</i>	Australian Raven	5					3	1	2			2	1		7	X	1	
	<i>Corvus bennetti</i>	Little Crow															X		
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark															X	1	
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter															X		
	<i>Petroica boodang</i>	Scarlet Robin															X		
	<i>Petroica goodenovii</i>	Red-capped Robin		1		2	2		1					2			X		
	<i>Eopsaltria griseogularis</i>	Western Yellow Robin							1							1	X		
	<i>Drymodes brunneopygia</i>	Southern Scrub-robin			1			2									X		
Timaliidae	<i>Zosterops lateralis</i>	Mauritius Olive White-eye															X		
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow															X		
	<i>Hirundo neoxena</i>	Welcome Swallow															X	1	
	<i>Hirundo nigricans</i>	Tree Martin															X		
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch															X		
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit															X	1	
Mammals																			
Canidae	<i>Canis lupus</i>	Dingo															X		
Felidae	<i>Felis catus</i>	House Cat														1			

		Survey	A															B	C	D
Family	Genus	Common Name	Site 8	Site 9	Site 11	Site 12	Site 10c	Site 4	Site 5	Site 6	Site 10b	Site 10a	Site 1	Site 3	Site 2	Site 7	Unknown	Yellowline	Unknown	
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat	1	1	1	1	1	1	1	1	1	1	1	1	1	1			9	
	<i>Ozimops planiceps</i>	Southern Free-tail Bat															X		4	
	<i>Taphozous australis</i>	Coastal Sheath-tail Bat															X			
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	1	1	1	1	1		1	1	1	1	1		1	1	X		17	
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X		1	
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat															X		2	
	<i>Nyctophilus major</i>	Greater Long-eared Bat																	1	
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat														1				
	<i>Vespadelus regulus</i>	Southern Forest Bat															X		11	
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr															X		2	
	<i>Dasyurus geoffroyi</i>	Chuditch															X			
	<i>Ningaui yvonneae</i>	Mallee Ningau															X		2	
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart				1		2	1	1			1			2	X		6	
	<i>Sminthopsis gilberti</i>	Gilbert's Dunnart															X		1	
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart															X		2	
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat															X			
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum		1	3	3						1	1				X		1	
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo															X			
	<i>Osphranter robustus</i>	Euro															X			
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby															X			
Muridae	<i>Mus musculus</i>	House Mouse	1		4	3	1				3	2				2	X		1	
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse						4			1	2	1	1			X		3	
	<i>Pseudomys bolami</i>	Bolam's Mouse															X		1	
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse															X			

A Cazaly Parker Range KLA 2010
 B Atlas of Living Australia
 C South-west arid birds Bell et al 2007
 D Nature Map

Appendix B
Results of the *EPBC Act* Protected
Matters Search
Vertebrate Fauna Assessment – Battler Project



EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 22/02/16 15:07:42

[Summary](#)

[Details](#)

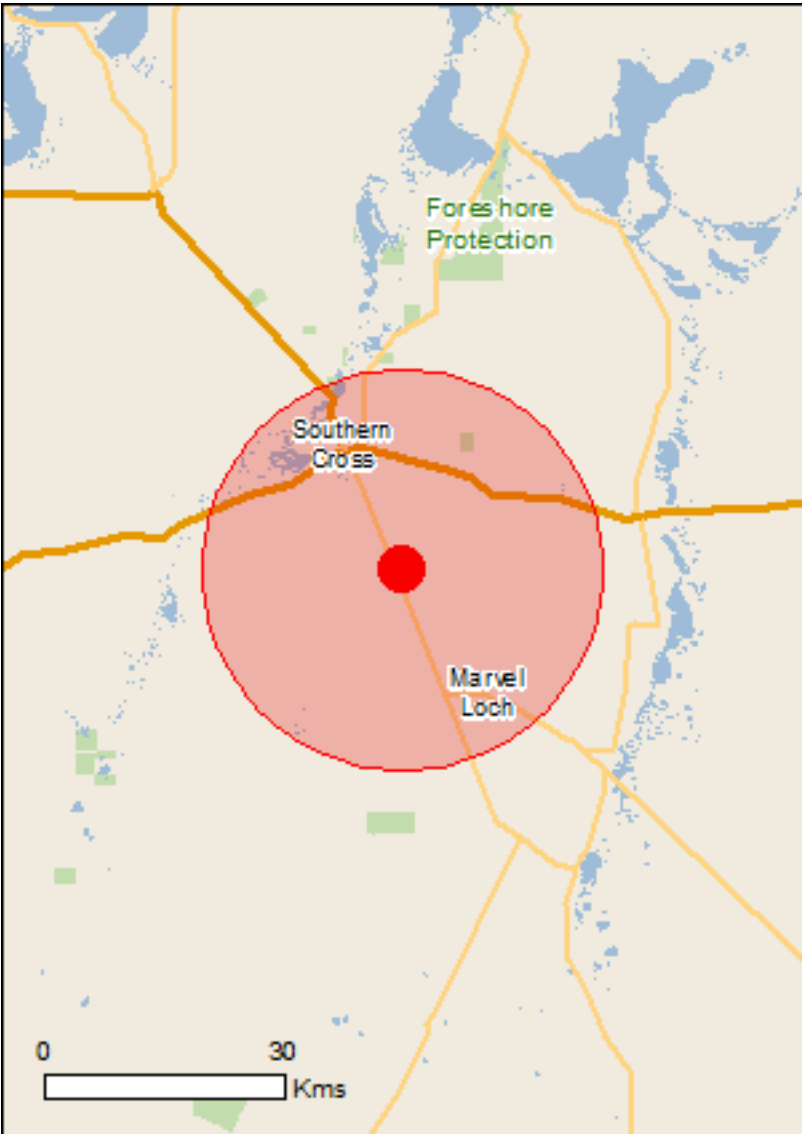
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 25.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	12
Listed Migratory Species:	5

Other Matters Protected by the EPBC Act

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

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

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	6
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Historic		
Goldfields Water Supply Scheme, Western Australia	WA	Listed place

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

Name	Status	Type of Presence
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area

Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area

Plants		
Acacia lobulata Chiddarcooping Wattle [55567]	Endangered	Species or species habitat likely to occur within area
Dasymalla axillaris Native Foxglove [38829]	Critically Endangered	Species or species habitat may occur within area
Eremophila resinosa Resinous Eremophila [11735]	Endangered	Species or species habitat likely to occur within area
Eremophila virens Campion Eremophila, Green-flowered Emu bush [21433]	Endangered	Species or species habitat may occur within area
Eremophila viscida Varnish Bush [2394]	Endangered	Species or species habitat likely to occur within area
Isopogon robustus Robust Coneflower [82646]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Ricinocarpos brevis [82879]	Endangered	Species or species habitat may occur within area
Roycea pycnophylloides Saltmat [21161]	Endangered	Species or species habitat may occur within area
Symonanthus bancroftii Bancrofts Symonanthus [12837]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land	[Resource Information]
The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.	

Name
Commonwealth Land -

Listed Marine Species	[<u>Resource Information</u>]	
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within

Name	Threatened	Type of Presence
Motacilla cinerea Grey Wagtail [642]		area Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Frog Rock	WA
Unnamed WA25801	WA
Wockallarry	WA

Invasive Species	[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.	

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.3467 119.39142

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Parks and Wildlife Commission NT, Northern Territory Government](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.