

Gidgee Gold Project:

Level 1 Vertebrate Fauna Survey November 2011 & March 2013



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June 2013

Executive Summary

Introduction

Panoramic Resources Limited is proposing to extend mining operations at their Gidgee Gold Project in the Shires of Meekatharra and Sandstone. Panoramic Resources Limited commissioned Western Wildlife to carry out a Level 1 vertebrate fauna survey of five study areas: O'Kearys, Swan Bitter, Howards, Wilsons and the proposed Manakado – Howards haul road. The fauna survey involved a field study to inventory the fauna habitats present in the study area and make opportunistic observations of fauna. To supplement the information gathered during the survey, a review of relevant fauna literature for the area was also carried out.

The aim of the Level 1 vertebrate fauna survey and literature review was to:

- Identify the fauna habitats present in the study area.
- List the vertebrate fauna that were recorded in the study area and/or have the potential to occur in the study area.
- Identify species of conservation significance, or habitats of particular importance for fauna, that may occur in the study area.

This report details the findings of the fauna surveys conducted in November 2011 and March 2013.

Methods

The Level 1 fauna survey was undertaken in accordance with Environmental Protection Authority (EPA) Position Statement No.3 (EPA 2002) and EPA Guidance Statement 56 (EPA 2004). The field survey was carried out by two zoologists on 14 – 18 November 2011 and 12 – 15 March 2013. The field study included:

- Identification of fauna habitats.
- Opportunistic records of fauna.
- Deployment of two motion-sensitive cameras in 2011.
- Targeted search for evidence of conservation significant mulgara species (*Dasyercus spp.*).

Species of conservation significance were classified as Conservation Significance 1 if listed under *The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *The Western Australian Wildlife Conservation Act 1950* (WC Act), Conservation Significance 2 if listed as a Priority species by the Department of Environment and Conservation, or Conservation Significance 3 if a locally significant species.

Results and Discussion

Five study areas at the Gidgee Gold Project were surveyed, O'Kearys, Swan Bitter, Howards, Wilsons and the proposed Manakado - Howards haul road. Across the five study areas eight fauna habitats were identified. The habitats were:

- Spinifex plains
- Mulga woodland on plains
- Mulga woodland on low rocky hills
- Acacia shrublands on low rocky hills
- Chenopod shrubland
- Sparse shrubland
- Minor creeks
- Cleared or highly disturbed areas

The five study areas have the potential to support up to nine frog, 75 reptile, 126 bird, 33 mammal and one freshwater fish species. During the site visits, one frog, seven reptiles, 67 birds and five mammals were recorded opportunistically.

A total of 14 fauna species of conservation significance have the potential to occur in the study area, consisting of eleven bird and three mammal species.

The nine species of Conservation Significance 1 that may occur are the:

- Malleefowl (*Leipoa ocellata*) – EPBC Act (Vulnerable), WC Act (Schedule 1)
- Eastern Great Egret (*Ardea modesta*) – EPBC Act (Migratory)
- Peregrine Falcon (*Falco peregrinus*) – WC Act (Schedule 4)
- Common Sandpiper (*Tringa hypoleucos*) EPBC Act (Migratory)
- Oriental Plover (*Charadrius veredus*) – EPBC Act (Migratory), WC Act (Schedule 3)
- Fork-tailed Swift (*Apus pacificus*) – EPBC Act (Migratory), WC Act (Schedule 3)
- Rainbow Bee-eater (*Merops ornatus*) – EPBC Act (Migratory), WC Act (Schedule 3)
- Slender-billed Thornbill (*Acanthiza iredalei iredalei*) – EPBC Act (Vulnerable)
- Crest-tailed Mulgara (*Dasyercus cristicauda*) – EPBC Act (Vulnerable), WC Act (Schedule 1)

Of these, the Peregrine Falcon was recorded in the study area during the 2011 site visit, the Rainbow Bee-eater is likely to occur throughout the study area and the Crest-tailed Mulgara may occur on the Spinifex plains at O'Kearys.

The five species of Conservation Significance 2 that may occur are the:

- Australian Bustard (*Ardeotis australis*) – Priority 4
- Bush Stone-Curlew (*Burhinus grallarius*) – Priority 4
- Striated Grasswren (*Amytornis striatus striatus*) – Priority 4
- Brush-tailed Mulgara (*Dasyercus blythi*) – Priority 4
- Long-tailed Dunnart (*Sminthopsis longicaudata*) – Priority 4

The Australian Bustard and Bush Stone-Curlew are very likely to be present in areas of Spinifex, shrubland or woodland on plains. The Long-tailed Dunnart may occur in rocky parts of O'Kearys or Wilsons, but the study site lacks the scree slopes and breakaways that are the favoured habitat of this species. The Striated Grasswren and Brush-tailed Mulgara may occur in areas of Spinifex plain at O'Kearys.

There are no locally significant (Conservation Significance 3) species likely to be present.

Extension of mining activities in the study areas is likely to result in the loss of some native vegetation (and therefore fauna habitats) from the study area. However, as the exact extent of the clearing is unknown at this stage, this report does not contain any assessment of potential impacts on vertebrate fauna.

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1. Introduction

Panoramic Resources Limited is proposing to extend mining operations at their Gidgee Gold Project in the Shires of Meekatharra and Sandstone. Panoramic Resources Limited commissioned Western Wildlife to carry out a Level 1 vertebrate fauna survey of five study areas: O'Kearys, Swan Bitter, Howards, Wilsons and the proposed Manakado – Howards haul road. O'Kearys, Swan Bitter and Wilsons have inactive open pits and infrastructure such as roads and camp. The fauna survey involved a field study to inventory the fauna habitats present in the study area and make opportunistic observations of fauna. To supplement the information gathered during the survey, a review of relevant fauna literature for the area was also carried out.

The aims of the Level 1 vertebrate fauna survey and literature review were to:

- Identify the fauna habitats present in the study area.
- List the vertebrate fauna that were recorded in the study area and/or have the potential to occur in the study area.
- Identify species of conservation significance, or habitats of particular importance for fauna, that may occur in the study area.

This report details the findings of the fauna surveys conducted in November 2011 (Swan Bitter, Howards and O'Kearys) and March 2013 (Wilsons and proposed Manakado – Howards haul road).

2. The Study Area – Context and Description

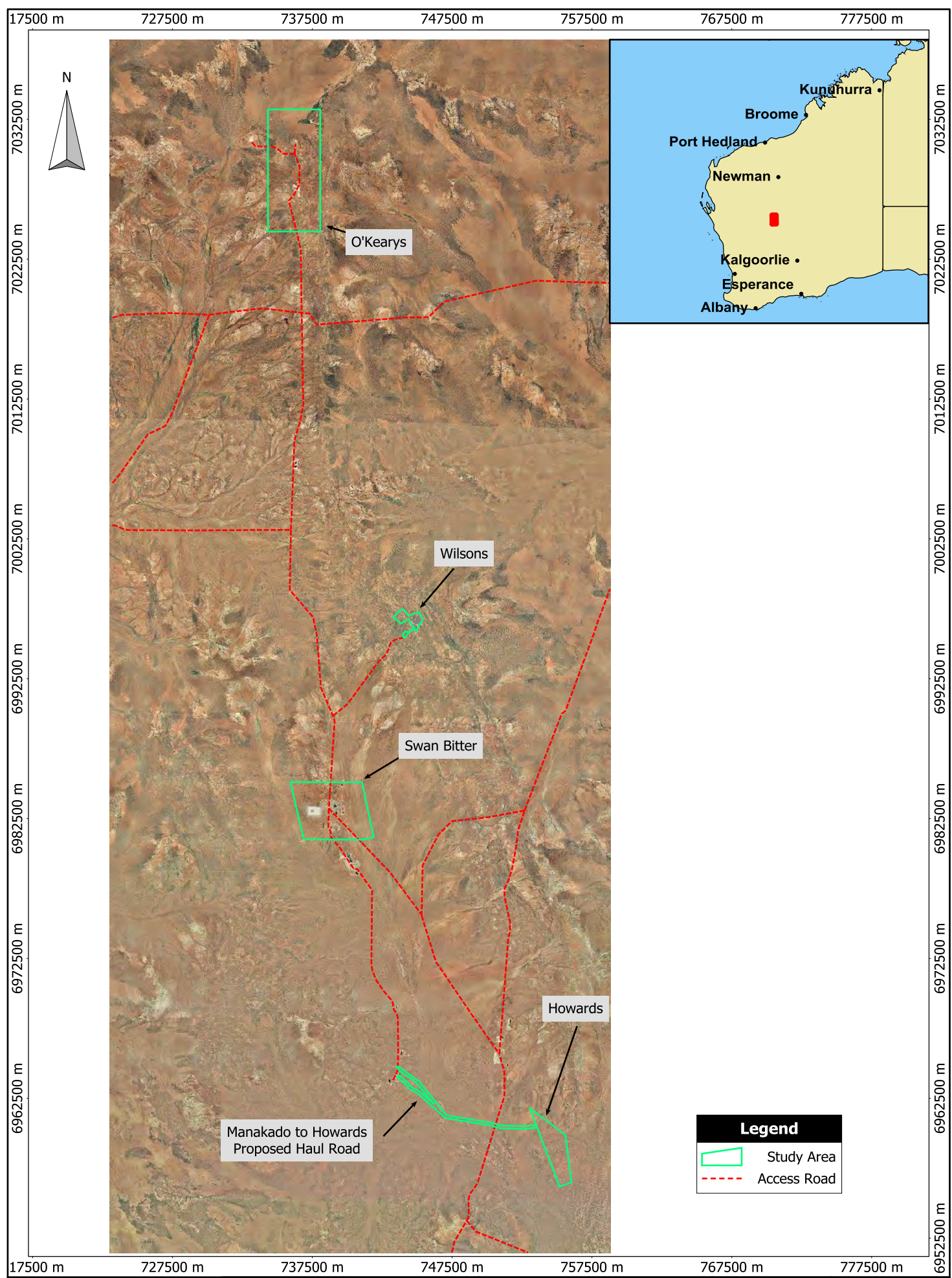
The study areas are located in the Shires of Meekatharra and Sandstone in the Murchison region of Western Australia (Figure 1). The study areas are about 88km southwest of Wiluna, 91km southeast of Meekatharra and 62km north of Sandstone.

The area of each study area is as follows:

- O'Kearys – 3,278ha
- Swan Bitter – 2,093ha
- Howards – 672ha
- Wilsons – 165ha
- Manakado – Howards haul road – 328ha

The study areas all have some evidence of mining activities. Swan Bitter, O'Kearys and Wilsons have open pits and access roads. The camp, workshop and processing facilities are within the Swan Bitter study area. Drilling and old drilling access tracks are present in all study areas.

The study areas fall within the Interim Biogeographic Regionalisation of Australia ('IBRA') Bioregion Murchison 1 – East Murchison Subregion (DEWHA 2004, Cowan 2001). The Murchison Bioregion is characterised by an arid climate, primarily with a winter rainfall of about 200mm. The primary land-use is grazing on native pastures (over 85%), with smaller areas of unallocated Crown land, Crown reserves, mining and conservation (Cowan 2001). The East Murchison Subregion is large at 7,847,996ha and is characterised by red sandplains, broad plains of red-brown soils, breakaways and saltlake systems (Cowan 2001). The vegetation in the region is dominated by Mulga woodlands, hummock grasslands, saltbush shrublands and Halosarcia shrublands (Cowan 2001).



Legend

- Study Area
- Access Road



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Scale: 1:350000
Original Size: A4
Air Photo Date: 2009
Grid: MGA94(50)

0 10 km

Panoramic Gold Pty Ltd
Gidgee Gold Project

Gidgee Gold Project
Study Areas

Figure 1

3. Methods

The survey was conducted as a Level 1 fauna survey in accordance with the Environmental Protection Authority (EPA) Position Statement No.3 (EPA 2002), Guidance Statement 56 (EPA 2004) and relevant Commonwealth Government guidelines. The Level 1 fauna survey included a search of available literature and databases (a 'desktop' study), and a field survey of the study area for four days in November 2011 (covering Swan Bitter, Howards and O'Kearys) and two days in March 2013 (Wilsons and the proposed Manakado – Howards haul road). The field survey served to put the desktop study into context, as well as allowing for the identification of fauna habitats and likely fauna assemblages of the study area.

3.1 Personnel

The personnel involved in the fauna survey, their qualifications and company affiliation, were as follows:

- **Supervising Zoologist:** Ms Jenny Wilcox - *BSc.Biol./Env.Sci., Hons.Biol.* - Western Wildlife
- **Field Zoologist:** Mr Richard King - *BSc.Env.Biol.* - Western Wildlife

The report was prepared by Ms Jenny Wilcox and reviewed by MBS Environmental.

3.2 Taxonomy and Nomenclature

Taxonomy and nomenclature for fauna species used in this report follow the Western Australian Museum checklists. These were last updated in January 2013 and are accessed at URL: <http://museum.wa.gov.au/research/departments/terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-western-australia>. In the text, common names are used where appropriate, and all scientific names are given in species lists. Where a species lacks a common name, they are referred to by their scientific name.

3.3 Habitat Mapping

Habitat mapping was undertaken using vegetation data provided by the flora and vegetation survey for the study area (Maia Environmental Consultancy 2012 and 2013) and observations made by fauna personnel in the field. The maps were produced by MBS Environmental from information provided by Western Wildlife.

3.4 Literature Review

Lists of fauna expected to occur in the study area were produced using information from a number of sources. These included publications that provide information on general patterns of distribution of frogs (Tyler *et al.* 2000), reptiles (Storr *et al.* 1983, 1990, 1999 and 2002), birds (Barrett *et al.* 2003; Johnstone and Storr 1998 and 2004), mammals (Churchill 1998, Menkhorst and Knight 2011; Van Dyck and Strahan 2008) and fish (Allen *et al.* 2002).

The databases listed in Table 1 were searched for fauna records in and around the study area. Note that the Fauna Survey Database Search includes the records from the 2011 survey of the O'Kearys, Swan Bitter and Howards study area, submitted as part of a licence return.

In all cases the extent of the database search was larger than the extent of the study area, in order to pick up records of species in the wider area that may also occur in the study area. Some species may occur on database results that are not likely to be present in the study area, usually due to a lack of suitable habitat or the study area being outside the known range of the species as presented in the literature. These species are not included in lists of expected fauna.

These sources of information were used to create lists of species that potentially occur in the study area. As far as possible, expected species are those that are likely to utilise the study area. The lists exclude species that have been recorded in the general region as vagrants, or for which suitable habitat is absent within the study area.

Table 1. Databases used in the preparation of Tables 4 - 7.

Database	Type of records held on database	Area searched
WA Museum Specimen Database (DEC 2007-)	Records of specimens held in the Western Australian Museum. Includes historical records.	40km radius around three points (each study area): 26°50'36"S, 119°22'41"E, 27°15'14"S, 119°24'32"E, 27°28'31"S, 119°34'50"E, 27°25'24"S, 119°27'50"E, 27°07'57"S, 119°28'09"E.
Fauna Survey Returns Database (DEC 2007-)	Records collected from fauna surveys carried out in Western Australia. Includes observational and trapping data.	40km radius around three points (each study area): 26°50'36"S, 119°22'41"E, 27°15'14"S, 119°24'32"E, 27°28'31"S, 119°34'50"E, 27°25'24"S, 119°27'50"E, 27°07'57"S, 119°28'09"E.
DEC's Threatened and Priority Fauna Database	Information and records on Threatened and Priority species in Western Australia	80km radius around a central point: 740445 E, 6993970 N (Zone 50).
Birds Australia Atlas Database (DEC 2007-)	Records of bird observations in Australia, 1998-current.	40km radius around three points (each study area): 26°50'36"S, 119°22'41"E, 27°15'14"S, 119°24'32"E, 27°28'31"S, 119°34'50"E, 27°25'24"S, 119°27'50"E, 27°07'57"S, 119°28'09"E.
EPBC Act Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and ecological communities, migratory species and marine species.	10km radius around five points (each study area): 26°50'36"S, 119°22'41"E, 27°15'14"S, 119°24'32"E, 27°28'31"S, 119°34'50"E, 27°25'24"S, 119°27'50"E, 27°07'57"S, 119°28'09"E.

3.5 Field Studies

Each field study was carried out by two zoologists. The first field study was carried out between 14 – 18 November 2011 and covered Swan Bitter, O'Kearys and Howards. The second field study was carried out between 13 – 14 March 2013 and covered Wilsons and the proposed Manakado – Howards haul road route. The field study component of a Level 1 fauna survey is primarily to identify the fauna habitats present in the study area. In addition, all fauna encountered during the field survey are recorded. The fauna species recorded are usually conspicuous species such as birds, large mammals and large reptiles. The presence of other species may be inferred from evidence such as tracks, burrows, scats or evidence of foraging.

In November 2011, two motion-sensitive cameras (Bushnell Trophy-Cam) were deployed with a bait of rolled oats, sardines and peanut butter, with the aim of detecting nocturnal species. The deployment dates and locations were as follows:

- 15-16 Nov 2011 at 740023 E, 6982169 N, (Zone 50) - a small sump at Howards
- 15-17 Nov 2011 at 737036 E, 6983158 N, (Zone 50) - mulga woodland at Swan Bitter
- 16-18 Nov 2011 at 736778 E, 7024824 N, (Zone 50) - creek at O'Kearys
- 17-18 Nov 2011 at 754158 E, 6958752 N, (Zone 50) - mulga woodland at Howards

As the Crest-tailed Mulgara (*Dasycercus cristicauda*) is known from the region, 6 person-hours were spent searching for the distinctive burrows and foraging marks made by this species. The searching was carried out in the Spinifex plain habitat in the O'Kearys study area.

3.6 Survey Limitations

Various factors can limit the effectiveness of a fauna survey. Pursuant to EPA Guidance Statement 56 (EPA 2004), these factors have been identified and their potential to impact on the effectiveness of the surveys has been assessed in Table 3. All fauna surveys have limitations, and not all fauna species present on the site are likely to be sampled during a survey. Fauna may not be recorded because they are rare, they are difficult to trap or observe, or because they are only present on the site for part of the year.

Table 2. Fauna survey limitations.

Potential Limitation	Extent of limitation for the fauna survey	
Experience of fauna personnel	Not limiting:	The supervising zoologist has over 12 years experience in fauna consulting. The team member has over 7 years experience.
Types of traps or other survey methods used	Not limiting:	No trapping was undertaken as these were Level 1 surveys. This restricts fauna records to opportunistic observations.
Number of trapping sites	Not limiting:	As above.
Ability to survey all habitats present	Not limiting:	All habitats present were surveyed during the fauna survey.
Availability of fauna information for the area in literature and on databases	Not limiting:	Moderate amount of fauna information available on databases, but previous studies at Gidgee Gold Mine have little or no observations of fauna.
Effects of weather during the survey	Minor limitation in Nov 2011:	Weather during the first field survey was hot and dry, reducing fauna activity during the heat of the day. However, weather conditions are unlikely to affect the outcomes of a Level 1 fauna survey.
Seasonal effects	Not limiting:	Seasonal effects are not taken into account with a Level 1 survey, as the primary function is habitat assessment.
Disturbance to site such as recent fires, cattle grazing	Not limiting:	Most of site is grazed by cattle, but the majority of vegetation is in good condition.
Ease of access to site	Not limiting:	Site access is generally very good with numerous tracks to all habitat types. Entirety of each site is accessible on foot.

3.7 Assessment of Conservation Significance

Three levels of conservation significance are used within this report to indicate the level of significance of fauna species. These are described in the following sub-sections.

3.7.1 Conservation Significance 1

Conservation Significance 1 (CS1) is the highest level of conservation significance, describing species that are protected under State or Commonwealth legislation. These species are considered to be of state and/or national conservation significance, and some species (e.g. some migratory species) may be considered of international significance.

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Commonwealth Government's primary piece of environmental legislation. Listed under Part 3 of the EPBC Act are 'matters of National Environmental Significance'. These include threatened species, threatened ecological communities and migratory species.

Fauna species are assessed against categories based on International Union for Conservation of Nature (IUCN) criteria, into:

- **Extinct:** Taxa not definitely located in the wild during the past 50 years.
- **Extinct in the wild:** Taxa known to survive only in captivity.
- **Critically Endangered:** Taxa facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** Taxa facing a very high risk of extinction in the wild in the near future.
- **Vulnerable:** Taxa facing a very high risk of extinction in the wild in the medium-term future.
- **Conservation Dependent:** Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Only fauna classified as 'extinct in the wild' 'critically endangered', 'endangered' or 'vulnerable' are listed as matters of National Environmental Significance.

The migratory species listed under the EPBC Act are those recognised under China-Australia Migratory Bird Agreement (CAMBA), the Japan-Australia Migratory Bird Agreement (JAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), or species listed under the Bonn Convention for which Australia is a range state. Species listed in JAMBA are also protected under Schedule 3 of the *Western Australian Wildlife Conservation Act 1950* (WC Act).

Reports on the conservation status of most vertebrate fauna species have been produced by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) in the form of Action Plans. An Action Plan is a review of the conservation status of a taxonomic group against IUCN categories. Action Plans have been prepared for amphibians (Tyler 1998), reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al.* 1996), rodents (Lee 1995) and bats (Duncan *et al.* 1999). These publications also use categories similar to those used by the EPBC Act. The information presented in some of the earlier Action Plans may be out of date due to changes since publication.

The WC Act is State legislation for fauna protection administered by the Department of Environment and Conservation (DEC). The WC Act lists species under a set of Schedules:

- **Schedule 1:** Fauna that are rare or likely to become extinct.
- **Schedule 2:** Fauna presumed to be extinct.
- **Schedule 3:** Migratory birds that are listed under JAMBA.
- **Schedule 4:** Other specially protected fauna (i.e. deemed to require special protection for reasons other than those in Schedules 1 – 3).

Schedule 1 species are further categorised by DEC into the categories 'extinct', 'extinct in the wild', 'critically endangered', 'endangered', 'vulnerable' and 'conservation dependent' species.

3.7.2 Conservation Significance 2

Species of Conservation Significance 2 (CS2) are not listed under State or Commonwealth Acts, but are listed as Priority species by DEC. These species may be considered to be regionally significant.

In Western Australia, DEC maintains a list of Priority Fauna made up of species that are not considered Threatened under the WC Act, but for which DEC feels there is cause for concern. There are five levels of Priority as defined by DEC.

- **Priority 1:** Taxa with few, poorly known populations on threatened lands.
- **Priority 2:** Taxa with few, poorly known populations on conservation lands.
- **Priority 3:** Taxa with several, poorly known populations, some on conservation lands.
- **Priority 4:** Taxa in need of monitoring.
- **Priority 5:** Taxa in need of monitoring (conservation dependent species).

3.7.3 Conservation Significance 3

Conservation Significance 3 (CS3) species are not listed under State or Commonwealth Acts or in publications on threatened fauna or as Priority species by DEC, but are considered by the author to be of local significance.

These are species considered to be of local significance in the study area because they are at the limit of their distribution in the area, they have a very restricted range or they occur in breeding colonies (e.g. some waterbirds). This level of significance has no legislative recognition and is based on interpretation of information on the species patterns of distribution. For example, the Government of Western Australia (2000) used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Bush Forever. Recognition of such species is consistent with the aim of preserving regional biodiversity.

4. Habitats of the Study Area

The fauna habitats in the study area were identified on the basis of the 14 vegetation communities identified by Maia Environmental Consultancy (2011 and 2013) and observations made in the field by the fauna team.

The eight fauna habitats were:

- Spinifex plains
- Mulga woodlands on plains
- Mulga woodlands on low rocky hills
- Acacia shrublands on low rocky hills
- Chenopod shrubland
- Sparse shrubland
- Minor creeks
- Cleared or highly disturbed areas

Each habitat is described below and presented in Figures 2 – 6. Vegetation descriptions are summarised from those in Maia Environmental Consultancy (2011 and 2013).

4.1 Spinifex Plains

The Spinifex plains are dominated by *Triodia lanigera* and grade from gravelly plains in the west to sandplain in the east (Plate 1). In the west, the Spinifex plain had occasional Mulga (*Acacia aneura*) trees and mallee eucalypts (*Eucalyptus kingsmillii* and/or *E. trivalva*). In the east, on the sandier plains, the Spinifex plain also had a scattering of shrubs, including *Acacia jamesiana*, *Prostanthera wilkieana*, *Leptosema chambersii* and *Goodenia xanthosperma*. Spinifex plains occur across 16.5% of the O'Kearys study area and do not occur in the remaining study areas.

Spinifex plains are likely to support a range of fauna that are likely to use Spinifex as shelter and potentially fauna that are unlikely to occur in the surrounding Mulga woodlands. Spinifex plains may support conservation significant species such as mulgara species (*Dasyercus cristicauda* and *D. blythii*), Australian Bustard (*Ardeotis australis*) and Striated Grasswren (*Amytornis striatus striatus*).



Plate 1. Spinifex Plain at O'Kearys.

4.2 Mulga Woodlands on plains

Mulga woodlands are dominated by *Acacia aneura* and occur on a range of hardpan, stony quartz, laterite and ironstone plains (Plates 2 – 3). The understorey in parts has a sparse tall shrubland of species such as Bowgada (*Acacia ramulosa*) and/or *Acacia minyura*. The understorey also usually consists of a sparse low shrubland of *Eremophila spp.*, *Acacia ayersiana*, Curara (*Acacia tetragonophylla*), Hop Mulga (*Acacia craspedocarpa*) and/or Cotton Bush (*Ptilotis obovatus*). Mulga woodlands on plains occur across 24.2% of O'Kearys, 68.1% of Swan Bitter, 81.8% of Howards and 84.3% of the Manakado – Howards haul road route study area.

As the dominant habitat in the region, Mulga woodland is likely to support a large range of vertebrate species. Small insectivorous birds forage and nest among Mulga trees. Where *Eremophila spp.* are present and flowering, nectar-feeding birds are likely to be present. Some reptile species, such as geckos, shelter under logs or in crevices on Mulga trees. Conservation significant species that may be present include mulgara species (*Dasycercus cristicauda* and *D. blythii*), Australian Bustard (*Ardeotis australis*) and Bush Stone-Curlew (*Burhinus grallarius*).



Plate 2. Mulga woodland on plains at Howards.



Plate 3. Mulga woodland on plains at Swan Bitter.

4.3 Mulga Woodlands on Low Rocky Hills

Mulga woodlands are dominated by *Acacia aneura* and occur on rocky hillslopes, hillcrests and outcrops, as well as stony plains (Plate 4). The understorey includes sparse tall shrubs such as Curara (*Acacia tetragonophylla*) or *Acacia balsamea*, and a sparse shrubland of *Eremophila* spp. and *Senna artemisioides*. This habitat occurs across 38.0% of O'Kearys, 9.5% of Howards and 79.0% of the Wilsons study area.

Similar to the habitat above, Mulga woodland on low rocky hills is also likely to support a range of birds and reptiles that occur in Mulga habitats. However, the rocky areas are also likely to support reptiles such as the Pygmy Python (*Antaresia perthensis*) that favour rocky habitats. These species may shelter in cracks and crevices in rocky outcrops. Conservation significant species that may be present include the Long-tailed Dunnart (*Sminthopsis longicaudata*).



Plate 4. Mulga woodland on low rocky hills at O'Kearys.

4.4 Acacia Shrubland on Low Rocky Hills

The Acacia shrubland occurs on the low rocky hills of dolerite and laterite and is dominated by *Acacia xanthocarpa* over *Eremophila exilifolia*, *Eremophila forrestii* and Cotton Bush (*Ptilotus obovatus*). Acacia shrubland occurs across 10.9% of the O'Kearys study area and 9.9% of the Wilsons study area.

Similar to the previous habitat, rocky areas are likely to support reptiles that favour rocky habitats, where they may shelter under rocks or in rock crevices. Conservation significant species that may be present include the Long-tailed Dunnart (*Sminthopsis longicaudata*).

4.5 Chenopod Shrubland

The Chenopod shrubland occurred mainly on quartz stony plains and consisted of Yellow Bindii (*Sclerolaena cuneata*), Three-winged Bluebush (*Maireana triptera*) and Fuchsia Bush (*Eremophila maculata*), with scattered Mulga (*Acacia aneura*). Chenopod shrublands occur across 3.8% of the Swan Bitter study area 14.3% of the Manakado – Howards haul road study area.

As this habitat is sparsely vegetated it is likely to support a lower diversity of fauna than some of the surrounding habitats. However, conservation significant species that may be present include the Slender-billed Thornbill (*Acanthiza iredalei iredalei*), Oriental Plover (*Charadrius veredus*) and Australian Bustard (*Ardeotis australis*).



Plate 5. Chenopod shrubland on the Manakado - Howards haul road route.

4.6 Sparse Shrubland

The sparse shrubland occurred mainly on undulating calcrete plains and hardpan plains (Plate 6). The shrubland consists of sparse *Eremophila patonii*, *Eremophila oppositifolia*, Flannel Bush (*Solanum lasiophyllum*) and Cotton Bush (*Ptilotus obovatus*). There are also scattered Mulga (*Acacia aneura*) trees. Sparse shrublands on plains occur across 2.2% of O'Kearys, 0.3% of Swan Bitter, 8.7% of Howards and 11.2% of the Wilsons study area.

Where *Eremophila spp.* are present and flowering, nectar-feeding birds are likely to be present. Some bird species may forage in the open spaces between shrubs and nest in dense shrubs. Conservation significant species that may be present include the Oriental Plover (*Charadrius veredus*) and Australian Bustard (*Ardeotis australis*).



Plate 6. Sparse shrubland on plains at Howards.

4.7 Minor Creeks

Minor creeks generally occur in areas with some rocky relief and are vegetated with Mulga (*Acacia aneura*) woodland over Granite Wattle (*Acacia quadrimarginea*). The creeks in the study area are unlikely to hold water for long periods of time, though there were some water pools in a creek in the southeast of O'Kearys (Plate 7), and in the centre of O'Kearys where mining activities had altered water flow forming broad shallow pools (Plate 8). Minor creeks were only present at O'Kearys, representing 5.1% of that study area.

As creeks are often densely vegetated, they provide shelter and breeding sites for birds and other fauna. Conservation significant species that may be present include the Rainbow Bee-eater (*Merops ornatus*), Eastern Great Egret (*Ardea modesta*) and Common Sandpiper (*Tringa hypoleucos*).



Plate 7. Minor creek at O'Kearys.



Plate 8. Shallow temporary pool at O'Kearys.

4.8 Cleared or Highly Disturbed Areas

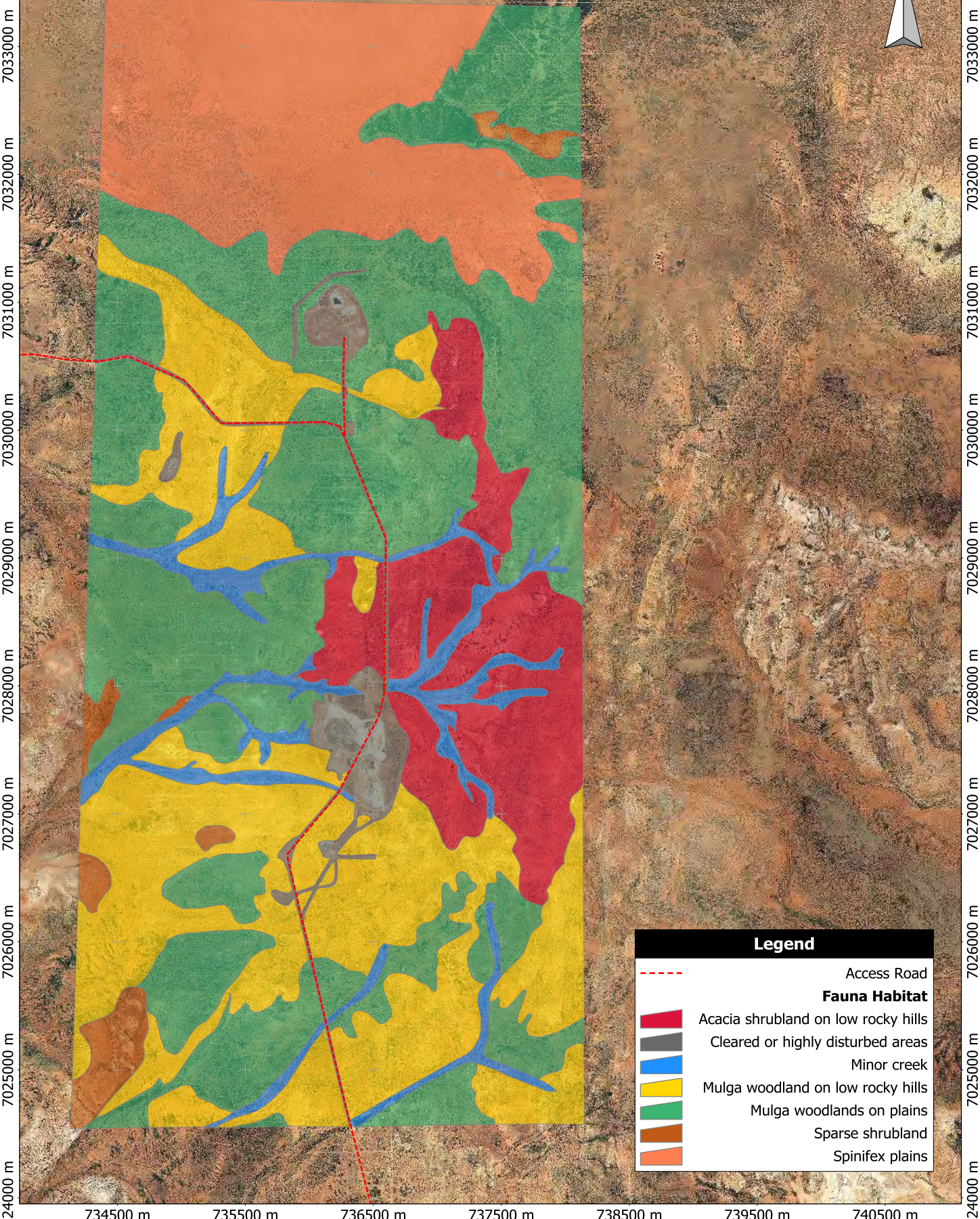
The cleared or highly disturbed areas (Plate 9) are generally those associated with past mining activities. This includes areas of open pits, waste dumps, the camp, roads, workshop and other infrastructure areas. This habitat type occurs at Swan Bitter, O'Kearys, Wilsons and at the western end of the Manakado – Howards haul road route study area.

Cleared and highly disturbed areas are not likely to support many species, but a few may occur including waterbirds in the water at the bottom of open pits, birds of prey that roost or nest on the edges of open pits and reptiles that bask on roads. Conservation significant species that may be present include the Peregrine Falcon (*Falco peregrinus*).



Plate 9. Disturbed area around the existing pit at Wilsons.

734500 m 735500 m 736500 m 737500 m 738500 m 739500 m 740500 m



Legend	
	Access Road
Fauna Habitat	
	Acacia shrubland on low rocky hills
	Cleared or highly disturbed areas
	Minor creek
	Mulga woodland on low rocky hills
	Mulga woodlands on plains
	Sparse shrubland
	Spinifex plains

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Scale: 1:40000
Original Size: A4
Air Photo Date: 2009
Grid: MGA94(50)

0 1 km

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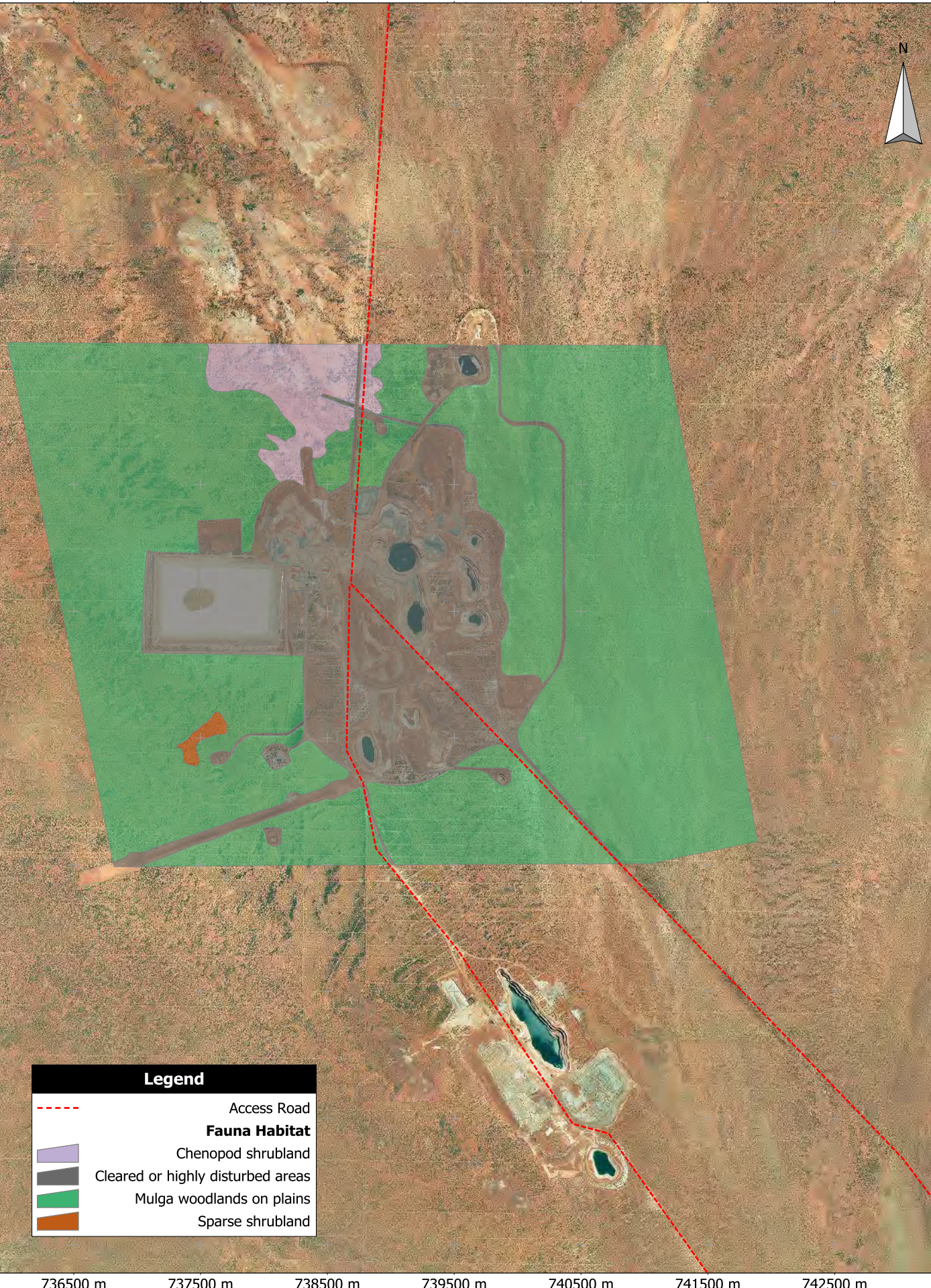
Fauna Habitats at
O'Kearys






Figure 2

736500 m 737500 m 738500 m 739500 m 740500 m 741500 m 742500 m

6987000 m
6986000 m
6985000 m
6984000 m
6983000 m
6982000 m
6981000 m
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6987000 m
6986000 m
6985000 m
6984000 m
6983000 m
6982000 m
6981000 m
6980000 m
6979000 m
6978000 m



Legend	
	Access Road
Fauna Habitat	
	Chenopod shrubland
	Cleared or highly disturbed areas
	Mulga woodlands on plains
	Sparse shrubland

736500 m 737500 m 738500 m 739500 m 740500 m 741500 m 742500 m




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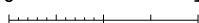
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Fauna Habitats
at Swan Bitter

Figure 3



Legend	
Fauna Habitat	
	Mulga woodland on low rocky hills
	Mulga woodlands on plains
	Sparse shrubland

 <p>Environmental + Water Resource Consultants</p> <p>4 Cook St West Perth WA 6005 Telephone: + 618 9228 3186 Facsimile: + 618 9228 3177 info@mbsenvironmental.com.au</p>	<p>Scale: 1:40000 Original Size: A4 Air Photo Date: 2009 Grid: MGA94(50)</p> <p>0 1 km</p> 	<p>Panoramic Gold Pty Ltd Gidgee Gold Project</p>	<p>Fauna Habitats at Howards</p> <hr/> <p>Figure 4</p>
	<p>W:\Panoramic\Gidgee\Drawings\Flora & Fauna\Fauna Map.map 29/05/2013 F4 Howards Habitat Areas Layout</p>		

743500 m

744000 m

744500 m

745000 m

745500 m

6998000 m

6997500 m

6997000 m

6996500 m

6996000 m

6995500 m

6995000 m



6998000 m

6997500 m

6997000 m

6996500 m

6996000 m

6995500 m

6995000 m






743500 m

744000 m

744500 m

745000 m

745500 m

Legend	
	Access Road
Fauna Habitat	
	Acacia shrubland on low rocky hills
	Mulga woodland on low rocky hills
	Sparse shrubland
	Cleared or highly disturbed areas




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Original Size: A4
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Grid: Australia MGA94 (50)

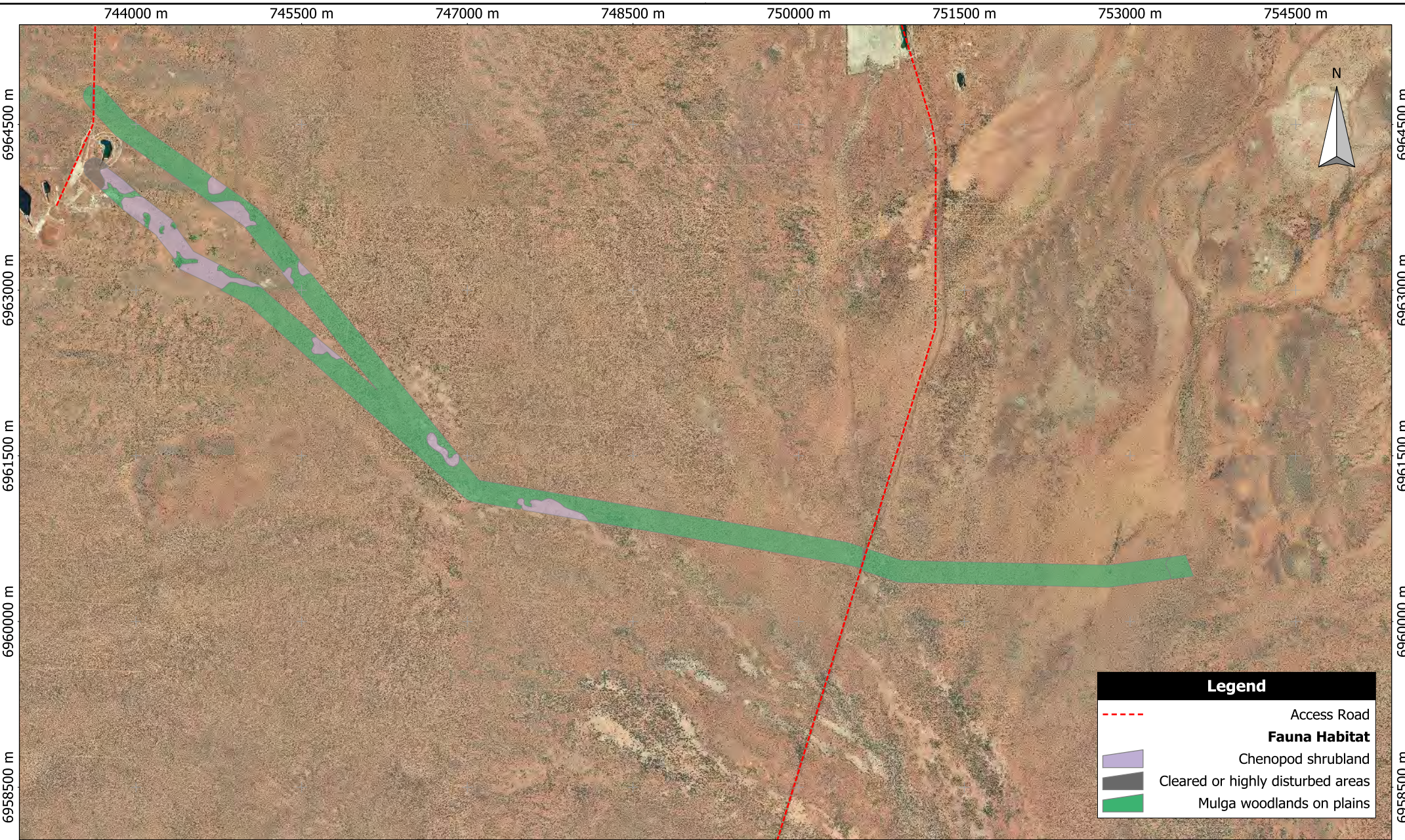
0 200 m







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Fauna Habitats
at Wilsons

Figure 5



Legend	
	Access Road
Fauna Habitat	
	Chenopod shrubland
	Cleared or highly disturbed areas
	Mulga woodlands on plains


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Scale: 1:45000
 Original Size: A4
 Air Photo Date: 2009
 Grid: Australia MGA94 (50)



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Fauna Habitats at the Manakado to Howards
 Proposed Haul Road
Figure 6

5. Vertebrate Fauna of the Study Area

The numbers of vertebrate species potentially occurring in the study area are summarised below in Table 3. The amphibians, reptiles, birds and mammals that have the potential to occur in the study area are listed in Tables 4 - 7. Indicated in each table are the species recorded:

- In each study area by Western Wildlife during the 2011 or 2013 site visits.
- In the wider area on the WA Museum Specimen Database (see Table 1).
- In the wider area on the Fauna Survey Returns Database (see Table 1).
- In the wider area on the Birds Australia Atlas Database – birds only (see Table 1).
- In the wider area on DEC's Threatened and Priority Fauna Database (see Table 1).
- In the wider area on the EPBC Protected mattered Search Tool (see Table 1).

Table 3. Summary of vertebrate fauna potentially occurring in the study area.

Taxon	Total species	Introduced species	Conservation significant species		
			CS1	CS2	CS3
Amphibians	9	0	-	-	-
Reptiles	75	0	-	-	-
Birds	126	0	8	3	-
Mammals	33	6	1	2	-
Freshwater Fish	1	0	-	-	-
Totals:	244	6	9	5	0

Fauna of conservation significance are discussed in the sections below and are summarised in Table 8. The results of the EPBC Act Protected Matters search and the DEC Threatened and Priority Fauna Database search are given in Appendices 1 and 2.

5.1 Amphibians

There are nine species of frog that have the potential to occur in the study area, of which one species was recorded during the site visit (Table 4). In addition, tadpoles of an unknown species of burrowing frog were recorded in pools in the O'Kearys study area. In general, the frog species that occur in the study area are common and widely distributed in the arid zone.

Frogs are likely to occur throughout the study area, potentially breeding anywhere that holds water after rainfall. Many species develop from tadpoles into frogs very quickly, and can make use of ephemeral pools. In particular, the O'Kearys study area has several minor creeks that are likely to hold water after summer or winter rains.

5.1.1 Amphibians of Conservation Significance

No frogs of conservation significance are likely to be present in the study areas.

5.2 Reptiles

There are 75 species of reptile that have the potential to occur in the study area, of which seven species were recorded opportunistically across the 2011 and 2013 site visits (Table 5). One species of freshwater turtle occurs in the region, but is probably absent from the study area due to the lack of riverine habitat. Similarly the Claypan Dragon (*Ctenophorus salinarum*) also occurs in the region, but favours salt lake habitats.

Most of the reptile species listed in Table 5 are common and widespread in the arid zone of Western Australia. Many of the reptiles are likely to have broad habitat preferences. Some species are likely to have preferences for Spinifex sandplains (e.g. *Liopholis inornata* and *Ctenotus grandis*) while others prefer woodlands and shrublands (e.g. *Morethia butleri* and *Ctenotus mimetes*).

5.2.1 Reptiles of Conservation Significance

No reptiles of conservation significance are likely to be present in the study areas.

5.3 Birds

There are 126 species of bird that have the potential to occur in the study area, of which 67 were recorded across the 2011 and 2013 site visits (Table 6). Seventeen of the birds listed in Table 6 are waterbirds. These species may occur at pools on minor creeks in the O'Kearys study area, or in water at the bottom of open pits in the O'Kearys, Swan Bitter or Wilsons study areas. Three waterbird species were recorded during the site visit. As waterbirds are very mobile, other species may occur from time to time, but the study area does not represent important waterbird habitat. The minor creeks in the O'Kearys and Wilsons study areas are also more densely vegetated than the surrounding woodlands and shrublands. They are likely to provide shelter and breeding sites for a range of bird species.

At the time of the 2011 site visit some of the shrubs (*Eremophila spp.*) were flowering, providing a seasonal food resource for nectar-feeding species such as the Pied Honeyeater. When the *Acacia* shrubs are seeding, they are likely to provide a food resource for seed-eating birds such as parrots and pigeons.

5.3.1 Birds of Conservation Significance

There are 11 birds of conservation significance that have either been recorded or may potentially occur in the study area. Each species is listed in the boxes below, and discussed.

Conservation Significance 1

Malleefowl This species is listed under Schedule 1 (Vulnerable) of the WC Act and as Vulnerable under the EPBC Act.	<i>Leipoa ocellata</i>
Eastern Great Egret This species is listed as migratory under the EPBC Act.	<i>Ardea modesta</i>
Peregrine Falcon This falcon is listed under Schedule 4 (other specially protected fauna) of the WC Act.	<i>Falco peregrinus</i>
Common Sandpiper This species is listed as migratory under the EPBC Act.	<i>Tringa hypoleucos</i>
Oriental Plover This species is listed as migratory under the EPBC Act and is listed under Schedule 3 of the WC Act.	<i>Charadrius veredus</i>
Fork-tailed Swift This species is listed as migratory under the EPBC Act and is listed under Schedule 3 of the WC Act.	<i>Apus pacificus</i>
Rainbow Bee-eater This species is listed as migratory under the EPBC Act.	<i>Merops ornatus</i>
Slender-billed Thornbill This species is listed as Vulnerable under the EPBC Act.	<i>Acanthiza iredalei iredalei</i>

The **Malleefowl** almost at its northern limit in the study area, though there are records to the north at Wiluna and the east at Yeelirrie on DEC'S Threatened and Priority Fauna Database (Appendix 2). This large ground-dwelling bird inhabits mallee and Acacia thickets that have a dense layer of leaf litter (Johnstone and Storr 1998). At Yeelirrie Station, regular monitoring of Malleefowl activity has occurred between 2000 and 2006, and Malleefowl have been found to occur patchily in shrubby habitats (Benshemesh 2007). The habitats present in the study area appear unsuitable for this species because they lack leaf litter and are generally quite open, rather than shrubby. Extensive searching for Malleefowl mounds during the site visits failed to find any evidence of Malleefowl, such as tracks or mounds. Although the Malleefowl can be locally common, it is rare in much of its range, and may be locally extinct in the vicinity of the study area.

The **Eastern Great Egret** (formerly known as the Great Egret, *Ardea alba*) was not recorded during the site visit, but may be an occasional visitor to the O'Kearys study area. This species generally occurs in the better-watered parts of Western Australia, such as the southwest, Kimberley and Pilbara, where it inhabits a variety of shallow freshwater and saltwater habitats (Johnstone and Storr 1998). Although a listed migratory species, the status of the Eastern Great Egret is secure.

The **Peregrine Falcon** is a widespread bird of prey that globally has a very large range and a very large population that appears to be secure (BirdLife International 2013). In Western Australia the population is secure, though this species may experience reductions at a local level due to human disturbance at nesting sites (Debus 1998). The Peregrine Falcon nests mainly on ledges on cliffs, rocky outcrops and quarries, and it may also use tall trees (Johnstone and Storr 1998). This species often takes advantage of man-made structures such as abandoned open pits, and was recorded near an open pit in the Swan Bitter study area during the site visit. The Peregrine Falcon may also occur in the O'Kearys and Wilsons study areas where there are open pits, but is less likely to occur in the Howards study area as this site lacks open pits and tall trees.

The **Common Sandpiper** was not recorded during the site visit (Table 6), but may be present all year, most commonly from September to March (Johnstone and Storr 1998). This species occurs in a range of salt and freshwater habitats, including coasts, river pools, drying swamps and floodwaters (Johnstone and Storr 1998). A site may be deemed important for this species if it supports more than 1% of the flyway population for the species, or 250 birds (Bamford *et al.* 2008). Although this species may occur in the O'Kearys study area on occasion, only one or two birds are likely to be present at any one time.

The **Oriental Plover** inhabits sparsely vegetated plains, as well as beaches and tidal flats (Johnstone and Storr 1998). This migratory species breeds in Mongolia and northern China, and is present in northern Australia from late August to early April. Although not recorded during the site visit, this species is likely to be a regular visitor to the region, and may occur in sparse shrubland, chenopod shrubland or in open ground in the study areas. A site may be deemed important for this species if it supports more than 1% of the flyway population for the species, or 700 birds (Bamford *et al.* 2008). It appears unlikely that such large numbers of birds would visit the study area.

The **Fork-tailed Swift** is a non-breeding visitor to Australia between September and April (Boehm 1962). While it can be scarce in southwest Australia this species is generally more common in the north (Johnstone and Storr 1998). The bird is primarily observed foraging for insects in proximity to cyclonic weather (Boehm 1962). Although a migratory species, the Fork-tailed Swift has a large range and a large population that appears to be stable (BirdLife International 2013). The Fork-tailed Swift is largely an aerial species and is unlikely to be affected by changes to the study area.

The **Rainbow Bee-eater** is a common species that migrates southwards in summer to breed. It was recorded from Wiluna on DEC's Threatened and Priority Fauna Database (Appendix 2). It is widespread in Western Australia and although it was not recorded during the site visit, it is likely to occur in the study areas. The Rainbow Bee-eater may forage anywhere over the study area, but is only likely to breed where there are sandy soils in which to burrow.

The **Slender-billed Thornbill** has a disjunct distribution through the southern arid zone (Johnstone and Storr 2004), reflecting the patchy availability of habitat. Away from the coast this species generally occurs around saltlakes, inhabiting chenopod shrubland, saltbush, bluebush or samphire (Johnstone and Storr 2004). The Slender-billed Thornbill was not recorded on any databases for the area, but is known from Lake Anneen (Johnstone and Storr 2004), about 100 km to the west of the study area. Although not recorded during the fauna survey, this species could potentially inhabit the chenopod shrubland in the Swan Bitter and Manakado - Howards haul road study areas. However, the chenopod shrubland at these locations is not associated with a large saltlake system and may be too isolated to support the Slender-billed Thornbill.

Conservation Significance 2

Australian Bustard

This species is listed as Priority 4 by DEC and as Near Threatened in the Action Plan for Australian Birds (Garnett and Crowley 2000).

Ardeotis australis

Bush Stone-Curlew

This species is listed as Priority 4 by DEC and as Near Threatened in the Action Plan for Australian Birds (Garnett and Crowley 2000).

Burhinus grallarius

Striated Grasswren

This species is listed as Priority 4 by DEC.

Amytornis striatus striatus

The **Australian Bustard** inhabits grasslands and savannah grasslands, moving nomadically in response to the presence of food (Johnstone and Storr 1998). This species was recorded at Wiluna and Sandstone on the DEC's Threatened and Priority Fauna Database (Appendix 2) and has also been recorded in the wider area on the WA Museum Specimen Database and the Fauna Survey Returns Database (Table 6). The Bustard is likely to occur in the study area, though it was not recorded during the site visit. Within the study area, the Australian Bustard is likely to favour Spinifex plains, sparse shrublands and chenopod shrubland and may also occur in open Mulga woodlands on plains. This species is slow to take flight, so is vulnerable to road mortalities, and may also be subject to hunting pressure in some parts of Western Australia (Garnett and Crowley 2000).

The **Bush Stone-Curlew** inhabits lightly wooded plains, sheltering during the day in thickets of grass or under shrubs (Johnstone and Storr 1998). This species roosts and nests on the ground and is vulnerable to feral predators such as the fox and may be vulnerable to road mortalities at night. The Bush Stone-Curlew was recorded at Meekatharra and Yeelirrie on DEC's Threatened and Priority Fauna Database (Appendix 2) and in the wider area on the Birds Australia Atlas Database (Table 6). Although not recorded during the site visit, this species may be present at any of the study areas.

The **Striated Grasswren** has been recorded from Meekatharra and Wiluna in the 1980s on DEC's Threatened and Priority Fauna Database (Appendix 2). The subspecies *Amytornis striatus striatus* occurs mainly in the eastern desert region in Western Australia, with an apparently isolated population between Meekatharra and Wiluna (Johnstone and Storr 2004). It inhabits Spinifex, Spinifex with low shrubs or *Acacia* shrubland over Spinifex on sandy or loamy plains (Johnstone and Storr 2004). Although not recorded during the site visit, this species may potentially occur on the Spinifex plains in the O'Kearys study area.

5.4 Mammals

There are 33 species of mammal that have the potential to occur in the study area, of which 27 are native and six introduced (Table 7). Five species of mammal were recorded opportunistically across the 2011 and 2013 site visits, three native species and two introduced (Table 7). The three native species observed were the Red Kangaroo (*Macropus rufa*), which is likely to be common on plains, Euro (*Macropus robustus*), which is likely to occur in both rocky areas and plains, and the Dingo (*Canis lupus dingo*), which is likely to occur in all habitats.

Almost a third of the mammals listed in Table 7 are insectivorous bats. These species are likely to forage over the study area at night. Some species, such as Hill's Sheath-tail Bat (*Taphozous hilli*), roost in caves or mine shafts, while others, such as the White-striped Freetail Bat (*Tadarida australis*), roost in tree hollows (Churchill 1998). There does not appear to be any large caves in the study area, but cave-roosting species may roost in crevices in small breakaways at Wilsons and O'Kearys, and forage in the study areas.

5.4.1 Mammals of Conservation Significance

There are three mammals of conservation significance that may occur in the study area. Each species is listed and discussed below.

Conservation Significance 1

Crest-tailed Mulgara

This species is listed under Schedule 1 (Vulnerable) of the WC Act and as Vulnerable under the EPBC Act.

Dasyurus cristicauda

The **Crest-tailed Mulgara** and the **Brush-tailed Mulgara** have recently been recognised as separate species, though databases may not have updated their records, showing all mulgara in Western Australia as the Crest-tailed Mulgara. Given the confusion, the Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011) treat both species as one. DEC's Threatened and Priority Species Database have records of Crest-tailed Mulgara at Wiluna in 2009 (Appendix 2), which is about 87km east-north-east of the O'Kearys study area. The most likely habitat to support these species is the Spinifex plain that occurs in the northern part of the O'Kearys study area, though they may also occur in mulga woodlands on plains, which occurs in the Howards, Manakado – Howards haul road and Swan Bitter. Searches on the Spinifex plains failed to find any evidence of these species. However, it should be noted that population sizes fluctuate between years, so detection of mulgara may be difficult when populations are small.

Conservation Significance 2

Brush-tailed Mulgara

This species is listed as Priority 4 by the DEC.

Dasyercus blythi

Long-tailed Dunnart

This species is listed as Priority 4 by DEC.

Sminthopsis longicaudata

The **Long-tailed Dunnart** is associated with breakaways and scree slopes, but also occurs on gravel or stony plains (Van Dyck and Strahan 2008). This species has been recorded at Lake Mason Station, Sandstone on DEC's Threatened and Priority Fauna Database and in the wider area on the WA Museum Specimen Database (Table 7). The Long-tailed Dunnart may potentially occur in the low rocky hills in the O'Kearys or Wilsons study area, though the majority of records of this species are from habitats with scree slopes and breakaways (Van Dyck and Strahan 2008).

5.5 Freshwater Fish

There is one fish that is likely to occur in the study area, the Spangled Perch (*Leiopotherapon unicolour*). This species is widespread across Western Australia, Northern Territory, Queensland and New South Wales, occurring in a wide range of habitats (Allen *et al.* 2002). The Spangled Perch potentially occurs in creeks and pools in the O'Kearys study area.

5.5.1 Freshwater Fish of Conservation Significance

There are no fish of conservation significance likely to occur in the study area.

6. Summary and Conclusions

Five study areas at the Gidgee Gold Project were surveyed, O'Kearys, Swan Bitter, Howards, Wilsons and the proposed Manakado - Howards haul road. Across the five study areas eight fauna habitats were identified. The habitats were:

- Spinifex plains
- Mulga woodland on plains
- Mulga woodland on low rocky hills
- Acacia shrublands on low rocky hills
- Chenopod shrubland
- Sparse shrubland
- Minor creeks
- Cleared or highly disturbed areas

The five study areas have the potential to support a wide range of vertebrate species including up to nine frog, 75 reptile, 126 bird, 33 mammal and one freshwater fish species. During the site visit, one frog, seven reptiles, 67 birds and five mammals were recorded opportunistically.

The 14 fauna of conservation significance that have the potential to occur in the study area are summarised in Table 8. There are no frogs or reptiles of conservation significance likely to occur, but there are eleven birds and three mammals of conservation significance that may occur.

The nine species of conservation significance 1 that may occur are the Malleefowl, Great Egret, Peregrine Falcon, Common Sandpiper, Oriental Plover, Fork-tailed Swift, Rainbow Bee-eater, Slender-billed Thornbill and Crest-tailed Mulgara. Of these, the Peregrine Falcon was recorded in the Swan Bitter study area during the 2011 site visit. The Malleefowl is likely to be very rare or locally extinct in the area, and the habitat in the study area appears unsuitable. The Great Egret and Common Sandpiper may occur around creeks and ponds on occasion, but the study area is unlikely to be important for these species. Similarly, the Oriental Plover may occur on open plains, though it is unlikely to be present in significant numbers. The Rainbow Bee-eater is likely to occur, though it is generally a common species, and the Fork-tailed Swift may overfly the study area on occasion. If present, the Slender-billed Thornbill is only likely to occur in the chenopod shrubland at Swan Bitter or on the Manakado - Howards haul road, and the Crest-tailed Mulgara may occur on the Spinifex plains at O'Kearys.

The five species of conservation significance 2 that may occur are the Australian Bustard, Bush Stone-Curlew, Striated Grasswren, Brush-tailed Mulgara and Long-tailed Dunnart. The Australian Bustard and Bush Stone-Curlew are very likely to be present in areas of Spinifex, shrubland or woodland on plains. The Long-tailed Dunnart may occur in rocky parts of O'Kearys or Wilsons, but the study site lacks the scree slopes and breakaways that are the favoured habitat of this species. The Striated Grasswren and Brush-tailed Mulgara may occur in areas of Spinifex plain at O'Kearys.

There are no locally significant (conservation significance 3) species likely to be present. This is a reflection of the uniformity of habitats present in the area, and the lack of features such as saltlakes, major rivers or ranges within the study area.

Extension of mining activities in the study area is likely to result in the loss of some native vegetation (and therefore fauna habitats) from the study area. However, as the exact extent of the clearing is unknown at this stage, this report does not contain any assessment of potential impacts on vertebrate fauna.

Table 4. Amphibians that potentially occur in the study area.

+ = species recorded in the study area during the 2011 or 2013 Level 1 fauna survey.

WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).

FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).

TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).

EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation Status	Records								
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	WAM	FSDB	TF	EPBC
Hylidae (tree frogs and water-holding frogs)										
Main's Frog <i>Cyclorana maini</i>										
Water-holding Frog <i>Cyclorana platycephala</i>										
Desert Tree Frog <i>Litoria rubella</i>		+	+					+		
Limnodynastidae (ground frogs)										
Northern Burrowing Frog <i>Neobatrachus aquilonius</i>										
Desert Trilling Frog <i>Neobatrachus sudellae</i>										
Shoemaker Frog <i>Neobatrachus sutor</i>										
Plonking Frog <i>Neobatrachus wilmorei</i>							+			
Centralian Burrowing Frog <i>Platyplectrum spenceri</i>										
Myobatrachidae (ground frogs)										
Western Toadlet <i>Pseudophryne occidentalis</i>							+			
# frog species expected in the study area:		9								
# frog species recorded in the study areas in 2011 or 2013:		1								

Table 5. Reptiles that potentially occur in the study area.

+ = species recorded in the study area during the 2011 or 2013 Level 1 fauna survey.

WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).

FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).

TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).

EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation Status	Records								
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	WAM	FSDB	TF	EPBC
Cheluidae (turtles)										
Steindachner's Turtle	<i>Chelodina steindachneri</i>									
Agamidae (dragon lizards)										
Mulga Dragon	<i>Caimanops amphiboluroides</i>									
Ring-tailed Dragon	<i>Ctenophorus caudicinctus</i>				+		+			
Military Dragon	<i>Ctenophorus isolepis</i>						+	+		
Central Netted Dragon	<i>Ctenophorus nuchalis</i>						+			
Western Netted Dragon	<i>Ctenophorus reticulatus</i>						+			
Claypan Dragon	<i>Ctenophorus salinarum</i>									
Lozenge-marked Dragon	<i>Ctenophorus scutulatus</i>	+	+			+	+	+		
Thorny Devil	<i>Moloch horridus</i>						+			
Bearded Dragon	<i>Pogona minor</i>			+			+	+		
Pebble Dragon	<i>Tympanocryptis cephalus</i>						+			
Diplodactylidae (geckoes)										
Fat-tailed Gecko	<i>Diplodactylus conspicillatus</i>						+			
Wheatbelt Stone Gecko	<i>Diplodactylus granariensis</i>						+			
	<i>Diplodactylus pulcher</i>						+			
	<i>Lucasium squarrosum</i>						+			
Sand-plain Gecko	<i>Lucasium stenodactylum</i>						+			
Marbled Velvet Gecko	<i>Oedura marmorata</i>									
Beaked Gecko	<i>Rhynchoedura ornata</i>						+			
Goldfield Spiny-tailed Gecko	<i>Strophurus assimilis</i>						+			
Jewelled Gecko	<i>Strophurus elderi</i>						+			
Western Spiny-tailed Gecko	<i>Strophurus strophurus</i>						+			
	<i>Strophurus wellingtonae</i>						+			
Carphodactylidae (knob-tailed geckoes)										
Barking Gecko	<i>Underwoodisaurus milii</i>									
	<i>Nephurus vertebralis</i>						+			
Banded Knob-tailed Gecko	<i>Nephurus wheeleri</i>						+			
Gekkonidae (geckoes)										
	<i>Gehyra variegata</i>	+					+	+		
Bynoe's Gecko	<i>Heteronotia binoei</i>						+			
Pygopodidae (legless lizards)										
	<i>Delma butleri</i>						+			
	<i>Delma tincta</i>									
Burton's Legless Lizard	<i>Lialis burtonis</i>									
	<i>Pygopus nigriceps</i>						+			

Table 5. (cont).

Species	Conservation Status	Records								
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	WAM	FSDB	TF	EPBC
Scincidae (skink lizards)										
<i>Cryptoblepharus buchanani</i>							+			
<i>Ctenotus grandis</i>										
<i>Ctenotus helenae</i>										
<i>Ctenotus leonhardii</i>							+			
<i>Ctenotus mimetes</i>										
<i>Ctenotus pantherinus</i>							+			
<i>Ctenotus schomburgkii</i>							+			
<i>Ctenotus severus</i>							+			
<i>Ctenotus uber</i>							+			
Pygmy Spiny-tailed Skink <i>Egernia depressa</i>							+			
Broad-banded Sand Swimmer <i>Eremiascincus richardsonii</i>			+				+			
<i>Lerista bipes</i>										
<i>Lerista desertorum</i>							+			
<i>Lerista macropisthopus</i>							+			
<i>Lerista kingi</i>										
<i>Lerista timida</i>							+			
Desert Skink <i>Liopholis inornata</i>										
Night Skink <i>Liopholis striata</i>										
Dwarf Skink <i>Menetia greyii</i>							+			
<i>Morethia butleri</i>							+			
Western Bluetongue <i>Tiliqua occipitalis</i>							+			
Varanidae (goanna or monitor lizards)										
Stripe-tailed Monitor <i>Varanus caudolineatus</i>							+			
Pygmy Desert Monitor <i>Varanus eremius</i>							+			
Perentie <i>Varanus giganteus</i>										
Gould's Goanna <i>Varanus gouldii</i>				+		+		+		
<i>Varanus panoptes</i>		+	+				+			
Black-tailed Monitor <i>Varanus tristis</i>										
Typhlopidae (blind snakes)										
<i>Ramphotyphlops hamatus</i>							+			
<i>Ramphotyphlops waitii</i>							+			
Boidae (pythons)										
Pygmy Python <i>Antaresia perthensis</i>										
Stimpson's Python <i>Antaresia stimsoni</i>							+			

Table 5. (cont).

Species	Conservation Status	Records								
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	WAM	FSDB	TF	EPBC
Elapidae (front-fanged snakes)										
Desert Death Adder	<i>Acanthophis pyrrhus</i>									
North-western Shovel-nosed Snake	<i>Brachyuropis approximans</i>									
Narrow-banded Shovel-nosed Snake	<i>Brachyuropis fasciolatus</i>									
Southern Shovel-nosed Snake	<i>Brachyuropis semifasciatus</i>						+			
Yellow-faced Whipsnake	<i>Demansia psammophis</i>									
Moon Snake	<i>Furina ornata</i>									
Monk Snake	<i>Parasuta monachus</i>						+			
Mulga Snake	<i>Pseudechis australis</i>									
Spotted Mulga Snake	<i>Pseudechis butleri</i>						+			
Ringed Brown Snake	<i>Pseudonaja modesta</i>						+			
Gwardar	<i>Pseudonaja mengdeni</i>						+			
Jan's Banded Snake	<i>Simoselaps bertholdi</i>						+			
Rosen's Snake	<i>Suta fasciata</i>						+			
# reptile species expected in the study area:		75								
# reptile species recorded in the study areas in 2011 or 2013:		7								

Table 6. Birds that potentially occur in the study area.

+ = species recorded in the study area during the 2011 or 2013 Level 1 fauna survey.

BA = species recorded in the area on the Birds Australia Atlas Database (see Table 1).

WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).

FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).

TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).

EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation Status	Records									
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC
Casuariidae (emu)											
Emu <i>Dromaius novaehollandiae</i>			+			+	+		+		
Megapodiidae (mound-builders)											
Malleefowl <i>Leipoa ocellata</i>	CS1										
Phasianidae (quails)											
Stubble Quail <i>Coturnix pectoralis</i>				+							
Anatidae (ducks & swans)											
Grey Teal <i>Anas gracilis</i>		+				+			+		
Pacific Black Duck <i>Anas superciliosa</i>											
Hardhead <i>Aythya australis</i>											
Australian Wood Duck <i>Chenonetta jubata</i>											
Pink-eared Duck <i>Malacorhynchus membranaceus</i>											
Australian Shelduck <i>Tadorna tadornoides</i>											
Podicipedidae (grebes)											
Australasian Grebe <i>Tachybaptus novaehollandiae</i>		+							+		
Hoary-headed Grebe <i>Poliiocephalus poliocephalus</i>											
Ardeidae (herons, egrets & bitterns)											
White-necked Heron <i>Ardea pacifica</i>											
White-faced Heron <i>Ardea novaehollandiae</i>											
Eastern Great Egret <i>Ardea modesta</i>	CS1										+
Accipitridae (osprey, hawks, eagles & harriers)											
Black-shouldered Kite <i>Elanus caeruleus</i>											
Square-tailed Kite <i>Hamirostra isura</i>											
Black-breasted Buzzard <i>Hamirostra melanosternon</i>											
Black Kite <i>Milvus migrans</i>											
Whistling Kite <i>Haliastur sphenurus</i>									+		
Brown Goshawk <i>Accipiter fasciatus</i>											
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>											
Little Eagle <i>Aquila morphnoides</i>											
Wedge-tailed Eagle <i>Aquila audax</i>		+						+	+		
Spotted Harrier <i>Circus assimilis</i>											

Table 6. (cont.)

Species	Conservation Status	Records									
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC
Falconidae (falcons)											
Brown Falcon <i>Falco berigora</i>						+					
Nankeen Kestrel <i>Falco cenchroides</i>		+			+	+		+			
Australian Hobby <i>Falco longipennis</i>						+					
Peregrine Falcon <i>Falco peregrinus</i>	CS1		+			+		+	+		
Black Falcon <i>Falco subniger</i>											
Rallidae (crakes, rails, coots & allies)											
Black-tailed Native Hen <i>Gallinula ventralis</i>											
Eurasian Coot <i>Fulica atra</i>					+						
Otididae (bustard)											
Australian Bustard <i>Ardeotis australis</i>	CS2							+	+	+	
Turnicidae (button-quails)											
Little Button-Quail <i>Turnix velox</i>		+		+					+		
Scolopacidae (stints, sandpipers & allies)											
Common Sandpiper <i>Tringa hypoleucos</i>	CS1										
Burhinidae (stone-curlews)											
Bush Stone-Curlew <i>Burhinus grallarius</i>	CS2						+			+	
Recurvirostridae (stilts & avocet)											
Black-winged Stilt <i>Himantopus himantopus</i>											
Charadriidae (plovers, dotterels & lapwings)											
Black-fronted Dotterel <i>Charadrius melanops</i>											
Red-kneed Dotterel <i>Erythrogonys cinctus</i>											
Inland Dotterel <i>Peltohyas australis</i>											
Oriental Plover <i>Charadrius veredus</i>	CS1										+
Banded Lapwing <i>Vanellus tricolor</i>							+				
Columbidae (pigeons & doves)											
Common Bronzewing <i>Phaps chalcoptera</i>		+	+		+	+	+		+		
Crested Pigeon <i>Ocyphaps lophotes</i>		+	+			+	+		+		
Diamond Dove <i>Geopelia cuneata</i>		+	+	+	+				+		
Psittacidae (cockatoos, parrots, lorikeets & rosellas)											
Galah <i>Cacatua roseicapilla</i>		+						+	+		
Little Corella <i>Cacatua sanguinea</i>											
Cockatiel <i>Nymphicus hollandicus</i>				+					+		
Budgerigar <i>Melopsittacus undulatus</i>		+	+	+			+		+		
Bourkes Parrot <i>Neophema bourkii</i>						+					
Mulga Parrot <i>Platycercus varius</i>			+		+	+			+		
Australian Ringneck <i>Platycercus zonarius</i>				+		+			+		
Cuculidae (cuckoos)											
Pallid Cuckoo <i>Cacomantis pallidus</i>		+					+		+		
Black-eared Cuckoo <i>Chrysococcyx osculans</i>		+							+		
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalus</i>			+	+				+	+		

Table 6. (cont.)

Species	Conservation Status	Records									
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC
Strigidae (hawk owls) Southern Boobook <i>Ninox novaeseelandiae</i>											
Tytonidae (barn owls) Barn Owl <i>Tyto alba</i>											
Podargidae (frogmouths) Tawny Frogmouth <i>Podargus strigoides</i>											
Caprimulgidae (nightjars) Spotted Nightjar <i>Eurostopodus argus</i>							+				
Aegothelidae (owlet-nightjars) Australian Owlet-Nightjar <i>Aegotheles cristatus</i>							+				
Apodidae (swifts) Fork-tailed Swift <i>Apus pacificus</i>	CS1										+
Halcyonidae (kingfishers) Red-backed Kingfisher <i>Todiramphus pyrrhopygius</i> Sacred Kingfisher <i>Todiramphus sanctus</i>											
Meropidae (bee-eaters) Rainbow Bee-eater <i>Merops ornatus</i>	CS1										+
Climacteridae (treecreepers) White-browed Treecreeper <i>Climacteris affinis</i>			+				+	+	+		
Maluridae (fairy-wrens, grasswrens & emu-wrens) Striated Grasswren <i>Amytornis striatus</i> Variegated Fairy-wren <i>Malurus lamberti</i> White-winged Fairy-wren <i>Malurus leucopterus</i> Splendid Fairy-wren <i>Malurus splendens</i>	CS2					+	+	+		+	
Pardalotidae (pardalotes) Red-browed Pardalote <i>Pardalotus rubricatus</i> Striated Pardalote <i>Pardalotus striatus</i>							+	+			
Acanthizidae (thornbills, gerygones & allies) Inland Thornbill <i>Acanthiza apicalis</i> Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i> Slender-billed Thornbill <i>Acanthiza iredalei</i> Slaty-backed Thornbill <i>Acanthiza robustirostris</i> Chestnut-rumped Thornbill <i>Acanthiza uropygialis</i> Southern Whiteface <i>Aphelocephala leucopsis</i> Western Gerygone <i>Gerygone fusca</i> Redthroat <i>Pyrrholaemus brunneus</i> Weebill <i>Smicronis brevirostris</i>	CS1	+		+		+	+		+		+
		+		+	+	+	+		+		
		+	+	+	+	+	+	+	+		
		+	+	+	+	+	+		+		
			+	+		+	+		+		
		+	+	+	+		+	+	+		
		+					+				

Table 6. (cont.)

Species	Conservation Status	Records								
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF
Meliphagidae (honeyeaters & chats)										
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	+	+	+	+	+	+			+
Black Honeyeater	<i>Sugomel niger</i>			+						+
Pied Honeyeater	<i>Certhionyx vareigatus</i>	+								+
Brown Honeyeater	<i>Lichmera indistincta</i>						+			
Singing Honeyeater	<i>Gavicalis virescens</i>	+		+	+	+	+			+
Grey-fronted Honeyeater	<i>Ptilotula plumulus</i>									
Yellow-throated Miner	<i>Manorina flavigula</i>	+	+				+	+		+
White-fronted Honeyeater	<i>Purnella albifrons</i>						+			
Orange Chat	<i>Epthianura aurifrons</i>							+		
Crimson Chat	<i>Epthianura tricolor</i>	+		+		+	+			+
Petroicidae (robins)										
Jacky Winter	<i>Microeca fascinans</i>									+
Hooded Robin	<i>Petroica cucullata</i>			+		+				
Red-capped Robin	<i>Petroica goodenovii</i>	+	+	+	+	+	+			+
Pomatostomidae (babblers)										
White-browed Babbler	<i>Pomatostomus superciliosus</i>	+			+		+			+
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	+	+				+	+		+
Cinclosomatidae (whipbird, wedgebills & quail-thrush)										
Chestnut-breasted Quail-Thrush	<i>Cinclosoma marginatum</i>	+	+	+	+		+			+
Chestnut Quail-Thrush	<i>Cinclosoma castanotus</i>									
Western Wedgebill	<i>Psophodes occidentalis</i>						+			
Neosittidae (sittellas)										
Varied Sittella	<i>Daphoenositta chrysoptera</i>			+			+			+
Pachycephalidae (shrike-tits, whistlers & allies)										
Rufous Whistler	<i>Pachycephala rufiventris</i>	+	+	+	+	+	+			+
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	+		+		+	+			+
Crested Bellbird	<i>Oreoica gutturalis</i>	+	+	+	+	+	+			+
Dicruridae (flycatchers, magpie-larks & fantails)										
Willie Wagtail	<i>Rhipidura leucophrys</i>	+	+	+	+	+	+			+
Magpie-Lark	<i>Grallina cyanoleuca</i>					+	+	+		
Campephagidae (cuckoo-shrikes & trillers)										
Black-faced Cuckoo-Shrike	<i>Coracina novaehollandiae</i>	+	+	+			+	+		+
Ground Cuckoo-Shrike	<i>Coracina maxima</i>			+			+			+
White-winged Triller	<i>Lalage tricolor</i>	+	+	+						+

Table 6. (cont.)

Species	Conservation Status	Records									
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC
Artamidae (woodswallows)											
Masked Woodswallow	<i>Artamus personatus</i>	+	+	+		+		+			
Black-faced Woodswallow	<i>Artamus cinereus</i>	+	+	+		+	+		+		
Dusky Woodswallow	<i>Artamus cyanopterus</i>						+				
Little Woodswallow	<i>Artamus minor</i>										
Cracticidae (butcherbirds & magpies)											
Grey Butcherbird	<i>Cracticus torquatus</i>	+	+					+		+	
Pied Butcherbird	<i>Cracticus nigrogularis</i>	+	+	+				+		+	
Australian Magpie	<i>Cracticus tibicen</i>		+					+	+	+	
Grey Currawong	<i>Strepera versicolor</i>		+		+			+		+	
Corvidae (ravens & crows)											
Torresian Crow	<i>Corvus orru</i>				+			+	+	+	
Little Crow	<i>Corvus bennetti</i>				+			+		+	
Ptilonorhynchidae (bowerbirds)											
Western Bowerbird	<i>Ptilonorhynchus maculatus</i>	+	+			+			+	+	
Hirundinidae (swallows & martins)											
White-backed Swallow	<i>Cheramoeca leucosternus</i>	+								+	
Welcome Swallow	<i>Hirundo neoxena</i>		+		+	+				+	
Tree Martin	<i>Hirundo nigricans</i>										
Fairy Martin	<i>Hirundo ariel</i>										
Sylviidae (old world warblers)											
Rufous Songlark	<i>Cincloramphus mathewsi</i>				+	+				+	
Brown Songlark	<i>Cincloramphus cruralis</i>				+					+	
Dicaeidae (flowerpeckers)											
Mistletoebird	<i>Dicaeum hirundinaceum</i>							+			
Estrildidae (grassfinches & allies)											
Zebra Finch	<i>Taeniopygia guttata</i>	+	+	+	+	+				+	
Motacillidae (pipits & wagtails)											
Australian Pipit	<i>Anthus australis</i>			+		+				+	
# bird species expected in the study area:		126									
# bird species recorded in the study areas in 2011 or 2013:		67									

Table 7. Mammals that potentially occur in the study area.

+ = species recorded in the study area during the 2011 or 2013 Level 1 fauna survey.

WAM = species recorded in the area on the Western Australian Museum Specimen Database (see Table 1).

FSDB = species recorded in the area on the Fauna Survey Returns Database (see Table 1).

TF = species recorded in the area on the DEC Threatened and Priority Fauna Database (see Table 1).

EPBC = species or species habitat recorded in the area on the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation Status	Records										
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC	
Tachyglossidae (echidnas)												
Echidna <i>Tachyglossus aculeatus</i>												
Dasyuridae (dasyurid marsupials)												
Kultarr <i>Antechinomys laniger</i>								+				
Crest-tailed Mulgara <i>Dasyercus cristicauda</i>	CS1									+		
Brush-tailed Mulgara <i>Dasyercus blythi</i>	CS2											
Wongai Ningai <i>Ningai ridei</i>								+				
Wooley's False Antechinus <i>Pseudantechinus woolleyae</i>								+				
Fat-tailed Dunnart <i>Sminthopsis crassicaudata</i>								+				
Little Long-tailed Dunnart <i>Sminthopsis dolichura</i>								+				
Hairy-footed Dunnart <i>Sminthopsis hirtipes</i>								+				
Long-tailed Dunnart <i>Sminthopsis longicaudata</i>	CS2							+				
Striped-faced Dunnart <i>Sminthopsis macroura</i>								+				
Ooldea Dunnart <i>Sminthopsis ooldea</i>								+				
Macropodidae (kangaroos and wallabies)												
Euro <i>Macropus robustus</i>		+										
Red Kangaroo <i>Macropus rufus</i>				+		+			+			
Emballonuridae (sheathtail bats)												
Yellow-bellied Sheathtail Bat <i>Saccolaimus flaviventris</i>												
Hill's Sheathtail Bat <i>Taphozous hilli</i>												
Molossidae (freetail bats)												
Inland Freetail Bat <i>Mormopterus planiceps</i>												
White-striped Freetail Bat <i>Tadarida australis</i>								+				
Vespertilionidae (ordinary bats)												
Gould's Wattled Bat <i>Chalinolobus gouldii</i>												
Finlayson's Cave Bat <i>Vespadelus finlaysoni</i>												
Inland Forest Bat <i>Vespadelus baverstocki</i>												
Inland Broad-nosed Bat <i>Scotorepens balstoni</i>												
Lesser Long-eared Bat <i>Nyctophilus geoffroyi</i>								+				
Muridae (rats and mice)												
House Mouse <i>Mus musculus</i>	Int.											
Spinifex Hopping-Mouse <i>Notomys alexis</i>								+				
Desert Mouse <i>Pseudomys desertor</i>								+				
Sandy Inland Mouse <i>Pseudomys hermannsbergensis</i>								+				
Canidae (dogs and foxes)												
Fox <i>Vulpes vulpes</i>	Int.											+
Dingo <i>Canis lupus dingo</i>		+										

Table 7. (cont.)

Species	Conservation Status	Records									
		O'Kearys	Swan Bitter	Howards	Wilsons	M – H haul rd	BA	WAM	FSDB	TF	EPBC
Felidae (cats) Feral/House Cat <i>Felis catus</i>	Int.										+
Leporidae (rabbits & hares) Rabbit <i>Oryctolagus cuniculus</i>	Int.		+			+			+		+
Bovidae (horned ruminants) Cow <i>Bos taurus</i> Goat <i>Capra hircus</i>	Int. Int.		+		+	+					+
# mammal species expected in the study area:		33									
# mammal species recorded in the study area in 2011 or 2013:		5									

Table 8. Summary of conservation significant (CS) fauna in the study area.

Species	Status	Records	Likelihood of occurrence	Habitat preferences	Likely habitat use in study area							
					Spinifex plains	Mulga woodlands on low rocky hills	Mulga woodlands on plains	Acacia shrublands on low rocky hills	Chenopod shrublands	Sparse shrublands	Minor creeks	Cleared Areas
BIRDS												
<i>Leipoa ocellata</i> Malleefowl	CS1	Recorded at Wiluna & Meekatharra (Appendix 2)	Low	Acacia thickets or mallee woodlands with leaf litter			✓					
<i>Ardea modesta</i> Eastern Great Egret	CS1	Recorded at Meekatharra (Appendix 2)	Low	Wetlands							✓	
<i>Falco peregrinus</i> Peregrine Falcon	CS1	Recorded at Swan Bitter in 2011	Present	Variety of habitats, nests in tall trees, cliffs, open pits	✓	✓	✓	✓	✓	✓	✓	✓
<i>Tringa hypoleucos</i> Common Sandpiper	CS1	Recorded at Wiluna (Appendix 2).	Moderate	Wetlands							✓	
<i>Charadrius veredus</i> Oriental Plover	CS1	-	Moderate	Open plains					✓	✓		
<i>Apus pacificus</i> Fork-tailed Swift	CS1	-	Low	Overfly any habitat	✓	✓	✓	✓	✓	✓	✓	✓
<i>Merops ornatus</i> Rainbow Bee-eater	CS1	Recorded at Wiluna (Appendix 2).	High	Forages in a variety of habitats, breeds in sandy areas	✓	✓	✓	✓	✓	✓	✓	
<i>Acanthiza iredalei iredalei</i> Slender-billed Thornbill	CS1	-	Low	Salt lakes					✓			
<i>Ardeotis australis</i> Australian Bustard	CS2	Recorded at Wiluna & Sandstone (Appendix 2)	High	Plains	✓		✓		✓	✓		

Table 8. (cont.)

Species	Status	Records	Likelihood of occurrence	Habitat preferences	Likely habitat use in study area							
					Spinifex plains	Mulga woodlands on low rocky hills	Mulga woodlands on plains	Acacia shrublands on low rocky hills	Chenopod shrublands	Sparse shrublands	Minor creeks	Cleared Areas
BIRDS (continued)												
<i>Burhinus grallarius</i> Bush Stone-Curlew	CS2	Recorded at Meekatharra (Appendix 2)	High	Creeks & lightly wooded plains	✓		✓		✓	✓	✓	
<i>Amytornis striatus striatus</i> Striated Grasswren	CS2	Recorded at Meekatharra & Wiluna (Appendix 2)	Low	Spinifex plains, Acacia shrublands on sands or loams.	✓		✓					
MAMMALS												
<i>Dasyercus cristicauda</i> Crest-tailed Mulgara	CS1	Recorded at Wiluna (Appendix 2)	Moderate	Spinifex plains and mulga woodlands on loamy sands	✓		✓					
<i>Dasyercus blythi</i> Brush-tailed Mulgara	CS2	-	Moderate	Spinifex plains and mulga woodlands on loamy sands	✓		✓					
<i>Sminthopsis longicaudata</i> Long-tailed Dunnart	CS2	Recorded at Wiluna (Appendix 2)	Low	Rocky areas, scree slopes and breakaways		✓		✓				

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Appendix 1. EPBC Protected Matters Search Tool results.

Species listed for the area 10k in radius from three points (26°50'36"S, 119°22'41"E, 27°15'14"S, 119°24'32"E and 27°28'31"S, 119°34'50"E, 27°25'24"S, 119°27'50"E and 27°07'57"S, 119°28'09"E) on the EPBC Protected Matters Search Tool.



Species	Status	Author's Comment
Slender-billed Thornbill <i>Acanthiza iredalei iredalei</i>	Vulnerable	Unlikely to be present due to lack of suitable habitat.
Rainbow Bee-eater <i>Merops ornatus</i>	Migratory (terrestrial)	May be present in the study area.
Eastern Great Egret <i>Ardea modesta</i>	Migratory (wetland & marine)	May be present in the study area.
Oriental Plover <i>Charadrius veredus</i>	Migratory (wetland)	May be present in the study area.
Fork-tailed Swift <i>Apus pacificus</i>	Migratory (marine)	May be present in the study area.

Appendix 2. DEC Threatened and Priority Fauna Database results.

Species listed for the area 80km in radius 740445 E, 6993970 N (Zone 50) on the DEC Threatened and Priority Fauna Database.

Species	Status	DEC records	Author's Comments
Crest-tailed Mulgara <i>Dasyercus cristicauda</i>	Schedule 1	Records from Yeelirrie (Wiluna) in 2009 and from Golden West Resources (Wiluna) in 2007.	May be present in the study area.
Malleefowl <i>Leipoa ocellata</i>	Schedule 1	Records from Yeelirrie (Wiluna) in 1984, Golden West Resources (Wiluna) in 2007, Meekatharra in 2010 and Wiluna in 2006.	Unlikely to be present in the study area.
Peregrine Falcon <i>Falco peregrinus</i>	Schedule 4	Record from Sandstone in 2005, Meekatharra in 1977 and Wiluna in 2001.	Recorded in the study area in 2011 (Swan Bitter)
Rainbow Bee-eater <i>Merops ornatus</i>	Migratory	Records from Wiluna in 1979 and 1980.	May be present in the study area.
Curlew Sandpiper <i>Calidris ferruginea</i>	Migratory	Records from Wiluna in 1979 and 1980.	Unlikely to be present in the study area –generally a coastal species, vagrant inland.
Common Sandpiper <i>Tringa hypoleucos</i>	Migratory	Record from Wiluna in 1980.	May be present in the study area.
Eastern Great Egret <i>Ardea modesta</i>	Migratory	Record from Nallan Dam (Meekatharra) in 2001.	May be present in the study area.
Striated Grasswren <i>Amytornis striatus striatus</i>	Priority 4	Records from Meekatharra in 1983 and Wiluna in 1984.	May be present in the study area.
Australian Bustard <i>Ardeotis australis</i>	Priority 4	Records from Yeelirrie (Wiluna) in 2009, Nallan Dam (Meekatharra) in 2001 and Sandstone in 1969.	May be present in the study area.
Bush Stone-Curlew <i>Burhinus grallarius</i>	Priority 4	Records from Meekatharra in 2001 and Yeelirrie in 2011.	May be present in the study area.
Long-tailed Dunnart <i>Sminthopsis longicaudata</i>	Priority 4	Records from Lake Mason Station in 2005 and 25km W of Wiluna in 2005.	May be present in the study area.

Appendix 3. Camera trap results.

Location	Species recorded	Pictures
740023 E, 6982169 N (Zone 50) (a small sump at Howards)	Nil	
737036 E, 6983158 N (Zone 50) (Mulga woodland at Swan Bitter)	Rabbit (<i>Oryctolagus cuniculus</i>) Goanna (<i>Varanus panoptes</i>)	
736778 E, 7024824 N (Zone 50) (Creek at O'Kearys)	Diamond Dove (<i>Geopelia cuneata</i>) Euro (<i>Macropus robustus</i>)	
754158 E, 6958752 N (Zone 50) (Mulga woodland at Howards)	Nil	