20 July 2009



Tropicana Gold Project
Tropicana-Transline Infrastructure Corridor
Level 1 Fauna Assessment

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

ecologia ENVIRONMENT

1025 Wellington Street WEST PERTH WA 6005 phone: 9322 1944 fax: 9322 1599 ACN 088 821 425 ABN 63 088 821 425

www.ecologia.com.au

TROPICANA GOLD PROJECT

TROPICANA–TRANSLINE INFRASTRUCTURE CORRIDOR

LEVEL 1 FAUNA ASSESSMENT

TROPICANA JOINT VENTURE

20 July 2009

Document Status						
Rev No.	**Author**	**Reviewer/s**	**Date**	**Approved for Issue**		
				Name	**Distributed To**	**Date**
5	J Turpin D Fleming S Pynt A Heidrich E Fox D Cancilla	S Ford	08/07/09	S Ford	B Bastow	20/07/09

Restrictions on Use

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

ecologia
ENVIRONMENT

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

Table of Contents

Tables

Figures

Appendices

Executive Summary

The Tropicana JV (TJV) is currently undertaking a pre-feasibility study on the viability of establishing the Tropicana Gold Project (TGP), which is centred on the Tropicana and Havana Gold prospects. The proposed TGP is located approximately 330 km east north-east of Kalgoorlie, and 15 km west of the Plumridge Lakes Nature Reserve, on the western edge of the Great Victoria Desert (GVD) biogeographic region of Western Australia. The project is a joint venture between AngloGold Ashanti Australia Limited (70% and Manager) and the Independence Group NL.

As part of the proposed TGP, the TJV intends to construct an infrastructure corridor between Kalgoorlie and the project area. The infrastructure corridor will contain an access road and / or fibre optical cable for the site communication. The TJV is currently evaluating two different routes: one via Pinjin Station and one via the existing Trans Australian Railway line access road. This report presents the findings of the fauna assessment for the Tropicana–Transline Infrastructure Corridor option (referred to as the "proposed infrastructure corridor" throughout). The proposed infrastructure corridor travels south of the proposed TGP; west of the boundary of the Plumridge Lakes Nature Reserve (immediately east of Tropicana) and south to the Trans Australian Access Road. The infrastructure corridor will be located in Miscellaneous License granted under the WA Mining Act (L39/186). An additional 30 km stretch of the Plumridge Lakes Access Track was also incorporated into the fauna assessment as a possible alternative route. The fauna assessment encompassed a 200 m corridor.

Initially, a desktop review was undertaken to determine the likelihood of occurrence of conservation significant species in the area, which then became the focal or target species of the field survey. A total of 14 conservation significant species were identified as potentially occurring along the proposed infrastructure corridor, and a further two species were of interest.

The Department of Environment and Conservation (DEC) has recently (August 2008) listed the yellow sandplains communities of the Great Victoria Desert as a Priority Ecological Community (PEC) Priority 3 because of the diverse fauna and flora communities that inhabit this system. The proposed infrastructure corridor traverses this habitat (for GPS coordinates see Table 3.3)

Fieldwork was conducted during the period 23rd July 2007 to 3rd August 2007 along the proposed route to locate and record fauna habitats and look for signs of each species of interest. All fauna habitats intercepted during the fauna assessment were recorded and, where necessary, walked transects were undertaken to scan suitable habitats more thoroughly. A total of 72 vertebrate species was recorded during the survey including conservation significant species and introduced fauna.

With regard to conservation significant fauna, signs of Southern Marsupial Mole (mole holes) and Malleefowl (eight mounds and fresh tracks) were observed. Potential Mulgara and Sandhill Dunnart habitat was noted but no direct evidence was recorded in the project corridor. Stands of large trees providing suitable nesting hollows for parrots were recorded.

Scats were discovered from rocky outcrops in the area that appear to be from a species of *Pseudantechinus*. Based on the currently known distribution of *Pseudantechinus* spp., the scats would be from *Pseudantechinus macdonnellensis* or *P. woolleyae*. A third possibility, *P. roryi*, has recently been synonymised with *P. macdonnellensis* (Westerman *et al.* 2008). While none of these species are conservation listed, the location of the scats in the infrastructure corridor represents a significant range extension for any of these species. The location at which the scats

were recorded will not be impacted by the current proposal, therefore no impacts to any *Pseudantechinus* sp. are anticipated.

A gnamma hole was discovered along the proposed route, and although it showed no direct signs of use by conservation significant species, its possible importance to local wildlife, particularly following rainfall, is worth noting.

A risk assessment (APPENDIX D) was conducted for the proposed works, and the following management recommendations summarise the outcomes of the assessment:

- Limit clearing thick mulga (*Acacia aneura*) stands where Malleefowl could potentially nest. These areas are often small unburnt 'islands' of mulga surrounded by open woodlands;
- Avoid disturbance to rocky outcrops that may provide habitat for *Pseudantechinus* spp.;
- Avoid disturbance to continuous sand dunes where Southern Marsupial Moles may occur;
- Use existing roads and tracks where possible. In some sections tracks exist near to the proposed infrastructure corridor. These should be used were possible to avoid additional clearing;
- Avoid clearing large stands of hollow-bearing trees (e.g. eucalypts, casuarinas) which may provide roosting and nesting sites for parrot species;
- Isolate and remove all waste, particularly food waste, from the work area to prevent attracting feral species;
- Ensure that fire extinguishing equipment is available during construction and that staff are trained in their use
- Avoid smoking near vegetated areas, particularly spinifex (*Triodia* spp.);
- Dust suppression measures should be implemented;
- Avoid all inactive Malleefowl mounds within the project footprint. In particular, note that one of them (649xxxE, 6674xxxN) is only 3 m from an existing track; and
- Ensure trained personnel are present during construction of the communication infrastructure to remove trapped fauna from trenches used to bury cables.

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

The Tropicana Joint Venture (TJV) is currently undertaking a pre-feasibility study on the viability of establishing the Tropicana Gold Project (TGP), which is centred on the Tropicana and Havana Gold prospects. The proposed TGP is located approximately 330 km east north-east of Kalgoorlie, and 15 km west of the Plumridge Lakes Nature Reserve, on the western edge of the Great Victoria Desert (GVD) biogeographic region of Western Australia (Figure 1.1). The project is a joint venture between AngloGold Ashanti Australia Limited (70% and Manager) and the Independence Group NL (30%).

The TGP consists of three main components (Figure 1.1):

- Operational Area - this area contains the mine, processing plant, aerodrome, village and other associated infrastructure;
- Water Supply Area - two basins have been investigated, the Minigwal Trough and Officer Basin; and
- Infrastructure Corridor - two options are under consideration (Tropicana–Transline and Pinjin Road options).

As part of the proposed TGP the TJV intends to construct an infrastructure corridor between Kalgoorlie and the project area. The infrastructure corridor will contain an access road and / or fibre optical cable for site communication. The TJV is currently evaluating two different routes, one via the Pinjin Station and one via the existing Trans Australian Railway line access road. This report presents the findings of the vertebrate fauna assessments for the Tropicana–Transline Infrastructure Corridor option (referred to as the "proposed infrastructure corridor" throughout). The proposed infrastructure corridor travels south of the proposed TGP; west of the boundary of the Plumridge Lakes Nature Reserve (immediately east of Tropicana) and along the route of a 4WD track, locally known as the Cable Haul Road, to the Trans Australian Access Road;. The proposed infrastructure corridor will be located in Miscellaneous License granted under the WA Mining Act (L39/186).

The proposed infrastructure corridor will require the widening of approximately 120 km of existing tracks, and the construction of approximately 95 km of new clearing connecting the southern part of the corridor to the proposed TGP (Figure 1.1). The infrastructure corridor diverts around the south-west corner of Plumridge Lakes Nature Reserve (corridor is approximately 15 km away from the reserve).

The proposed infrastructure corridor will be up to 30 m wide depending on the infrastructure established. In order to avoid areas of significant vegetation or populations of federally or state list threatened plant species, a 200 m wide corridor was assessed along its length.

This page has been left blank intentionally

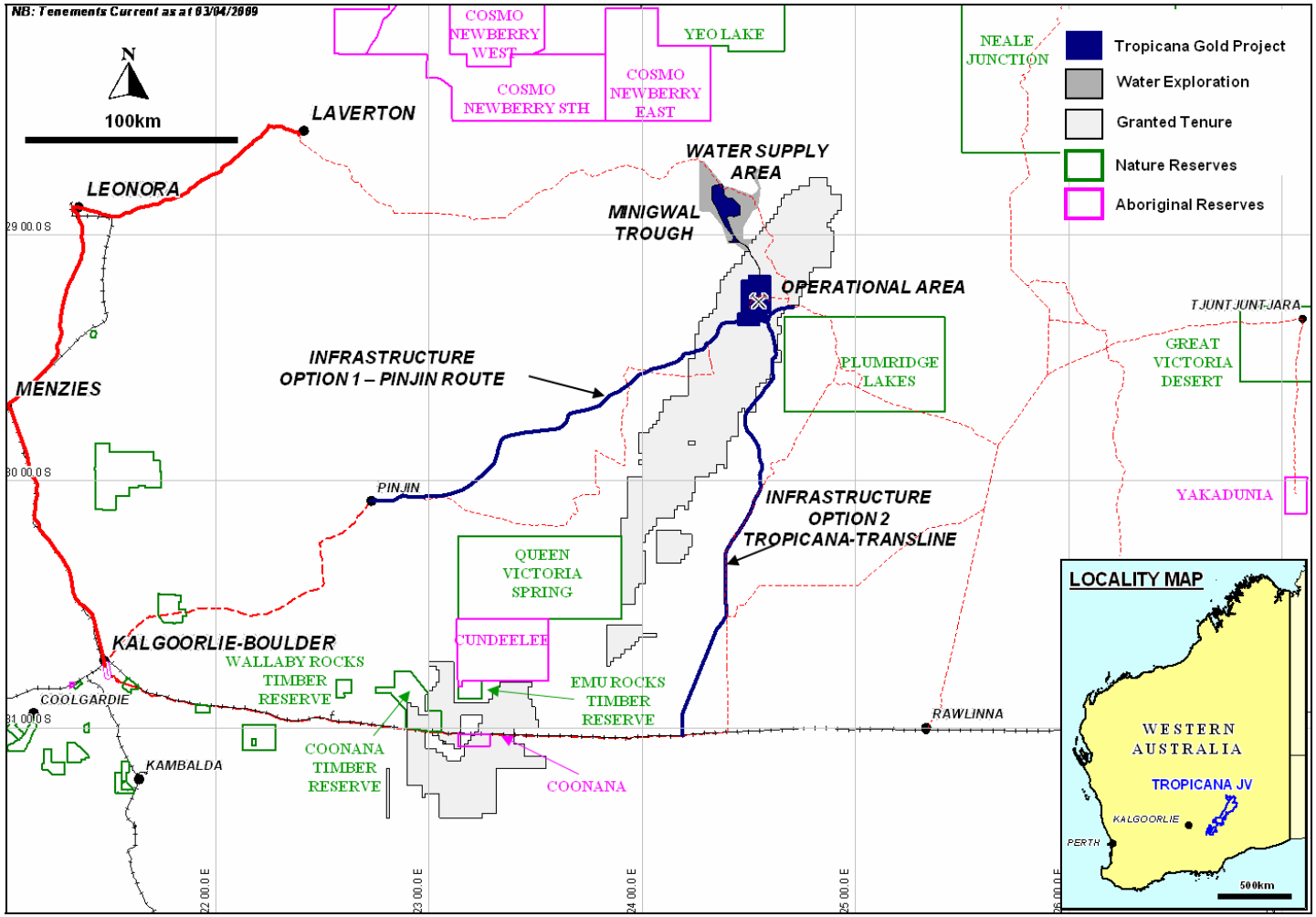

Figure 1.1 Location of the Tropicana Gold Project showing the Tropicana–Transline Infrastructure Corridor

This page has been left blank intentionally

1.2 LEGISLATIVE FRAMEWORK

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

- *The Precautionary Principle*

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

- *The Principles of Intergenerational Equity*

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

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

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

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

Native fauna and fauna in Western Australia are protected at a Federal level under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and at a State level under the Wildlife Conservation Act 1950 (WC Act).

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

The WC Act was developed to provide for the conservation and protection of wildlife in Western Australia. Under Section 14 of this Act, all fauna and flora within Western Australia is protected; however, the Minister may, via a notice published in the Government Gazette, declare a list of fauna taxa identified as likely to become extinct, or is rare, or otherwise in need of special protection. The current listing was gazetted in August 2008.

1.3 PREVIOUS FAUNA STUDIES

Relatively few studies have been undertaken in the Great Victoria Desert bioregion when compared with well surveyed areas, such as the Pilbara bioregion. Data from three previous fauna studies are included in APPENDIX A and provide a regional context. These are from surveys at Plumridge Lakes (Burbidge *et al.* 1976), Mulga Rock (Martinick & Associates 1986) and the Tropicana Operational Area (*ecologia* 2009b).

Plumridge Lakes Nature Reserve is located within 25 km of the proposed Tropicana Gold Project, within both the Shield and Central subregions of the Great Victoria Desert bioregion. The Mulga Rock survey, conducted approximately 15 km north of the Queen Victoria Springs Nature Reserve, is located approximately 100 km south-south-west of the Operational Area. The survey of the Operational Area has been conducted by *ecologia* Environment and is located inside the Tropicana project area providing recent and detailed biological information of the region (*ecologia* 2009b).

1.4 SURVEY OBJECTIVES

The Environmental Protection Authority (EPA) supports the following objectives with regard to fauna management:

- maintain the abundance, species diversity and geographical distribution of terrestrial fauna and,
- protect Specially Protected (Threatened) fauna, consistent with the provisions of the *Wildlife Conservation Act 1950*.

This survey was conducted to determine impacts of the proposed development of an Access Road and / or communication corridor on native fauna, in particular those species of conservation significance.

Fourteen species of conservation significance are assessed as having potential to occur within the proposed infrastructure corridor and therefore key aims of the fauna survey were to:

- Determine the suitability of habitat to support the Southern Marsupial Mole (*Notoryctes typhlops*; EPBC Act Endangered, WC Act Schedule 1), and where suitable habitat exists, determine presence via dug trenches (as per guidelines from Benshemesh 2005a);
- Determine the suitability of habitat to support the Sandhill Dunnart (*Sminthopsis psammophila*; EPBC Act Endangered, WC Act Schedule 1) and Brush-tailed Mulgara (*Dasycercus blythi*; DEC Priority 4), and where suitable habitat exists, undertake a search for secondary evidence;
- Determine the suitability of habitat to support the Malleefowl (*Leipoa ocellata*; EPBC Act Vulnerable, WC Act Schedule 1), and where suitable habitat exists, determine presence via active mounds;
- Determine the suitability of habitat to support any other rare fauna potentially impacted by the construction project as determined through literature reviews and consultation with the Department of Environment and Conservation; and
- Document habitat trees suitable to provide nesting sites for rare parrots (Naretha Blue Bonnet *Northiella haematogaster narethae* and Princess Parrot *Polytelis alexandrae*).

1.5 BIOPHYSICAL ENVIRONMENT

1.5.1 Climate

The northern section of the proposed infrastructure corridor is located in the south-west of the Great Victoria Desert which experiences an arid climate with summer and winter rainfall ranging from 150 to 190 mm per year (Beard 1974; Beard 1975; Barton and Cowan 2001). The southern section of the infrastructure corridor is located on the boundary between the southern Great Victoria Desert and the Nullarbor (Nyanga Plain), and experiences a semi-arid to arid climate with a mean rainfall of between 180 and 230 mm (Bunting and Van de Graaff 1977). Rainfall is fairly evenly distributed throughout the year but is sporadic, and long periods of drought are common.

No long-term climate records are available for the study area and the closest Bureau of Meteorology weather stations with current records are located at Laverton, approximately 220 km north-east of the northern end of the road, Balgair, approximately 100 km south-east of the southern end of the road; and Kalgoorlie-Boulder, approximately 260 km west of the southern end of the road. Climatic conditions for the study area can be extrapolated from data recorded at these three locations (Figure 1.2). Laverton, Balgair and Kalgoorlie-Boulder stations receive more rainfall than that indicated by Beard (1974; Beard 1975) and Barton and Cowan (2001) for the Great Victoria Desert.

The information presented in Figure 1.2 was compiled using records from:

- Laverton - located at 28.63 °S/ 122.41 °E (records from 1899 – 2007);
- Balgair - located at 31.09 °S/ 125.66 °E (records from 1982 – 2007); and
- Kalgoorlie-Boulder Airport - located at 30.78 °S/ 121.45 °E (records from 1939 – 2007) (Bureau of Meteorology, 2007).

Mean annual rainfall records for Balgair, Laverton and Kalgoorlie-Boulder are 277.8 mm, 233.4 mm and 266.1 mm respectively. The climate is strongly influenced by a band of high pressure known as the sub-tropical ridge. For much of the year this ridge is located to the south, allowing east to south-east winds to prevail. The ridge moves north during winter allowing occasional cold fronts to pass over the Goldfields.

Summer rainfall is generally associated with cyclonic rainfall extending into the interior, and this may result in heavy rainfall between January and April (Laverton received 233.6 mm in February 1995 and Kalgoorlie received 307.8 mm in February 1948). It is not uncommon for very little rain to occur for months. Rainfall for the 12 month period prior to the first of the surveys (23rd of July to 3rd of August 2007), was 251 mm for Laverton, 279 mm for Balgair, and 215 mm for Kalgoorlie-Boulder (Bureau of Meteorology 2008).

Kalgoorlie-Boulder has a dry climate with hot summers and cool winters, (Bureau of Meteorology 2007). January is the hottest month with an average maximum of 33.6°C, and temperatures of above 40°C occur nearly once a week. Winters are cool with July being the coolest month, with average maximum and minimum temperatures of 16.7°C and 4.9°C respectively. The lowest maximum temperature recorded was 7.2°C on 19 July 1961. Overnight temperatures fall below freezing about 4 times in a typical winter; such events occur on clear nights following a day of cold southerly winds.

Temperature extremes are also experienced in the region, with the highest maxima at Laverton and Balgair being 46.1°C (1957) and 47.6°C (1991) respectively. Lowest minima fall below zero during the winter months and the lowest minima recorded at Laverton and Balgair were -2.4°C (1969) and -5.0°C (2006) respectively.

1.5.2 Biogeography

The Interim Biogeographic Regionalisation for Australia categorises the Australian continent into regions defined on the basis of geology, landforms, vegetation, fauna and climate (IBRA 2000). The survey area spans four subregions of the Great Victoria Desert, Coolgardie and Nullarbor bioregions (Figure 1.3). At the northern end, close to Tropicana camp, the corridor runs through the Central subregion of the Great Victoria Desert bioregion (GVD2). The middle section runs through the Shield subregion of the same bioregion (GVD1), and the southern section of the corridor through the eastern border of the Eastern Goldfields subregion of the Coolgardie bioregion (COO3), and extends into the Nullarbor Central Band subregion (NUL2) of the Nullarbor bioregion.

Overall, the Great Victoria Desert bioregion is dominated by longitudinal sand dunes with a predominant east-west orientation and ring dunes separated by interdune corridors and sand plains (Bunting and Van de Graaff 1977). Each of the subregions traversed by the project area is described below, from Barton and Cowan (2001).

1. The Central subregion (Great Victoria Desert): arid active sand ridge desert with extensive dune fields; landforms consist of salt lakes and major valley floors with lake derived dunes, sand plains; vegetation is primarily a tree steppe of *Eucalyptus gongylocarpa*, *Acacia aneura* and *E. youngiana* over hummock grassland dominated by *Triodia basedowii* on the aeolian sands. *Acacia* dominates colluvial soils along with *Eremophila* and *Santalum* spp.

2. Shield subregion (Great Victoria Desert): western end of the GVD region, underlain by the Yilgarn Craton; highest proportion of sandplains in the bioregion; landforms consist of salt lakes and major valley floors with lake derived dunes, sand plains with patches of seif dunes running east west; areas of moderate relief with out-cropping and silcrete-capped mesas and plateaus (breakaways)

3. The Eastern Goldfields subregion (COO3) (Coolgardie bioregion): lying on the Yilgarn Craton's Eastern Goldfields Terrains, gently undulating plains interrupted in the east by a horst of Proterozoic basic granulite, vegetation is mallees, Acacia thickets and shrub-heaths on sandplains, diverse Eucalypt woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. The area is rich in endemic acacias.

4. The Nullarbor Central Band subregion (NUL2) (Nullarbor bioregion): tertiary limestone plain with subdued arid karst features, subregion is dominated by the Nullarbor Plain, which is wholly contained within the much larger Bunda Plateau. It supports a bluebush-saltbush steppe in central areas; low woodlands of *Acacia papyrocarpa* (western myall) over *Maireana sedifolia* (bluebush); *Myoporum platycarpum* and *Eucalyptus oleosa* in the east and west

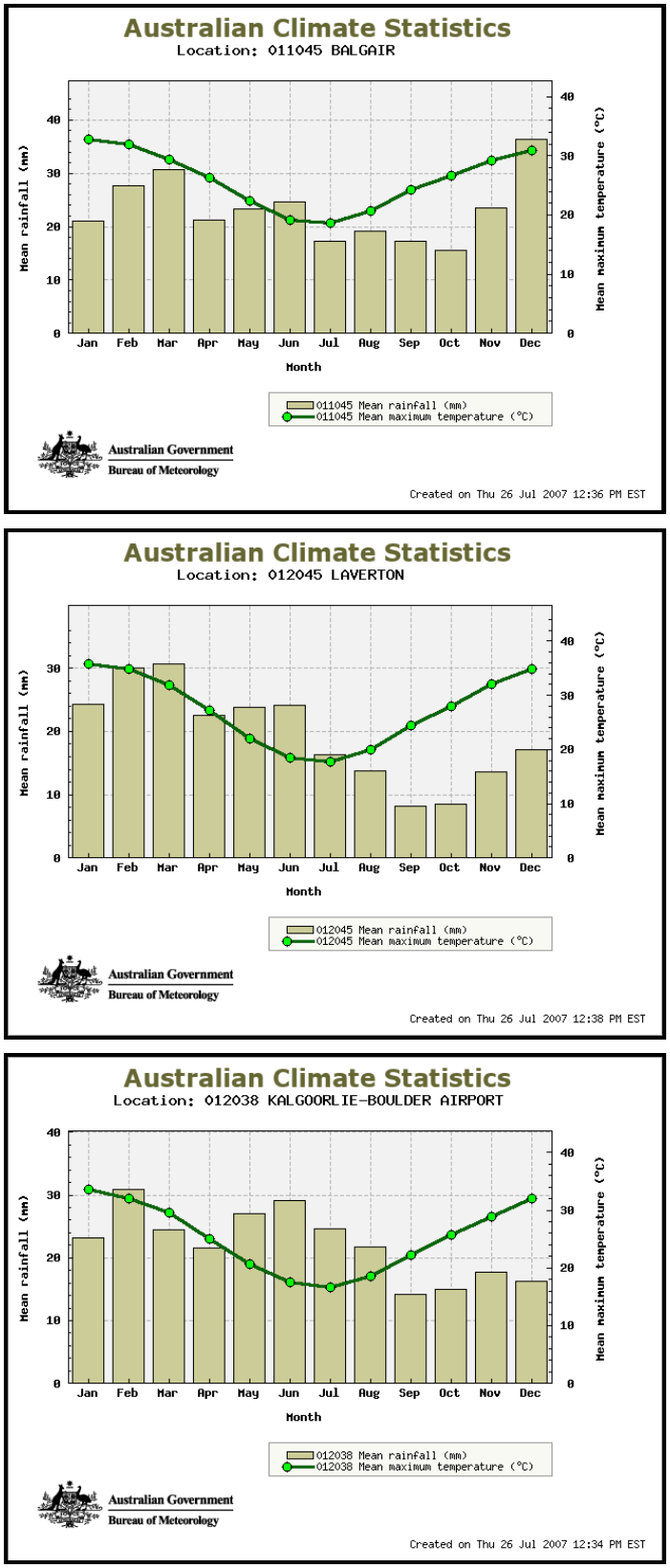

Figure 1.2 Mean monthly rainfall and mean maximum temperature data for Balgair, Laverton and Kalgoorlie-Boulder weather stations (BOM 2007)

This page has been left blank intentionally

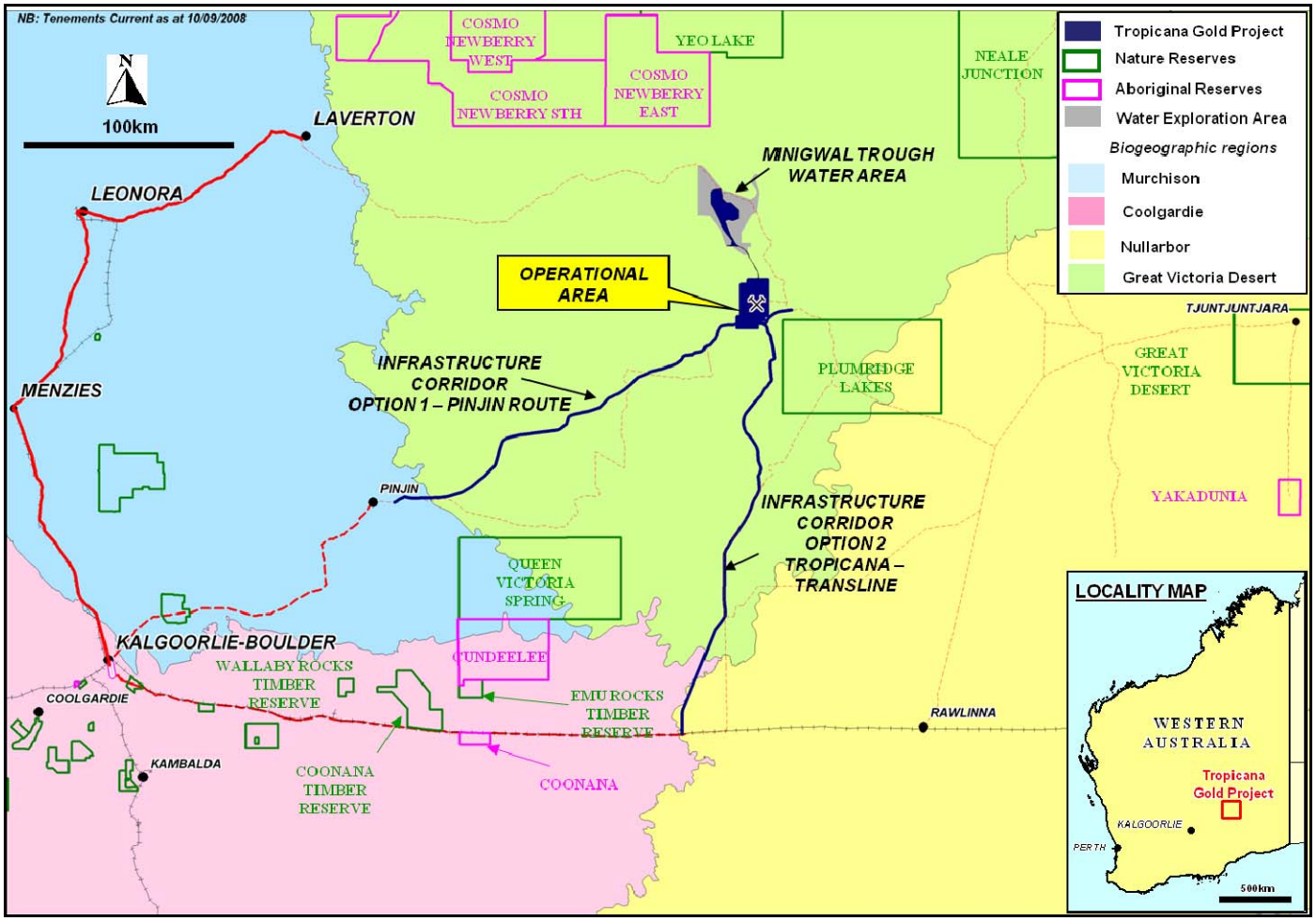

Figure 1.3 The Biogeographic regions associated Tropicana–Transline Infrastructure Corridor

This page has been left blank intentionally

1.5.3 Vegetation

The majority of the proposed infrastructure corridor (middle and northern sections) is situated in the Helms Botanical District, near the border of the Great Victoria Desert and the Nullarbor Plain, within the Eremaean Botanical Province. The southernmost section is situated on the boundary of the Eucla Botanical District (Nyanga Plain) within the Eremaean Botanical District and the Coolgardie Botanical District within the south-western Interzone.

Beard (1975) described distinct vegetation units within close proximity to and including the proposed infrastructure corridor:

Northern section

- Tree (*Eucalyptus gongylocarpa*, *E. youngiana*) and shrub steppe between sand hills with hummock grassland (*Triodia basedowii*).
- *Acacia aneura* (mulga) low woodland between sand ridges.
- *Acacia aneura* / *Casuarina cristata* (*C. pauper*) woodland (mulga and sheoak).

Middle section

- Tree (*Eucalyptus gongylocarpa*, *E. youngiana*) and scattered *Acacia aneura* shrub steppe on sandplain with hummock grassland (*Triodia basedowii*).

Southern section

- Mosaic *Eucalyptus oleosa* (mallee) and *Triodia scariosa* with patches of *Eucalyptus salmonophloia* and *Eucalyptus salubris* (gimlet) woodland.
- *Acacia aneura* / *Casuarina cristata* (*C. pauper*) / *Myoporum* and *Atriplex* (saltbush) or *Kochia* (bluebush) thickly wooded succulent steppe.

This page has been left blank intentionally

2.0 METHODS

The survey methods adopted by *ecologia* are aligned with the Environmental Protection Authority's Guidance Statement No. 56 (EPA 2004) and Position Statement No. 3 (EPA 2002).

The proposed infrastructure corridor occurs predominantly within the Great Victoria Desert bioregion. A review of Guidance Statement No. 56 showed that a Level 1 survey was recommended, incorporating a desktop assessment and reconnaissance visit. The purpose of a reconnaissance field survey is to verify the accuracy of the background study, to further delineate and characterise the fauna and faunal assemblages present and identify potential impacts. It requires:

> "*a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area*" (EPA 2004).

2.1 DETERMINATION OF SURVEY SAMPLING DESIGN AND INTENSITY

Prior to the development of survey methods, a review was undertaken of factors likely to influence survey design (Table 2.1).

Table 2.1 Factors likely to influence survey design (EPA 2004).

FACTOR	RELEVANCE	COMMENT
Bioregion – level of existing survey/ knowledge of the region and associated ability to predict accurately.	Limited information on fauna of the project area	The level of existing knowledge in the Great Victoria Desert bioregion is low and few fauna surveys have been undertaken in the region. Existing surveys include those conducted by *ecologia* (2009), Martinick and Associates (1986) and Burbidge *et al*. (1976)
Landform special characteristics/ specific fauna/ specific context of the landform characteristics and their distribution and rarity in the region.	The project area lies at the transition from Great Victoria Desert to Nullarbor bioregion	The survey area traverses a range of different fauna habitats, including Salmon Gum woodlands, which are near their easternmost distribution. Other fauna habitats are well represented in the surrounding region. Landforms vary from dune/interdune systems to open sandy plain to red-earth based woodlands.
Lifeforms, life cycles, types of assemblages and seasonality (e.g. migration) of species likely to be present.	Survey undertaken in July/August	This survey was conducted during winter. Activity of reptile taxa was reduced by cold wet weather, but mammal and bird activity was less affected. Fauna habitats and secondary species evidence were still recordable. Despite the cool, wet weather several reptile species were recorded but no amphibians were observed.
Number of different habitats or degree of similarity between habitats within a survey area.	Widely different habitats occur	The survey area traverses a range of differing fauna habitats, all of which were investigated during the survey.

FACTOR	RELEVANCE	COMMENT
Climatic constraints (e.g. temperature or rainfall that preclude certain sampling methods).	Survey undertaken in July/August	This survey was conducted during winter. Activity of reptile taxa was reduced by cold wet weather, but mammal and bird activity were less affected as these taxa are generally less affected by cold weather. Several reptile species were recorded but no amphibians were found.
Sensitivity of the environment to the proposed activities.	Extensive undisturbed habitat	The receiving environment is highly intact and undisturbed relative to other parts of the state and local impacts are not expected to result in reductions to biodiversity in the region. However much of the northern and middle section of the proposed infrastructure corridor potentially traverses a Priority 3 ecological community (PEC) listed by DEC (for locations see Table 3.3).
Size, shape and location of the proposed activities.	Infrastructure corridor approx. 300 km long	The proposed infrastructure corridor route is approximately 270 km long with an additional 30 km surveyed as an optional route. The survey covered 200 m on either side of the corridor centreline. Localised impacts to fauna and fauna habitat are anticipated within this corridor.
Scale and impact of the proposal.	Localised direct impact	Vegetation clearing and road construction will have localised effects on fauna and fauna habitats along the length of the infrastructure corridor during construction. The effect on local biodiversity resulting from the clearing of vegetation will be low, but impacts due to vehicle strike, increased risk of fire, increased access to introduced fauna, dust and noise pollution during both the construction and operational phases could cause localised losses of biodiversity. These impacts are discussed in Section 5.0.

2.2 LITERATURE REVIEW AND DATABASE SEARCHES

The following databases were consulted in the formulation of potential fauna (including conservation significant fauna) lists. A search area bound by coordinates 29°S, 124°E (NW corner) and 30°S, 125°E (SE corner) was used.

- Western Australian Museum (WAM) FaunaBase
- Birds Australia Birdata
- Department of Environment, Heritage, Water and the Arts (DEWHA) Protected Matters database
- DEC Threatened fauna database

2.3 SURVEY TIMING

The field work was conducted by a team of four *ecologia* personnel from 23rd July to 3rd August 2007, with a total of 36 person days.

2.4 SITE SELECTION

Site selection was based on locating suitable habitat for conservation significant species and species of interest within the 200 m wide corridor. This was determined primarily using aerial maps of the area and recognising fauna habitat changes in the field while traversing the proposed infrastructure corridor.

Searching was focussed upon the habitat types listed in Table 2.2, as these are the habitats preferred by conservation significant species flagged as potentially occurring within the survey area.

Table 2.2 Habitat types of interest

PREFERED HABITAT	SPECIES	REFERENCES
Long unburnt spinifex on sand dunes	Sandhill Dunnarts, Brush-tailed Mulgara, Woma Python	Gaikhorst (pers comm.); (Masters 1993; DEC 2007b; Koertner *et al.* 2007; DEH 2008; Ehmann and Watson 2008a)
Sand dunes	Southern Marsupial Mole	(Benshemesh 2004; Benshemesh 2005a)
Long unburnt mallee/mulga thickets	Malleefowl	(Benshemesh 1992; Benshemesh 2000; Garnett and Crowley 2000)
Regenerating hummock grassland on red dunes and plains	Great Desert Skink	(McAlpin 2001; Pavey 2006b; McGuire 2008)
Eucalypt woodlands	Princess Parrot, Naretha Blue Bonnet, Peregrine Falcon, South-west Carpet Python	(Johnstone and Storr 1998; Garnett and Crowley 2000; DEC 2007a; DEWHA 2008a)
Chenopod shrub steppe in treeless or sparsely wooded flatlands	Slender-billed Thornbill	(Garnett and Crowley 2000; Pavey 2006c; DEWHA 2008b)

2.5 PROPOSED INFRASTRUCTURE CORRIDOR SURVEY

During the survey, records were made of all fauna habitats traversed by the proposed infrastructure corridor. Due to the remote location of the infrastructure corridor, two vehicles and four personnel were required to undertake the survey. An existing section of the Tropicana–Transline Infrastructure Corridor was surveyed at a rate of approximately 25 km per day (for 200 km plus 30 km of alternate route), while the new section of the corridor was surveyed at a rate of approximately 10 km per day (for approx. 70 km).

Where the proposed infrastructure corridor impacted on habitat suitable for supporting fauna species of conservation significance, walking transects were conducted parallel to the road by all personnel, spaced 25 – 50 m apart, to cover a 200 m corridor. Evidence such as tracks, scats, feeding signs and breeding structures were recorded. Searching for reptiles and any observations of birds and mammals were also recorded. Records were made of significant habitats, such as mature trees with hollows, which may provide nesting or refuge habitat for rare parrots known to occur in the area.

Where appropriate, these habitats were flagged for avoidance during clearing. This enabled a qualitative interpretation of the impacts of clearing to be made on

sedentary fauna species within and adjacent to the clearance zone. Notes and location data on fauna habitats are listed in APPENDIX C.

Additionally, opportunistic records were made of all mammals, reptiles and birds observed during the survey.

2.6 SPECIES-SPECIFIC SURVEY METHODOLOGY

2.6.1 Southern Marsupial Mole (*Notoryctes typhlops*)

Where extensive sand dune fields were encountered, Southern Marsupial Mole (SMM) monitoring trenches were excavated to detect their presence. Three suitable sand dunes for SMM were discovered and monitored during the survey (Table 2.3).

Table 2.3 Locations and GPS coordinates of Southern Marsupial Mole survey sites.

SITE	LOCATION	GPS
MMS1	Infrastructure Corridor (alternate route)	656491mE
		6688084mN
MMS2	Infrastructure Corridor (alternate route)	655357mE
		6685417mN
MMS3	Infrastructure Corridor	646882mE
		6670945mN

Datum WGS 84, Zone 51J

The cryptic subterranean habits of the SMM make direct examination virtually impossible; however, studies in the Northern Territory indicate that indirect methods provide a reliable means for determining the distribution and abundance of SMM. The most efficient means of surveying SMM is to count the number of 'mole holes' underground. These signs persist for a number of years, thus providing a high yield of counts relatively easily (Benshemesh 2005a). The specialised techniques developed by Benshemesh (2005a) were implemented during this survey.

Where extensive sand dune fields were encountered monitoring trenches were excavated to detect the presence of the SMM. Three to four trenches were installed at the peak, middle and foot of each dune. Each trench was dug to a depth of approximately 1.5 m and all four walls were smoothed to create an even surface to optimise clarity of results. A small ramp into the trench was constructed on the southern wall to enable any inadvertently captured animals to escape easily. Trenches were oriented east-west to maximise exposure of the main, southern face to the sun to reduce drying time. Drying is necessary to allow the backfilled mole tunnels (mole holes) to become visible, particularly the older ones. Benshemesh (2005a) suggests the typical drying time is three to five days. Due to the nature of this survey some of the sites were left to dry for up to nine days after opening. Checking the trenches involved searching for all apparent mole holes, and measuring their location, appearance, condition and several other factors after Benshemesh (2005a), as shown in Table 2.4.

Table 2.4 Mole hole characteristics recorded.

CHARACTER	DESCRIPTION
Dmin, Dmax	the minimum and maximum diameter of each mole hole;
Angle	the angle of the long axis of the mole hole from the horizontal;
Depth	depth of the mole hole from the surface;
X	distance from the left edge of the face; and
Trench face	dimensions of the trench face
Clarity	the clarity of the mole hole on a scale from 1 (unclear) to 3 (very clear)
Confidence	that what is measured is in fact a mole hole, on a scale from 1 (unconfident) to 3 (very confident);
Tap test	record whether there is any difference between the amount of sand that falls away when tapping within the mole hole relative to the surrounding sand. This was scored as 1 (no difference) to 3 (large difference); and
Age:	A subjective evaluation of the appearance of the mole hole. Age descriptions and their meaning are given as follows:
Fresh	Fresh loose sand pours from the mole hole with little or no provocation;
Recent	Recent clear and sharp edged; sand inside is firm but not free-flowing;
Oldish	Oldish neither recent nor highly degraded;
Old	Old mole hole faint and easily missed; sand inside appears firm but is softer than surrounding sand; and
Very old	Very old, very faint and very easily missed, but often made apparent by flinging sand.

2.6.2 Sandhill Dunnart (*Sminthopsis psammophila*)

Prior to the commencement of the survey, survey staff from *ecologia* visited the Perth Zoo to view photographs of trapping sites utilised by Mr. Gaikhorst and Ms. Lambert. Some survey staff also visited the location of one of Gaikhorst and Lambert's trapping sites to examine known suitable habitat for the Sandhill Dunnart.

Mr Gaikhorst was one of the members of the survey team and was therefore involved in determining which habitats were prospective for Sandhill Dunnarts. These were determined to include open areas supporting large, mature spinifex on yellow sand dunes (Gaikhorst pers. comm.; Churchill 2001; Pearson and Churchill 2008). When areas similar to this were encountered, opportunistic surveys for Sandhill Dunnart burrows were undertaken by the fauna personnel.

2.6.3 Malleefowl (*Leipoa ocellata*)

Methods used to determine the occurrence of Malleefowl included observations of habitats adjacent to tracks (searching for Malleefowl mounds) during normal surveying activities and targeted searches of thicker vegetation, e.g. mulga patches, for Malleefowl mounds.

2.6.4 Brush-tailed Mulgara (*Dasycercus blythi*)

Occurrence of mulgara was thought to require suitable spinifex hummock habitats, sometimes associated with drainage systems and/or low shrubs (Caton 2007; Koertner *et al.* 2007). Due to the habit of individuals building and using multiple

burrows within their territory (Caton 2007), areas where mulgara are present are typically characterised by several medium-sized burrows located amongst spinifex hummocks.

Searches of suitable sites were lead by personnel with previous mulgara survey experience.

Personnel searched for areas of moderately aged, sizeable spinifex clumps with 'runways' between them along which mulgara could potentially forage. Within such areas, searches for the characteristic burrow systems and scats of mulgara were undertaken.

2.7 ANIMAL ETHICS

Surveying was conducted as per *ecologia*'s Animal Ethics Code of Practice, which conforms to Section 5 of the *Australian code of practice for the care and use of animals for scientific purposes* (NHMRC 2004). No voucher specimens were lodged with the W.A. Museum as all fauna was identified to species in the field.

2.8 TAXONOMY AND NOMENCLATURE

Nomenclature for mammals and amphibians within this survey are as per the W.A. Museum's FaunaBase. Nomenclature for birds is according to Christidis and Boles (2008) and reptiles according to Wilson and Swan (2008). References used for identification are listed in Table 2.5.

Table 2.5 References used for identification.

FAUNA GROUP	REFERENCE
Mammals	Menkhorst and Knight (2004)
Bats	Churchill (1998), Menkhorst and Knight (2004)
Birds	Simpson and Day (2004)
Reptiles	Cogger (2000), Wilson and Swan (2008)
Geckos	Cogger (2000), Wilson and Swan (2008)
Skinks	Storr et al.(1999), Wilson and Swan (2008)
Dragons	Cogger (2000), Wilson and Swan (2008)
Varanids	Cogger (2000), Wilson and Swan (2008)
Legless Lizards	Cogger (2000), Wilson and Swan (2008)
Snakes	Storr et al. (2002), Wilson and Swan (2008)
Amphibians	Tyler et al. (2000), Cogger (2000)

2.9 SURVEY TEAM

Project Manager: Jeff Turpin
Field Staff: Jeff Turpin
Glen Gaikhorst
Dawn Fleming
Thomas Rasmussen

The survey was conducted under DEC Licence SF005952.

3.0 RESULTS

3.1 SURVEY LIMITATIONS

Limitations of the current survey are summarised in Table 3.1.

Table 3.1 Summary of survey limitations.

CONSTRAINT	RELEVANT	COMMENT
Competency/ experience of the consultant carrying out the survey.	No	All members of the survey team have appropriate training, experience and mentoring in fauna identification and fauna surveys.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	No	Signs of several targeted species were found during the survey. Survey methods are appropriate to a Level 1 survey.
Proportion of fauna identified, recorded and/ or collected.	Moderate constraint	Collection of data relied mainly on secondary evidence of species. Most evidence was identified with a high level of confidence. In some cases, scats could not be identified to species level (e.g. *Pseudantechinus* sp.).
Sources of information (previously available information as distinct from new data).	Moderate constraint	Very few surveys have been undertaken in the region. Available literature was examined and a search of fauna databases was conducted to determine likely species composition in the area.
The proportion of the task achieved and further work which might be needed.	No	Reconnaissance survey completed and all necessary Southern Marsupial Mole trenches dug and analysed.
Timing/ weather/ season/ cycle.	Moderate constraint	This survey was conducted during the winter months. Activity of reptile taxa was reduced by cold wet weather, but mammal and bird activity were less affected. Fauna habitats and secondary evidence were still recorded.
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	Moderate constraint	Extensive areas of burnt vegetation reduced fauna numbers in the southern section (approx. 35 km continuous stretch burnt)
Intensity (in retrospect was the intensity adequate).	No	Survey intensity was adequate for Level 1 reconnaissance survey
Completeness (e.g. was relevant area fully surveyed).	No	Despite difficult access along the 70 km stretch of undeveloped track the entire proposed infrastructure corridor was adequately surveyed. All potential Southern Marsupial Mole sites were analysed along with four sites from the previous *ecologia* survey carried out in 2007.
Resources (e.g. degree of expertise available in animal identification to taxon level).	No	All fauna was identified in the field.

CONSTRAINT	RELEVANT	COMMENT
Remoteness and/ or access problems.	No	Suitably equipped vehicles (i.e. 16 ply tires) made the survey area considerably accessible.
Availability of contextual (e.g. biogeographic) information on the region.	Moderate constraint	Little contextual information is available for the region. Existing surveys include *ecologia* (2009b), Martinick and Associates (1986) and Burbidge *et al*. (1976)
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	No	Sampling methods were adequate for the requirements of the survey.

3.2 FAUNA HABITATS AND COMMUNITIES

3.2.1 Fauna habitats

The fauna habitats occurring along the proposed infrastructure corridor are consistent with those described by Beard (1975). In the northern section, sand ridges were encountered with bands of mixed mulga and eucalypt woodland occurring between them. Further south, the sand ridges gave way to open sandplain supporting mixed eucalyptus and acacia woodlands with some Salmon Gum (*Eucalyptus salmonophloia*) woodland (near the eastern margin of this woodland). Continuing south, major habitat changes occur with the transition from the Great Victoria Desert bioregion to the Nullarbor bioregion; this corresponds with the change from the Helms botanical district to the Coolgardie / Eucla botanical districts.

Northern Section

- Sand ridges supporting mixed low *Acacia* spp. and other species shrublands over *Triodia* spp. (in unburnt areas) (Plate 1)
- Tree (*Eucalyptus gongylocarpa, E. youngiana*) and shrub steppe between sand hills with hummock grassland (*Triodia basedowii*) (Plate 2)
- *Acacia aneura* (mulga) low woodland between sand ridges (Plate 3)
- *Acacia aneura* / *Casuarina cristata* (*C. pauper*) woodland (mulga and sheoak) (Plate 4)

Middle Section

- Tree (*Eucalyptus gongylocarpa, E. youngiana*) and scattered *Acacia aneura* shrub steppe on sandplain with hummock grassland (*Triodia basedowii*) (Plates 5 and 6)

Southern section

- Mosaic *Eucalyptus oleosa* (mallee) and *Triodia scariosa* with patches of *Eucalyptus salmonophloia* and *Eucalyptus salubris* (gimlet) woodland (Plates 7 and 8)
- *Acacia aneura* / *Casuarina cristata* (*C. pauper*) / *Myoporum* and *Atriplex* (saltbush) or *Kochia* (bluebush) thickly wooded succulent steppe (Plate 9)

Examples of these habitat types are given in Table 3.2.

A large proportion of the southern end of the proposed infrastructure corridor (notably from 653750e 6636600n to 632750e 6618000n) had been subject to intensive

burning and it was unlikely that this section could currently support large numbers of native fauna.

A number of significant habitats were recorded along the proposed infrastructure corridor. These comprised mulga woodland (potentially supporting Malleefowl), vegetated yellow sand dunes with large spinifex (potentially supporting Sandhill Dunnarts and SMM), vegetated sand plains with dense spinifex (potentially supporting Brush-tailed Mulgara and Sandhill Dunnarts), tree hollows (potentially supporting conservation significant parrots), and rocky outcrops (possibly supporting *Pseudantechinus* sp.).

Table 3.2 Examples of habitats encountered along the infrastructure corridor.

Plate 1
Mixed low shrubland with sparse *Triodia* sp. on dune

Plate 2
Open *Eucalyptus gongylocarpa* / *Callitris columellaris* woodland with scattered mixed low shrubs over moderately open to moderately dense low *Triodia* sp. hummocks on sandy interdune

Plate 3
Interdunal moderately dense mulga (*Acacia aneura*) woodland over scattered low shrubs with little understorey over hard reddish soil

Plate 4
Acacia aneura low trees over mixed shrubs over hummock grass (*Triodia* sp.)

Plate 5
Mixed *Acacia / Eucalyptus / Casuarina* open woodland over mixed low shrubs over very open *Triodia* sp. on sandplain

Plate 6
Mixed *Acacia aneura* / *Eucalyptus* spp. low woodland with scattered mixed low shrubs over open *Triodia* sp. over stony soils

Plate 7
Open *Eucalyptus oleosa* low mallee trees over sparse *Senna* spp. over open *Triodia* sp. over sand

Plate 8
Very open low Salmon Gum trees over open to moderately dense *Maireana sedifolia* with scattered mixed shrubs on sandy soil

Plate 9
Open *Casuarina pauper* low trees over open *Maireana sedifolia* low shrubs

3.2.2 Yellow Sandplain Community

The DEC has listed the yellow sandplains community near the Queen Victoria Nature Reserve as a Priority 3 Priority Ecological Community (PEC) due to the high diversity of small vertebrates, unusual combinations of species and large numbers of threatened species (Brush-tailed Mulgara, Southern Marsupial Mole, Sandhill Dunnart, Woma Python, Malleefowl, Scarlet-chested Parrot, Princess Parrot and Major Mitchell's Cockatoo) as well as the presence of rare and poorly known plant species this habitat supports (see APPENDIX E). However, yellow sandplains are known to support grass trees (*Xanthorrhoea* sp.) and *Banksia* spp. which were not recorded during the flora survey.

Nevertheless, GPS coordinates outlining the southern extent of the PEC yellow sandplain (from DEC) are given in APPENDIX E and suggest that sections totalling 15 km may be potentially impacted by the proposed project (see Table 3.3, Figure 3.1). The northern boundary of the yellow sandplains is still unknown.

Table 3.3 Locations, GPS-coordinates and extent of possible PEC impact areas

LOCATION	WGS84 Zone 51 J		DISTANCE
	EASTING	NORTHING	km
Section A			
Northern end	657618	6736247	12
Southern end	655817	6725644	
Section B			
Northern end	648319	6716559	3
Southern end	646023	6713764	

In Figure 3.1, below, the potential southern boundary (supplied by DEC) of the PEC is shown between yellow markers. The infrastructure corridor appears to avoid the PEC for most of its length, apart from some potential areas in the northern section which are possibly near its edge and may cross it (green boundary).

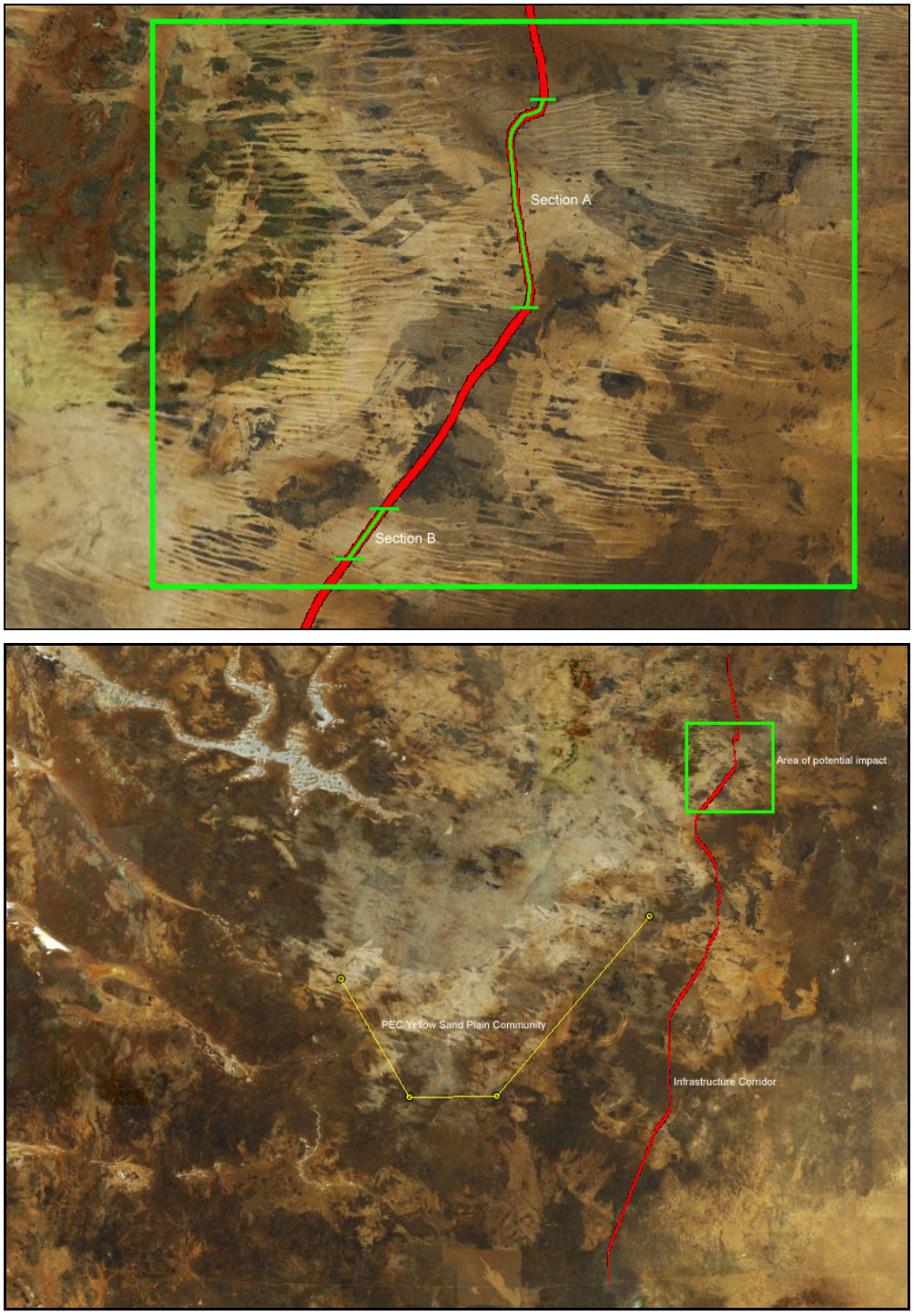

Figure 3.1 Location of yellow sandplain Priority Ecological Community in relation to infrastructure corridor. Section A and B indicates where PEC may traverse the infrastructure corridor

3.3 FAUNA ASSEMBLAGES

Based on previous surveys and W.A. Museum collections of fauna species within and in close proximity to the survey area, 31 native and seven introduced mammal, 116 bird, 102 reptile and four frog species potentially occur along the infrastructure corridor. During this survey a total of 72 fauna species were recorded either directly or by secondary evidence, including conservation significant and introduced fauna (APPENDIX A).

3.3.1 Mammals

Ten mammal species were identified during surveys, including two introduced species: Camel (*Camelus dromedaries*) and European Rabbit (*Oryctolagus cuniculus*). Scats were found from the search area that resembled *Pseudantechinus* sp., a genus not previously recorded from the area.

3.3.2 Birds

Forty-five bird species from 25 families were identified during this survey. Regent Parrots (*Polytelis anthopeplus*) were sighted in Salmon Gum Woodland near Kitchener.

3.3.3 Reptiles and Amphibians

Seventeen species of reptiles were recorded including two agamids, two elapids, six geckos and seven skinks. Despite some rainfall during the trip, no amphibians were recorded.

4.0 CONSERVATION SIGNIFICANT FAUNA

4.1 STATUTORY FRAMEWORK

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

Schedule 1 of the Commonwealth EPBC Act contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Extinct, Extinct in the wild and Conservation Dependent. Definitions of categories relevant to fauna occurring or potentially occurring in the project area are provided in Table 4.1.

Table 4.1 Definitions of categories under the Environment Protection and Biodiversity Conservation Act.

CATEGORY	DEFINITION
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state; • The Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); or • The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).

Classification of rare and endangered fauna under the *WA Wildlife Conservation (Specially Protected Fauna) Notice 2008(2)* of the WC Act recognises four distinct schedules, as listed in Table 5.2 below. In addition, the Department of Environment and Conservation (DEC) maintains a Priority Fauna list which includes those removed from the WC Act and other species known from only a few populations or in need of monitoring. Five Priority Codes are recognised, as detailed in Table 5.3.

Table 4.2 Definition of Schedules under the *Wildlife Conservation Act 1950*.

SCHEDULE	DEFINITION
Schedule 1 (S1)	Fauna which are Rare or likely to become extinct, are declared to be fauna that is in need of special protection.
Schedule 2	Fauna which are presumed to be extinct are declared to be fauna that

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

Table 4.3 Definition of Department of Environment and Conservation Priority Codes.

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

4.2 POTENTIAL CONSERVATION SIGNIFICANT FAUNA

Searches of threatened fauna databases indicated that three species of mammal, eight species of bird and three reptile species of conservation significance have been recorded, or have the potential to occur, in the vicinity of the infrastructure corridor (Table 4.4).

Table 4.4 Conservation significant fauna occurring or potentially occurring in project area.

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE
	EPBC	WCA	DEC			
MAMMALS						
Southern Marsupial Mole *Notoryctes typhlops*	EN	S1		Little is known about ecology, but believed to occur in aeolian dunes with various vegetation types.	One specimen from Queen Victoria Springs Nature Reserve (QVS; Pearson and Turner (2000).	**HIGH** Suitable habitat exists and mole holes recorded during the survey.
Brush-tailed Mulgara *Dasycercus blythi*			P4	Sand dune swales or along the base of dunes with medium to dense spinifex (*Triodia* sp.) hummocks.	One individual trapped at Mulga Rock in 1985 (Martinick and Associates Pty Ltd 1986). One individual trapped at Queen Victoria Springs NR in 1987 (Pearson 1991). Recorded at Neale Junction (*ecologia* 2009a) and 50 km south of Tropicana Gold project area (*ecologia* obs.).	**HIGH** Records from surrounding region. Secondary evidence was found near the TIIC.
Sandhill Dunnart *Sminthopsis psammophila*	EN	S1		Sand dunes with large mature *Triodia* hummock grasses.	Records from approx. 50 km SSW of Tropicana on Plumridge West Track (G. Gaikhorst, pers. comm.) and from Great Victoria Desert (DEC records).	**MEDIUM** Suitable habitat recorded in the infrastructure corridor, and occurs in the region.
BIRDS						
Malleefowl *Leipoa ocellata*	VU	S1		Mallee eucalypt woodland and scrub with sandy substrate.	Recent sighting south of Plumridge Lakes Nature Reserve (PLNR).	**HIGH** Suitable habitat exists; mounds were found (all inactive) and recent tracks of individuals.

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE
	EPBC	WCA	DEC			
Peregrine Falcon *Falco peregrinus*		S4		Cliff edges along rivers, ranges, and wooded waterways.	Sighted in the Tropicana project area during an *ecologia* Level 2 fauna survey in March, 2008.	**HIGH** Suitable habitat exists, and this species was recorded relatively close to the infrastructure corridor recently during another survey.
Fork-tailed Swift *Apus pacificus*	M			Almost entirely aerial, low to very high airspace over varied habitat, particularly associated with storm fronts	Recorded in large numbers from within 45km of the project area (*ecologia* 2009).	**MEDIUM** Recorded in areas nearby suggesting that species may occur.
Naretha Blue Bonnet *Northiella haematogaster narethae*		S4		Lightly wooded plains on the periphery of the Nullarbor Plain.	18 individuals observed at PLNR in 1984 (DEC record).	**MEDIUM** Suitable habitat occurs in south of infrastructure corridor. Sightings at PLNR suggest species may occur.
Australian Bustard *Ardeotis australis*			P4	Open or lightly wooded country.	Several recent records from the region (DEC record, *ecologia* 2009) and recorded during this survey.	**MEDIUM** No suitable habitat on infrastructure corridor, but occurs in the region.
Slender-billed Thornbill (western) *Acanthiza iredalei iredalei*	VU			Chenopod shrub steppe in treeless or sparsely wooded flatlands.	No previous records in vicinity. Known from south (Rawlinna to Eucla) and east (Lake Ballard) of Tropicana.	**LOW** No previous records from area. Little suitable habitat exists along infrastructure corridor.
Princess Parrot *Polytelis alexandrae*	VU	S1		Highly nomadic desert species, inhabiting lightly wooded country and sheoak woodland.	Anecdotal records of birds at PLNR. Formerly DEC Priority 4.	**LOW** No recent records, species is infrequently encountered and nomadic.

SPECIES	CONSERVATION SIGNIFICANCE			HABITAT	PREVIOUS RECORDS	LIKELIHOOD OF OCCURRENCE
	EPBC	WCA	DEC			
Grey Falcon *Falco hypoleucos*			P4	Shrubland, grassland and wooded watercourses.	One record from 1992 at PLNR (DEC record).	**LOW** Suitable habitat occurs but species is infrequently encountered within range.
REPTILES						
Woma Python *Aspidites ramsayi*		S4	P1	Sandy country supporting woodlands and shrublands, often with spinifex.	Recorded from further south in the latter half of last century (WAM FaunaBase).	**MODERATE** Suitable habitat exists. Species is infrequently observed, even when resident.
South-west Carpet Python *Morelia spilota imbricata*			P4	Semi-arid coastal and inland habitats, banksia woodland, eucalypt woodlands and grasslands	Only record from within 25 km of the project area (*ecologia* 2009b).	**MODERTE** Record from area nearby, possibly occurs in eucalypt/casuarina woodland
Great Desert Skink *Egernia kintorei*	VU	S1		Regenerating hummock grassland on red dunes and plains.	Closest record ENE of Laverton, approx. 150 km from Tropicana (WAM records).	**LOW** Suitable habitat may occur; however nearest record is over 100 km away.

Note: EPBC = *Environment Protection and Biodiversity Conservation Act 1999*; WCA = *Wildlife Conservation Act 1950*; DEC = Department of Environment and Conservation Priority Fauna

This page has been left blank intentionally

4.3 CONSERVATION SIGNIFICANT FAUNA RECORDED

4.3.1 Southern Marsupial Mole (*Notoryctes typhlops*) – EPBC Act Endangered

Also known by the indigenous name of Itjaritjari, the SMM (*Notoryctes typhlops*) is a small fossorial marsupial that has adapted to a life spent almost entirely underground. With remnant eyes, no external ears, a tubular body shape, short muscular forelimbs and spade-like claws, *N. typhlops* is well adapted to its subterranean existence and rarely ventures above ground (Benshemesh 2008) does not build tunnel systems or 'swim' through the sand but instead it tunnels through the lightly compacted sands of the central deserts and backfills the tunnels behind itself (Benshemesh 2008).

SMM have been recorded from the central deserts of Australia, including the Tanami, Great Victoria and Simpson Deserts (Benshemesh 2004). The species' preferred habitat is longitudinal sand dunes, interdunal flats and maybe also the sandy soils along river flats (Maxwell *et al.* 1996; Benshemesh 2008). Prey includes underground invertebrates, particularly larvae and pupae, and small vertebrates; e.g. ants and their larvae, termites, beetles and their larvae, moth larvae and small reptiles (Benshemesh 2004).

To date very little is known about the *N. typhlops* social behaviour or reproductive biology apart from information deduced from anatomical studies. Females have only 2 teats in a backwards facing pouch and males have there testes hidden between their skin and their abdominal wall (Benshemesh 2008) Interestingly almost all of the several hundred backfilled tunnels recorded in Central Australia are of adult size indicating that young *N. typhlops* do not construct tunnels.

No decline in abundance has been documented due to the extremely cryptic nature of this species, but the lack of records in recent years, particularly given the increase in human visitation to the area of occupancy, gives considerable cause for concern (Maxwell *et al.* 1996). The most likely cause for any decline in abundance is predation from feral foxes and cats, changed fire regimes, and trampling and habitat changes as a result of cattle and camel populations (Maxwell *et al.* 1996; Benshemesh 2008)

Three SMM sites were established during this survey along the infrastructure corridor (Figure 4.1). Evidence of mole activity was recorded from all three sites (APPENDIX B). Fresh holes were discovered at both MMS1 and MMS2.

Potential Impacts (Southern Marsupial Mole)

The proposed infrastructure corridor traverses several areas of sand dunes, typically avoiding large dunes and crossing dune systems at low points near the ends of the dunes. One dune (located at 51J 654982 E; 6724273 N) is dissected by the proposed track and widening of the existing track through this dune system should be minimised to reduce the area of the dune that is compacted.

Accidentally generated fires caused during construction and operational phases of the infrastructure corridor may alter the abundance and composition of invertebrate and small vertebrate prey, which could be indirectly detrimental to mole populations in affected areas.

SMM carcasses occur frequently in the scats of introduced foxes, and to a lesser extent dingos and feral cats (Benshemesh, 2004), suggesting that the species is susceptible to predation by introduced predators. Introduced predators often use tracks to access areas and many are thought to hunt along the edges of these tracks.

Development of the infrastructure corridor may increase predation pressure in the immediate vicinity of the project.

Due to the large areas of sand dunes located on either side of the infrastructure corridor that is not expected to be impacted by this project, impacts to the regional populations of SMM are not expected to be significant. Impacts mentioned above will be restricted to the immediate vicinity of the infrastructure corridor

4.3.2 Malleefowl (*Leipoa ocellata*) – EPBC Act Vulnerable, WC Act Schedule 1

Malleefowl are a large, distinctive ground-dwelling bird reaching a length of 70 cm and weighing up to 2.5 kg. They are well-known for their habit of constructing large mounds (up to 1.5 m diameter) of sand, soil and vegetation in which they lay clutches of approximately 16 eggs that are incubated through a combination of the sun's direct heat and heat generated by the decomposition of vegetation.

Malleefowl breed in monogamous pairs. Eggs are laid in spring to summer within the mound, and are then tended by the male who maintains a stable temperature of the eggs by adding or removing soil and leaf litter to the mound (Marchant and Higgins 1993). Chicks dig their way out of the mound after hatching and are immediately independent, able to feed and fly within hours of surfacing (Simpson and Day 2004). These large mounds can remain in the landscape for many years and can be used to map Malleefowl distribution. The highest breeding densities are typically found in vegetation that is at least 40 years post fire (Woinarski 1989; Benshemesh 1990; Benshemesh 1992) and they rarely breed in vegetation that has been burnt within the last 15 years (Tarr 1965; Crowley *et al.* 1969).

Malleefowl prefer habitat consisting of scrubs and thickets of eucalypt mallee or acacia mulga and other dense litter-forming shrublands (Johnstone and Storr 1998). They feed on seeds and herbage, including wheat (Benshemesh 1999). Once common and widespread across the semi-arid regions of southern Australia, Malleefowl have declined severely in the last century, with a 20% decrease in abundance and 50% decrease in area of occupancy (Garnett and Crowley 2000; Benshemesh 2005b). Their distribution is currently highly fragmented, increasing the risk of extinction (Benshemesh 2005b). Their decline is mainly due to habitat loss and fragmentation caused by clearing for agriculture and the subsequent degradation of remnant patches by sheep, as well as predation by foxes (Johnstone and Storr 1998; Garnett and Crowley 2000).

Eight inactive Malleefowl mounds were recorded along the proposed infrastructure corridor (Table 4.5) and fresh tracks were also discovered. Significant locations are shown in Figure 4.1. Ages of Malleefowl mounds can be determined using methods by Bancroft and Bamford (2006) (Table 4.6). Based on these descriptions, ages of the mounds found vary from 'recently used' to 'very old'.

Table 4.5 Malleefowl mound information

Burnt mulga woodland regenerating after a recent fire. Mound constructed from small stones, approximately 4 m wide, with vegetation growing within it. Mound raised with a defined central depression. Inactive. 656xxxE 6735xxxN	
Dense mulga woodland with dense understorey on stony rise. Mound constructed of small stones and sand. Rim of mound slightly raised with signs of heavy erosion, well defined central depression. Inactive with no sign of recent use. 651xxxE 6720xxxN	
Mulga woodland with dense *Eremophila* understorey. Mound constructed of sand, showing extensive erosion. Slightly raised mound with a poorly defined central depression, and eroded rim. Recent Malleefowl tracks found nearby (see below). In same continuous patch of mulga as mound above. Inactive. 650xxxE 6718xxxN	
Dense mulga woodland with open understorey. Slightly raised mound made of sand, raised rim and defined central depression containing a thick leaf litter layer. Mound showing some signs of erosion. Inactive. 654xxxmE 668xxx7N	

Mulga woodland with open understorey. Raised mound approximately 0.5 m high, with a defined central depression and raised rim. Mound made from sand, showing signs of erosion and covered in a lichen crust. Mulga woodland dense with most crowns overlapping. Mound 250 m south of mound above. Inactive. 654xxxmE 6682xxxN	
Mulga woodland with dense understorey. Raised mound approximately 0.4 m high, with a well defined central deep depression dug below ground level. Mound made from sand with a wide rim slightly eroded. Three metres from existing track. Inactive. 649xxxE 6674xxxN	
Open mulga woodland with dense understorey. Very old mound, slightly raised made from sand, with an eroded rim. Central depression poorly defined with *Eremophila* sp. shrubs regenerating on mound and *Notomys* pop holes within mound. In close proximity to above mound. Inactive. 649xxxE 6674xxxN	

Mulga woodland with open understorey. Old eroded mound constructed from sand. Poorly defined central depression and rim. Inactive. 645xxxE 6667xxxN	

Datum: WGS84

Table 4.6 Categories of age of Malleefowl mounds (Bancroft and Bamford 2006).

Category	Description
Active	Fresh scratchings, loose soil and mound dug out in preparation for the breeding season or mounded for breeding. Mounds containing abundant but weathered plant material and shell fragments have been used regularly over at least the previous few years.
Recently used (1-5 years)	No signs of very recent activity, such as scratchings. Soil surface compacted and little plant material present. However, mound slopes still steep and no plants growing in mound.
Moderately old (5-25 years)	No recent activity, soil compacted and no plant material. Surface of mound showing some weathering, such as loose soil and debris accumulating in central depression, and some plant colonisation possibly present.
Old (26-100 years)	Mound moderately to very weathered, often with a veneer of gravel on the slopes because of removal of fine materials from the surface. Some bushes growing on mound.
Very old (l00+ years)	Mound very weathered. Profile low and central depression poorly defined. Bushes and even small trees growing on mound.

Potential Impacts (Malleefowl)

Direct impacts by the development of the infrastructure corridor that could potentially affect Malleefowl include clearing of nesting mounds that may be reused in the future. Loss of suitable habitat in the Wheatbelt has resulted in an increased importance of the marginal habitat that occurs in the eastern goldfield region. Loss of thick stands of mallee could potentially reduce the amount of available habitat for this species. Increases in feral predators will also potentially impact this species as they move along cleared corridors.

Due to the low level of impact, such as the relatively small areas of vegetation that will be cleared, that the construction of the infrastructure corridor will have on the region no significant impacts are expected.

4.4 POTENTIALLY OCCURRING CONSERVATION SIGNIFICANT FAUNA

4.4.1 Brush-tailed Mulgara (*Dasycercus blythi*) – DEC Priority 4

The Brush-tailed Mulgara has only recently been reclassified and separated from the genetically and morphologically distinct Crest-tailed Mulgara (*Dasycercus cristicauda*) (Woolley 2006). The more widespread Brush-tailed Mulgara is not listed in the EPBC Act (1999) at present and is listed as Priority 4 (fauna in need of monitoring) on the DEC Priority and Threatened Fauna list (2008). However, since previous records did not distinguish between the two species there is ambiguity over the exact distribution of both species.

Brush-tailed Mulgara occur in spinifex grasslands throughout much of the arid zone, digging their burrows in the flats between low sand dunes (Woolley 2008). Believed to be generally solitary, Brush-tailed Mulgara construct several single entranced, multi-tunnelled burrows within their home range (Woolley 2008).

According to distribution maps contained in Van Dyck and Strahan (2008), and given the recent records of this species during a survey at Neale Junction Nature Reserve (*ecologia* 2009a), it is considered that Brush-tailed Mulgara is the mulgara species inhabiting the region surrounding the Operational Area.

Areas of possibly suitable habitat comprising moderately dense spinifex (Masters 1993; Baker *et al.* 1994; Baker 1996; Baker and Johnson 2001) located along the TTIC were searched and secondary evidence of mulgara (exact species unknown) was recorded approximately 25 km east of the project corridor at 669978E 6704568N (Figure 4.1).

Further habitat thought to be suitable for mulgara was recorded at six locations along the proposed infrastructure corridor (Table 4.7).

Due to the limited time of the survey it was not possible to systematically survey all areas potentially supporting mulgara for direct signs such as burrows.

Table 4.7 Locations of potential Mulgara habitat.

Site	GPS (WGS84, 51J)	
MUL1	656006 E	6749102 N
MUL2	656070 E	6747721 N
MUL3	655963 E	6725560 N
MUL4	655959 E	6725560 N
MUL5	652858 E	6722272 N
MUL6	652244 E	6721792 N

4.4.2 Sandhill Dunnart (*Sminthopsis psammophila*) – EPBC Act Endangered, WC Act Schedule 1

The Sandhill Dunnart can be distinguished from other members of its genus by its large size and distinctive tail that has a crest of stiff black hairs (Churchill 2001). Its distribution appears to be limited to the Great Victoria Desert of Western and South Australia (Pearson and Churchill 2008).

The Sandhill Dunnart has been found in a variety of sandy habitats, usually on dune systems with an understorey of spinifex and an overstorey of eucalypt woodland, mallee or desert oak (*Allocasuarina decaisneana*) (Maxwell *et al.* 1996; Pearson and

Churchill 2008). Sandhill Dunnarts are nocturnal, sheltering during the day in nests constructed in large spinifex hummocks that have started to die off in the centre (Churchill 2001). Sandhill Dunnarts are active creatures with large home ranges of approximately 7.5 ha and the ability to move large distances in a relatively short time, with movements of almost 2 km occurring in only 2 hours. Breeding occurs in spring to early autumn (Pearson and Churchill 2008). Sandhill Dunnarts are generalist feeders and are largely opportunistic (Churchill 2001).

There have been few recorded captures of this species, and hence there has been no recorded decline, but this species has probably been affected by predation by foxes and cats, and alteration of habitat due to changed fire regimes (Maxwell et al., 1996). Furthermore, there is evidence that Sandhill Dunnart distribution and survival is governed by the presence of spinifex hummocks of specific maturity and structure which varies according to spinifex species, rainfall, drainage, soil type, plant ages and fire history (Churchill 2001).

Records exist of this species occurring in sandy habitats along the Plumridge West Track, approximately 50 km south-southwest of the Tropicana Gold Project and half way along the proposed infrastructure corridor (G. Gaikhorst, pers. comm.).

Although this species is known to occur in the region, only one area of suitable habitat for the Sandhill Dunnart was recognised along the infrastructure corridor. This species is not likely to be impacted by the proposed development due to the small area of potential habitat that is expected to be disturbed.

4.4.3 Peregrine Falcon (*Falco peregrinus*) – WC Act Schedule 4

This nomadic or sedentary falcon is medium sized with bluish-grey back and a buff white underside interspersed with black. Adults also have a black crown, black moustache-like markings, a white throat, a dark bill with prominent yellow fleshy base and yellow legs. The Peregrine Falcon is widespread in many parts of Australia and some of its continental islands, but absent from most deserts and the Nullarbor Plain.

The Peregrine Falcon occurs most commonly near cliffs along coasts, rivers and ranges and around wooded watercourses and lakes. Peregrines feed almost entirely on birds, especially parrots and pigeons. Peregrines primarily nest on ledges in cliffs, granite outcrops and in quarries, but may also nest in tree hollows around wetlands. Eggs are predominantly laid in September (Johnstone and Storr 1998; Olsen *et al.* 2006). The species is considered to be moderately common in the Stirling Range, uncommon in the Kimberley, Hamersley and Darling Ranges, and rare or scarce elsewhere (Johnstone and Storr 1998)

Limiting factors and threats on this species include human disturbance at nest sides, decline of prey caused by introducing mammal predators and reproductive failure following exposure of pesticides (Cooper and Beauchesne 2007).

One individual was opportunistically sighted within the proposed TGP operational area and close to the proposed infrastructure corridor during another *ecologia* fauna survey in March 2008 (*ecologia* 2009b). However, due to the widespread distribution of this species in Australia and the extent of suitable habitat outside of the study area, impacts of the infrastructure corridor development are expected to be negligible.

4.4.4 Fork-tailed Swift (*Apus pacificus*) – EPBC Act Migratory

The Fork-tailed Swift (*Apus pacificus*) is a small insectivorous species with a white throat and rump and a deeply forked tail (Morcombe 2000). It is distributed from central Siberia and throughout Asia, breeding in north-east and mid-east Asia, and

wintering in Australia and south New Guinea. It is a relatively common trans-equatorial migrant from October to April throughout mainland Australia (Simpson and Day 2004). In Western Australia the species begins to arrive in the Kimberley in late September, the Pilbara in November and in the South-west by mid-December (Johnstone and Storr 1998). In Western Australia, the Fork-tailed Swift is considered uncommon to moderately common near the north-west, west and south-east coasts, common in the Kimberley and rare or scarce elsewhere (Johnstone and Storr 1998).

Fork-tailed swifts are nomadic in response to broad-scale weather pattern changes. They are attracted to thunderstorms where they can be seen in flocks, occasionally up to 2,000 birds. They rarely land, living almost exclusively in the air and feeding entirely on aerial insects, especially nuptial swarms of beetles, ants, termites and native bees (Simpson and Day 2004).

Fork-tailed Swifts were not recorded during this survey although they may occasionally occur along the infrastructure corridor. Due to its aerial life style this species is unlikely to be impacted by the project.

4.4.5 Naretha Blue Bonnet (*Northiella haematogaster narethae*) – WC Act Schedule 4

The Naretha Blue Bonnet has a restricted distribution along the wooded northern and western fringes of the Nullarbor Plain and into the southern parts of the Great Victoria Desert (Johnstone and Storr 1998). This parrot is moderately common to common, occurring in casuarina or acacia woodland, often near chenopod shrubland (Garnett and Crowley 2000). They breed in late winter and spring, building nests in hollows and cracks of larger eucalypts, casuarinas and acacias. The Naretha Blue Bonnet feeds on the seeds of native and exotic plants. Although there is no sign of a decline in this species, it has a very restricted distribution.

Naretha Blue Bonnets have been recorded from Plumridge Lakes Nature Reserve (Burbidge *et a*l. 1976). Suitable habitat for this species, which is similar to that recorded for Regent Parrots, was recorded during the survey. Due to the limited area of impact expected along the infrastructure corridor and the large area of undisturbed habitat in the region no significant impacts are expected.

4.4.6 Australian Bustard (*Ardeotis australis*) – Priority 4 (DEC)

The Australian Bustard is large ground-dwelling bird that occurs Australia-wide and utilises a number of open habitats, including open or lightly wooded grasslands, chenopod flats, plains and heathlands (Johnstone and Storr 1998). It is a nomadic species, ranging over very large areas, and thus its abundance varies locally and seasonally from scarce to common. Occurrence of this species is largely dependent on rainfall and hence food availability. The Bustard has an omnivorous diet, feeding on grasses, seeds, fruit, insects and small vertebrates. It is commonly seen in areas affected by locust or mouse plagues. At night it roosts in trees, or on the ground in treeless areas. During the day, it flies out onto the plains for food. In northern Australia, the Australian Bustard generally breeds late in the wet season or early in the dry (January to March).

Although the population size is still substantial, there has been a massive historical decline in abundance, particularly south of the tropics, but also across northern Australia (Garnett and Crowley 2000). This is a result of hunting, degradation of its grassland habitat by sheep and rabbits, and predation by foxes and cats (Frith 1976; Garnett and Crowley 2000; Department for Environment and Heritage South Australia 2006). Bustards readily desert nests in response to disturbance by

humans, sheep or cattle (Garnett and Crowley 2000). Consequently, it has been listed as Priority 4 by the DEC (taxa in need of monitoring).

Recent sightings from other *ecologia* fauna surveys within the region indicate that this species is relatively common in the region. Due to the extent of suitable habitat outside the impact area and the nomadic nature of this species, the infrastructure corridor is not expected to significantly impact this species.

4.4.7 Slender-billed Thornbill (western subspecies) (*Acanthiza iredalei iredalei*) – EPBC Act Vulnerable

The western subspecies of the Slender-billed Thornbill is a small bird (6g) that occurs in the arid and semi-arid zones of southern Western Australia and South Australia. Slender-billed Thornbills are uncommon, rare or extinct across most of their range with the exception of populations on the mid-west coast, where they are considered moderately common (Johnstone and Storr 2004; EPBC 2008)

Slender-billed Thornbills are found predominantly in chenopod shrublands, in treeless or sparsely wooded flatlands, and also samphire and low melaleuca scrubs (Johnstone and Storr 2004; Pavey 2006a). They are usually observed in pairs or small groups of up to 10 birds, feeding on small invertebrates caught on the ground or in low shrubs.

Habitat destruction of the chenopod vegetation by livestock and rabbits has resulted in a very reduced and disjointed distribution across southern Western Australia (Recher and Davis 2000; Johnstone and Storr 2004). Invasive alien tramp ants have also been identified as a threat to the western Slender-billed Thornbill in Western Australia (EPBC 2008).

There are no records of this species occurring within the infrastructure corridor, and there was very little suitable habitat for Slender-billed Thornbills recorded along the infrastructure corridor. Therefore the impacts of the proposed development will be minimal to nonexistent for this species.

4.4.8 Princess Parrot (*Polytelis alexandrae*) – EPBC Act Vulnerable, DEC Priority 4

This medium-sized, gregarious parrot is a scarce to uncommon, nomadic, and patchily distributed species. As a result, its biology and ecology have never been well studied in the wild (Garnett and Crowley 2000). It is usually found in pairs, family groups or small flocks of up to 30 individuals (Johnstone and Storr 1998), although occasionally it congregates in loose flocks of up to 100 birds (Forshaw and Cooper 2002).

The Princess Parrot occurs in the sandy deserts of central Australia (Garnett and Crowley 2000), principally concentrated in the Great Sandy, Gibson, Tanami and Great Victoria deserts (Blyth and Burbidge 1997). The preferred habitat is lightly wooded country including desert oak *(Casuarina decaisneana*), open mallee-spinifex and open marble gum (*Eucalyptus gongylocarpa*) woodland (Johnstone and Storr 1998). It has been observed feeding on the ground and in vegetation, on seeds, flowers and leaves, particularly of Triodia, Acacia and proteaceous species (Johnstone and Storr 1998). Because of their nomadic habit, Princes Parrots are able to exploit the sudden availability of food resulting from the unpredictable and patchy rainfall associated with the arid regions of Australia. Princess Parrots are irregular visitors in most areas, with intervals of up to 20 years between sightings (Blyth and Burbidge 1997).

Princess parrots nest in tree hollows in eucalypts, laying between two and six eggs usually in spring, although it is possible that breeding can occur any time following rainfall (Forshaw and Cooper 2002). The total population of this species in Australia has been estimated at 5000 individuals and they are believed to have suffered a decline in numbers over the last 100 years (Garnett and Crowley 2000).

There has been a record of this species from Plumridge Lakes Nature Reserve (Burbidge *et al.* 1976). Suitable habitat for this species, similar to that recorded for other parrot species, was recorded within the survey area. Due to the small areas of suitable habitat that will be impacted by this development and the large areas of undisturbed habitat in the region, no significant impacts are expected to affect this species.

4.4.9 Grey Falcon (*Falco hypoleucos*) – DEC Priority 4

Grey Falcons are a rare, nomadic, smoke-grey raptor species with bright orange-yellow legs and feet, a bill with yellow base, black tip and orange-yellow cere (Venn 2003). It is sparsely distributed across much of arid and semi-arid Australia. In Western Australia, they are restricted to the northern half, occurring in a variety of habitats ranging from wooded drainage systems through to open spinifex plains. Grey Falcons once occurred across much of Western Australia, with sightings as far south as York and New Norcia during colonial times. However, the current distribution is now thought to be restricted to north of 26°S (Johnstone and Storr 1998). Because the distribution of this species is very scarce over an extremely large area, sightings of this species are very uncommon.

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

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

The last sighting of this species close to the project area was in 1992 at Plumridge Lakes Nature Reserve (Burbidge *et al*. 1976). Suitable habitat for the Grey Falcon was found through out the infrastructure corridor; however the proposed development is not foreseen to impact this species due to the small area expected to be impacted by this project and the large areas of undisturbed habitat found in the region.

4.4.10 Great Desert Skink (*Egernia kintorei*) – EPBC Act Vulnerable, WC Act Schedule 1

The Great Desert Skink is found in the western deserts region of central Australia. This communal skink is found on sandplains and clay-based or loamy soils vegetated with spinifex, where it excavates large, complex, multi-entranced burrows (Wilson and Swan, 2003). Up to 10 individuals can inhabit a single burrow system. Burrows

can usually be identified by the large communal latrine area outside the burrow entrance that the individuals habitually use to defecate (McAlpin 2001; Gardner *et al.* 2008).

The species is crepuscular to nocturnal, with an omnivorous diet consisting of a wide range of invertebrates, particularly termites, small vertebrates, and the leaves, flowers and fruit of several plant species, particularly the Bush Tomato (*Solanum* spp.) (McAlpin 2001). The Desert Skink enters hibernation in late autumn to early winter, emerging in early spring to begin breeding (McAlpin 1997).

The Great Desert Skink appears to prefer a mosaic landscape with vegetation of different ages. They are most common in sites that have been burnt three to fifteen years previously, and with at least 50% bare ground (McAlpin 2001). The current distribution of this species appears to consist of several isolated populations. Strongholds are in the Tanami Desert, Uluru, and an area of the Gibson Desert north of Warburton (McAlpin 2001). They have disappeared from several former habitats, including much of the Gibson and Great Sandy Deserts (McAlpin 2001). The main threats come from changed fire regimes and predation from feral predators.

Suitable habitat for Great Desert Skinks was recorded along the infrastructure corridor, however no records of this species exist within 150 km of the infrastructure corridor. Therefore, this species is not expected to occur and is not expected to be impacted by the proposed development.

4.4.11 Woma Python (*Aspidites ramsayi*) – WC Act Schedule 4, DEC Priority 1

The Woma is a large python, growing to up to 2.7 metres. It occurs across Australia in the subhumid to arid interior and also in the south west of Western Australia. Within Western Australia the Woma is found in four potentially disjunct populations: the South-west, the arid north-west, Tanami Desert and Peron Peninsula. The south-west population extends from Yuna (near Geraldton), south to Boddington and east to the western edge of the Nullarbor Plain (Storr *et al.* 2002)

Womas can be found in woodlands, heaths and shrublands, often with spinifex, in the sub-humid to arid interior. They are a nocturnal species, sheltering during the day in abandoned monitor and mammal burrows and in soil cracks (Wilson and Swan 2008). Womas prey on lizards, snakes, birds and small mammals which they often attract to within striking distance by wiggling their tail (Ehmann and Watson 2008a).

Land clearing and predation by feral fauna has caused a decline in populations, particularly in the gorges of south-west Western Australia (Wilson and Swan 2008). Womas were formerly abundant in south-western sandplain habitat, but recent records for the species are few and come from widespread localities (Maryan 2002).

Suitable habitat for Woma Pythons occurs along the infrastructure corridor, and therefore the development of these areas may pose some risk to this species despite them not being found during the survey. Due to the low level of impact expected from the development of the infrastructure corridor, the level of expected risk is low.

4.4.12 South-west Carpet Python (*Morelia spilota imbricata*) – WC Act Schedule 4

The South-west Carpet Python (*Morelia spilota imbricata*) inhabits temperate climatic areas with good winter rains and dry summers. This sub-species occurs in south-west Western Australia, from Northampton, south to Albany and eastwards to Kalgoorlie. It also occurs in undisturbed remnant bushland near Perth and the Darling Ranges, Yanchep National Park, and Garden Island (DEC 2007a).

Records from near Oakajee represent the northern limit for the species distribution. The South-west Carpet Python has been recorded from semi-arid coastal and inland habitats, Banksia woodland, eucalypt woodlands, and grasslands.

Carpet Pythons are arboreal, terrestrial, and rock-dwelling and can shelter in burrows made by other animals, hollow tree limbs, or rock crevices. Carpet Pythons have long periods of inactivity. At Dryandra in south-west Western Australia, Carpet Pythons remained inactive for several months during winter, where they may shelter in tree hollows for up to five months (DEC 2007a).

The South-west Carpet Python has declined in distribution due to the loss of bushland habitat for land developments and agriculture, and changed fire regimes. Predation by exotic predators (foxes and feral cats) may have also contributed to the decline of python populations. Habitat destruction has been implicated in the decline of *M. s. imbricata* populations in the Esperance area (DEC 2007a).

South-west Carpet Python was recorded to the west of the infrastructure corridor (GPS co-ordinate 628xxx E, 6733xxxN). The specimen was found recently killed crossing a track during a Southern Marsupial Mole survey. Despite very few records in region there is a moderate likelihood that this species occurs along the infrastructure corridor.

Carpet pythons are thought to be fairly scarce in the region surrounding the infrastructure corridor. This reduces the likelihood of individuals being impacted by the project and due to the low level of impact expected combined with the large areas of suitable habitat across the region, the expected impact of the construction and operation of the infrastructure corridor is expected to be low.

4.5 OTHER SIGNIFICANT FAUNA RECORDS

4.5.1 Regent Parrot (*Polytelis anthopeplus*)

The Regent Parrot (*Polytelis anthopeplus*) is common to areas consisting of river red gum, black box and casuarina woodland, over mallee and acacia shrubland. It occurs across a narrow band of habitat from the coast between Perth and Bunbury and east to Esperance (Simpson and Day 2004). Sightings of this species north of its core habitat, such as Tropicana, are rare and indicate the edge of the species range. Such information is useful for monitoring the demography of the species.

Regent Parrots were sighted in the southern section of the proposed infrastructure corridor in Salmon Gum woodland (Figure 4.1). All habitats suitable for parrot nesting i.e. large trees with hollows were recorded during the survey. Locations are listed in Table 4.8.

Provided these potential habitat trees are not removed, it is considered unlikely that the infrastructure corridor construction or operation will adversely impact this highly mobile species.

Table 4.8 Locations of suitable habitat for Regent Parrots.

Tree type	GPS (WGS-84)	
Casuarina	654785E	6754208N
Casuarina	654843E	6753842N
Casuarina	654999E	6752951N
Eucalypt	654644E	6760444N
Eucalypt	654685E	6756928N
Eucalypt	654664E	6755464N
Eucalypt	654654E	6755147N
Eucalypt	655198E	6752134N
Eucalypt	655445E	6751400N
Eucalypt	655400E	6751370N
Eucalypt	655602E	6751075N
Eucalypt	656126E	6748603N
Eucalypt	656225E	6746609N
Eucalypt	656610E	6744307N
Eucalypt	656712E	6743801N
Eucalypt	656747E	6743393N
Eucalypt	652208E	6721136N
Eucalypt	648240E	6716396N
Eucalypt	646233E	6668937N
Mallee eucalypt	654675E	6760452N
Mallee eucalypt	654534E	6759137N
Mallee eucalypt	654640E	6758090N
Mallee eucalypt	654675E	6754505N
Mallee eucalypt	651818E	6720671N
Marble Gum	656271E	6726220N
Marble Gum	656153E	6725958N
Marble Gum	648022E	6716185N
Marble Gum	643394E	6663143N
Marble Gum	642011E	6660971N
Marble Gum	640614E	6658763N
Marble Gum	639487E	6656991N
Marble Gum	638987E	6656204N
Salmon Gum	622529E	6597668N
Salmon Gum	622021E	6596677N
Salmon Gum	620844E	6593625N
Salmon Gum	619524E	6590595N
Salmon Gum	619584E	6590592N
Salmon Gum	617361E	6585843N

4.5.2 *Pseudantechinus* spp.

Mammal scats collected from a stony ridge, adjacent to the proposed infrastructure corridor (655698E 6750397N) were identified as likely to be from one of two species of false antechinus: *Pseudantechinus woolleyae* or *P. macdonnellensis*. A third possibility, P. roryi, has recently been synonymised with P. macdonnellensis (Westerman et al. 2008). This conclusion was drawn based on previous knowledge of the appearance of false antechinus scats by the field zoologists and the habitat where it was found. If the scats are from a false antechinus species it would be a significant range extension for either of these species.

Due to the wide distribution of suitable habitat for these species, the infrastructure corridor is unlikely to have a significant impact on either of the *Pseudantechinus* species.

4.5.3 Yellow Sandplain Priority Ecological Community

Yellow sandplains of the Great Victoria Desert, which have been recently listed as a Priority Ecological Community (PEC), occur within the proposed infrastructure corridor particularly in the northern part of the project area (for GPS coordinates see Table 3.3). This community is listed as Priority 3(ii) - poorly known ecological communities that are known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur; much of it is not under imminent threat.

The listing has been made due to its distinctive plant communities, its high number of threatened species, an unusual combination of species, and extremely high diversities of small vertebrates as well as its hot spot for mallee eucalypt species.

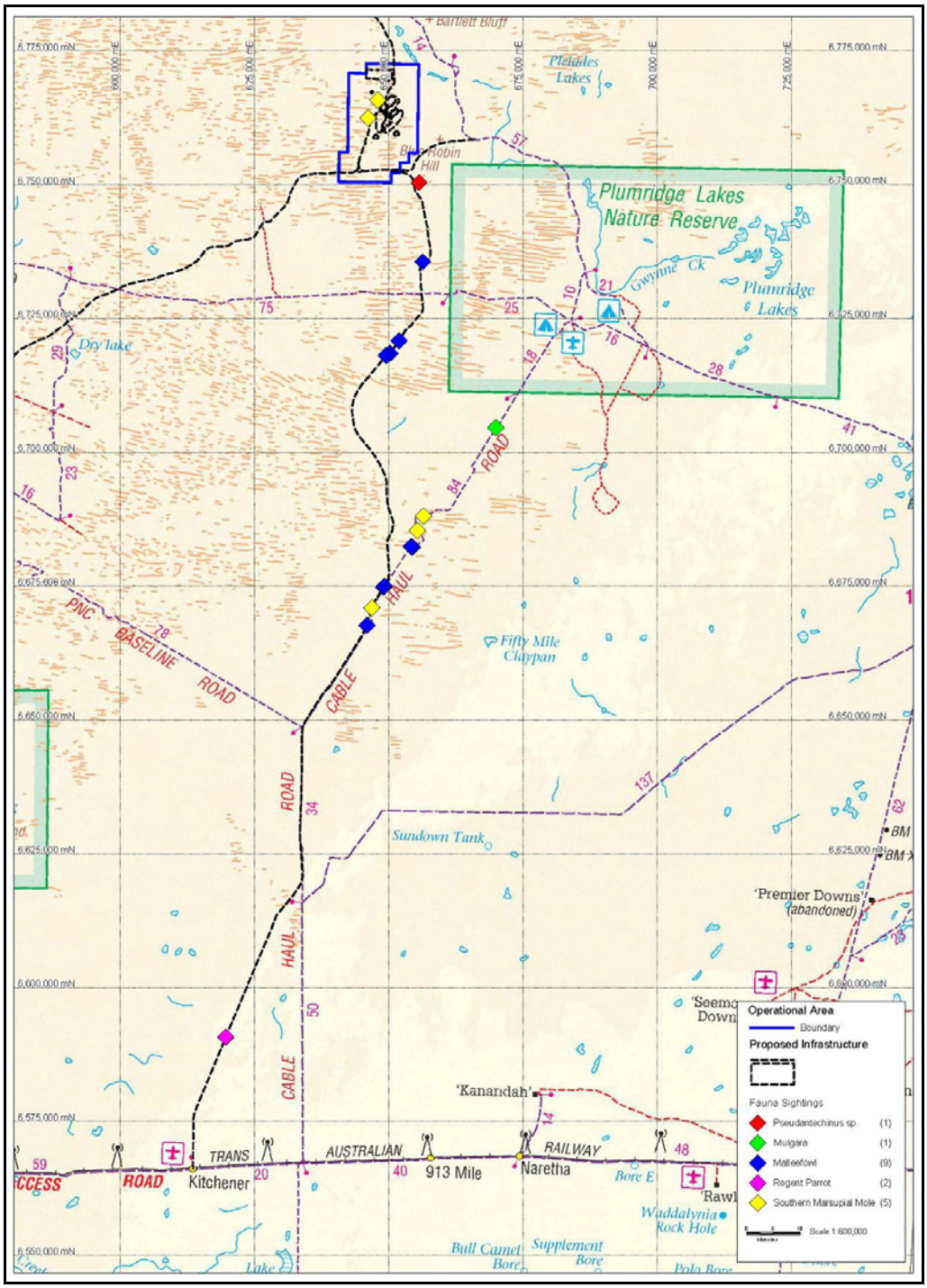

Figure 4.1 Conservation significant species either observed directly or identified from secondary evidence within the proposed infrastructure corridor

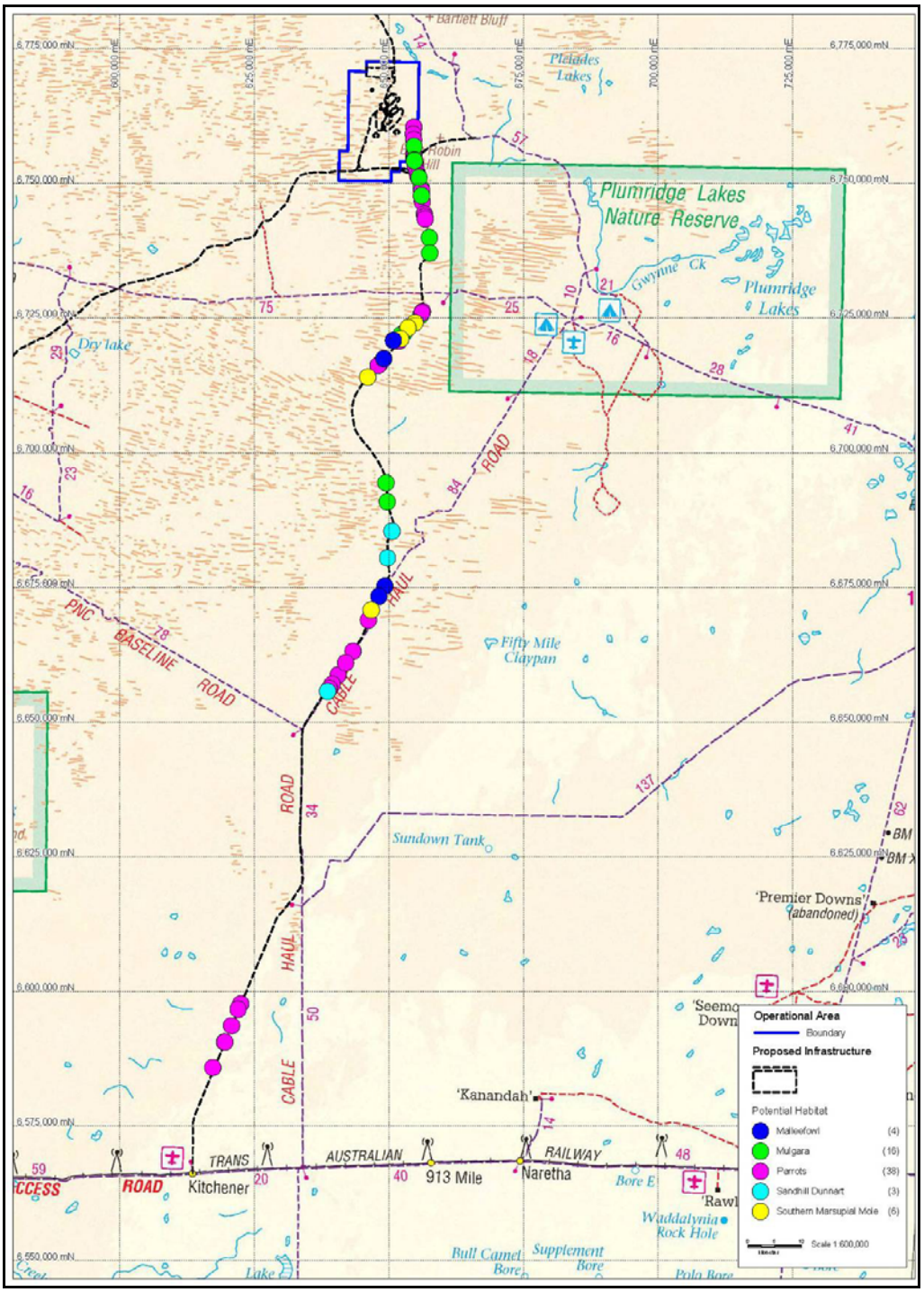

Figure 4.2 Location of suitable habitat for conservation significant species

5.0 IMPACT ASSESSMENT

5.1 THREATENING PROCESSES

A risk assessment (APPENDIX D) was undertaken by *ecologia* to determine potential impacts arising from the infrastructure corridor on vertebrate fauna and residual impacts following the implementation of the management strategies identified in this document (Section 6.0). Significance of the risks was classified as either High (site/issue specific management programmes required, advice/approval from regulators required), Medium (specific management and procedures must be specified) or Low (managed by routine procedures) (APPENDIX D). All of the residual risks identified during the risk assessment were classified as either medium or low.

Impacts identified in the risk assessment can be classified as:

Direct Impacts

- Habitat loss and fragmentation through clearing of native vegetation;
- Vehicle strikes on surface-dwelling and burrowing fauna have the potential to cause fauna mortality; and
- Fauna may become trapped in fibre optic cable trench during construction.

Secondary Impacts

- Increased risk of fire associated with movement of employees and machinery;
- Degradation of fauna habitat due to invasion and spread of weeds;
- Increased movement of feral fauna in the area resulting in increased predation pressure and/or increased competition;
- Disruption to resident fauna due to increased noise, vibration, light and dust pollution; and
- Potentially increased population densities of feral fauna due to increased availability of surface water.

Vegetation clearing

The primary impact on native fauna arising from the project will be the loss of fauna habitat in the disturbance footprint. This will result in the loss of small and sedentary fauna that are unable to move out of the area prior to the disturbance occurring.

Clearing of vegetation is both an unavoidable part of the planned project and the most direct localised impact on fauna communities in the Operational Area. Impacts from vegetation clearing include both direct mortality of fauna that occur in the area and the reduction of available habitat. Locally this is significant but due the long and narrow shape of the infrastructure corridor and the large areas of undisturbed habitat that occur in the surrounding region, the regional impacts will not be significant.

Clearance programs should be designed to occur over a period of time to allow the movement of fauna away from clearing activities. All areas should be rehabilitated as soon as is practical and areas that are to be cleared should be delineated. Habitat important to conservation significant species should be retained as much as possible.

Fire

The proposed operational area is located in a large area of native vegetation that has largely avoided impacts from human activities (e.g. pastoralism, agriculture and forestry). The main degradation of habitat in the region occurs from frequent and

widespread fires. Spinifex grasslands are most susceptible to fire, and some areas have been burnt in the past 5 years. The impacts of wildfire have been observed in the surrounding region with many of the Sandhill Dunnart monitoring sites utilised by Glen Gaikhorst and Cathy Lambert being burnt within recent years. The cause of most fires in the area is most likely associated with lightning strikes associated with summer thunder storms.

Most vegetation communities throughout arid Australia have become adapted to a regime of fires lit by Aboriginal people. However, early European explorers to the southern Great Victoria Desert reported little burning in the area (Churchill 2001), suggesting this area may be vulnerable to the impacts of fire.

As well as the direct loss of habitat, fires have also resulted in habitat fragmentation in the area. Fire tends to travel along the sand dunes (where spinifex grows), isolating the dune swales from surrounding areas. This may either limit animal movements between the swales, or increase the predation risk due to an absence of ground cover.

To prevent further degradation of habitat from wildfire, the TJV would benefit from implementing strict fire controls, ensuring that appropriate fire fighting equipment is readily available, all vehicles are fitted with fire extinguishers, and staff are trained in their use. TJV is also advised to discourage personnel from creating new tracks through dune fields or areas with mature spinifex as fires can be started when spinifex collects and ignites under vehicles.

In addition to the increased fire risk, discussed above, potential secondary impacts arising from the project include the introduction of weed species, the increase and/or introduction of non-native fauna populations, and disruption to fauna communities from dust, vibration and noise pollution.

Spread of weeds

If adequate weed hygiene measures are not implemented, the introduction of weed species to the area is possible. Disturbance to and clearing of native vegetation during construction can facilitate weed colonisation, resulting in these species dominating the understorey to the exclusion of annuals and eventually larger perennials. Of 20 studies on environmental weed impact in Australia, 19 demonstrated that weed species contribute to a decline in species richness, canopy cover or frequency of native species. Although no studies have been undertaken in sub-tropical Australia, studies on vertebrates in tropical Australia (Braithwaite *et al.* 1989; Griffin *et al.* 1989), South Africa (Winterbottom 1970) and the United States (Brock *et al.* 1986) indicate a substantial decline in species richness and abundance following the introduction of exotic weed species.

Vehicle Strikes

Vehicle strikes constitute a relatively small impact on regional vertebrate fauna. Incidents are relatively rare and typically affect only single individuals. Any incidents that involve conservation significant species should be reported to local authorities such as DEC staff and bodies frozen and sent to either DEC or WAM representatives.

Feral Fauna

Human habitation may result in the introduction and expansion of non-native fauna populations. Increased food and water resources allow these species to reach numbers that otherwise would not be possible in the arid zones of Australia. Artificial water sources such as evaporation ponds or water sumps may provide increased water resources that could support higher numbers of feral fauna as water supplies are typically restricting factors for these non arid adapted species. All artificial water

sources should be suitably fenced off to prevent access by all fauna. Roads and tracks also provide increased access to some areas as foxes and cats show some affinity to travelling along cleared corridors. This could potentially increase predation pressures along the infrastructure corridor.

Noise, Light and Dust Pollution

The effects of noise, vibration, light pollution and dust pollution on native fauna are well documented. Damage to vegetation may arise from airborne particulate matter, resulting in altered species composition, reduced growth and biomass and increased ecosystem stress. This may result in insect infestations and plant disease epidemics (Grantz *et al.* 2003). A decline in vegetation quality is likely to impact faunal assemblages, affecting food and habitat resources.

Noise and light pollution may disrupt fauna species, or even alter community structure due to the negative response of wildlife to new stimuli. Over time most species will either habituate to the noise events associated with mining operations, or move to a suitable distance away from the noise source so that the noise event is no longer disturbing (Larkin 1996; Radle 1998). Due to the large areas of relatively undisturbed habitat in the region, movement of some individuals away from noise sources will not cause significant impacts. Bat species are an exception and are sensitive to both light and noise pollution, particularly approaching and during the maternity season (Mann *et al.* 2002). Noise pollution may encourage the promotion of bat species with low frequency echolocation calls (generally larger species) which may alter the natural species composition in an area (Zagorodniuk 2003).

Noise and light sources may also attract fauna species to areas of the mine infrastructure that provide suitable microhabitats and resources (food wastes, grass and water). Insects attracted to light sources may attract insectivorous species and thus increase the frequency of fauna-human interactions in these locations. Feral predators may associate human activity with food resources and become attracted to these areas. Generally, significant impacts are not expected to arise due to these interactions and in some instances the interaction can be beneficial to particular fauna groups, such as bats and introduced predators. An increase in introduced predator densities is highly undesirable because of potential impacts to native fauna inhabiting nearby areas.

Noise and light pollution is not expected to be significant threats during construction and operation of the infrastructure corridor. Dust pollution from construction and regular vehicle movement along the access track may impact habitat along the track although only a small area (5m border along the track) may be affected. Regular rainfall events during summer and winter will also help to minimise the impact of dust of habitats.

Trapped Fauna

During the construction phase, when the fibre optic communications cable is being installed, the trench used to bury the cable will form a natural pit fall trap. Typically high numbers of fauna become trapped in such trenches and some species (such as venomous snake species) may pose a hazard to construction personnel. This impact has been observed frequently and standard control methods have been developed. During construction, if the trench has been left open over night, trained personnel must remove all fauna from the trench. This will greatly reduce the mortality of trapped individuals and reduce the risk to construction personnel.

5.2 IMPACTS ON FAUNA HABITATS

The region surrounding the infrastructure corridor is generally undisturbed and combined with the limited level of clearing required along the corridor, no fauna habitat types are expected to be significantly impacted by the development of the infrastructure corridor. Localised impacts are expected due to clearing activities but these are expected to be minimal.

5.3 IMPACTS ON FAUNAL ASSEMBLAGES

While there will be a localised impact on biodiversity (i.e. loss of fauna from within clearance areas), it is not anticipated that the project will have a major or ongoing impact on fauna biodiversity. The implementation of management strategies will help to further minimise any potential impacts (see Section 6.0).

5.3.1 Priority Ecological Community

Sections of the proposed infrastructure corridor that may potentially impact on the Yellow Sand Plain PEC are located in the northern section of the project area (GPS coordinates are listed in Table 3.3). Yellow sandplain communities of the Great Victoria Desert are listed as P3 by DEC (Department of Environment and Conservation) as it is an ecosystem at risk or threatened by mining. Due to its distribution and its location close to the project area the development of the infrastructure corridor may potentially impact this community. Although large areas of this PEC occur west of the Tropicana–Transline Infrastructure Corridor, further details about the extent and location of this community are currently unknown and, therefore, any potential impact of the proposed infrastructure corridor on this community can not be fully appreciated.

6.0 RECOMMENDATIONS

The following management recommendations, arising from the risk assessment (APPENDIX D), are provided below to mitigate impacts of the development on native fauna.

- Limit clearing thick mulga (*Acacia aneura*) stands where Malleefowl could potentially nest. These areas are often small unburnt 'islands' of mulga surrounded by open woodlands;
- Avoid disturbance to rocky outcrops which may provide habitat for *Pseudantechinus* spp.;
- Avoid disturbance to continuous sand dunes where Southern Marsupial Moles may occur;
- Use existing roads and tracks where possible. In some sections tracks exist near to the proposed infrastructure corridor. These should be used were possible to avoid additional clearing;
- Avoid clearing large stands of hollow-bearing trees (e.g. eucalypts, casuarinas) which may provide roosting and nesting sites for parrot species;
- Isolate and remove all waste, particularly food waste, from the work area to prevent attracting feral species;
- Ensure that fire extinguishing equipment is available during construction and that staff are trained in their use
- Avoid smoking near vegetated areas, particularly spinifex (*Triodia* spp.);
- Dust suppression measures should be implemented;
- Avoid all inactive Malleefowl mounds within the project footprint. In particular, note that one of them (649xxxmE, 6674xxxmN) is only 3 m from an existing track; and
- Ensure trained personnel are present during construction of the communication infrastructure to remove trapped fauna from trenches used to bury cables.

This page has been left blank intentionally

7.0 REFERENCES

Baker, L. (1996). The Distribution, Habitat Requirements and Status of the Mulgara (*Dasycercus cristicauda* Krefft). Masters. Department of Ecosystem Management, University of New England.

Baker, L. M. and Johnson, K. A. (2001). Recovery Plan for the Mulgara *Dasycercus cristicauda*. Unpublished report for the Endangered Species Unit of the Conservation Commission of the Northern Territory.

Baker, L. M., Masters, P., and Johnson, K. (1994). Research plan for the Mulgara, *Dasycercus cristicauda*. Unpublished Report for the Conservation Commission of the Northern Territory.

Bancroft, W. and Bamford, M. (2006). Fauna values of Gindalbie Metals' Karara and Mungada Haematite/Magnetite projects. Unpublished report for Woodman Environmental Consultants. Bamford Consulting Ecologists.

Barton, B. and Cowan, M. (2001). Great Victoria Desert 2 (GVD2 - Great Victoria Desert Central subregion). In *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* Department of Conservation and Land Management. Perth. pp 351-357.

Beard, J. S. (1974). *Great Vistoria Desert : the vegetation of the Great Victoria Desert area : 1:1,000,000 vegetation series : explanatory notes to sheet 3.*, Nedlands, WA : University of Western Asutralia Press. ISBN 0855640456. Contains: The vegetation of the Great Victoria Desert area by J.S.Beard.

Beard, J. S. (1975). *Vegetation Survey of Western Australia: Great Victorian Desert*. University of Western Australia Press, Perth.

Benshemesh, J. (1990). Management of Malleefowl with regard to fire. In *The Mallee Lands, a Conservation Perspective*. (J. C. Noble, P. J. Joss and G. K. Jones, Eds.). CSIRO. Melbourne. pp 206-211.

Benshemesh, J. (1992). The conservation ecology of Malleefowl, with particular regard to fire. Monash University.

Benshemesh, J. (1999). Draft National Recovery Plan for Malleefowl. Version 5. E. Australia, Canberra.

Benshemesh, J. (2000). National Recovery Plan for Malleefowl. Department of Environment Water Heritage and the Arts.

Benshemesh, J. (2004). Recovery Plan for Marsupial Moles *Notoryctes typhlops* and *N. caurinus*, 2005-2010. Northern Territory Department of Infrastructure Planning and Environment, Alice Springs.

Benshemesh, J. (2005a). Manual for Marsupial Mole Survey and Monitoring by Trenches. Anangu-Pitjantjatjara Land Management and the Department of Heritage and Environment (SA).

Benshemesh, J. (2005b). National Recovery Plan for Malleefowl 2006-2010. Department of Environment Water Heritage and the Arts, Adelaide.

Benshemesh, J. (2008). Itjaritjari, *Notoryctes typhlops*. In *Mammals of Australia*, 3rd Edition. (S. Van Dyck and R. Strahan, Eds.). Reed New Holland. Sydney. pp 412-413.

Blyth, J. and Burbidge, A. (1997). What do we know about the Princess Parrot *Polytelis alexandrae*? *Eclectus*, **3**: 26-29.

Braithwaite, R. W., Lonsdale, W. M. and Esthbergs, J. A. (1989). Alien vegetation and native biota in tropical Australia: impact of *Mimosa pigra*. *Biological Conservation*, **48**: 189-210.

Brock, C. E., Brock, C. H., Jepson, K. L. and Ortega, J. C. (1986). Ecological effects of planting African lovegrasses in Arizona. *National Geographic Research*, **2**: 456-463.

Bunting, J. A. and Van de Graaff, W. J. E. (1977). Cundeelee Western Australia, 1: 250 000 Geological Series - Explanatory Notes. *Geological Survey of Western Australia*.

Burbidge, A. A., McKenzie, N. L., Chapman, A. and Lambert, P. M. (1976). The wildlife of some existing and proposed reserves in the Great Victoria and Gibson Deserts, Western Australia. *Wildlife Research Bulletin of Western Australia*, **5**: 1-16.

Caton, W. (2007). Husbandry Guidlines, Mulgara (*Dasycercus cristicauda*). Alice Springs Desert Park, Alice Springs.

Christidis, L. and Boles, W. E. (2008). *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Collingwood.

Churchill, S. (1998). *Australian Bats*. Reed New Holland, Sydney.

Churchill, S. (2001). Recovery Plan for the Sandhill Dunnart (*Sminthopsis psammophila*). Department for Environment and Heritage South Australia, Adelaide.

Cogger, H. G. (2000). *Reptiles and Amphibians of Australia*. Reed New Holland, Sydney.

Cooper, J.M., Beauchesne, S.M. (2007). COSEWIC status report on Peregrine Falcon *Falco peregrinus*. Committee on the status of endangered wildlife in Canada, Errington, BC. Canada.

Crowley, R. D., Heislers, A. and Ealey, E. H. M. (1969). Effects of fire on wildlife. *Proceedings Fire Ecology Symposium*. Monash University.

Department of Environment and Conservation (2007a). Species Profile: Carpet Python. Department of Environment and Conservation, Perth.

Department of Environment and Conservation (2007b). Species Profile: Woma. Department of Environment and Conservation, Perth.

Department of Environment and Heritage (2008). Sandhill Dunnart *Sminthopsis psammophila.* Endangered. Departement of Environment and Heritage, Port Lincoln.

Department for Environment and Heritage South Australia (2006). Bush Stone-curlew *Burhinus grallarius*. Department for Environment and Heritage, Government of South Australia.

DEWHA (2008a). Approved Conservation Advice for *Polytelis alexandrae* (Princess Parrot). Environment Protection and Biodiversity Conservation Act 1999.

DEWHA (2008b). Approved Conservation for *Acanthiza iredalei iredalei* (Slender-billed Thornbill(western)). Environment Protection and Biodiversity Conservation Act 1999.

ecologia Environment (2009a). Neale Junction Nature Reserve Fauna Assessment in collaboration with Department of Environment and Conservation. Unpublished report for Tropicana Joint Venture.

ecologia Environment (2009b). Tropicana Gold Project Operational Area Vertebrate Fauna Assessment. Unpublished Report for Tropicana Joint Venture.

Ehmann, H. and Watson, M. (2008a). Fact sheet: Woma Python *Aspidites ramsayi*. South Australian Arid Lands Natural Resources Management Board. South Australia, Australian Government.

Ehmann, H. and Watson, M. (2008b). Grey Falcon, *Falco hypoleuca*. Government of Australia. South Australian Arid Lands Natural. South Australia.

Environmental Protection Authority (2002). Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection. Perth.

Environmental Protection Authority (2004). Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Perth.

EPBC (2008). Approved Conservation for *Acanthiza iredalei iredalei* (Slender-billed Thornbill(western)). Environment Protection and Biodiversity Conservation Act 1999.

Forshaw, J. M. and Cooper, W. T. (2002). *Australian Parrots*. Alexander Editions, Robina.

Frith, A. J. (1976). *Readers Digest Complete Birds of Australia*. Readers Digest, Sydney.

Gardner, M. G., Hugall, A. F., Donnellan, S. C., Hutchinson, M. N. and Foster, R. (2008). Molecular systematics of social skinks: phylogeny and taxonomy of the *Egernia* group (Reptilia: Scincidae). *Zoological Journal of the Linnean Society*, **154**: 781-794.

Garnett, S. T. and Crowley, G. M. (2000). *The Action Plan for Australian Birds*. Environment Australia, Canberra.

Grantz, D. A., Garner, J. H. B. and Johnson, D. W. (2003). Ecological effects of particulate matter. *Environment International*, **29**: 213-239.

Griffin, G. F., Stafford-Smith, D. M., Morton, S. R., Allan, G. E. and Masters, K. A. (1989). Status and implications of the invasion of Tamarisk (*T. aphylla*) on the Finke River, Northern Territory, Australia. *Journal of Environmental Management*, **29**: 297-315.

IBRA (2000). *Revision of the Interim Biogeographical Regionalisation for Australia (IBRA) and development of Version 5.1.* Environment Australia.

Johnstone, R. E. and Storr, G. M. (1998). *Handbook of Western Australian Birds, Volume I - Non-Passerines (Emu to Dollarbird)*. Western Australian Museum, Perth.

Johnstone, R. E. and Storr, G. M. (2004). *Handbook of Western Australian Birds, Volume II - Passerines (Blue-winged Pitta to Goldfinch)*. Western Australian Museum, Perth.

Koertner, G., Pavey, C. R. and Geiser, F. (2007). Spatial ecology of the mulgara in arid Australia: impact of fire history on home range size and burrow use. *Journal of Zoology*, **273**: 350-357.

Larkin, R. P. (1996). Effects of military noise on wildlife: a literature review. *USACERL Technical report 96/21*.

Mann, S. L., Steidl, R. J. and Dalton, V. M. (2002). Effects of cave tours on breeding *Myotis velifer*. *Journal of Wildlife Management*, **66**: 618-624.

Marchant, S. and Higgins, P. J. (1993). *Handbook of Australian, New Zealand and Antarctic Birds.* Oxford University Press, Melbourne.

Martinick and Associates Pty Ltd (1986). Mulga Rock Flora, Fauna and Radioecology Survey. Unpublished report for PNC Exploration (Australia) Pty Ltd.

Martinick and Associates Pty Ltd. (1986). Mulga Rock Flora, Fauna and Radioecology Survey. Unpublished report for PNC Exploration (Australia) Pty Ltd.

Maryan, B. (2002). Status of the Woma, *Aspidites ramsayi*, in south-west Western Australia. *The Western Australian Naturalist*, **23**(3): 167-172.

Masters, P. (1993). The effects of fire-driven succession and rainfall on small mammals in spinifex grassland at Uluru National Park, Northern Territory. *Wildlife Research*, **20**: 803-813.

Maxwell, S., Burbidge, A. A. and Morris, K. D., Eds. (1996). *The 1996 Action Plan for Australian Marsupials and Monotremes*. Wildlife Australia, Canberra.

McAlpin, S. (1997). Conservation of the Great Desert Skink, *Egernia kintorei*, at Uluru-Kata Tjuta National Park, N.T. A. N. C. Agency, Canberra.

McAlpin, S. (2001). The recovery plan for the Great Desert Skink (*Egernia kintorei*) 2001-2011. Arid Lands Environment Centre, Alice Springs.

McGuire, L. (2008). Australian Threatened Species. Great Desert Skink *Egernia kintorei*. Australian Government.

Menkhorst, P. and Knight, F. (2004). *A Field Guide to the Mammals of Australia*. Oxford University Press, Melbourne.

Morcombe, M. (2000). *Field Guide to Australian Birds*. Steve Parish Publishing Pty Ltd. , Archerfield, Australia.

National Health and Medical Research Council (2004). Australian code of practice for the care and use of animals for scientific purposes. Canberra.

Olsen, J., Fuentes, E., Dykstra, R. and Rose, A. B. (2006). Male Peregrine Falcon *Falco peregrinus* fledged from a cliff-nest found breeding in a stick-nest. *Australian Field Ornithology*, **23**: 8-14.

Olsen, P. D. and Olsen, J. (1985). Distribution, status, movements and breeding of the Grey Falcon *Falco hypoleuca*. CSIRO Division of Wildlife and Rangelands Research.

Pavey, C. (2006a). Threatened Species of the Northern Territory. Slender-billed Thornbill (western subspecies) *Acanthiza iredalei iredalei.* Department of Natural Resources Environment and the Arts. Parks and Wildlife Commission Northern Territory.

Pavey, C. (2006b). Threatened species of the Northern Territory: Great Desert Skink, Tjakura, *Egernia kintorei*. Department of Natural Resources Environment and the Arts, Parks and Wildlife Commission Northern Territory.

Pavey, C. (2006c). Threatened species of the Northern Territory: Slender-billed Thornbill (western subspecies). Department of Natural Resources Environment and the Arts. Parks and Wildlife Commission Northern Territory.

Pearson, D. (1991). First records of the mulgara, *Dasycercus cristicauda*, from the Gibson Desert and Queen Victoria Spring nature reserves. *Western Australian Naturalist*, **18**: 159-161.

Pearson, D. J. and Churchill, S. K. (2008). Sandhill Dunnart, *Sminthopsis psammophila*. In *Mammals of Australia*, 3rd Edition. (S. Van Dyck and R. Strahan, Eds.). Reed New Holland. Sydney. pp 156-158.

Radle, A. L. (1998). "The Effect of Noise on Wildlife: A Literature Review." from http://interact.uoregon.edu/MediaLit/FC/WFAEResaearch/radle.html.

Recher, H. F. and Davis, W. E. (2000). A contribution to the natural history of the Slender-billed Thornbill *Acanthiza iredalei* in Western Australia. *Australian Bird Watcher*, **18**: 297-305.

Simpson, K. and Day, N. (2004). *Field Guide to the Birds of Australia*. Penguin Group, Camberwell.

Storr, G. M., Smith, L. A. and Johnstone, R. E. (1999). *Lizards of Western Australia I: Skinks.* Western Australian Museum, Perth.

Storr, G. M., Smith, L. A. and Johnstone, R. E. (2002). *Snakes of Western Australia*. Western Australian Museum, Perth.

Tarr, H. E. (1965). The Mallee-fowl in Wyperfeld National Park. *Australian Bird Watcher*, **2**: 140-144.

Tyler, M. J., Smith, L. A. and Johnstone, R. E. (2000). *Frogs of Western Australia*. Western Australian Museum, Perth.

Venn, D. R. (2003). Grey Falcon, *Falcon hypoleuca*. Department of Resources and Environment. Flora and Fauna Guarantee Act 1988, No. 83, Department of Sustainability and Environment, State of Victoria.

Westerman, M., Young, J. and Krajewski, C. (2008). Molecular relationships of species of *Pseudantechinus*, *Parantechinus* and *Dasykaluta* (Marsupialia: Dasyuridae). *Australian Mammalogy*, **29**: 201-212.

Wilson, S. and Swan, G. (2008). *A Complete Guide to Reptiles of Australia*. New Holland Publishers, Sydney.

Winterbottom, J. M. (1970). The birds of alien *Acacia* thickets of the South African Western Cape. *Zoologica Africana*, **5**: 49-57.

Woinarski, J. C. Z. (1989). Broombush harvesting in southeastern Australia. In *Mediterranean landscapes in Australia: mallee ecosystems and their management.* (J. C. Noble and R. A. Bradstock, Eds.). CSIRO. Melbourne. pp 362-378.

Woolley, P. A. (2006). Studies on the Crest-tailed Mulgara *Dasycercus cristicauda* and the Brush-tailed Mulgara *Dasycercus blythi* (Marsupialia: Dasyuridae). *Australian Mammalogy*, **28**: 117-120.

Woolley, P. A. (2008). Brush-tailed Mulgara, *Dasycercus blythi*. In *The Mammals of Australia*. (S. Van Dyck and R. Strahan, Eds.). Reed New Holland. Sydney. pp 47-48.

Zagorodniuk, I. V. (2003). Bat communities in urban areas: species selection by the frequency of their ultrasonic signals. *Proceedings of the National Academy of Sciences of the Ukraine*, **8**: 184-189.

This page has been left blank intentionally

APPENDIX A RECORDED AND POTENTIALLY OCCURRING FAUNA SPECIES

This page has been left blank intentionally

Appendix A1 Mammals.

FAMILY and Species	Common Name	Menkhorst and Knight (2004)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Operational Area (*ecologia* 2009)	This Survey
TACHYGLOSSIDAE							
Tachyglossus aculeatus	Echidna	X				X	X
DASYURIDAE							
Antechinomys laniger	Kultarr	X					
Dasycercus blythi	Brush-tailed Mulgara	X		X			X
Dasycercus cristicauda	Crest-tailed Mulgara†						
Ningaui ridei	Wongai Ningaui	X	X	X	X	♦	
Ningaui yvonnae	Mallee Ningaui	X		X	X	♦	
Pseudantechinus sp.							X
Sminthopsis crassicaudata	Fat-tailed Dunnart	X		X	X	X	
Sminthopsis dolichura	Little Long-tailed Dunnart	X		X	X	X	
Sminthopsis hirtipes	Hairy-footed Dunnart	X		X	X	X	
Sminthopsis ooldea	Ooldea Dunnart	X		X	X	X	
Sminthopsis psammophila	Sandhill Dunnart	X		X			
NOTORYCTIDAE							
Notoryctes typhlops	Southern Marsupial Mole	X				X	X
MACROPODIDAE							
Macropus fuliginosus	Western Grey Kangaroo				X	X	X
Macropus robustus	Euro	X			X	X	
Macropus rufus	Red Kangaroo	X	X		X	X	X
EMBALLONURIDAE							
Taphozous hilli	Hill's Sheathtail Bat	X				X	
MOLLOSIDAE							
Mormopterus planiceps	Inland Freetail Bat	X			X	X	
Tadarida australis	White-striped Freetail Bat	X			X	X	X

FAMILY and Species	Common Name	Menkhorst and Knight (2004)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Operational Area (*ecologia* 2009)	This Survey
VESPERTILIONIDAE							
Chalinolobus gouldii	Gould's Wattled Bat	X				X	
Nyctophilus geoffroyi	Lesser Long-eared Bat	X				X	
Nyctophilus ssp. (central form)	Central Long-eared Bat					X	
Nyctophilus timoriensis	Greater Long-eared Bat				X		
Scotorepens balstoni	Inland Broad-nosed Bat	X				X	
Vespadelus finlaysoni	Inland Cave Bat	X				X	
Vespadelus baverstocki	Inland Forest Bat	X					
MURIDAE							
Leporillus conditor	Greater Stick-nest Rat	X				X	
**Mus musculus*	House Mouse	X	X	X	X	X	
Notomys alexis	Spinifex Hopping Mouse	X	X	X	X	X	X
Notomys mitchelli	Mitchell's Hopping Mouse	X					
Pseudomys desertor	Desert Mouse	X				X	
Pseudomys bolami	Bolam's Mouse	X					
Pseudomys hermannsburgensis	Sandy Inland Mouse	X	X	X	X	X	
CANIDAE							
**Canis lupus dingo*	Dingo	X	X			X	
**Vulpes vulpes*	Red Fox	X	X			X	
FELIDAE							
**Felis catus*	House Cat	X	X			X	
BOVIDAE							
**Capra hircus*	Goat	X					
CAMELIDAE							
**Camelus dromedarius*	One-humped Camel	X	X			X	X
LEPORIDAE							
**Oryctolagus cuniculus*	European Rabbit	X	X			X	X

*Introduced species; ♦identity unconfirmed; † Crest-tailed Mulgara are considered to be absent from the region, and possibly extinct in Western Australia.

Appendix A2 Birds.

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
CASUARIIDAE							
Dromaius novaehollandiae	Emu	X	X	X		X	X
MEGAPODIIDAE							
Leipoa ocellata	Malleefowl	X				X	X
ANATIDAE							
Anas gracilis	Grey Teal	X		X			
PODICIPEDIDAE							
Poliocephalus poliocephalus	Hoary-headed Grebe	X				X	
COLUMBIDAE							
Columba livia	Rock Dove	X					
Phaps chalcoptera	Common Bronzewing	X	X	X		X	
Ocyphaps lophotes	Crested Pigeon	X			X	X	
Geopelia cuneata	Diamond Dove	X				X	
PODARGIDAE							
Podargus strigoides	Tawny Frogmouth	X	X	X	X	X	X
EUROSTOPODIDAE							
Eurostopodus argus	Spotted Nightjar	X				X	X
AEGOTHELIDAE							
Aegotheles cristatus	Australian Owlet-nightjar	X	X	X		X	
APODIDAE							
Apus pacificus	Fork-tailed Swift	X				X	
ARDEIDAE							
Ardea novaehollandiae	White-faced Herron	X		X			
ACCIPITRIDAE							

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Haliastur sphenurus	Whistling Kite	X	X		X		
Accipiter fasciatus	Brown Goshawk	X	X				
Accipiter cirrocephalus	Collared Sparrowhawk					X	
Circus assimilis	Spotted Harrier	X					
Aquila audax	Wedge-tailed Eagle	X	X	X		X	X
Hieraaetus morphnoides	Little Eagle	X	X			X	
FALCONIDAE							
Falco cenchroides	Nankeen Kestrel	X	X			X	
Falco berigora	Brown Falcon	X	X		X	X	X
Falco longipennis	Australian Hobby	X	X		X	X	
Falco hypoleucos	Grey Falcon	X		X			
Falco subniger	Black Falcon	X					
Falco peregrinus	Peregrine Falcon	X				X	
RALLIDAE							
Fulica atra	Eurasian Coot	X				X	
OTIDIDAE							
Ardeotis australis	Australian Bustard	X	X	X	X	X	X
CHARADRIIDAE							
Charadrius ruficapillus	Red-capped Plover	X	X				
Vanellus tricolor	Banded Lapwing					X	
TURNICIDAE							
Turnix velox	Little Button-quail	X		X		X	
CACATUIDAE							
Lophochroa leadbeateri	Major Mitchell's Cockatoo	X					
Eolophus roseicapilla	Galah	X	X	X		X	X
Nymphicus hollandicus	Cockatiel	X	X	X		X	

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
PSITTACIDAE							
Glossopsitta porphyrocephala	Purple-crowned Lorikeet					X	
Polytelis anthopeplus	Regent Parrot	X			X	X	X
Polytelis alexandrae	Princess Parrot	X					
Barnardius zonarius	Australian Ringneck	X	X	X	X	X	X
Northiella haematogaster	Naretha Blue Bonnet			X			
Psephotus varius	Mulga Parrot	X	X	X		X	
Melopsittacus undulatus	Budgerigar	X	X			X	X
Neophema splendida	Scarlet-chested Parrot	X	X			X	
Pezoporus occidentalis	Night Parrot	X					
CUCULIDAE							
Chalcites basalis	Horsfield's Bronze-cuckoo	X	X			X	X
Chalcites osculans	Black-eared Cuckoo	X	X			X	X
Cacomantis pallidus	Pallid Cuckoo	X	X	X		X	X
STRIGIDAE							
Ninox novaeseelandiae	Southern Boobook	X	X				
TYTONIDAE							
Tyto javanica	Eastern Barn Owl	X		X			
Tyto longimembris	Eastern Grass Owl	X					
HALCYONIDAE							
Todirhamphus pyrrhopygius	Red-backed Kingfisher	X	X	X		X	
Todirhamphus sanctus	Sacred Kingfisher	X	X				
MEROPIDAE							
Merops ornatus	Rainbow Bee-eater	X	X			X	
CLIMACTERIDAE							
Climacteris affinis	White-browed Treecreeper	X	X	X		X	

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Climacteris rufa	Rufous Treecreeper	X			X		
MALURIDAE							
Malurus splendens	Splendid Fairy-wren	X	X			X	
Malurus leucopterus	White-winged Fairy-wren	X	X				X
Malurus lamberti	Variegated Fairy-wren	X					
Malurus pulcherrimus	Blue-breasted Fairy-wren	X					
Amytornis striatus	Striated Grasswren	X	X				
ACANTHIZIDAE							
Pyrrholaemus brunneus	Redthroat	X	X			X	X
Smicrornis brevirostris	Weebill	X	X		X	X	X
Gerygone fusca	Western Gerygone	X					
Acanthiza robustirostris	Slaty-backed Thornbill	X	X			X	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X	X			X	X
Acanthiza uropygialis	Chestnut-rumped Thornbill	X	X	X	X	X	X
Acanthiza iredalei	Slender-billed Thornbill	X	X				
Acanthiza apicalis	Inland Thornbill	X	X		X	X	X
Aphelocephala leucopsis	Southern Whiteface	X	X	X		X	
PARDALOTIDAE							
Pardalotus rubricatus	Red-browed Pardalote		X				
Pardalotus striatus	Striated Pardalote	X	X		X	X	X
MELIPHAGIDAE							
Certhionyx variegatus	Pied Honeyeater	X		X			
Lichenostomus virescens	Singing Honeyeater	X	X			X	X
Lichenostomus leucotis	White-eared Honeyeater	X					
Lichenostomus ornatus	Yellow-plumed Honeyeater	X					X
Lichenostomus plumulus	Grey-fronted Honeyeater	X	X		X	X	X

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Purnella albifrons	White-fronted Honeyeater	X	X	X	X	X	X
Manorina flavigula	Yellow-throated Miner	X	X	X	X	X	X
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	X	X	X		X	X
Anthochaera carunculata	Red Wattlebird	X	X		X	X	X
Ephthianura tricolor	Crimson Chat	X	X			X	
Epthianura aurifrons	Orange Chat					X	
Ephthianura albifrons	White-fronted Chat	X					
Sugomel niger	Black Honeyeater	X	X				
Lichmera indistincta	Brown Honeyeater	X				X	
POMATOSTOMIDAE							
Pomatostomus superciliosus	White-browed Babbler	X	X	X		X	X
PSOPHODIDAE							
Cinclosoma castanotum	Chestnut Quail-thrush	X		X			
Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush	X	X	X			
NEOSITTIDAE							
Daphoenositta chrysoptera	Varied Sittella	X				X	
CAMPEPHAGIDAE							
Coracina maxima	Ground Cuckoo-shrike	X			X	X	X
Coracina novaehollandiae	Black-faced Cuckoo-shrike	X	X	X	X	X	X
Lalage sueurii	White-winged Triller	X	X	X			
PACHYCEPHALIDAE							
Pachycephala inornata	Gilbert's Whistler	X		X			
Pachycephala rufiventris	Rufous Whistler	X	X	X		X	X
Colluricincla harmonica	Grey Shrike-thrush	X	X			X	X
Oreoica gutturalis	Crested Bellbird	X	X		X	X	X

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
ARTAMIDAE							
Artamus personatus	Masked Woodswallow	X				X	
Artamus cinereus	Black-faced Woodswallow	X	X	X		X	X
Cracticus torquatus	Grey Butcherbird	X	X	X	X	X	X
Cracticus nigrogularis	Pied Butcherbird	X	X	X	X	X	X
Cracticus tibicen	Australian Magpie	X	X			X	
Strepera versicolor	Grey Currawong	X	X			X	X
RHIPIDURIDAE							
Rhipidura albiscapa	Grey Fantail	X					
Rhipidura leucophrys	Willie Wagtail	X	X	X	X	X	X
CORVIDAE							
Corvus bennetti	Little Crow	X	X	X		X	X
Corvus orru	Torresian Crow	X	X		X		
MONARCHIDAE							
Grallina cyanoleuca	Magpie-lark	X	X			X	
PECTROICIDAE							
Microeca fascinans	Jacky Winter	X	X		X	X	X
Petroica goodenovii	Red-capped Robin	X	X	X	X	X	X
Melanodryas cucullata	Hooded Robin	X	X	X	X	X	
MEGALURIDAE							
Cinclorhamphus mathewsi	Rufous Songlark	X					
Cinclorhamphus cruralis	Brown Songlark	X	X	X			
HIRUNDINIDAE							
Cheramoeca leucosterna	White-backed Swallow	X				X	X
Hirundo neoxena	Welcome Swallow	X					
Petrochelidon nigricans	Tree Martin	X				X	

FAMILY and Species	Common Name	Simpson and Day (2004)	Birdata	Plumridge Lakes (Burbidge *et al.*, 1976)	Mulga Rocks (Martineck and Associates 1986)	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
NECTARINIIDAE							
Dicaeum hirundinaceum	Mistletoebird	X	X			X	X
ESTRILDIDAE							
Taeniopygia guttata	Zebra Finch	X	X			X	X
MOTACILLIDAE							
Anthus novaeseelandiae	Australasian Pipit	X	X	X		X	

Appendix A3 Herpetofauna.

FAMILY and Species	Common Name	Tyler *et al.* (1994)	Wilson and Swan (2008)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
AMPHIBIANS								
HYLIDAE								
Cyclorana platycephala	Water-holding Frog	X						
MYOBATRACHIDAE								
Neobatrachus centralis	Desert Trilling Frog			X			♦	
Neobatrachus kunapalari	Kunapalari Frog	X						
Neobatrachus suta	Shoe-maker Frog	X						
REPTILES								
GEKKONIDAE								
Diplodactylus conspicillatus	Fat-tailed Gecko					X	X	
Diplodactylus granariensis	Western Stone Gecko		X			X	X	X
Diplodactylus pulcher			X			X		
Gehyra purpurascens					X	X	X	
Gehyra variegata			X		X	X	X	X
Heteronotia binoei	Bynoe's Gecko		X			X	X	X
Lucasium damaeum	Beaded Gecko		X	X		X	X	X
Lucasium maini			X			X		
Lucasium squarrosum			X					
Lucasium stenodactylum	Sand-plain Gecko					X		
Nephrurus laevissimus	Pale Knob-tailed Gecko		X		X	X	X	
Nephrurus levis	Smooth Knob-tailed Gecko		X	X		X	X	
Nephrurus vertebralis			X	X		X		
Rhynchoedura ornata	Beaked Gecko		X			X	X	X
Strophurus assimilis	Thorn-tailed Gecko		X					

FAMILY and Species	Common Name	Tyler *et al.* (1994)	Wilson and Swan (2008)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Strophurus elderi	Jeweled Gecko		X		X	X	X	
Strophurus intermedius	Southern Spiny-tailed Gecko					X		
Strophurus strophurus	Western Spiny-tailed Gecko						X	
Strophurus wellingtonae								X
Underwoodisaurus milli	Barking Gecko		X			X		
PYGOPODIDAE								
Delma australis								X
Delma butleri			X			X	X	
Delma nasuta							X	
Delma petersoni			X		X	X	X	
Lialis burtonis	Burton's Snake-lizard		X			X	X	
Pygopus nigriceps	Western Hooded Scaly-foot		X			X	X	
SCINCIDAE								
Cryptoblepharus carnabyi			X			X	X	
Cryptoblepharus plagiocephalus	Common Fence Skink		X			X		
Ctenotus ariadnae			X				X	
Ctenotus atlas			X		X	X		X
Ctenotus brooksi			X		X	X	X	
Ctenotus calurus			X			X	X	
Ctenotus dux	Narrow-lined Ctenotus		X				X	
Ctenotus grandis			X				X	
Ctenotus greeri			X				X	
Ctenotus helenae			X			X	X	
Ctenotus leae			X		X	X		
Ctenotus leonhardii			X				X	
Ctenotus pantherinus ocellifer	Leopard Ctenotus		X			X	X	

FAMILY and Species	Common Name	Tyler *et al.* (1994)	Wilson and Swan (2008)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus		X		X	X	X	
Ctenotus schomburgkii			X		X	X	X	X
Cyclodomorphus branchialis	Gilled Slender Blue-tongue				X			
Cyclodomorphus melanops elongatus	spinifex Slender Blue-Tongue		X			X	X	
Egernia depressa	Pygmy Spiny-tailed Skink		X					
Egernia inornata	Desert Skink		X	X	X	X	X	
Egernia striata	Night Skink		X			X	X	
Eremiascincus richardsonii	Broad-banded Sand-swimmer		X			X	X	
Hemiergis initialis						X		X
Lerista bipes			X		X	X	X	
Lerista desertorum			X			X	X	X
Lerista muelleri			X		X	X	X	X
Lerista picturata						X		
Lerista taeniata							X	
Menetia greyii			X	X	X	X	X	
Morethia boulengeri						X		
Morethia butleri			X		X	X	X	
Morethia obscura			X			X		
Proablepharus reginae			X			X	X	
Tiliqua multifasciata	Centralian Blue-tongue		X	X		X	X	
Tiliqua occipitalis	Western Blue-tongue		X	X		X	X	
Tiliqua rugosa	Bobtail					X		X
AGAMIDAE								
Amphibolurus longirostris	Long-nosed Dragon		X				X	
Caimanops amphiboluroides	Mulga Dragon		X				X	
Ctenophorus caudicinctus	Ring-tailed Dragon		X					

FAMILY and Species	Common Name	Tyler *et al.* (1994)	Wilson and Swan (2008)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
Ctenophorus clayi	Black-collared Dragon					X	X	
Ctenophorus cristatus	Crested Dragon		X	X		X	X	
Ctenophorus fordi	mallee Military Dragon		X			X	X	
Ctenophorus isolepis gularis	Central Military Dragon		X	X	X	X	X	X
Ctenophorus nuchalis	Central Netted Dragon		X		X	X	X	
Ctenophorus reticulatus	Western Netted Dragon		X	X	X	X	X	
Ctenophorus salinarum	Claypan Dragon		X					
Ctenophorus scutulatus	Lozenge-marked Dragon		X			X		
Diporiphora reginae			X			X	X	
Diporiphora winneckei	Blue-lined Dragon		X					
Moloch horridus	Thorny Devil		X		X	X	X	
Pogona minor	Dwarf Bearded Dragon		X	X		X	X	X
Pogona nullarbor	Nullarbor Bearded Dragon					X		
Tympanocryptis lineata	Lined Earless Dragon					X		
VARANIDAE								
Varanus brevicauda	Short-tailed Pygmy Monitor						X	
Varanus eremius	Pygmy Desert Monitor		X		X	X	X	
Varanus giganteus	Perentie		X				X	
Varanus gilleni	Pygmy Mulga Monitor		X			X	X	
Varanus gouldii	Gould's Goanna		X		X	X	X	
Varanus tristis	Black-headed Monitor		X				X	
TYPHLOPIDAE								
Ramphotyphlops bituberculatus	Prong-snouted Blind Snake		X			X		
Ramphotyphlops endoterus			X				X	
Ramphotyphlops waitii			X			X	X	

FAMILY and Species	Common Name	Tyler *et al.* (1994)	Wilson and Swan (2008)	Plumridge Lakes (Burbidge *et al.* 1976)	Mulga Rocks (Martineck and Associates 1986)	WAM FaunaBase	Tropicana Gold Project Operational Area (*ecologia* 2009)	This Survey
PYTHONIDAE								
Antaresia stimsoni	Stimson's Python		X					
Aspidites ramsayi	Woma Python		X			X		
Morelia spilota imbricata	south-west Carpet Python		X				X	
ELAPIDAE								
Acanthophis pyrrhus	Desert Death Adder		X				X	
Brachyurophis fasciolatus	Narrow-banded Shovel-nosed Snake		X				X	
Brachyurophis semifasciatus	Southern Shovel-nosed Snake		X				X	
Demansia psammophis	Yellow-faced Whipsnake		X				X	
Furina ornata	Moon Snake		X					
Neelaps bimaculatus	Black-naped Snake						X	
Parasuta monachus	Monk Snake		X			X	X	X
Pseudechis australis	Mulga Snake		X			X	X	
Pseudonaja modesta	Ringed Brown Snake					X	X	X
Pseudonaja nuchalis	Western Brown Snake		X			X	X	
Simoselaps bertholdi	Jan's Banded Snake		X			X	X	
Suta fasciata	Rosen's Snake		X					

♦ Identity unconfirmed

APPENDIX B SOUTHERN MARSUPIAL MOLE HOLE DATA

This page has been left blank intentionally

Appendix B1 Hole data for Southern Marsupial Moles.

SITE	EASTING	NORTHING	DATE	TRENCH	HOLE	D min	D max	DEPTH	TRENCH FACE	CLARITY	CONFIDENCE	TAP TEST	AGE
MMS1	656491	6688084	01/08/2007	2	1	50	50	120	1000 x 700	3	3	3	fresh
MMS1	656491	6688084	01/08/2007	2	2	52	54	170	1000 x 700	2.5	2.5	2	recent
MMS1	656491	6688084	01/08/2007	2	3	43	56	150	1000 x 700	2.5	2.5	2	recent
MMS1	656491	6688084	01/08/2007	2	4	43	44	190	1000 x 700	3	3	2.5	oldish
MMS1	656491	6688084	01/08/2007	2	5	45	50	290	1000 x 700	3	2.5	2.5	old
MMS1	656491	6688084	01/08/2007	3	1	40	165	180	1000 x 700	2.5	2.5	3	fresh
MMS1	656491	6688084	01/08/2007	4	1	44	90	280	1000 x 700	1.5	1.5	2	oldish
MMS1	656491	6688084	01/08/2007	4	2	44	47	380	1000 x 700	3	3	2	oldish
MMS1	656491	6688084	01/08/2007	4	3	44	44	180	1000 x 700	1.5	1.5	1	old
MMS1	656491	6688084	01/08/2007	4	4	42	44	130	1000 x 700	1.5	1.5	1	old
MMS2	655357	6685417	01/08/2007	1	1	43	47	240	1000 x 700	3	3	3	fresh
MMS2	655357	6685417	01/08/2007	2	1	42	44	140	1000 x 700	3	3	3	fresh
MMS2	655357	6685417	01/08/2007	2	2	43	72	185	1000 x 700	3	2	3	fresh
MMS2	655357	6685417	01/08/2007	2	3	47	50	160	1000 x 700	3	3	3	fresh
MMS2	655357	6685417	01/08/2007	2	4	42	100	180	1000 x 700	3	2	3	fresh
MMS2	655357	6685417	01/08/2007	2	5	43	75	160	1000 x 700	3	2	3	fresh
MMS2	655357	6685417	01/08/2007	2	6	43	44	210	1000 x 700	3	3	3	fresh
MMS2	655357	6685417	01/08/2007	2	7	42	44	220	1000 x 700	3	3	3	fresh
MMS2	655357	6685417	01/08/2007	4	1	50	55	185	1000 x 700	3	3	3	fresh
MMS3	646882	6670945	01/08/2007	2	1			100	1000 x 700	1	2		old

Note: Sites all occur in zone 51 J. All measurements are in millimetres (mm). Trenches numbering is as: 1) Crest, 2) upper slope, 3) mid slope, 4) lower slope, along north facing side of site sand dune. "Trench Face" is measured as length x width. "X" is the distance from the left margin of the trench face. "Clarity", "Confidence" and "Tap Test" are scales developed by Benshemesh (2005) with 1 = not confident and 3 = very confident.

This page has been left blank intentionally

APPENDIX C NOTES ON FAUNA HABITATS ALONG THE PROPOSED INFRASTRUCTURE CORRIDOR

This page has been left blank intentionally

Appendix C1 Locations and notes for fauna habitats along the infrastructure corridor.

From		To		Comment
654595E	6761030N	654625E	6757164N	Open mulga - interspersed with tree stands
654685E	6756928N	654755E	6754415N	Thicker mulga - interspersed with tree stands - poor/medium potential mulgara habitat lacking large unburnt spinifex
654785E	6754208N	654999E	6752951N	Thicker mulga - interspersed with casuarina tree stands. Poor/medium potential mulgara habitat lacking large unburnt spinifex
655081E	6752661N	655383E	6751339N	Open mulga with some good gum stands
655602E	6751075N	656070E	6747721N	Mixed eucalypt/mulga with spinifex understorey - medium potential for mulgara
656225E	6746609N	656432E	6744889N	Open mulga
656610E	6744307N	656747E	6743393N	Open mulga - good Marble Gum stands
657011E	6742576N	657053E	6742047N	Young scattered eucalypt over spinifex - good tree stands
657534E	6739903N	657623E	6737079N	Mixed eucalypt mallee woodland with thick spinifex understorey - Medium /high potential for mulgara
657630E	6736773N	656254E	6726666N	Open mulga - poor habitat
656271E	6726220N	656153E	6725958N	Good Marble gums
655831E	6725566N	655361E	6724642N	Thick mulga stand and good spinifex
655185E	6724504N			Gnamma hole
654942E	6724283N	654000E	6723500N	Thick mulga stand and good spinifex
654845E	6724118N			Sand dune - Yellow/orange sand
653584E	6723179N	652208E	6721136N	Open Sand plain - yellow/orange sand
652396E	6721922N			Thick mulga patch
650861E	6720842N	649084E	6717469N	Thick mulga - Malleefowl habitat
648928E	6717367N	648022E	6716185N	Open and burnt, scattered marble gums
646100E	6714000N			Sand dune
644909E	6712506N	644500E	6711500N	Eucalypt woodland, grevillea and spinifex on calcrete ridges - previously burnt
643456E	6710095N	648056E	6697896N	Burnt habitat, red soil - interspersed gum stands
649483E	6694401N			Thick mulga and spinifex on red sand - Potential mulgara habitat
649719E	6690906N			Thick spinifex - possible mulgara habitat
649705E	6690842N	650687E	6686113N	Patchy burnt habitat
650594E	6685399N	649762E	6680483N	Thick spinifex

From		To		Comment
649287E	6675210N	648169E	6673304N	Thick mulga - Malleefowl habitat
646743E	6670788N			Sand dune – Southern Marsupial Mole habitat
643394E	6663144N	637000E	6653750N	Marble gum Stands
638663E	6655673N			Sand dune - Potential Sandhill Dunnart habitat
653750E	6636600N	632750E	6618000N	Burnt - poor habitat
623871E	6600310N			Road widens all the way to Kitchener Rail Crossing
622529E	6597668N	617361E	6585843N	Interspersed Salmon Gum and casuarina stands
617750E	6586000N			Poor habitat to end of proposed infrastructure corridor

APPENDIX D RISK ASSESSMENT

This page has been left blank intentionally

Appendix D1 Fauna impact risk assessment.

Risk Issue	Event or Action	Impact	Inherent Risk			Controls	Residual Risk		
			Likelihood	Consequence	Risk Level		Likelihood	Consequence	Significance
Vegetation clearing	Clearing of fauna habitat	Loss of local vertebrate fauna communities	5	2	**10**	Clearing should be restricted to that which is necessary. Clearing boundaries should be clearly defined. Areas no longer required to be cleared should be rehabilitated as soon as is practicable.	5	1	**5**
	Clearing of fauna habitat	Habitat fragmentation	4	2	**8**	Avoid dividing small discrete habitat types such as mallee thickets were possible.	3	2	**6**
	Clearing of fauna habitat	Adverse impact to ecological function and loss of local biodiversity	3	2	**6**	Clearing should be restricted to that which is necessary. Clearing boundaries should be clearly defined. Areas no longer required to be cleared should be rehabilitated as soon as is practicable.	3	1	**3**
	Clearing of fauna habitat	Loss of regionally significant fauna habitat	4	2	**8**	Avoid impact to regionally significant, isolated fauna habitat.	2	2	**4**
	Clearing of fauna habitat	Loss of Conservation Significant Fauna	3	2	**6**	Avoid clearing mallee thickets and patches of old thick spinifex that form small discrete habitats.	3	1	**3**
	Clearing of fauna habitat	Displacement of fauna into adjacent communities resulting in greater competition for resources in surrounding populations	5	1	**5**	Largely unavoidable as areas are permanently changed. Stagger clearing events to allow movement of fauna away from clearing sites.	5	1	**5**
Fire	Wildfire as a result of clearing, construction or mining activities	Temporary destruction of fauna habitat	2	4	**8**	Adhere to fire prevention strategies.	1	4	**4**

Risk Issue	Event or Action	Impact	Inherent Risk			Controls	Residual Risk		
			Likelihood	Consequence	Risk Level		Likelihood	Consequence	Significance
	Increased frequency of fire	Lasting vegetation and ecosystem change as a result of changed fire regime	1	4	**4**	Adhere to fire prevention strategies.	1	4	**4**
Spread of weeds	Inadequate weed hygiene management during clearing and construction	Long-term reduction of fauna habitat quality over lease	2	4	**8**	Implement and audit weed hygiene measures. Remove weed outbreaks as soon as they are discovered to avoid extensive removal and rehabilitation costs at a later date.	1	3	**3**
Vehicle Strikes	Vehicle movements during construction and operation	Fauna mortality resulting in reduction of local fauna populations	5	1	**5**	Reduce speeds around dusk and dawn, when terrestrial fauna activity is highest. In areas of significant fauna mortality, roadkill should be removed daily to avoid attracting eagles, buzzards, kites and other scavenging animals.	3	1	**3**
Feral Fauna	Access to unsealed food waste or artificial water sources	Increased abundance of introduced fauna	3	3	**6**	Adequate waste management and hygiene should prevent access to animals. Water sources should be fenced to prevent access by animals.	1	3	**3**
	Attraction or introduction of feral fauna to project area	Increased predation pressure on native fauna.	2	4	**8**	Baiting control programmes for foxes and cats should be introduced to counter potential increases in feral predator abundance	1	4	**4**
	Attraction or introduction of feral fauna to project area	Increased competition with native fauna.	2	4	**8**	Quarantine measures should be implemented to prevent house mouse and rat introduction.	1	4	**4**
Noise Pollution	High volume, localised noise events as a result of operations	Disruption of local fauna populations	1	2	**2**	Adhere to noise management procedures.	1	1	**1**
Light Pollution	Nocturnal light pollution as a result of operations	Altered fauna community structures	1	2	**2**	Develop light pollution management procedures if necessary. Use lighting levels appropriate to task required and safety standards. Reduce light pollution where possible. Use directional lighting equipment where possible.	1	1	**1**

Risk Issue	Event or Action	Impact	Inherent Risk			Controls	Residual Risk		
			Likelihood	Consequence	Risk Level		Likelihood	Consequence	Significance
	Nocturnal light pollution as a result of operations	Disruption of bird migration	1	2	**2**	As above.	1	1	**1**
Dust	Dust emissions arising from construction activities and continued use of access road	Localised damage to vegetation resulting in loss of fauna habitat	3	2	**6**	Adhere to dust management and suppression procedures.	2	2	**4**
Trapped fauna	Fauna trapped in the trench used to bury the optical fibre cable during the construction phase	Local reduction in fauna populations.	5	4	**20**	Trained personnel (experienced in venomous snake handling) to remove trapped fauna from the trench daily if the trench is left open over night.	5	1	**5**

Appendix D2 Risk Matrix used in the fauna impact risk assessment.

RISK MATRIX		LIKELIHOOD				
		5 – ALMOST CERTAIN	**4 – LIKELY**	**3 – POSSIBLE**	**2 – UNLIKELY**	**1 – RARE**
		Is expected to occur in most circumstance	Will probably occur in most circumstance	Could occur	Could occur but not expected	Occurs in exceptional circumstances
CONSEQUENCES	**5 - CATASTROPHIC** Significant impact to fauna species of conservation significance or regional biodiversity	**25**	**20**	**15**	**10**	**5**
	4 - MAJOR Impact to fauna species of conservation significance in project area.	**20**	**16**	**12**	**8**	**4**
	3 - MODERATE Loss of fauna biodiversity in project area.	**15**	**12**	**9**	**6**	**3**
	2 - MINOR Short term or localised impact to fauna biodiversity.	**10**	**8**	**6**	**4**	**2**
	1 - INSIGNIFICANT No impact to fauna of conservation significance or biodiversity.	**5**	**4**	**3**	**2**	**1**

High risk, site/issue specific management programs required, advice/approval from regulators required.
Medium risk, specific management and procedures must be specified.
Low risk, managed by routine procedures.

APPENDIX E DEC INFORMATION ABOUT PRIORITY ECOLOGICAL COMMUNITY (PEC)

Request for information from Damien Cancilla to Jill Pryde, DEC
Thursday, 8th January 2009

Hi Jill,

I'm just enquiring about a PEC,

– No.53 - **Yellow sandplain communities of the Great Victoria Desert;** Very diverse mammalian and reptile fauna, distinctive plant communities. Threats: mining - Priority 3 (ii)

Our client would like us to comment on potential impacts to this community, but as yet we have not been able to ascertain the location or extent of this community. I have spoken with David Pearson, as he was quoted as the reference for describing this community, but he was also uncertain about the extent and location.

Is it possible for you to forward any further information about this community or suggest how we can with determine potential impacts to it?

Sincerely

Damien Cancilla

Zoologist
ecologia Environment
1025 Wellington Street
WEST PERTH WA 6005
Phone: (08) 9322 1944
Fax: (08) 9322 1599
damien.cancilla@ecologia.com.au
www.ecologia.com.au

Response from Jill Pryde to Damien Cancilla
Thursday, 8th January 2009

Damien

Unfortunately I don't have much further information, however we do believe this broadscale community is an ecosystem at risk threatened by mining, hence its listing as P3

Priority Three: Poorly known ecological communities

(ii) communities known from a few widespread occurrences, which are either large or within significant remining areas of habitat in which other occurrences may occur, much of it not under imminent threat

David supplied the southern boundaries (we are still trying to ascertain the northern boundaries)

30 10'S, 123 20'E south-east to 30 30'S, 123 33'E, then east to 30 30'S, 123 50'E, then north east to at least 30 00'S, 124 20' E.

From David Pearson's description: In regards to the southern Great Victoria Desert sandplains, the PEC was originally put on the list following survey at Queen Victoria Spring NR (study site by David Pearson, DEC). This was due to the incredibly high small vertebrate diversity (more species of small terrestrial reptile and mammal species per ha of anywhere in WA), unusual combinations of species (mixture of SW and arid), high numbers of threatened species (Mulgara, Marsupial Mole, Sandhill Dunnart, Woma Python, Mallee Fowl, Scarlet-chested and Princess Parrots, Pink Cockatoo, etc.) and a hot spot for mallee eucalypt species as well as other rare/poorly known plant species.

Jill Pryde
A/Snr Ecologist
Species and Communities Branch
Department of Environment and Conservation (DEC)