A LEVEL ONE SURVEY
OF THE
VERTEBRATE FAUNA
INFRASTRUCTURE CORRIDOR – PINJIN OPTION
L31/57, L39/185, PINJIN – TROPICANA GOLD PROJECT

TROPICANA JOINT VENTURE

ANGLOGOLD ASHANTI AUSTRALIA

INDEPENDENCE GROUP NL

By Ninox Wildlife Consulting

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EXECUTIVE SUMMARY

Ninox Wildlife Consulting was commissioned by AngloGold Ashanti Australia Limited on behalf of the Tropicana Joint Venture, to assess the significance of the vertebrate fauna and their habitats along a proposed infrastructure corridor between Pinjin, approximately 140km east of Kalgoorlie, and the proposed operational area of the Tropicana Gold Project, approximately 215km to the north east of Pinjin, covering a total area of approximately 600ha.

A Level 1 Reconnaissance Survey took place over two periods, five days in December 2007 and five days in March 2008. The survey was done during the driest and hottest periods and much of the area had been severely burnt, particularly those areas of yellow sandplains and dunes. Existing data for the remote areas was scarce.

The area assessed during this survey lies within the Interim Biogeographic Regionalisation for Australia (IBRA) boundaries of the very eastern portion of Murchison (MUR) and a larger portion of the Great Victoria Desert (GVD).

A wide variety of habitats was inspected and some were singled out as being of particular significance to fauna. These included mulga woodland suitable for Malleefowl nesting (one recent nest located). Others included:

- expanses of granite sheet formations;
- granite boulders;
- chenopod flats both *Maireana* and *Halosarcia;*
- *Casuarina* (sheoak) woodlands;
- mature *Eucalyptus gongylocarpa* woodlands with hollows;
- mature *Eucalyptus* and *Callitris* woodland mix;
- isolated mulga woodlands;
- dunes and swales containing mature vegetation including *Xanthorrhoea* sp.;
- Thryptomene shrublands (*Aluta maisonneuvei);*
- Four Mile Dam (just out of the survey area);
- yellow sand-plain heaths (mainly burnt or recovering from burn);
- yellow sand dunes – very few with intact vegetation (burnt);
- red sand-plains with spinifex and eucalypts;
- red sand dunes with intact vegetation;
- orange sand-plains with heath/ tree mix;
- open grasslands;
- mulga woodlands with varying understorey vegetation and soil types;
- open mallee woodlands over spinifex;
- spinifex.

Recorded along the route were 45 bird species, nine reptiles and four native mammals (some unidentified species of bat were also seen). No frogs were recorded. Evidence of four species of introduced mammal was noted.

Potentially occurring within these diverse habitats are an additional 72 bird species (plus one considered extinct in the area), 27 mammal (plus six considered extinct in the area), six frog and 106 reptile species.

Eleven bird, 10 mammal and three reptile species known to occur, or that once occurred, in the general area are listed under State and/or Australian Government legislation. Animals considered extinct in the area have been included if suitable habitat was present within the Survey Area although they are not expected to be present. An Australian Bustard nest with one egg was found in a small remnant of unburnt vegetation on yellow sandplain, and two abandoned Malleefowl nests (one recent and one older) were located in mulga woodlands.

Separate surveys by other consultants have been carried out to ascertain the presence of Sandhill Dunnarts (*Sminthopsis psammophila)* and the Southern Marsupial Mole (*Notoryctes typhlops*). Both could be present in suitable habitat that has not been recently burnt. While no specific survey was undertaken to ascertain the presence of either the Brush-tailed Mulgara (*Dasycercus blythi*) or Crest-tailed Mulgara (*Dasycercus cristicauda*), it is possible that the former occurs in suitable habitat along the proposed infrastructure route; this judgement is based on current distribution patterns for these two small marsupials.

Eight locations (habitats) considered to be of significance to vertebrate fauna are recommended to be left undisturbed and the access road re-routed. Other more widespread areas considered important to fauna are recommended for additional care to be taken during road and infrastructure construction to minimise damage.

1 INTRODUCTION

1.1 Project Overview

Ninox Wildlife Consulting (Ninox) was commissioned by AngloGold Ashanti Australia Limited (AngloGold) on behalf of the Tropicana Joint Venture (TJV), to assess the significance of the vertebrate fauna and their habitats along a proposed infrastructure corridor between Pinjin and the proposed operational area of the Tropicana Gold Project (TGP), a distance of approximately 220km and covering in the region of 600 hectares, hereafter called the Survey Area (Figure 1). Pinjin is approximately 133km north-east of Kalgoorlie and the TGP is approximately 330km east-north-east of Kalgoorlie. The Pinjin infrastructure corridor lies within miscellaneous leases L31/57 and L39/185 which are managed by AngloGold. The TGP is a joint venture between AngloGold Ashanti Australia Limited (70% and Manager) and the Independence Group NL.

Tropicana is within 15km of the northwest boundary of the Plumridge Lake Nature Reserve, Western Australia. The Survey Area lies within the Interim Biogeographic Regionalisation for Australia (IBRA) boundaries of the very eastern portion of Murchison (MUR) and a larger portion of the Great Victoria Desert (GVD) (Thackway 1998) and the boundary mixes between the two; and the climatic zones: Semi Arid, Arid and Desert (Johnstone & Storr 1998).

1.2 Survey Objectives

In order to fulfil the objectives shown below, the Survey Area was assessed as a Level 1 Reconnaissance Survey as defined in Guidance Statement No. 56 (Environmental Protection Authority [EPA] 2004). This included a site visit that took place over two periods (2nd to 7th December 2007 and 10th to 15th March 2008 inclusive) and involved driving the entire length of the proposed access route.

The main objectives of this vertebrate fauna assessment were to:

- provide a list of species recorded during the reconnaissance survey;
- provide a predicted list of all vertebrate fauna that might occur within the Survey Area;
- provide an assessment of the regional and local conservation value of rare, threatened and vulnerable species that could occur in the Survey Area as listed under:
    1. the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC 1999*);
    2. the *Wildlife Conservation Act 1950* (*WCA 1950*);
    3. Department of Environment and Conservation (DEC) Priority Fauna list.

See Section 6 for a more complete description of these statutory requirements.

Also, please note that two species of particular conservation significance: the Marsupial Mole (*Notoryctes typhlops*) and Sandhill Dunnart (*Sminthopsis psammophila*), were the subject of separate studies and are not discussed in detail in this current report.

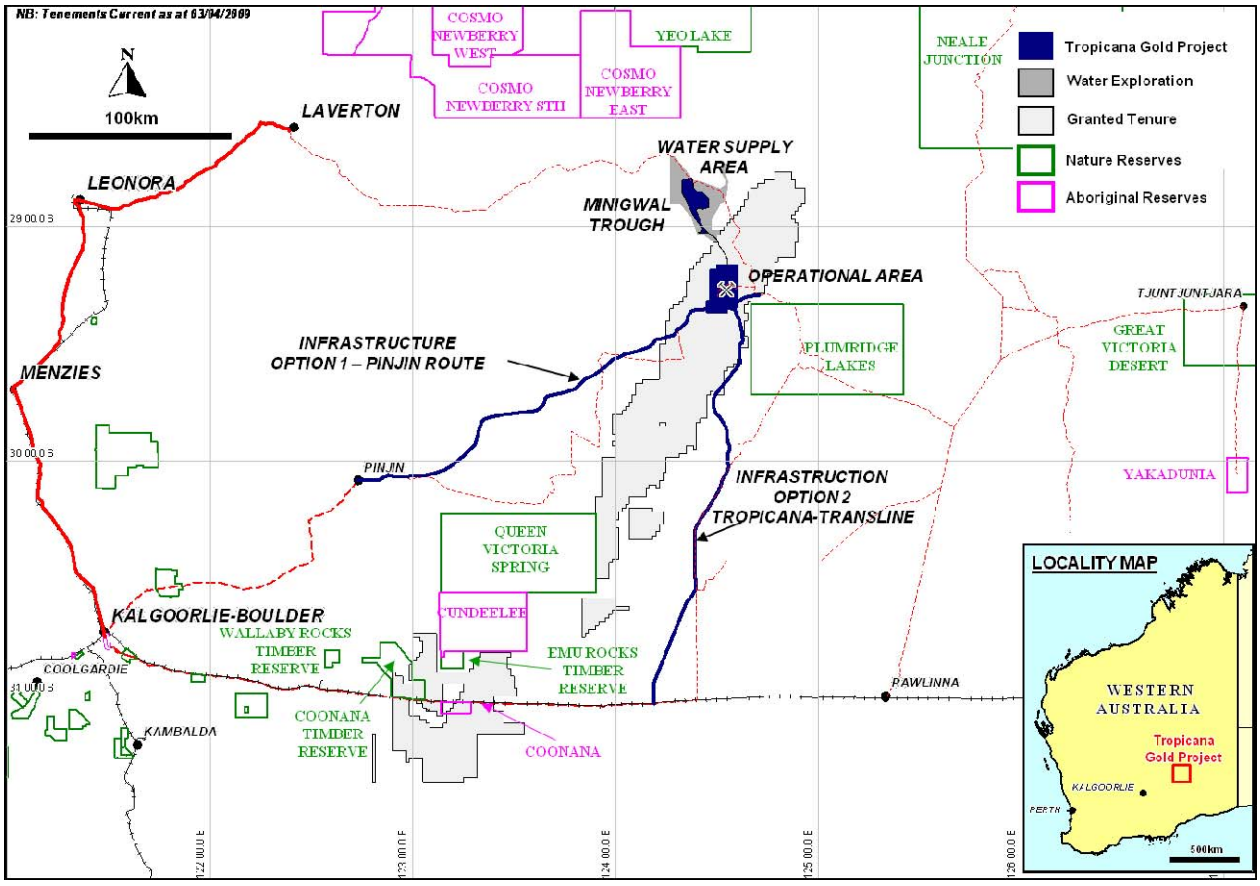


Figure 1 Layout of Proposed Mine Access Road and Infrastructure Corridor – Pinjin Option shown.

2 BIOPHYSICAL ENVIRONMENT

2.1 Landforms and Soils

The Helms Botanical District is characterised by undulating topography with longitudinal dunes (Beard (1990). Between the dunes the soils are characterised by shallow earthy soils overlying red brown hardpan, and other soils are red earthy sands or red brown sand of the dunes (Beard 1990). The geology is characterised by quaternary sand plain over Permian and Mesozoic rocks (Beard 1990).

The Austin Botanical District is characterised by gently undulating topography with occasional ranges of low hills, with extensive sandplains in the east (Beard 1990). The soils are principally shallow earth loam overlying red-brown hardpans, shallow stony loams on hills and red earthy sands on sand plains (Beard 1990). The geology is characterised by Archaean granite with infolded volcanics and greenstones on like ages (Beard 1990).

2.2 Vegetation

The Eremaean Botanical Province is typified by plants from the families Mimosaceae (*Acacia* spp.), Myrtaceae (*Eucalyptus* spp.), Myoporaceae (*Eremophila* spp.), Chenopodiaceae (Samphires, Bluebushes, Saltbushes), Asteraceae (Daisies) and Poaceae (grasses).

Arid shrublands make up the vast majority of vegetation types encountered in the Murchison region. Most landscapes are dominated by mixed shrubland/scrubland, with few or no trees or perennial grasses, with shrubs apparently randomly scattered or loosely aggregated, and with large amounts of bare ground and shallow red soils exposed between the shrubs (Curry *et al.* 1994).

The vegetation of the Helms Botanical District is very consistent and is characterised by tree steppe of *Eucalyptus gongylocarpa* and *Triodia basedowii* (Beard 1974). Overall the sandy areas are a mosaic of tree and shrub communities, however *Eucalyptus gongylocarpa* is dominant on sand dunes only where it occurs locally between them (Beard 1990).

The Austin Botanical District is essentially Mulga (*Acacia aneura*) woodlands associated with red loams over siliceous hardpans on the plains (van Vreeswyk, 1994) reducing to scrub on the rises and hills (Beard, 1990). Mulga and *Eremophila* shrublands dominate on stony plains, whilst chenopod communities are more often associated with duplex soils (Pringle, 1994).

2.3 Climate

Beard (1990) describes the Helms Botanical District as arid with rain during summer and winter producing annual precipitation of 200 mm. The Austin District is characterised by an arid climate with cool winters and hot, dry summers. Rain falls in both the warm and cool seasons (Beard, 1990).

3 METHODOLOGY

3.1 Data and Literature Review

A detailed literature review consisted of two parts:

1. a search of State and Australian Government vertebrate fauna databases; and
2. a review of published literature on the vertebrate fauna of the general area.

Literature sources for the construction of the predicted species list shown in Appendix 1 included but were not limited to:

- mammals, frogs and reptiles: Burbidge *et al*. (1976); Churchill (1998); Cogger (1992); DEC (2008); McKenzie & Burbidge (1979); Tyler *et al*. (2000); Van Dyck & Strahan (2008); Wilson and Swan (2008).

- birds: Barrett *et al*. (2003); DEC (2008); Johnstone and Storr (1998 and 2004).

3.2 Field Survey

A Level 1 Reconnaissance Survey as defined by the Environmental Protection Authority (2004) took place over two periods (2nd to 7th December 2007 and 10th to 15th March 2008 inclusive) and involved driving the entire length of the proposed access route. Approximately half of the Survey Area south of Tropicana was assessed during December 2007, with the remaining half assessed during March 2008. This work was conducted by two skilled personnel under Scientific Collecting Licence SF005871 issued to Ninox Wildlife Consulting by DEC.

While the total length of the proposed route was traversed by vehicle, all of the major fauna habitats were inspected by both personnel on foot, approximately 150 to 200m either side of the centreline of the route.

All fauna observed while driving along the route were recorded. Birds are readily observed and were the main group recorded. Amphibians, reptiles and mammals are usually recorded through intensive trapping and are infrequently recorded during site assessments such as this. However, these animals were noted when active, or captured by hand-foraging. Hand foraging consists of searching through leaf-litter, under peeling bark on dead trees and under rocks and/or logs. Identifiable signs of fauna such as scats, tracks and diggings were also noted.

Additional time was spent in habitats considered suitable for fauna of conservation significance; for example, some areas were gridded to search for the presence of burrows or tracks of species such as Mulgara, Sandhill Dunnarts, and Malleefowl, and to assess the level of fauna activity from the abundance of tracks.

4 SURVEY LIMITATIONS

The survey was carried out during the drier and hotter parts of the year, December 2007 and March 2008. The March period was very hot and all ground burrowing animals, including invertebrates, had dug deeper to avoid the extreme temperatures.

Approximately 60% of the western portion of the track that was surveyed in December had recently been subject to a hot burn, including much of the yellow sandplains. Although very little fauna activity was noted, a few birds of prey were seen along this burnt section. The recent fire was extensive and intense (see photographs in Mattiske Consulting Pty Ltd 2008), with the result that there was a severe limitation on any assessment of both fauna habitats and potential faunal assemblages.

Because of the extremely long hours spent by field personnel assessing habitats and opportunistically sampling during daylight, no nocturnal sampling was conducted either on foot or by vehicle. The lack of roads and tracks also precluded this latter sampling technique due to safety concerns.

Existing data for much of the survey area is minimal, and Barton and Cowan (2001a and 2001b) state that no systematic biological survey of the subregion has been undertaken although some localised studies have been intensive and long-term. There is little data on the habitat requirements of the remaining mammals and other, uncommon, vertebrates.

5 RESULTS

5.1 Fauna Habitats of the Survey Area

Habitats within the project area are diverse and wide ranging and pass through the IBRA bioregions of MUR and GVD, defined as:

> *"MUR Murchison Mulga low woodlands, often rich in ephemerals, on outcrop hardpan washplains and fine-textured Quaternary alluvial and eluvial surfaces mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Areas of red sandplains with mallee-mulga parkland over hummock grasslands occur in the east."*
>
> *"GVD Great Victoria Desert Arid active sand-ridge desert of deep Quaternary aeolian sands overlying Permian and Mesozoic strata of the Officer Basin. Tree steppe of Eucalyptus gongylocarpa, Mulga and E. youngiana over hummock grassland dominated by Triodia basedowii. Arid, with summer and winter rain."* Environment Australia (2000)

Within MUR it is considered that "Woodlands and shrublands …and grasslands are generally in fair or good condition and are either declining or show a static trend. All of these communities are threatened by grazing …and changed fire regimes… " Ecosystems within this bioregion are not considered Vulnerable. (www.naturebase.net.au 2008))

Within the GVD region three ecosystems are considered at risk, of these one is potentially present within the Survey Area: the yellow sandplain (and yellow dune system) where the "*distinctive plant communities are threatened by grazing, feral animals, mining and changed fire regimes"* (www.naturebase.net.au 2008).

The western portion of the Survey Area in the GVD has the highest proportion of yellow sandplains and dunes, and unfortunately much of that area had been recently burnt (approximately 60%) or is in various stages of recovery from earlier fires. It is known that these large intense wildfires have reduced the vegetation biomass, and therefore may have had a negative impact on the diverse native mammal and reptile fauna of the region (www.naturebase.net.au 2008).

Most habitat (and vegetation) types are typical of their regions (MUR and GVD). The ecotones between them are of interest because there are significant isolated 'islands' consisting of pockets of varying forms of vegetation, soils and geology types that are not typical of their greater surrounds. An example is the isolated pockets of mulga woodlands within the various sandplains. Also, within the MUR and GVD are pockets that are considered typical of their regions but again containing differing vegetation, soil and geology types than their wider surrounds, examples include chenopod flats, and granites. Because of this most of the following habitats may be considered as 'islands' within their regions and all were located along the route.

- expanses of granite sheet formations – MUR
- granite boulders - MUR
- chenopod flats both *Maireana* and *Halosarcia* - MUR
- *Casuarina* woodlands - MUR & GVD
- mature *Eucalyptus gongylocarpa* woodlands- GVD

- mature *Eucalyptus* and *Callitris* woodland mix - GVD
- isolated mulga woodlands – GVD
- dunes and swales containing mature vegetation including *Xanthorrhoea* sp. - GVD
- Thryptomene shrublands (*Aluta maisonneuvei)* - MUR & GVD
- Four Mile Dam (just out of the survey area) - MUR

Some of these could be considered as 'Island Refugia' (EPA 2004) and could possibly contain isolated populations of fauna. These fauna may include short range endemics (SREs) as defined in Guidance Statement 56 (EPA 2004) and other dependant fauna such as some geckoes, granite dependant dragons, salt flat dependent dragons and other fauna that may only exist in certain restricted ecosystems such as these.

Other more widespread habitats noted along the track route include:

- yellow sand-plain heaths (mainly burnt or recovering from burn);
- yellow sand dunes – very few with intact vegetation (burnt);
- red sand-plains with spinifex and eucalypts;
- red sand dunes with intact vegetation;
- orange sand-plains with heath/ tree mix;
- open grasslands;
- mulga woodlands with varying understorey vegetation and soil types;
- open mallee woodlands over spinifex (mainly);
- spinifex.

Many of these habitats have been affected by fire and are in various stages of recovery, in some only very small areas are long unburnt. An example is the long unburnt mature eucalypts (*Eucalyptus gongylocarpa)* areas that provide hollows of varying sizes for a range of species that rely on these for shelter. Hollows take very long periods of time to develop and should be considered significant fauna habitat. Spinifex grasslands also support a wide range of species that is dependent on it for shelter.

Between these differing habitats there will be a sequence of flowering and seeding events that will provide food for a range of native fauna species including invertebrates. Many will move between these food resource areas. The ecological links that provide a continuous and uninterrupted transition for the movement of fauna between these habitats is vitally important. Recent fire has produced large expanses of bare ground and caused fragmentation of habitat and food resources, therefore, corridors between fragmented areas will be essential for the movement of fauna.

Although Four Mile Dam is situated just outside of the defined Survey Area, it is a permanent water source and may provide an important resource for several species of fauna, mainly birds. This dam is on the Pinjin – Kurnalpi Road and is situated approximately seven kilometres south-west of Pinjin on the western side of the road. A description of this location is given in Table 5. The dam is unlikely to be impacted if the road is widened to the opposite side and disturbance to the water-body and surrounds is prevented. The area itself is quite degraded and weed infested and it is surrounded by a ring of *Melaleuca* sp. shrubs and eucalypt mallees. It appeared to be used by a range of waterbirds and other fauna.

A number of these habitats are considered to be of significance to fauna and are described in detail in Section 9.

5.2 Fauna of the Survey Area

Forty-five bird, nine reptile and four native mammal species were recorded within the Survey Area (plus some unidentified species of bat were seen). No frogs were recorded. Evidence of four species of introduced mammal was noted. The field observations from both reconnaissance surveys and data search results have been included in Appendix 1 along with opportunistic observations done in the Pinjin homestead area by Turpin (2008).

Potentially occurring within these diverse habitats are 118 bird species (including one species of bird considered extinct in the area) 115 reptile, 37 mammal (including six species considered extinct in the area) and six frog species.

Species of conservation significance are discussed in Section 7.

5.2.1 Birds

One hundred and eighteen native bird species could be present along the survey area (Appendix 1) although one of these is considered to be extinct in the local area. Forty five species were recorded during the survey.

A few species of waterbird have been included in the predicted list and are mainly the plover or dotterel group that could be found in the chenopod flowline flats that may be seasonally inundated. Some of these birds may be found at the perimeter of water bodies at any time when water is present and most are considered common.

The Survey Area transects a narrow section of this chenopod flat which could support the Slender-billed Thornbill and it is envisaged that there will be little impact as long as any drainage flows, if there are any, are maintained both during and after construction of the road and infrastructure.

Ducks and other waterbirds may only be present in the Four Mile Dam, west of Pinjin, and that is unlikely to be impacted if appropriate management is undertaken.

Some of the species listed in Appendix 1 may only occur seasonally or when specific conditions are met. For example, some of the honeyeaters may visit the area only when particular plants are flowering. Birds of prey such as the Brown Goshawk, Little Eagle, Wedge-tailed Eagle, and Brown Falcon are highly mobile and wide-ranging. Other smaller birds such as thornbills and fairy-wrens are less mobile and as such are more likely to be affected by disturbance to their habitat.

5.2.2 Native Mammals

Four native mammal species were recorded along the survey area and some unidentified bats were disturbed from their hollows on several occasions while travelling among the mature eucalypts. Typically in surveys such as this, only the larger native mammals were recorded; these were the Echidna (*Tachyglossus aculeatus*), Red Kangaroo (*Macropus rufus*), Euro (*Macropus robustus*) and Dingo (*Canis lupus dingo*). Additional records of mammals recorded along the route are presented in Gaikhorst and Lambert (2008).

Appendix 1 shows that 27 additional native mammal species, including 10 species of bat, could potentially occur within the Survey Area, although six are considered extinct in the area.

5.2.3 Amphibians

Not surprisingly, no frogs were recorded during the survey periods. However, six species could occur within the Survey Area (Appendix 1), mainly burrowing frogs. One species of frog was recorded in the three Nature Reserves during previous surveys (Appendix 1).

5.2.4 Reptiles

Of the nine species of reptile recorded during the assessment, the most common was the Central Desert Dragon (*Ctenophorus isolepis gularis*) that mainly inhabits sandy areas with spinifex. Because of the diversity of habitat types, up to 115 species of reptile could occur within the Survey Area (Appendix 1).

Additional records of reptiles recorded along the route are presented in Gaikhorst and Lambert (2008).

The Spotted Mulga Snake (*Pseudechis butleri*) is the only vertebrate endemic to the MUR region (www.naturebase.net.au 2008). The arid zones are known to support much of the herpetological wealth of Australia and spinifex in particular supports many species of reptile (Wilson & Swan 2008); therefore, it can be expected that the Survey Area will support many of these species.

5.2.5 Introduced Species

Nine introduced mammals are likely to occur throughout the Survey Area (Appendix 1). Evidence of four species was seen and it is expected that all nine are likely to occur along the route. Camel tracks were seen throughout the GVD sandplain area. Evidence of rabbits was seen sporadically throughout the Survey Area and some cat prints were seen at a number of locations. Donkey scats were seen at one location and several areas had evidence of dog/dingo.

Grazing and soil compaction from both the camel and rabbit would have relatively severe consequences for small burrowing fauna including the Southern Marsupial Mole.

6 STATUTARY AND OTHER REQUIREMENTS

This section of the document describes the various Australian and State Government Acts that cover rare, threatened and vulnerable vertebrate fauna species and was correct at the time of the preparation of this document.

Additionally, in any discussion of rare, threatened or vulnerable species, several aspects require clarification before the significance of these species can be considered in context of the development of the proposed access road and infrastructure.

- Resident, habitat-specific rare fauna are much more susceptible to the influences of disturbance than nomadic or migratory species.
- Not all rare species are equally susceptible to disturbance; some rare species such as the Peregrine Falcon can accommodate high levels of disturbance.
- The concept of species rarity is a dynamic process considerably influenced by the level of survey work carried out in a particular location.

6.1 Australian Government Legislation

In 1974, Australia signed the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). As a result, an official list of endangered, vulnerable or presumed extinct species was constructed (Schedule 1) and is regularly updated (*Endangered Species Protection Act 1992*).

In July 2000 this Act was replaced by *The Environment Protection and Biodiversity Conservation Act 1999 (EPBC 1999)*, which retained the schedule of threatened species of the Act it replaced.

There are six parts to the EPBC Act covering species that are:

- extinct;
- extinct in the wild;
- critically endangered;
- endangered;
- vulnerable; and
- conservation dependent.

6.1.1 International Agreements

Australia has entered into international agreements for the protection of migratory birds. These agreements are between Japan-Australia (JAMBA), China-Australia (CAMBA), and the Republic of Korea (ROKAMBA). However, the JAMBA list differs to the Schedule 3 list discussed in Section 6.2.

6.2 State Legislation

Currently in Western Australia, rare or endangered species are protected by the *Wildlife Conservation Act 1950 (WCA 1950)*. The various schedules defined under this act are:

- **Schedule 1**: A native species that is rare or likely to become extinct, are declared to be fauna that is in need of special protection.
- **Schedule 2**: A native species that is presumed to be extinct, are declared to be fauna that is in need of special protection.
- **Schedule 3**: Birds that 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**: A native species that is in need of special protection, otherwise than for the reasons specified in Schedules 1, 2 and 3.

This Act is periodically reviewed and the current list of protected fauna can be viewed on DEC's (Department of Environment and Conservation) Faunabase website.

6.3 DEC Priority Species

While not covered under any government legislation, the species listed under the DEC Priority Fauna List require some discussion at to their potential or actual presence within the Survey Area. These species are

generally listed to indicate that they require either monitoring at a species or population level. They are classified as:

- Priority 1 - 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 2 - 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 3 - 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 4 - 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 be if present circumstances change. These taxa are usually represented on conservation lands.

- Priority 5 - 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.

The Priority Fauna List does not confer any additional legal protection to the species listed apart from the normal protection afforded to most native animals. It does, however, indicate the need for vigilance during the construction and commissioning of development projects to manage native vegetation and rehabilitation so that Priority species, should they occur, do not meet the criteria for listing on the Threatened Species List as a result of that development.

6.4 Significant Fauna Habitats

Australia-wide, a small number of Threatened Ecological Communities (TEC's) has been defined under Australian Government legislation. However, while not defined under any legislation, some fauna habitats within a proposed development site may be locally significant because they:

- support rare or vulnerable species;
- support specialised or habitat specific fauna;
- are regionally or locally uncommon; or
- are restricted in area.

Although not protected under any State or Australian Government legislation, in the interests of good project management, where possible, conservation of such locations within a project area will provide the basis for the fauna component of an environmental management system to be put in place for the duration of a project.

7 FAUNA OF CONSERVATION SIGNIFICANCE

7.1 Birds

Three birds of conservation significance were recorded within the Survey Area: Malleefowl, Australian Bustard and the Rainbow Bee-eater.

A Malleefowl was seen and footprints were noted, as were two nesting mounds, one quite recent and one older (Table 1). Both nests were found in mulga woodland. An Australian Bustard nest with one egg was found in a small remnant of unburnt vegetation on the yellow sandplain (approximately 200m x 50m) that was surrounded by large, severely burnt but recovering vegetation (Plate 1 and Plate 2).

Table 1 GPS locations of birds recorded that are listed under Australian Government or State Acts.

SPECIES	RECORDED	GPS (WGS84)		MAP
		Easting (mE)	Northing (mN)	
Malleefowl	Seen	495 070	6673 550	22
Malleefowl	Nest (recent)	510 xxx	6 675 xxx	20
Malleefowl	Many footprints	560 200	6 705 700	13
Malleefowl	Nest (old)	637 xxx	6 752 xxx	5
Rainbow Bee-eater	Seen	487 000	6 674 000	23
Rainbow Bee-eater	Seen	569 550	6 713 110	11
Australian Bustard	Seen	527 500	6 687 050	18
Australian Bustard	Nest with egg	527 xxx	6 687 xxx	18
Australian Bustard	Footprints	560 200	6 705 700	13
Australian Bustard	Footprints	569 550	6 713 110	11
Australian Bustard	Footprints	589 500	6 723 700	9
Australian Bustard	Footprints	663 630	6 758 160	3

Plate 1 Australian Bustard nest and egg (see just below centre).

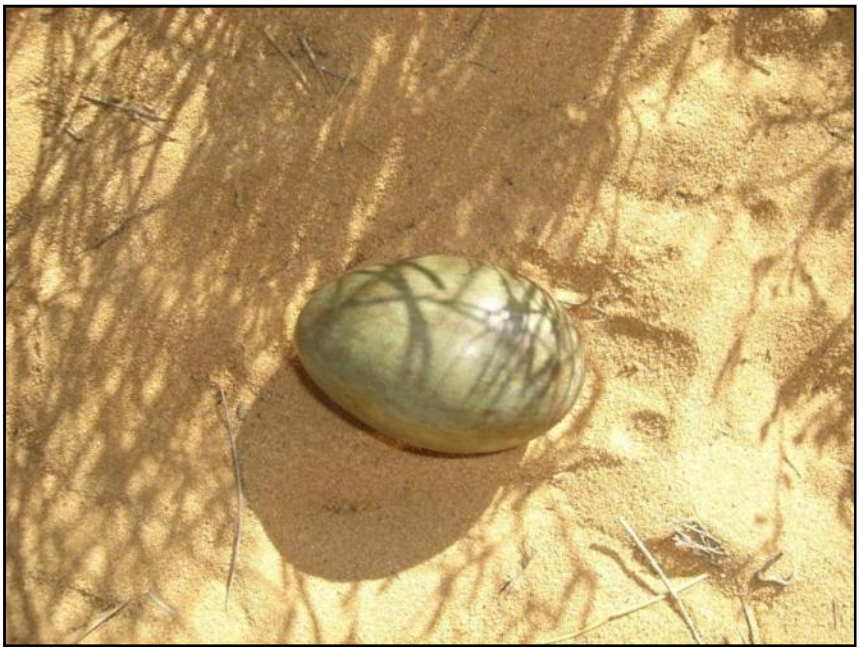


Plate 2 Australian Bustard egg in nest.

The egrets listed in the EPBC listing (Appendix 2) have been omitted from this discussion because of lack of habitat and consequently they will not be present in the Survey Area.

Table 2 provides details on the status, distribution, habitat, potential impact of development and impact reduction strategies for the three species of conservation significance recorded and the seven potentially occurring within the Survey Area.

Table 2 Rare, threatened, vulnerable, and Priority listed bird species recorded or that could potentially occur in the general area of the Pinjin – Tropicana Survey Area. (Some currently considered locally extinct have been included.)

Species	**Malleefowl – *Leipoa ocellata***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Once common and widespread in the semi-arid zone, especially north and east of the mulga-eucalypt line (Johnstone and Storr 1998). This large bird is now patchily distributed.
Habitat	Mainly mallee and *Acacia* scrublands.
Occurrence	Table 1 shows that one bird and fresh footprints were seen, and two nesting mounds were located during the survey. Both nests were in mulga woodland, the recent one was in the MUR region and the older one in the GVD region.
Impact	No impact if construction takes place outside nesting period (usually August to December).
Impact Reduction	Avoid the recent nesting habitat at the western end of the Survey Area. Impact reduction measures required.
Species	**Peregrine Falcon - *Falco peregrinus***
Status	Other Specially Protected Fauna – Wildlife Conservation Act (1950).
Distribution	Throughout Australia.
Habitat	Most habitat types with a preference for tree-lined watercourses (of which there are none in the survey area). Cliffs and rocky outcrops including mines.
Occurrence	Unlikely. This bird has a widespread distribution and can be found in most areas although it is uncommon. Not usually found in the desert regions but may be present in the western section of the Survey Area.
Impact	No impact from the road construction or infrastructure development is predicted for this species.
Impact Reduction	No impact reduction strategies need be considered.
Species	**Australian Bustard - *Ardeotis australis***
Status	Listed under DEC's Priority Fauna List as P4
Distribution	Much of the state except heavily wooded areas – scarce to common.
Habitat	Various – open, lightly wooded grasslands and sandplains with spinifex, chenopod heaths and low heathland.
Occurrence	Bustards were recorded within the Survey Area.
Impact	No impact if construction takes place outside nesting period. Usually November to June.
Impact Reduction	Impact reduction measures required.
Species	**Oriental Dotterel – *Charadrius veredus***
Status	Listed as Migratory under EPBC Act (1999): ROKAMBA/JAMBA
Distribution	Casual vagrant in the south
Habitat	Sparsely vegetated plains and samphire
Occurrence	Unlikely
Impact Reduction	No impact from construction is predicted for this species.

Species	**Major Mitchell's Cockatoo – *Cacatua leadbeateri***
Status	Other Specially Protected Fauna – Wildlife Conservation Act (1950)
Distribution	Disjunct populations. Occurs in the southern portion of the GVD south to Queen Victoria Spring.
Habitat	Lightly or sparsely wooded country particularly in tall eucalypts near water.
Occurrence	Unlikely where no water present within its range. Most likely at the western end of the Survey Area but cannot be discounted in other areas where mature eucalypts are present and water is available.
Impact	As long as suitable eucalypt hollows are maintained no impact is likely.
Impact Reduction	Impact reduction measures required.
Species	**Princess Parrot – *Polytelis alexandrae***
Status	Listed under DEC's Priority Fauna List as P4
Distribution	Eastern deserts south to Queen Victoria Spring.
Habitat	Lightly wooded country, Marble Gum (*Eucalyptus gongylocarpa*) over spinifex.
Occurrence	Likely.
Impact	If utilising Marble Gum (*E. gongylocarpa*) hollows for nesting, impact likely.
Impact Reduction	Impact reduction measures required.
Species	**Night Parrot – *Pezoporus occidentalis***
Status	Endangered – EPBC Act (1999) Critically Endangered – Wildlife Conservation Act (1950)
Distribution	Once widespread in the Kimberley and arid zone, now presumed extinct in the pastoral zone and possibly through the deserts
Habitat	Mainly dense, low vegetation, particularly spinifex grasslands near water, or samphire; could also occur on in low chenopod shrublands with saltbush and bluebush (Blyth 1996).
Occurrence	The lack of confirmed sightings of this bird through most of its former distribution indicates that it is unlikely to be present within the Survey Area; however, suitable habitat is present and it cannot be discounted.
Impact	Should the alignment of the proposed corridor coincide with suitable dense, low vegetation including spinifex and/or chenopod shrublands, especially where these are in the vicinity of water, there is the potential to impact on this ground-dwelling parrot.
Impact Reduction	A precautionary approach of avoiding areas of suitable habitat would reduce any potential impact on this species should it occur.
Species	**Fork-tailed Swift – *Apus pacificus***
Status	Listed as Migratory under EPBC Act (1999): JAMBA/CAMBA
Distribution	This bird breeds in north-east and mid-east Asia, visiting Australia during the southern hemisphere spring and summer. Often seen preceding or accompanying thunderstorms, this aerial species rarely lands in Australia, feeding and probably sleeping on the wing.
Habitat	Almost completely aerial in Australia.
Occurrence	May be observed flying over the general area at any time during the spring and summer. Recorded at Neale Junction Nature Reserve during the 1970s.
Impact	Because this bird rarely lands, no impact is predicted.
Impact Reduction	No impact reduction measures required.
Species	**Rainbow Bee-eater – *Merops ornatus***
Status	Listed as Migratory under EPBC Act (1999); JAMBA
Distribution	Western one third of the State and particularly over the better watered portions and the Kimberley, migrates south to breed during spring and early summer.
Habitat	Lightly wooded country preferably with sand and where water is available.
Occurrence	Recorded within the Survey Area.
Impact	Because of the wide distribution of this bird, there is unlikely to be any impact on the species.
Impact Reduction	No impact reduction measures required.
Species	**Striated Grasswren – *Amytornis striatus***

Status	Listed under DEC's Priority Fauna List as P4
Distribution	Eastern deserts including Great Victoria Desert.
Habitat	Mainly spinifex (with or without shrubs), sand ridges and interdunes.
Occurrence	Known from Queen Victoria Spring. Patchily distributed.
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Thick-billed Grasswren – *Amytornis textilis***
Status	Listed under DEC's Priority Fauna list as P4
Distribution	Was widespread in arid regions before the spread of rabbits.
Habitat	Open shrubland especially with spinifex and areas where suitable cover occurs.
Occurrence	Considered extinct in the region.
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Slender-billed Thornbill (Samphire Thornbill) – *Acanthiza iredalei iredalei***
Status	Listed under DEC's Priority Fauna list as P4
Distribution	This bird is patchily distributed through the southern arid zone of Western Australia.
Habitat	Chenopod shrublands including samphire, has a reference for *Aluta maisonneuvei* and *Maireana* heaths and shrubland often treeless or very open flatlands.
Occurrence	This small bird could occur along the road route where chenopod shrublands occur.
Impact	There may be some impact on this small bird due to loss of habitat. However, given the extensive distribution of its preferred habitat in the Eastern Goldfields, this development is unlikely to adversely affect the species as a whole.
Impact Reduction	Proposed road and infrastructure development should be located to minimise habitat loss where this bird could occur.

7.2 Mammals

Of the 37 mammals, potentially occurring within the Survey Area, four are protected under either Australian Government and/or State legislation (*Table 3*). Table 3 provides details on the status, distribution, habitat, potential impact of development and impact reduction strategies for each of the species of conservation significance recorded or potentially occurring within the Survey Area. Because of its conservation significance, one marsupial, the Mulgara, has been discussed separately (Section 7.2.1).

Two native mammals, the Sandhill Dunnart (*Sminthopsis psammophila*) and Southern Marsupial Mole (*Notoryctes typhlops*) are listed under the EPBC Act 1999 and WCA 1950 and are likely to be present in the Survey Area. Additional assessments were being undertaken separately to establish the presence of these two mammals. Results from these survey results are presented in URS (2008) and in Gaikhorst and Lambert (2008) and their results are not discussed in this current document.

More than 40% of each of the Murchison and Great Victoria Desert regions original mammal fauna is now considered regionally extinct (www.naturebase.net.au 2008). Consequently, six of the 10 mammal species listed below are considered to be extinct in the area. However, as intensive, systematic survey of much of the region has not been undertaken, due consideration should be given to minimising habitat disturbance on the possibility that isolated populations could still be located.

Table 3 Rare, threatened, vulnerable, and Priority listed mammal species that could occur in the general area of the Pinjin – Tropicana Survey Area. (Some considered locally extinct have been included.)

MAMMALS	
Species	**Brush-tailed Mulgara – *Dasycercus blythi***
Status	Listed under DEC's Priority Fauna as P4
Distribution	Arid sandy areas of Australia.
Habitat	Mainly known from sandy dune or sand plains country with a cover of spinifex. This habitat was thoroughly trapped for Sandhill Dunnarts by Gaikhorst & lambert (2008) but no Brush-tailed Mulgaras were captured.
Occurrence	Possible burrow located (Plate 4). Likely to occur in suitable sandy arid areas within the Survey Area. While not captured during the Gaikhorst & Lambert (2008) trapping, this is the most likely species to be present along the proposed Pinjin route. More information is provided on this species in Section 7.2.1
Impact	Impact on individuals may occur during road establishment and infrastructure development in likely habitats.
Impact Reduction	Impact reduction measures required.
Species	**Crest-tailed Mulgara – *Dasycercus cristicauda***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Arid sandy areas of Australia.
Habitat	Mainly known from sandy dune country with a cover of spinifex.
Occurrence	Considered extinct in Western Australia; recent surveys in Neale Junction Nature Reserve to the north-east of Pinjin/Tropicana revealed only *Dasycercus blythi*; unlikely to occur in the Survey Area. More information is provided on this species in Section 7.2.1
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Chuditch – *Dasyurus geoffroyii***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Previously throughout much of Australia including the arid interior. Now confined to the south west of the State.
Habitat	Sclerophyll forests. Desert populations would inhabit areas with tree and limb hollows, burrows, and hollowed termite mounds.
Occurrence	Unlikely – considered extinct in the area.
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Sandhill Dunnart – *Sminthopsis psammophila***
Status	Endangered – EPBC Act (1999) Endangered – Wildlife Conservation Act (1950)
Distribution	Small sections in South Australia and the Great Victoria Desert.
Habitat	In Western Australia - sandy country but not necessarily restricted to sand ridges. This small marsupial has been caught in woodland (including *Eucalyptus gongylocarpa* woodland), mallee, and shrubland, all associated with spinifex (Hart 1986).
Occurrence	No Sandhill Dunnarts were captured by Gaikhorst and Lambert (2008). Potentially suitable habitat if various areas remain unburnt for long periods.
Impact	Likely given the degree of suitable habitat in the Great Victoria Desert region.
Impact Reduction	Impact reduction measures required.

Species	**Numbat – *Myrmecobius fasciatus***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Once widespread throughout the region, now restricted to small pockets in south west WA. Has been reintroduced into south east SA and south west NSW.
Habitat	In areas dominated by eucalypts and hollow logs. Requires termites for food.
Occurrence	Unlikely – considered extinct in the area.
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Bilby – *Macrotis lagotis***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Once inhabiting most of the arid and semi-arid parts of Australia, this species is now mainly known from the central deserts with isolated populations occurring in Western Australia and Queensland.
Habitat	Once occupied a range of habitats wherever it was able to establish large, burrow systems.
Occurrence	Considered extinct in the area but suitable habitat occurs.
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Southern Marsupial Mole - *Notoryctes typhlops***
Status	Endangered – EPBC Act (1999) Endangered – Wildlife Conservation Act (1950)
Distribution	Sand dune deserts of central Australia.
Habitat	Underground 20 to 60cm in dune crests and slopes (not swales and flats).
Occurrence	Highly likely in dune country (see report prepared by URS 2008).
Impact	Will be impacted by road construction through suitable habitat.
Impact Reduction	Impact reduction measures required.
Species	**Boodie (Burrowing Bettong) – *Bettongia lesuer***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Once extremely common and widespread, this small wallaby is now restricted to four islands off the Western Australian coast This species has been reintroduced to Heirisson Prong following a fox and cat control program.
Habitat	Wherever the soil is suitable for the large warrens that these animals construct.
Occurrence	Considered extinct in the area. Unlikely to be present along the road route. Old mounds located in three locations in grasslands near Tropicana (see Plate 3).
Impact	No impact.
Impact Reduction	No impact reduction measures required.
Species	**Central Long-eared Bat – *Nyctophilus* sp. *(previously N. timoriensis)***
Status	Listed under DEC's Priority Fauna list as P4
Distribution	Patchy occurrence throughout area.
Habitat	Mixed eucalypt woodlands with prominent shrub strata and sheoak woodland around granites.
Occurrence	Likely.
Impact	Loss of roosting habitat could occur if eucalypts with small hollow limbs are removed during road construction.
Impact Reduction	Impact reduction measures required.

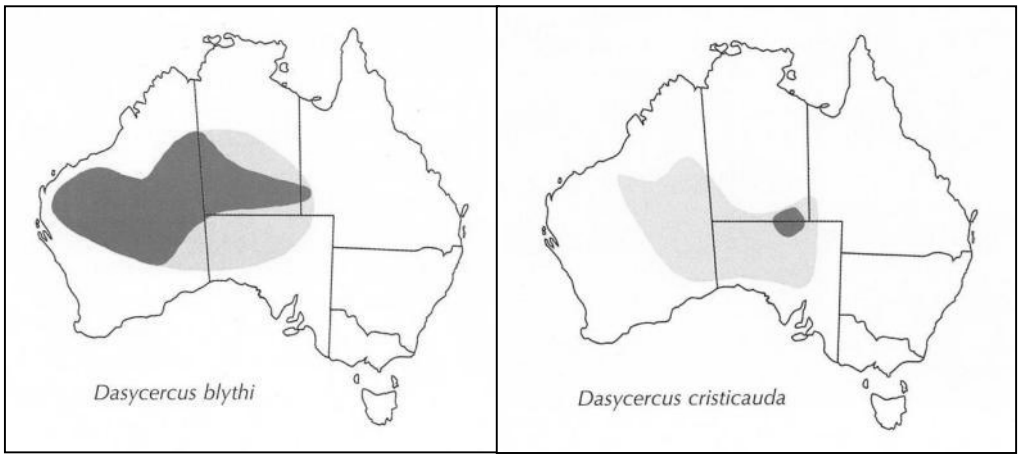
Species	**Greater Stick-nest Rat – *Leporillus conditor***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Previously across the Midwest of WA to much of central SA and eastern NSW. Now in WA restricted to isolated captive populations.
Habitat	Seems to have preferred the sandplains and was exclusively herbivorous.
Occurrence	Unlikely – considered extinct in the area.
Impact	No impact.
Impact Reduction	No impact reduction measures required.

Plate 3 Abandoned Boodie mound.

7.2.1 Mulgara (Dasycercus species*)*

Recently the Mulgara genus (*Dasycercus)* has undergone taxonomic review and it was found that what has been known as the single species Mulgara *(Dasycercus cristicauda)* is now two distinct species (Van Dyck 2008). The distribution of the Brush-tailed Mulgara (*Dasycercus blythi)* includes a large proportion of central Western Australia and southern Northern Territory (Map 1). The Survey Area lies within this species' distribution. The Brush-tailed Mulgara is listed as P4 on DEC's Priority Fauna listing.

At the time of the survey, the Crest-tailed Mulgara *(Dasycercus cristicauda)* was considered extinct in Western Australia but it remains listed as Vulnerable under the State's *Wildlife Conservation Act (1950)* and more significantly, is listed on the *EPBC (1999)* legislation. However, there are no recent records of this species in Western Australia; its current distribution includes the southern Simpson Desert where the borders of the Northern Territory, South Australia and Queensland converge, and the Tirari and Strzelecki Deserts of South Australia (Masters 2008).



Map 1 Maps showing the current (dark grey) and historical (light grey) distribution of the Brush-tailed Mulgara (*Dasycercus blythi*) and Crest-tailed Mulgara (*Dasycercus cristicauda*). (Woolley [2008a] and Masters [2008] respectively.)

Both Mulgara species are small but solid and muscular marsupials that feed on large insects, spiders, scorpions and small vertebrates. Males range from about 125-220mm and females from 125-170mm. They are adapted to desert conditions by producing concentrated urine enabling them to survive on the moisture obtained from their prey. Some populations appear to fluctuate widely, being present in an area for some time and then disappearing, only to reappear at a later date.

Their fur colour is a light sandy brown or rufous above and greyish-white below. The distal two-thirds of the tail is covered by black hairs, which form a crest in *Dasycercus cristicauda*. Ears are short and rounded and both fore- and hind-feet have five toes. The main threats to Mulgara are thought to be:

- habitat loss through:
  - vegetation clearing for mining, roads and other human activity;
  - grazing and ground compaction by stock animals;
  - increased fire frequency or intensity;
- predation or competition for food resources by introduced predators such as the:
  - fox;
  - feral cat
  - feral dog or dog/dingo crossbreeds.

Suitable habitat for Mulgara can often be characterised by the presence of hummock grasslands with medium to dense cover (e.g. Triodia) and shrublands on sandy soils (Woolley 2008b; Menkhorst & Knight 2004). Mulgara burrows vary geographically in shape and size. In the Pilbara region of Western Australia, burrows have been observed with between two and nine entrances, tunnels mostly on a single level and to a depth of about 300 mm, shaped typically as an arch over a flat bottom with a height of 70-80 mm and width of 80-100 mm at the base. Internal tunnels are mostly 50-70 mm wide leading to grass lined nests. Both males and females use two to nine burrows but average about three. Burrows are confined to a small area as home ranges may only be approximately 440 m2 (Thompson and Thompson 2007). The Brush-tailed Mulgara currently occurs in scattered populations at fairly low density, but may be locally abundant (Woolley 2008b).

As footprints of Mulgaras are readily identified and burrows may also be recognised, searches were carried out by Ninox personnel in several locations in suitable habitat; however, no trapping was undertaken. During the Ninox survey, burrows were located in one section on deep orange sands but no footprints were noted nearby that could confirm the current existence of either Mulgara species. A photograph of the burrow is shown (Plate 4).

Plate 4 Small burrow (possibly Brush-tailed Mulgara) in orange sands.

During 2008 studies for the proposed Pinjin infrastructure corridor, extensive trapping for the Sandhill Dunnart (*Sminthopsis psammophila*) was undertaken in a wide range of habitats (Gaikhorst and Lambert 2008). This included 1,120 trapnights using Elliott traps. Although Mulgaras are readily captured by this trapping technique none was recorded by this team.

In a recent and intensive survey of the Neale Junction Nature Reserve only the Brush-tailed Mulgara (*Dasycercus blythi*) was captured (Landscope 2009). This reserve is approximately 100 km from the NE Tropicana operational area and 250km NE of the start of the proposed Pinjin infrastructure corridor.

Based on the information provided above, and given the current understanding of distribution patterns of these two *Dasycercus* species, the species most likely to occur in suitable habitat along the proposed Pinjin infrastructure corridor is the Bush-tailed Mulgara (*Dasycercus blythi*).

7.3 Amphibians

No frog species of conservation significance is expected to be located within the Survey Area.

7.4 Reptiles

Three reptile species that could potentially occur within the Survey Area are listed under the EPBC Act 1999, WC Act 1950 and/or DEC's Priority Fauna list. These are the Great Desert Skink (*Egernia*

kintorei), the small Southern Desert Lerista (*Lerista puncticauda)* and the Woma (*Aspidites ramsayi)*. These are discussed in more detail in Table 4 which provides details on the status, distribution, habitat, potential impact of development and impact reduction strategies for each of the species of conservation significance recorded or potentially occurring within the Survey Area.

Table 4 Rare, Threatened, Vulnerable, and Priority listed reptile species that could occur in the general area of the Pinjin – Tropicana Survey Area. (Some species considered locally extinct have been included.)

REPTILES	
Species	**Great Desert Skink – *Egernia kintorei***
Status	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)
Distribution	Known from scattered locations in the Great Sandy, Gibson and Great Victoria Deserts.
Habitat	Generally associated with spinifex hummock grasslands on a range of substrates.
Occurrence	Could occur within the Survey Area in suitable habitats.
Impact	Impact could occur to individuals during road establishment and infrastructure development.
Impact Reduction	Impact reduction measures may be required.
Species	**Southern Desert Lerista – *Lerista puncticauda***
Status	Listed under DEC's Priority Fauna list as P2
Distribution	Five Western Australia Museum specimens: known only from one locality in far southwest of the Great Victoria Desert (25 km NNE of Queen Victoria Spring).
Habitat	Arid shrublands.
Occurrence	Possible.
Impact	Individuals may be impacted if they occur in suitable habitat within the Survey Area.
Impact Reduction	Impact reduction measures may be required.
Species	**Woma – *Aspidites ramsayi***
Status	Other Specially Protected Fauna – Wildlife Conservation Act (1950) Listed under DEC's Priority Fauna list as P1
Distribution	Subhumid to arid interior and south western arid areas of WA.
Habitat	Woodlands, shrublands and heaths often associated with spinifex.
Occurrence	Possible in suitable habitat.
Impact	Impact on this python could occur during both construction and operation of the access road, and infrastructure development.
Impact Reduction	Impact reduction measures may be required.

8 SIGNIFICANT VERTEBRATE FAUNA HABITATS

Several of the habitats within the Survey Area are considered by Ninox to be significant to vertebrate fauna; some may be considered to be 'island refugia' in that they are limited in area, or are not well represented along the route. These habitats are described below (Table 5) with explanations as to the reasons for their selection. Photographs of some of these habitats are provided in Plates 1 – 14, and their locations are shown in Figures 2 to 7. Recommendations for the protection of these habitats are given in Appendix 4.

Table 5 Map, Plate and Figure number, GPS locations, and descriptions of significant fauna habitats within the Pinjin to Tropicana Survey Area.

MAP Plate #	Figure # Areas of Avoidance #	GPS - WGS 94	HABITAT DESCRIPTION
Map 24 Plate 5	**Figure 2 1**	483 630mE 6 672 250mN	*Casuarina* woodland to 6m with mixed shrubs to 2m including *Acacia, Eremophila, Ptilotus, Maireana, Dodonaea, Solanum, Santalum, Scaevola* with emergent *Eucalyptus* and mulga on loamy sands with mixed rock, granite scatter and calcareous earth. A very diverse area with important summer flowering food resource for many birds and invertebrates (butterflies). Many honey-eaters and insectivorous birds present and evidence of macro fauna. May be considered an isolated island habitat.
Map 24 Plate 6	**Figure 2 2**	469 750mE 6 666 950mN	Four Mile Dam (just out of Survey Area) – reported to be a permanent water source. Several species of waterbird were utilising the dam. *Melaleuca* and *Eucalyptus* surround the dam at high water mark. Important water source for a variety of fauna; if permanent then fauna will have become reliant on it.
Map 22 Plate 7	**Figure 3 3**	491 500mE 6 674 150mN	Granite boulders – open mulga shrubland to 3m over mixed *Acacia* and other shrubs to 1m on granite boulder outcropping with some exfoliation, on red loams and granite soils.
Map 22 Plate 8	**Figure 3 4**	493 500mE 6 674000mN	Granite sheet – just to the south of planned route. Has low fringing open mulga and mixed small shrubs on very shallow granite soils.
Map 21 Plate 9	**Figure 4 5**	499 000mE 6 674 250mN	Narrow section of chenopod salt flats and drainage line leading to/from a large expanse of salt flat covered in various chenopod species on silts. The area is lined with *Eucalyptus* and low mixed shrubs on gypsum? levee-bank dunes.
Map 20 Plates 10;11	**Figure 5 6**	510 xxx mE 6 675 xxx mN	Recent Malleefowl nest. Small patch of suitable mulga woodland utilised by this bird for nesting, the woodland is clearly seen on the map. Open mulga woodland to 4m with sparse shrub layer to 1.5m on brown loams with scattered quartz pebbles and gravels.
Map 6 Plate 12	**Figure 6 7**	618 000mE 6 738 500mN	At approximately 617 000mE to 619 500mE the route is planned to cross and follow yellow dunes that have mature and intact vegetation. This area should be avoided.
Map 3A Plates 13;14	**Figure 7 8**	634 000mE 6 751 650mN	The proposed route is to follow an intact yellow dune system and pass through an isolated and unusual vegetation complex. The area in the swale is open, mature and long unburnt eucalypt woodland with patches of mulga and *Callitris* on spinifex and with scattered *Xanthorrhoea*. This area should be avoided.

Plate 5 Casuarina Woodland

Plate 6 Four Mile Dam

Plate 7 Granite boulders.

Plate 8 Granite sheet.

Plate 9 Chenopod salt flat.

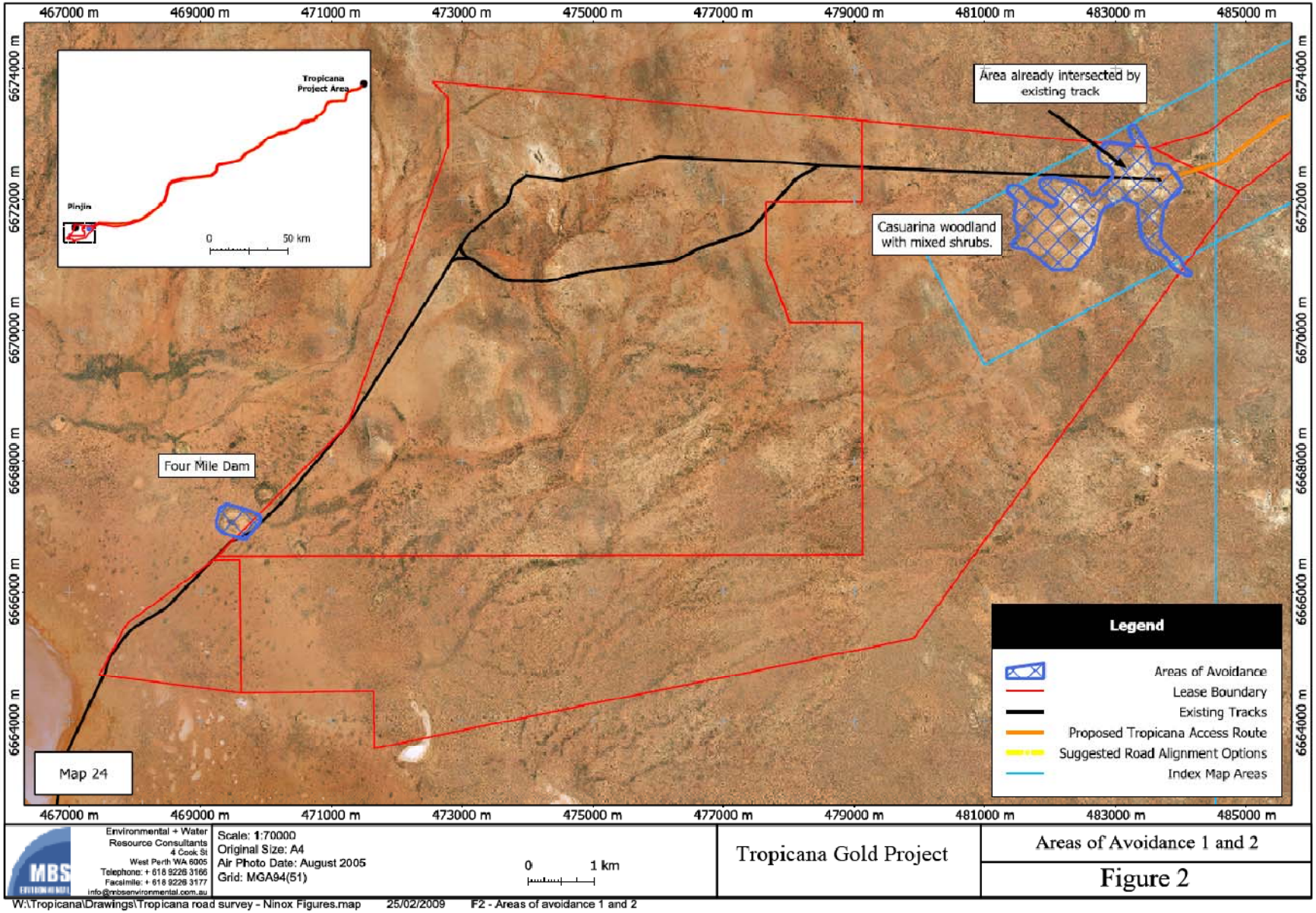
Plate 10 Malleefowl nest area (mulga woodland).

Plate 11 Malleefowl nest (in mulga woodland).

Plate 12 Yellow dune system with mature vegetation.

Plate 13 Yellow dune vegetation.

Plate 14 Mature interdune vegetation.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Tropicana Project Area
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Area already intersected by existing track
Casuarina woodland with mixed shrubs.
Four Mile Dam
Map 24
Legend
Areas of Avoidance
Lease Boundary
Existing Tracks
Proposed Tropicana Access Route
Suggested Road Alignment Options
Index Map Areas
Environmental + Water Resource Consultants
4 Cook St
West Perth WA 6005
Telephone: + 618 9226 3166
Facsimile: + 618 9226 3177
info@mbsenvironmental.com.au
Scale: 1:70000
Original Size: A4
Air Photo Date: August 2005
Grid: MGA94(51)
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1 km
Tropicana Gold Project
Areas of Avoidance 1 and 2
Figure 2
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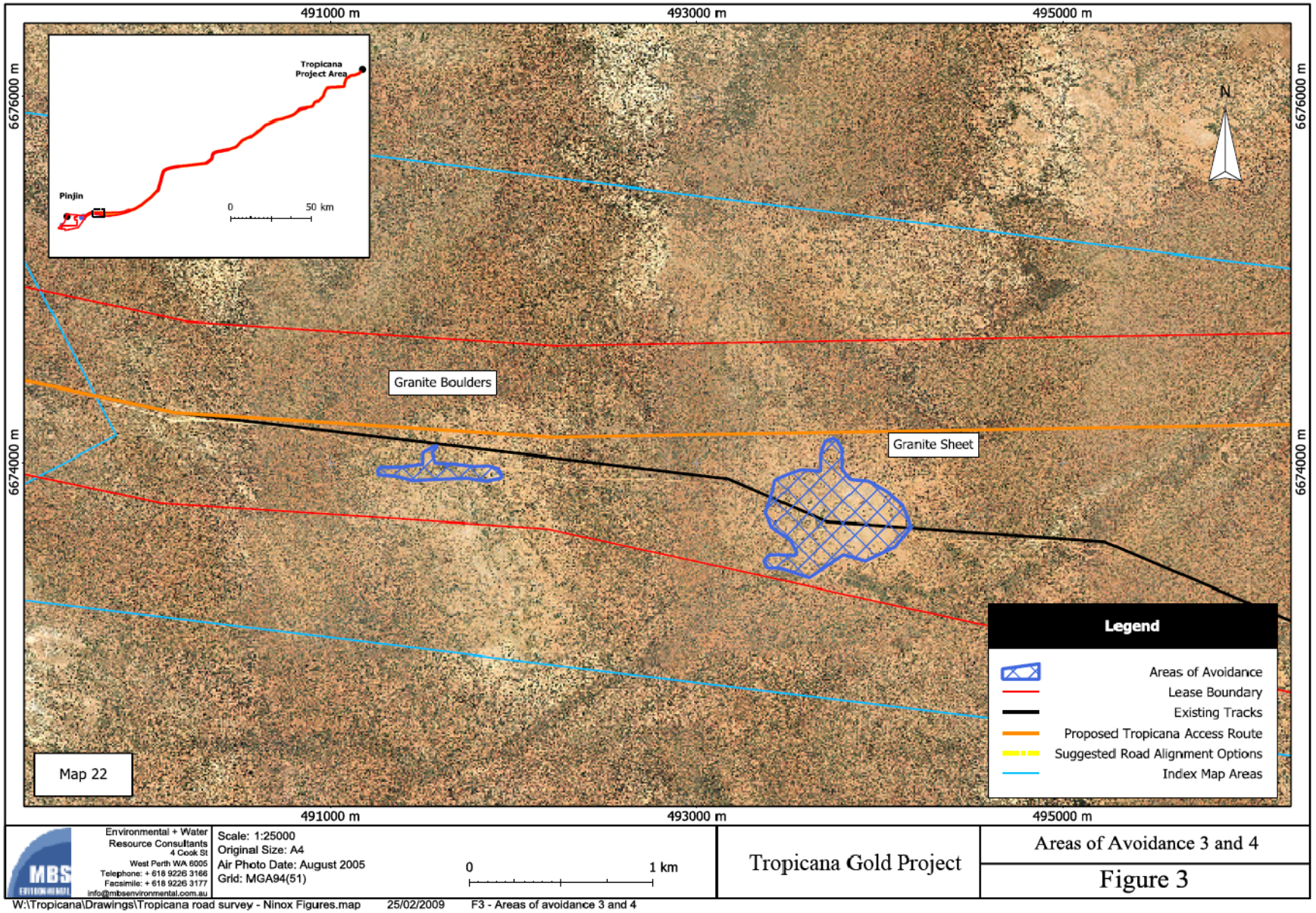
25/02/2009
F2 - Areas of avoidance 1 and 2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Tropicana
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Granite Boulders
Granite Sheet
Map 22
Legend
Areas of Avoidance
Lease Boundary
Existing Tracks
Proposed Tropicana Access Route
Suggested Road Alignment Options
Index Map Areas
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Facsimile: + 618 9226 3177
info@mbsenvironmental.com.au
Scale: 1:25000
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Tropicana Gold Project
Areas of Avoidance 3 and 4
Figure 3
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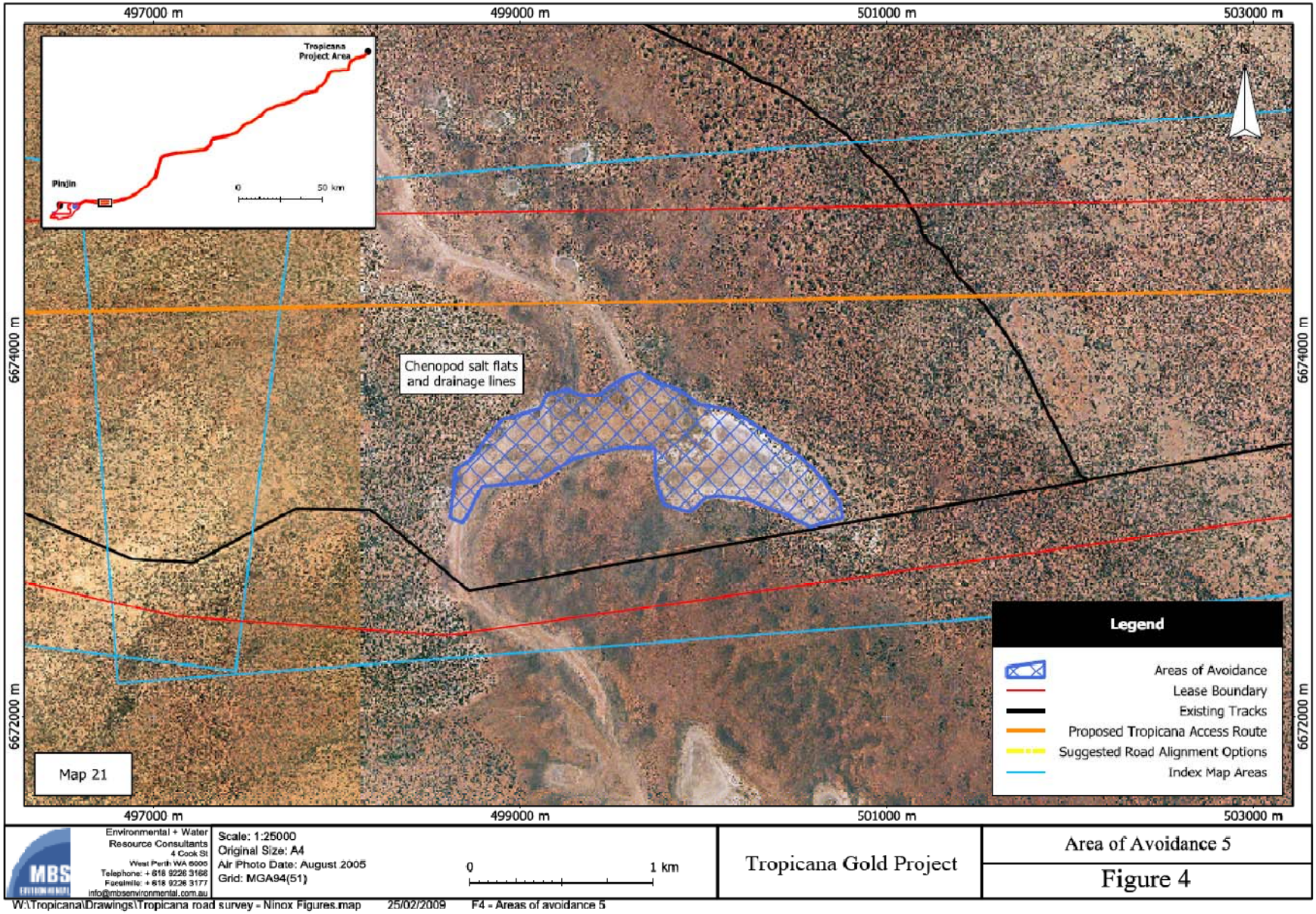
25/02/2009
F3 - Areas of avoidance 3 and 4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Tropicana Project Area
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Chenopod salt flats and drainage lines
Map 21
Legend
Areas of Avoidance
Lease Boundary
Existing Tracks
Proposed Tropicana Access Route
Suggested Road Alignment Options
Index Map Areas
Environmental + Water Resource Consultants
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info@mbsenvironmental.com.au
Scale: 1:25000
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Grid: MGA94(51)
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Tropicana Gold Project
Area of Avoidance 5
Figure 4
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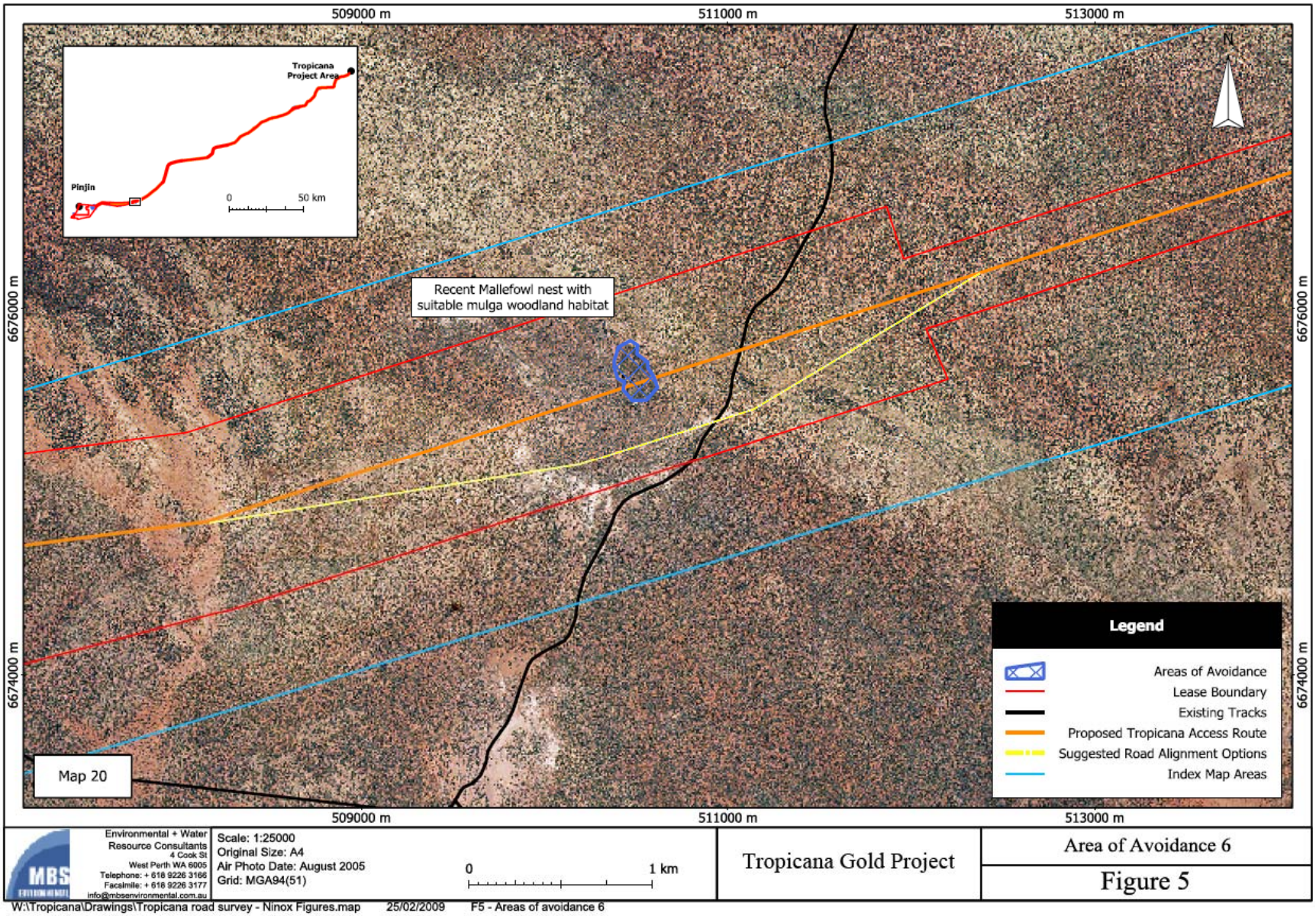
509000 m
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Tropicana Project Area
Pinjin
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50 km
Recent Mallefowl nest with suitable mulga woodland habitat
Map 20
Legend
Areas of Avoidance
Lease Boundary
Existing Tracks
Proposed Tropicana Access Route
Suggested Road Alignment Options
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Original Size: A4
Air Photo Date: August 2005
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Tropicana Gold Project
Area of Avoidance 6
Figure 5
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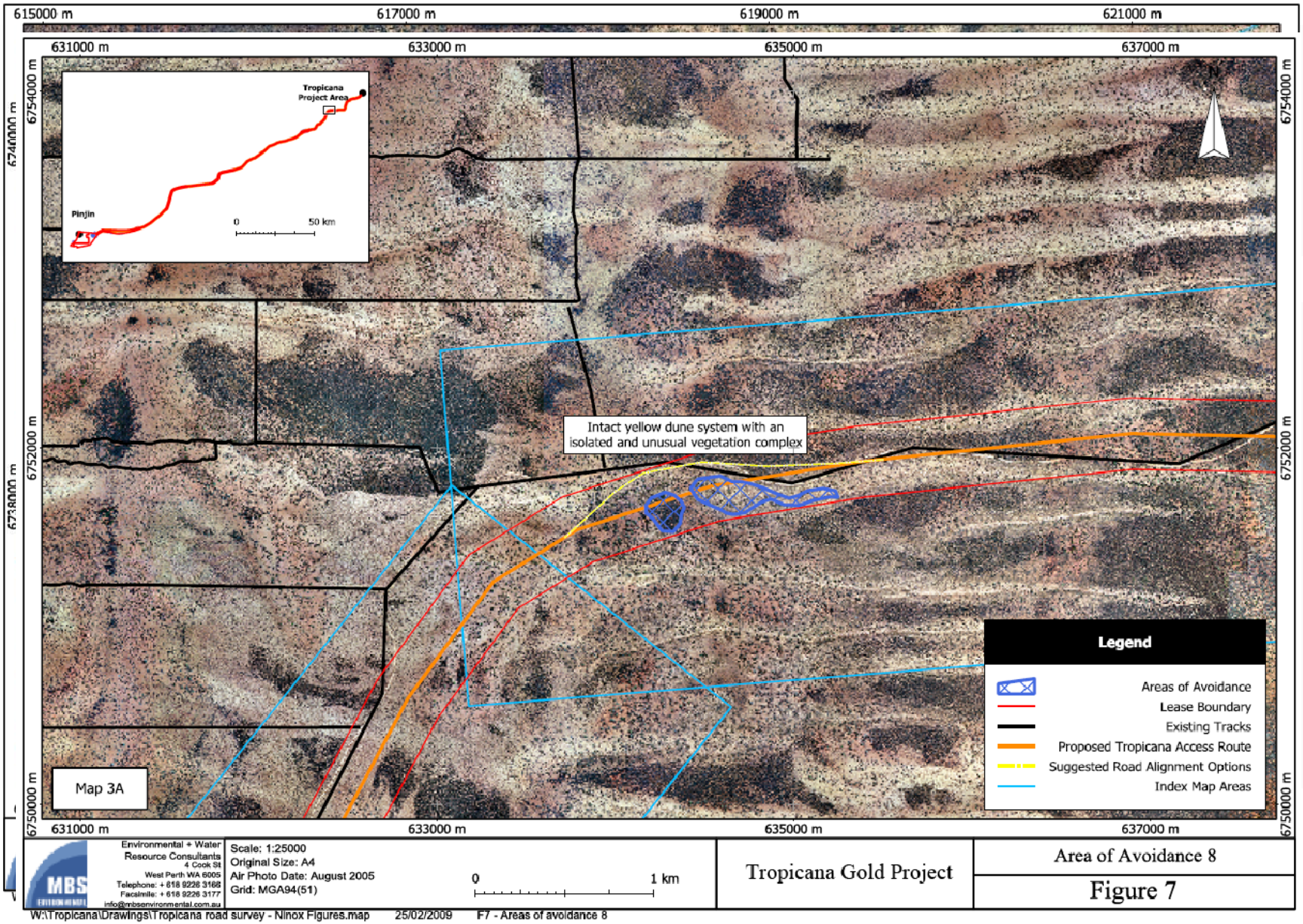
F5 - Areas of avoidance 6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Tropicana Project Area
Pinjin
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50 km
N
Intact yellow dune system with an isolated and unusual vegetation complex
Map 3A
Legend
Areas of Avoidance
Lease Boundary
Existing Tracks
Proposed Tropicana Access Route
Suggested Road Alignment Options
Index Map Areas
Environmental + Water Resource Consultants
4 Cook St
West Perth WA 6005
Telephone: + 618 9226 3166
Facsimile: + 618 9226 3177
info@mbsenvironmental.com.au
Scale: 1:25000
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Tropicana Gold Project
Area of Avoidance 8
Figure 7
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25/02/2009
F7 - Areas of avoidance 8

Even though these habitats above are singled out for particular attention there are other more widespread habitats that are important and care should be taken to minimise damage when constructing the road and infrastructure near or through these areas. Appendix 4 provides examples and description of several types of habitat that occur along the proposed route where care should be taken to minimise disturbance.

The point of including these habitats is to stress the importance of remnant, reasonably long unburnt areas of varying vegetation, geology and soils. So much of the area has been seriously burnt or is recovering from fairly recent burns, particularly the yellow sandplains, that the area could be quite depleted of fauna. The remnant unburnt vegetation areas are the sources from which the burnt areas are to be re-populated. The rate of recovery of fauna would be dependent on the rate of recovery of vegetation and their ecological processes including shelter, prey species including invertebrates, flowering, seeding etc. Great care should be taken to minimise further loss of mature vegetation or recovering vegetation particularly on the yellow sandplains that are so vulnerable to wildfire.

9 DISCUSSION AND CONCLUSIONS

The animals that were recorded within the Survey Area included 45 bird, four native mammal and nine reptile species. Four introduced mammals were also recorded. An additional 73 bird, 33 mammal, six frog and 106 reptile species could potentially occur within the Survey Area. Of these, one bird and six mammal species are considered extinct in the area.

Table 2, Table 3and Table 4 list those species that are considered of conservation significance that are known, or could potentially occur within the Survey Area. These are summarised below although those that are considered to be extinct in the area have not been included in this summary:

Table 6 Summary of those species of conservation significance that are known or could potentially occur within the habitats of the Survey Area. (Species recorded during the survey are marked in bold.).

BIRDS	CONSERVATION LEVEL	POTENTIAL TO OCCUR
Leipoa ocellata **Malleefowl**	**Vulnerable – EPBC Act (1999)** **Vulnerable – Wildlife Conservation Act (1950)**	**Recorded during the survey**
Falco peregrinus Peregrine Falcon	Other Specially Protected Fauna – Wildlife Conservation Act (1950)	Unlikely to occur
Ardeotis australis **Bustard**	**P4 - DEC's Priority Fauna List**	**Recorded during the survey**
Charadrius veredus Oriental Dotterel	Migratory under EPBC Act (1999): ROKAMBA/JAMBA	Unlikely to occur
Cacatua leadbeateri Major Mitchell's Cockatoo	Other Specially Protected Fauna – Wildlife Conservation Act (1950)	Unlikely to occur
Polytelis alexandrae Princess Parrot	P4 - DEC's Priority Fauna List	Likely to occur
Pezoporus occidentalis Night Parrot	Endangered – EPBC Act (1999) Critically Endangered – Wildlife Conservation Act (1950)	Unlikely to occur
Apus pacificus Fork-tailed Swift	Migratory under EPBC Act (1999): JAMBA/CAMBA	Likely to occur seasonally
Merops ornatus **Rainbow Bee-eater**	**Migratory under EPBC Act (1999); JAMBA**	**Recorded during the survey**

BIRDS	CONSERVATION LEVEL	POTENTIAL TO OCCUR
Amytornis striatus Striated Grasswren	P4 - DEC's Priority Fauna List	Likely to occur
Amytornis textilis Thick-billed Grasswren	P4 - DEC's Priority Fauna List	Likely to occur
Acanthiza iredalei iredalei Slender-billed Thornbill (Samphire Thornbill)	P4 - DEC's Priority Fauna List	Likely to occur
MAMMALS		
Dasycercus blythi Brush-tailed Mulgara	P4 - DEC's Priority Fauna List	Likely to occur
Dasycercus cristicauda Crest-tailed Mulgara	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
Dasyurus geoffroii Chuditch	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
Sminthopsis psammophila Sandhill Dunnart	Endangered – EPBC Act (1999); Endangered – Wildlife Conservation Act (1950)	Likely to occur
Myrmecobius fasciatus Numbat	Vulnerable – EPBC Act (1999); Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
Macrotis lagotis Bilby	Vulnerable – EPBC Act (1999); Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
Notoryctes typhlops Southern Marsupial Mole	Endangered – EPBC Act (1999); Endangered – Wildlife Conservation Act (1950)	Likely to occur
Bettongia lesueur Boodie	Vulnerable – EPBC Act (1999); Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
Nyctophilus sp. *(*previously *N. timoriensis)* Central Long-eared Bat	P4 - DEC's Priority Fauna List	Likely to occur
Leporillus conditor Greater Stick-nest Rat	Vulnerable – EPBC Act (1999); Vulnerable – Wildlife Conservation Act (1950)	Considered locally extinct Unlikely to occur
REPTILES	**CONSERVATION LEVEL**	**POTENTIAL TO OCCUR**
Egernia kintorei Great Desert Skink	Vulnerable – EPBC Act (1999) Vulnerable – Wildlife Conservation Act (1950)	Likely to occur
Lerista puncticauda Southern Desert Lerista	P2 - DEC's Priority Fauna List	Likely to occur
Aspidites ramsayi Woma	Other Specially Protected Fauna – Wildlife Conservation Act (1950) P1 - DEC's Priority Fauna list	Likely to occur

The western portion of the survey area within the GVD has the highest proportion of yellow sandplains that are considered at risk. Between 21% and 40% of the GVD has been affected by fire since 1989 (EPA 2007). In both the GVD and MUR approximately 40% of their mammal fauna has become extinct from a number of causes including changed fire regimes. During the survey period it was noted that much of the area burnt was yellow sand-plain and, because of the extent and intensity of the fires (see photographs in Mattiske Consulting Pty Ltd 2008), many animals would not have survived. No animal remains were found in these burnt areas. Numerous footprints indicated that the remnant unburned patches were heavily used by many fauna species. An Australian Bustard nest with one egg was located in a small patch of unburnt vegetation.

There are major gaps in the faunal data for the GVD because of the lack of systematic biological surveys apart from some assessment of the biota on proposed and current nature reserves, (www.naturebase.net.au

2008) and data appears to be scarce for these remote areas. Because of the paucity of information on the fauna within the Survey Area some of the data was used from the three nearby Nature Reserves.

Only a small section of the eastern portion of the MUR was traversed and was typical of the vegetation and soil types for the bioregion. *"The bioregion is rich and diverse in both its flora and fauna but most are wide ranging and usually occur in adjoining regions"* (www.naturebase.net.au , 2008). This is also true into the GVD bioregion where isolated pockets of mulga woodland occur. These pockets may be significant to isolated populations of native fauna and may possibly be considered as 'Island Refugia' to dependant fauna including short range endemics EPA (2004).

While there are many habitat types there are only a small number of sensitive habitats that are recommended to be bypassed. These areas include: any granite sheet and boulder areas; intact reasonably long unburned vegetation on either the red or yellow dunes and nearby swales and plains; mature eucalypts with hollows; dunes and swales that contain mature *Xanthorrhoea*; sheoak woodland; chenopod salt-flats; and Four Mile Dam.

10 RECOMMENDATIONS

A series of recommendations are given in Appendix 5 for the protection of vertebrate fauna habitats. While many of the recommendations may be standard practice for AngloGold Ashanti Australia Limited, they have been reproduced in this document in order to reinforce their importance in minimising the impact of development of this access road and infrastructure on fauna. The maintenance of healthy vegetation, reduction of impact on soils through appropriate planning for drainage all assist in preserving fauna habitats and, as a consequence, the animals that rely on them.

In summary, the recommendations include:

- minimising the clearing of vegetation wherever possible;
- re-routing the access road and infrastructure corridor away from significant fauna habitats;
- additional and more intensive fauna surveys be conducted to compensate for the lack of information on the remote areas;
- additional surveys would also compensate for the difficulty in adequately assessing fauna habitats in the sandplain areas within the western portion of the Survey Area given the extent and intensity of the recent fire.

11 PERSONNEL

Ninox team members included:

Field assessment	- Senior zoologist	- Maureen Francesconi
	- Field assistant	- John Francesconi
Report preparation	-	- Maureen Francesconi
		- Jan Henry

12 ACKNOWLEDGEMENTS

The Ninox Wildlife team would like to sincerely thank the members of Mattiske Consulting, Scott, Matt and Dan for their good humour and plant identification. We would particularly like to thank Boots for his help in guiding us along the track, fixing tyres, and providing first class food and the comforts of camp during our December trip. Thanks to Steve for cooking some of the meals during the December trip and organizing the March trip within the constraints of the remote camp. Lastly but importantly we would like to thank Siobhan for her organizational skills in keeping the job on track both in December and March, her good humour, and for being our guide on the March trip.

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Appendix 1 List of vertebrate fauna species recorded or predicted to occur (including those considered extinct in the area) within the Pinjin – Tropicana Survey Area.

Key

Data Sources

- Recorded - Fauna recorded during the December 2007 and March 2008 Level 1 Reconnaissance Survey (Ninox 2008).
- QV Spr - Records from Queen Victoria Spring Nature Reserve (Burbidge *et al* 1976; McKenzie & Burbidge 1979)
- Plumridge - Recorded from Plumridge Lakes Nature Reserve (Burbidge *et al* 1976; McKenzie & Burbidge 1979)
- Neale - Recorded form Neale Junction Nature Reserve (Burbidge *et al* 1976; McKenzie & Burbidge 1979)
- Pinjin - Opportunistic observations Pinjin Homestead area (Turpin 2008)

Columns left blank indicate species listed based on current distribution patterns as shown in the references listed in Section 3.1.

Conservation Status – Australian Government

- V - Vulnerable under the EPBC Act 1999
- E - Endangered under the EPBC Act 1999
- J - JAMBA treaty
- C - CAMBA treaty
- R - ROKAMBA treaty
- M - Listed as Migratory

Conservation Status – Western Australia

- CR - Critically Endangered under the Wildlife Conservation Act 1950
- VU - Vulnerable under the Wildlife Conservation Act 1950
- OP - Other Specially Protected Fauna under the Wildlife Conservation Act 1950
- EN - Endangered under the Wildlife Conservation Act 1950
- P# - Listed under DEC's Priority Fauna list

MAMMALS		Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
TACHYGLOSSIDAE								
Tachyglossus aculeatus	Short-beaked Echidna	Tracks		**X**				**X**
DASYURIDAE								
Antechinomys laniger	Kultarr							
Dasycercus blythi	Brush-tailed Mulgara		**P4**					
Dasycercus cristicauda	Crest-tailed Mulgara	Considered extinct in the area	**V/VU**					
Dasyurus geoffroii	Chuditch	Considered extinct in the area	**V/VU**					
Ningaui ridei	Wongai Ningaui				**X**		**X**	
Ningaui yvonneae	Southern Ningaui							
Sminthopsis crassicaudata	Fat-tailed Dunnart							
Sminthopsis dolichura	Little Long-tailed Dunnart							
Sminthopsis hirtipes	Hairy-footed Dunnart				**X**		**X**	
Sminthopsis ooldea	Ooldea Dunnart	Eastern edge of survey area			**X**		**X**	
Sminthopsis psammophila	Sandhill Dunnart	Considered out of range but habitat present	**E/EN**					
MYRMECOBIIDAE								
Myrmecobius fasciatus	Numbat	Considered extinct in the area	**V/VU**					
THYLACOMYIDAE								
Macrotis lagotis	Bilby, Dalgyte	Considered extinct in the area	**V/VU**					
NOTORYCTIDAE								
Notoryctes typhlops	Southern Marsupial Mole		**E/EN**					
POTOROIDAE								
Bettongia lesueur graii	Burrowing Bettong, Boodie	Considered extinct in the area/old mounds	**V/VU**					
MACROPODIDAE								
Macropus fuliginosus	Western Grey Kangaroo				**X**			**X**
Macropus robustus	Euro			**X**				**X**
Macropus rufus	Red Kangaroo			**X**		**X**		
BURRAMYIDAE								
Cercartetus concinnus	Western Pygmy-possum							

MAMMALS		Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
VESPERTILIONIDAE								
Chalinolobus gouldii	Gould's Wattled Bat				X			
Chalinolobus morio	Chocolate Wattled Bat							
Nyctophilus geoffroyi	Lesser Long-eared Bat				X			
Nyctophilus sp. (timoriensis)	Central Long-eared Bat		P4					
Mormopterus sp. *(Tadarida planiceps)*	Southern Freetail-bat				X			
Scotorepens balstoni	Inland Broad-nosed Bat							
Scotorepens greyii	Little Broad-nosed Bat	Out of range			X			
Tadarida australis	White-striped Freetail-bat				X			X
Vesperdelus baverstocki	Inland Forest Bat							
Vesperdelus finlaysoni	Finlayson's Cave bat	Habitat lacking			X			
MURIDAE								
Leporillus conditor	Greater Stick-nest Rat	Considered extinct in the area	V/E					
Notomys alexis	Spinifex Hopping-mouse				X	X	X	
Notomys mitchelli	Mitchell's Hopping-mouse	May be in western edge of survey area			X			
Pseudomys bolami	Bolam's Mouse							
Pseudomys desertor	Desert Mouse							
Pseudomys hermannsburgensis	Sandy Inland Mouse				X	X	X	
CANIDAE								
Canis lupus dingo	Dingo/dog	Tracks		X		X		
INTRODUCED MAMMALS								
MURIDAE								
Mus musculus	House Mouse				X	X	X	
LEPORIDAE								
Oryctolagus cuniculus	Rabbit	Scats and burrows		X	X	X	X	X
CANIDAE								
Vulpes vulpes	Fox	? Tracks			X		X	X
FELIDAE								
Felis catus	Feral Cat	Tracks		X		X	X	
EQUIDAE								

MAMMALS		Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Equus asinus	Donkey	Scats		X				
CAMELIDAE								
Camelus dromedarius	One-humped Camel	Tracks and scats		X	X	X	X	X
BOVIDAE								
Bos taurus	Domestic Cattle							X
Capra hircus	Feral Goat							
Ovis aries	Sheep							X

REPTILES	Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
AGAMIDAE	**Dragons**						
Caimanops amphiboluroides							
Ctenophorus caudicinctus graafi	Recorded at the Northern edge GVD						
Ctenophorus clayi	Prefers red sand ridges with spinifex			X			
Ctenophorus cristatus				X	X		X
Ctenophorus fordi	Prefers sand with spinifex			X		X	X
Ctenophorus isolepis gularis			X	X	X	X	
Ctenophorus nuchalis							
Ctenophorus ornatus	Prefers granite sheet						
Ctenophorus pictus	May be out of range						
Ctenophorus reticulatus					X		
Ctenophorus salinarum	Prefers Chenopod habitat						
Ctenophorus scutulatus	Prefers stony ground and chenopod		X				X
Diporiphora linga	Recorded at Queen Victoria Spring			X			
Diporiphora winneckei	Prefers sand ridges						
Lophognathus longirostris						X	
Moloch horridus			X	X		X	
Pogona m. minor				X	X		

REPTILES	Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Tympanocryptis cephala							
GEKKONIDEA	**Geckoes**						
Crenadactylus ocellatus horni							
Diplodactylus conspicillatus	May be out of range					**X**	
Diplodactylus g. granariensis				**X**			
Diplodactylus pulcher							
Lucasium damaeum				**X**	**X**		
Lucasium maini							
Lucasium squarrosum							
Lucasium stenodactylum	Isolated southern pocket						
Nephrurus laevissimus	Prefers desert sand ridges with spinifex			**X**		**X**	
Nephrurus l. levis					**X**	**X**	
Nephrurus stellatus	Possible out of range prefers yellow sandridges						
Nephrurus vertebralis	Prefers stony heavy soils				**X**		
Rhynchoedura ornata							
Strophurus assimilis							
Strophurus elderi							
Strophurus strophurus				**X**			
Strophurus wellingtonae							
Underwoodisaurus milii							
Gehyra purpurascens							
Gehyra variegata				**X**		**X**	**X**
Heteronotia binoei			**X**			**X**	**X**
PYGOPODIDAE	**Legless lizards**						
Delma australis							
Delma butleri							
Delma fraseri	Recorded in GVD						
Delma nasuta							
Delma tincta							
Lialis burtonis			**X**				
Pygopus nigriceps							
SCINCIDAE	**Skinks**						

REPTILES	Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Cryptoblepharus carnabyi							
Cryptoblepharus buchanani			X				
Ctenotus ariadnae							
Ctenotus atlas				X			
Ctenotus b. brooksi	Prefers red sand dunes						
Ctenotus calurus							
Ctenotus dux	Prefers desert dunes					X	
Ctenotus g. grandis	Prefers spinifex deserts						
Ctenotus greeri							
Ctenotus helenae						X	X
Ctenotus leae	Prefers desert sand dunes					X	
Ctenotus leonhardii							
Ctenotus mimetes	Stony areas and sand						
Ctenotus nasutus	Prefers deserts with spinifex						
Ctenotus pantherinus ocellifer			X	X		X	
Ctenotus piankai	Prefers dunes and sand flats						
Ctenotus quattuordecimlineatus				X			
Ctenotus schomburgkii			X	X			
Ctenotus severus	Prefers granites with Acacia						
Ctenotus u. uber	May be out of range						
Cyclodomorphus m. elongatus							
Egernia depressa							
Egernia formosa							
Egernia inornata				X	X	X	
Egernia kintorei		V/VU					
Egernia striata	Prefers inter-dunes and flats with spinifex					X	
Eremiascincus richardsonii							
Lerista bipes							
Lerista desertorum							
Lerista kingi sp.nov.							
Lerista m. macropisthopus							
Lerista picturata							

REPTILES	Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Lerista puncticauda	Recorded at Queen Victoria Spring	**P2**					
Lerista rhodonoides							
Menetia greyii					**X**		
Morethia butleri							
Morethia obscura							
Proablepharus reginae	Eastern edge of range						
Tiliqua multifasciata					**X**		
Tiliqua occipitalis					**X**		**X**
Tiliqua rugosa							**X**
VARANIDAE	**Goannas**						
Varanus brevicauda							
Varanus caudolineatus	Prefers hard stony ground with mulga						
Varanus eremius	Prefers sandy deserts with spinifex						
Varanus giganteus							
Varanus gilleni	Arboreal - associated with mulga or casuarina						
Varanus gouldii			**X**				**X**
Varanus panoptes rubidus	May be out of range						
Varanus t. tristis							
TYPHLOPIDAE	**Blind Snakes**						
Ramphotyphlops bicolor							
Ramphotyphlops bituberculatus							
Ramphotyphlops endoterus							
Ramphotyphlops hamatus	Prefers samphire flats and mallee with spinifex						
Ramphotyphlops waitii	Prefers pale sands and red loams with meat ants						
BOIDAE	**Pythons**						
Antaresia s. stimsoni							
Aspidites ramsayi		**P1/OP**					
ELAPIDAE	**Poisonous Snakes**						
Acanthophis pyrrhus							
Brachyurophis f. fasciolata							
Brachyurophis semifasciatus							
Demansia p. psammophis							

REPTILES	Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Furina ornata							
Neelaps bimaculatus	May be out of range						
Parasuta monachus							
Pseudechis australis	Restricted to heavy soils and mulga					X	
Pseudechis butleri							
Pseudonaja modesta							
Pseudonaja nuchalis							X
Simoselaps bertholdi							
Suta fasciata							

FROGS		Comments	Status	Recorded	QV Spr	Pumridge	Neale	Pinjin
Cyclorana maini	Main's Frog	Occurs in flat country subject to seasonal flooding						
Neobatrachus aquilonius	Northern Burrowing Frog	In sparsely vegetated country at edge of water						
Neobatrachus kunapalari	Kunapalari Frog	Usually found on impervious soils			X	X	X	
Neobatrachus sutor	Shoemaker Frog	Clay or loamy soils						
Pseudophryne guentheri	Guenther's Toadlet	Commonly found under rocks, timber, leaf litter						
Pseudophryne occidentalis	Western Toadlet	Usually associated with granites						

BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
CASUARIIDAE								
Dromaius novaehollandiae	Emu			**X**		**X**		**X**
MEGAPODIIDAE								
Leipoa ocellata	Malleefowl	Nests and footprints recorded	**V/VU**	**X**				**X**
PHASIANIDAE								
Coturnix pectoralis	Stubble Quail							
ACCIPITRIDAE								
Hamirostra melanosternon	Black-breasted Buzzard							
Haliastur sphenurus	Whistling Kite							
Accipiter fasciatus	Brown Goshawk			**X**				
Accipiter cirrhocephalus	Collared Sparrowhawk							
Aquila morphnoides	Little Eagle			**X**				**X**
Aquila audax	Wedge-tailed Eagle			**X**		**X**		**X**
Circus assimilis	Spotted Harrier							
FALCONIDAE								
Falco berigora	Brown Falcon			**X**	**X**		**X**	**X**
Falco cenchroides	Australian Kestrel			**X**	**X**		**X**	**X**
Falco longipennis	Australian Hobby			**X**				
Falco peregrinus	Peregrine Falcon		**OP**					
RALLIDAE								
Gallinula ventralis	Black-tailed Native-hen							
OTIDIDAE								
Ardeotis australis	Australian Bustard	Nest with egg recorded	**P4**	**X**	**X**	**X**		**X**
TURNICIDAE								
Turnix velox	Little Button-quail				**X**	**X**	**X**	
RECURVIROSTRIDAE								
Cladorhynchus leucocephalus	Banded Stilt							
CHARADRIIDAE								
Vanellus tricolor	Banded Lapwing							**X**
Charadrius ruficapillus	Red-capped Plover							
Charadrius melanops	Black-fronted Dotterel							**X**

BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
Charadrius veredus	Oriental Dotterel		**M J/R**					
Erythrogonys cinctus	Red-kneed Dotterel							
Peltohyas australis	Inland Dotterel				**X**			
COLUMBIDAE								
Phaps chalcoptera	Common Bronzewing			**X**				**X**
Ocyphaps lophotes	Crested Pigeon			**X**				**X**
Geopelia cuneata	Diamond Dove							
PSITTACIDAE								
Cacatua roseicapilla	Galah			**X**		**X**		**X**
Cacatua leadbeateri	Major Mitchell's Cockatoo		**OP**					
Nymphicus hollandicus	Cockatiel					**X**	**X**	
Glossopsitta porphyrocephala	Purple-crowned Lorikeet							**X**
Polytelis alexandrae	Princess Parrot		**P4**					
Barnardius zonarius	Australian Ringneck			**X**	**X**	**X**	**X**	**X**
Platycercus varius	Mulga Parrot			**X**	**X**	**X**	**X**	**X**
Neophema splendida	Scarlet-chested Parrot						**X**	
Melopsittacus undulatus	Budgerigar						**X**	
Pezoporus occidentalis	Night Parrot		**CR/E**					
CUCULIDAE								
Cuculus pallidus	Pallid Cuckoo					**X**		**X**
Chrysococcyx osculans	Black-eared Cuckoo							
Chrysococcyx basalis	Horsfield's Bronze Cuckoo							**X**
STRIGIDAE								
Ninox novaeseelandiae	Boobook Owl			**X**	**X**		**X**	**X**
TYTONIDAE								
Tyto alba	Barn Owl					**X**		
PODARGIDAE								
Podargus strigoides	Tawny Frogmouth				**X**	**X**	**X**	
CAPRIMULGIDAE								
Eurostopodus argus	Spotted Nightjar						**X**	
AEGOTHELIDAE								

BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
Aegotheles cristatus	Australian Owlet-nightjar			X		X		X
APODIDAE								
Apus pacificus	Fork-tailed Swift		M/J/C				X	
HALCYONIDAE								
Todiramphus pyrrhopygia	Red-backed Kingfisher					X	X	
MEROPIDAE								
Merops ornatus	Rainbow Bee-eater		M	X				X
CLIMACTERIDAE								
Climacteris affinis	White-browed Treecreeper					X		
Climacteris rufa	Rufous Treecreeper							
MALURIDAE								
Malurus splendens	Splendid Fairy-wren			X				X
Malurus lamberti	Variegated Fairy-wren	Edge of range						
Malurus leucopterus	White-winged Fairy-wren							X
Amytornis striatus	Striated Grasswren		P4				X	
Amytornis textilis	Thick-billed Grasswren	Extinct in the area	P4					
PARDALOTIDAE								
Pardalotus rubricatus	Red-browed Pardalote	May be too far south of their range						
Pardalotus striatus	Striated Pardalote							
ACANTHIZIDAE								
Pyrrholaemus brunneus	Redthroat			X				X
Smicrornis brevirostris	Weebill			X	X			X
Acanthiza apicalis	Broad-tailed Thornbill			X				X
Acanthiza robustirostris	Slaty-backed Thornbill							
Acanthiza iredalei	Slender-billed Thornbill		P4					
Acanthiza uropygialis	Chestnut-rumped Thornbill			X	X	X		X
Acanthiza chrysorrhoa	Yellow-rumped Thornbill			X	X			
Aphelocephala leucopsis	Southern Whiteface					X		X
MELIPHAGIDAE								
Lichmera indistincta	Brown Honeyeater			X				X
Certhionyx niger	Black Honeyeater							

Vertebrate fauna: Pinjin Infrastructure Corridor, Tropicana Gold Project.

BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
Certhionyx variegatus	Pied Honeyeater					X		
Lichenostomus virescens	Singing Honeyeater			X	X			X
Lichenostomus plumulus	Grey-fronted Honeyeater			X			X	X
Lichenostomus ornatus	Yellow-plumed Honeyeater							
Lichenostomus leucotis	White-eared Honeyeater							
Melithreptus brevirostris	Brown-headed Honeyeater	Probably too far east of their range						
Phylidonyris albifrons	White-fronted Honeyeater			X	X	X		X
Manorina flavigula	Yellow-throated Miner			X	X	X	X	X
Acanthagenys rufogularis	Spiny-cheeked Honeyeater			X	X	X		X
Anthochaera carunculata	Red Wattlebird							X
Ephthianura albifrons	White-fronted Chat							
Ephthianura aurifrons	Orange Chat						X	
Ephthianura tricolor	Crimson Chat							
PETROICIDAE								
Microeca fascinans	Jacky Winter			X				
Petroica goodenovii	Red-capped Robin			X		X	X	X
Petroica cucullata	Hooded Robin			X		X	X	
POMATOSTOMIDAE								
Pomatostomus superciliosus	White-browed Babbler			X		X	X	X
CINCLOSOMATIDAE								
Psophodes occidentalis	Western Wedgebill							
Cinclosoma castanotus	Chestnut Quail-thrush					X		
Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush							
NEOSITTIDAE								
Daphoenositta chrysoptera	Varied Sittella							
PACHYCEPHALIDAE								
Oreoica gutturalis	Crested Bellbird			X	X	X	X	X
Pachycephala rufiventris	Rufous Whistler			X	X	X		X
Pachycephala inornata	Gilbert's Whistler				X	X	X	
Colluricincla harmonica	Grey Shrike-thrush			X		X		X
DICRURIDAE								

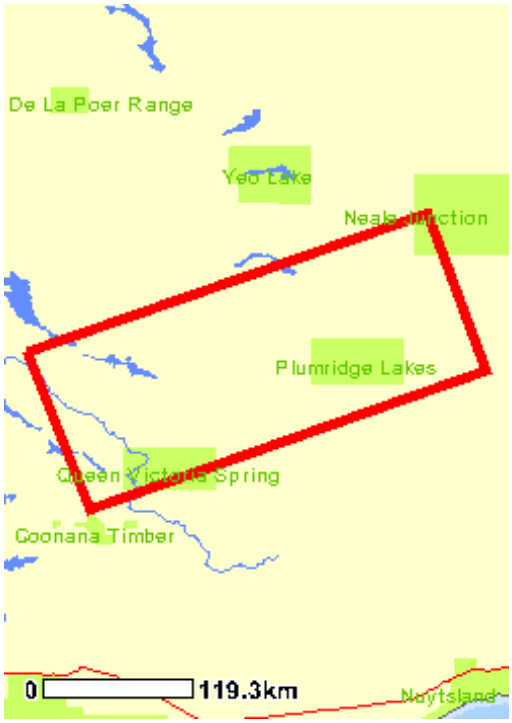
BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
Rhipidura leucophrys	Willie Wagtail			X		X		X
Grallina cyanoleuca	Magpie-lark							X
CAMPEPHAGIDAE								
Coracina novaehollandiae	Black-faced Cuckoo-shrike			X	X	X	X	X
Coracina maxima	Ground Cuckoo-shrike							
Lalage triclolor	White-winged Triller					X	X	
ARTAMIDAE								
Artamus personatus	Masked Woodswallow							
Artamus superciliosus	White-browed Woodswallow							
Artamus cinereus	Black-faced Woodswallow			X		X	X	
Artamus minor	Little Woodswallow	Little or no suitable habitat						
CRACTICIDAE								
Cracticus torquatus	Grey Butcherbird			X	X	X	X	X
Cracticus nigrogularis	Pied Butcherbird			X	X	X	X	X
Cracticus tibicen	Australian Magpie							X
Strepera versicolor	Grey Currawong			X	X			X
CORVIDAE								
Corvus coroniodes	Australian Raven							X
Corvus orru	Torresian Crow							
Corvus bennetti	Little Crow			X		X	X	X
PTILONORHYNCHIDAE								
Ptilonorhynchus maculatus guttatus	Western Bowerbird							
HIRUNDINIDAE								
Cheramoeca leucosternum	White-backed Swallow							
Hirundo neoxena	Welcome Swallow							
Hirundo nigricans	Tree Martin							
Hirundo ariel	Fairy Martin							X
SYLVIIDAE								
Cinclorhamphus mathewsi	Rufous Songlark							
Cinclorhamphus cruralis	Brown Songlark					X		
DICAEIDAE								

BIRDS		Comments	Status	Recorded	QV Spring	Plumridge	Neale	Pinjin
Dicaeum hirundinaceum	Mistletoebird			X				X
PASSERIDAE								
Taeniopygia guttata	Zebra Finch						X	X
MOTACILLIDAE								
Anthus australis	Australian Pipit			X		X		X

Appendix 2 EPBC Act Protected Matters Report

EPBC Act Protected Matters Report 22 April 2008 19:01

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.
You may wish to print this report for reference before moving to other pages or websites.
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html



This map may contain data which are © Commonwealth of Australia (Geoscience Australia) © 2007 MapData Sciences Pty Ltd, PSMA

Search Type: Line

Buffer: 0 km

Coordinates: -29.4708,122.3533, -28.3450,125.6123, -29.6190,126.0863, -30.7448,122.8668, -29.4610,122.3533, -29.461,122.3533

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	8
Migratory Species:	8

Other Matters Protected by the EPBC Act

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

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

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	2
Listed Marine Species:	5
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

State and Territory Reserves:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Acanthiza iredalei iredalei * Slender-billed Thornbill (western)	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata * Malleefowl	Vulnerable	Species or species habitat likely to occur within area
Polytelis alexandrae * Princess Parrot, Alexandra's Parrot	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasycercus cristicauda * Mulgara	Vulnerable	Species or species habitat likely to occur within area
Notoryctes typhlops * Yitjarritjarri, Southern Marsupial Mole	Endangered	Species or species habitat likely to occur within area
Sminthopsis psammophila * Sandhill Dunnart	Endangered	Species or species habitat may occur within area
Reptiles		
Egernia kintorei * Great Desert Skink, Tjakura, Warrarna, Mulyamiji	Vulnerable	Species or species habitat may occur within area
Plants		
Conospermum toddii * Victoria Desert Smokebush	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Leipoa ocellata * Malleefowl	Migratory	Species or species habitat likely to occur within area
Merops ornatus * Rainbow Bee-eater	Migratory	Species or species habitat may occur within area

Migratory Wetland Species

Birds

Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area

Migratory Marine Birds

Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus ***** Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Neale Junction Nature Reserve WA

Queen Victoria Spring Nature Reserve WA

Extra Information

State and Territory Reserves [Dataset Information]

Neale Junction Nature Reserve, WA

Queen Victoria Spring Nature Reserve, WA

Caveat

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

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

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

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

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

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

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

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

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

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

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

Acknowledgments

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Appendix 3 Recommendations for the protection of significant fauna habitats within the Pinjin to Tropicana Survey Area.

MAP Plate #	GPS - WGS 94	HABITAT DESCRIPTION
Map 24 **Plate 5**	483 630mE 6 672 250mN	*Casuarina* woodland to 6m with mixed shrubs to 2m including *Acacia, Eremophila, Ptilotus, Maireana, Dodonaea, Solanum, Santalum, Scaevola* with emergent *Eucalyptus* and mulga on loamy sands with mixed rock, granite scatter and calcareous earth. A very diverse area with important summer flowering food resource for many birds and invertebrates (butterflies). Many honey-eaters and insectivorous birds present and evidence of macro fauna. May be considered an isolated island habitat **On existing Pinjin Road – straighten route to north to bypass this area.**
Map 24 **Plate 6**	469 750mE 6 666 950mN	Four Mile Dam – reported to be a permanent water source. Several species of waterbird were utilising the dam. *Melaleuca* and *Eucalyptus* surround the dam at high water mark. Important water source for a variety of fauna; if permanent then fauna will have become reliant on it. (Just out of defined survey area) **On existing road – map marked to construct road further south of the existing road away from the dam. A shade-cloth fence should be erected along the south side of the dam's tree surrounds during the construction of the road. The bottom of the fence should be approx 1m above the ground to allow movement of fauna to the water. Construction personnel to be kept away from the water body to prevent disturbance to waterbirds and other fauna.**
Map 22 **Plate 7**	491 500mE 6 674 150mN	Granite boulders – open mulga shrubland to 3m over mixed *Acacia* and other shrubs to 1m on granite boulder outcropping with some exfoliation, on red loams and granite soils. **Granite boulders to the south of the existing road, new road alignment further to the north, if possible, to avoid these granites.**
Map 22 **Plate 8**	493 500mE 6 674000mN	Granite sheet – just to the south of planned route. Has low fringing open mulga and mixed small shrubs on very shallow granite soils **Avoid granite sheets if at all possible – move road to north slightly.**
Map 21 **Plate 9**	499 000mE 6 674 250mN	Narrow section of chenopod salt flats and drainage line leading to/from a large expanse of salt flat covered in various chenopod species on silts. The area is lined with *Eucalyptus* and low mixed shrubs on gypsum? levee-bank dunes. **This narrow area may present drainage flow problems. If the drainage flow is altered plant death may occur and this will affect the fauna that depends on it. (Slender-billed Thornbills may utilise this area, nearby is its preferred habitat of Thryptomene heath** *Aluta maisonneuvei* **and combined with the Chenopods may create the perfect area for them.)**
Map 20 **Plates 10;11**	510 xxxmE 6 675 xxxmN	Recent Malleefowl nest. Small patch of suitable mulga woodland utilised by this bird for nesting, the woodland is clearly seen on the map. Open mulga woodland to 4m with sparse shrub layer to 1.5m on brown loams with scattered quartz pebbles and gravels. **This patch of small mulga is right on the proposed alignment and should not be disturbed due to the suitability of the area for nesting by Malleefowl. It would be preferable if the route was further north to avoid this area. The road should not be moved south because of the weathered granite outcropping as seen in the pale sections on the map. This outcropping is in itself an important habitat that is restricted in area.**

MAP Plate #	GPS - WGS 94	HABITAT DESCRIPTION
Map 6 **Plate 12**	618 000mE 6 738 500mN	At approximately 617 000mE to 619 500mE the road is planned to cross and follow yellow dunes that have mature and intact vegetation. This area should be avoided. **Move the road to go between the dunes rather than along or across them.**
Map 3A **Plates 13;14**	634 000mE 6 751 650mN	The proposed road is to follow an intact yellow dune system and pass through an isolated and unusual vegetation complex. The area in the swale is open mature and long unburnt eucalypt woodland with patches of mulga and *Callitris* on spinifex and with scattered *Xanthorrhoea*. This area should be avoided. **The route could take a wider arc to the south and follow the existing road until it gets past this area.**

Appendix 4 Examples of other habitats of importance within the Pinjin – Tropicana Survey Area that are more widespread than those described in Appendix 4.

MAP	HABITAT SUMMARY	DESCRIPTION	GPS
24	Maireana flats	Large expanse of *Maireana* shrubland to 1.2m with emergent Acacias to 4m with scattered *Dodonaea* over grasses on clay sands with scattered pebbles – a preferred habitat of the Slender-billed Thornbill	479000 6672500
23	Casuarina woodland	Casuarina woodland to 3m over mixed shrubs to 1.5m including *Maireana*, *Dodonaea*, *Eremophila*, on calcarious earths	483077 6672330
23	Eucalypt mallee	Eucalypt mallee woodland to 4m over shrub layer of *Acacias* to 1.5m over spinifex clumps on rich red sandy loams	487000 6674000
23	Mulga woodland	An isolated patch of dense mulga woodland that could be considered an island just north of the proposed road alignment	488000 6675000
22	Eucalypt mallee	Eucalypt mallee woodland to 3m over small sparse shrubs to 1m over spinifex on red sandy loams. Malleefowl seen here	495000 6673500
21 to 14 & 12	Yellow sandplains & dunes	The yellow sandplains and dunes begin at Easting 504000 map 21 and are severely burnt through to Map14, Easting 557000 where only small patches of recently unburnt (but recovering from previous burn) heath begin. More areas burnt further along. Most of Map 12 yellow sandplain burnt. No mature yellow sandplain heath seen between Map 8 and 21. Further burn affected yellow sandplains occur on the eastern end of the road route – some have intact vegetation.	various
13;11;10;7	Eucalypt & Callitris Woodland	Long unburnt *Eucalyptus* and *Callitris* woodland to 6m over mixed shrubs to 1.5m with spinifex clumps on orange sands. (Malleefowl and Bustard tracks seen Map 13)	560200 6705700 574500 6714200 579670 6717100 601600 6731400 609000 6733400
11	Eucalypt woodland with spinifex	Very open tall eucalypt woodland to 9m over smaller Eucalypts to 3m over smaller eucalypts to 1.5m over mixed shrubs over Spinifex on orange sands. Bustard footprints seen.	569550 6713110
22;11;3A;	Thryptomene heath (*Aluta maisonneuvie)*	Several small patches of this community are dotted along the road route. They are very small areas and may be subject to Short Range Endemic issues and Island Refugia. Thryptomene heath to 1.5m with emergent mulga to 5m and scattered small eucalypts to 3m over occasional mixed shrubs to 0.5m on brown gravely clays and 'granite' type sands. These heaths are the preferred habitats of the Slender-billed Thornbills	501630 6674093 571110 6713220 576294 6714622 624980 6752000 649000 6753000
10;9	Isolated mulga shrublands	Isolated mulga shrubland to 3.5m with no understorey on orange clay sands. Isolated mulga shrubland to 4m over spinifex understorey on red loams with pesolite gravels. Isolated tall mulga shrubland to 6m over mixed shrubs to 2m over spinifex on orange sandy clays	578990 6716600 587300 6722100 589500 6723700

MAP	HABITAT SUMMARY	DESCRIPTION	GPS
9	Casuarina woodland	Open casuarina woodland to 8m with scattered mulga over mixed shrubs to 2m including *Hakea, Eremophila, Acacia, Senna, Olearia, Exocarpa*, on brown clays and with termite mounds.	590120 6724200
6;1	Eucalypt woodland	Open mature eucalypt woodland to 14m over mixed shrubs to 2m over sparse mixed shrubs to 1m over spinifex on deep pink sands (burrows found and echidna footprints (Map 6)	615330 6736480 645100 6752500
6	Eucalypt woodland	Open burnt eucalypt woodland – some mature trees with hollows over open ground (no spinifex)	613600 6735200
3	Open grasslands	Wide plain of open grasslands of mixed grasses including *Aristida* and *Eragrostis* with emergent *Acacia* shrubs and occasional *Ptylotis*.	663000 6758200
2	Eucalypt & Casuarina woodland	Open mature Eucalypt with hollows & casuarina woodland to 8m over mixed shrubs to 2m including *Senna*, *Eremophila* and *Dodonaea* on brown clay loams with dense quartz scatter	655340 6754990
1	Eucalypt woodland	Open mature eucalypt woodland to 10m over diverse mix of shrubs to 2.5m including *Senna, Acacia*, and scattered mulga over spinifex clumps on brown loams with pebble scatter. Inter dune.	649200 6752850

Appendix 5 General and site specific recommendations for the protection of vertebrate fauna and their habitats.

This appendix provides some general and specific recommendations for the construction, maintenance and operation of the proposed access road. The majority are aimed at minimising impact on fauna habitats.

- Keep any clearing of native vegetation to an absolute minimum by upgrading established tracks and roads where possible.
- Mature eucalypts should not be removed, particularly if they contain any hollows.
- Machinery should be cleaned prior to commencement of work to prevent the possibility of disease to the flora and the introduction of weeds, both of which could have an impact on fauna.
- Any cleared vegetation should be left in spoil heaps to create fauna micro-habitat.
- Lay-down areas should be kept to a minimum and care taken for selection of sites not to include high quality vegetation.
- Evidence has shown that two of the native mammals, Sandhill Dunnart and Southern Marsupial Mole, require spinifex habitats that are reasonably long unburned. Because of the massive extent of the fires throughout these habitats great care should be taken to minimise further damage and a stringent fire management plan should be implemented for the project's life.
- Dust management systems should be put in place throughout the project's life.
- Bypass sensitive habitats, such as the Four Mile Dam, salt pans, granites, and the lakes west of the survey area.
- Implement an environmental policy of strict speed limits, particularly at dawn and dusk, to minimise interactions between vehicles and fauna on the road.
- Implement a policy to manage interactions between other road users and fauna.
- Education of all personnel as to the significance of native fauna should be undertaken, particularly species of conservation significance.
- Education of staff as to the need for caution when encountering snakes. A competent and trained person should be available for the safe removal of snakes from the work area.
- Injured animals should be reported to a designated Environmental Officer.
- Because of the paucity of available information on the Survey Area, fauna surveys may be required and carried out with guidance from DEC.
- Management of Four Mile Dam – no disturbance – create a barrier of a shade cloth wall to fence off construction work from the dam and prohibit human interference.
- One small, distinct dune located on map 7 (is this of Mattiskees maps?) at GPS 605 800mE and 6 732 00mN is unusually diverse and complex (why? What does it contain that suggests this? Is this part of the flora survey or fauna survey findings?), consisting of open mulga and *Eucalyptus* woodland over mixed small shrubs on a low yellow dune with patches of calcareous type soils and small rock scatter. This dune is not within the proposed route but is a short distance to the south and should not be disturbed during the construction process.
- There are eight areas identified as important which the current alignment of the access road route passes through. These areas are recommended to remain undisturbed and the road re-routed. For details of these eight areas see Appendix 3.
- The additional habitats described in Appendix 4 are important for fauna and care should be taken during construction to minimise disturbance as much as possible.
- A more accurate assessment of faunal assemblages within the GVD region will only be achieved through systematic biological surveys in more remote and previously inaccessible areas.