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# Dry Season Fauna Survey Old Pirate Prospect, Tanami Desert, N.T.


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# Executive Summary

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ABM Resources NL ("ABM") is a mineral exploration company that currently holds tenements of over 30,000 km<sup>2</sup> in the Tanami-Arunta and Central Australia regions. EcOz Environmental Services was contracted by ABM to undertake a dry season fauna study of the Old Pirate project area. A wet season flora and fauna study was conducted by GHD Pty Ltd (GHD) in April 2012.

The fauna survey was conducted during the late dry season period (September 2012), which aimed to capture the species assemblages at this location. A total of seven trapping sites were established during these surveys, all targeting habitat proposed to be disturbed by exploration operations (i.e. roads, bulk sampling), including replicate sites to ensure that spatial differences within similar habitat was captured to a degree. Five additional sites were visited to record opportunistic fauna and flora records.

The field surveys of the proposed project areas recorded a total of 57 terrestrial vertebrate species, comprising of, 20 reptiles, 27 birds and 10 mammals. The majority of species were identified through trapping, active search techniques, incidental observations and camera traps.

The combined desktop and field studies yielded 105 terrestrial vertebrate species present in the overall area (Appendix A). As expected, the dry season survey yielded fewer records (57 versus 93) than the previous wet season survey by GHD.

The majority of species recorded during the survey are common and generally widespread throughout similar habitat in the region (based on an earlier survey in April 2012 by GHD).

Based on existing records and a review of the biology of the state and commonwealth-listed threatened species, approximately 22 threatened species could exist at the Old Pirate project area. Of the 22 threatened and one proposed threatened species highlighted in the desktop review, three were found to be present at the site. The wet season study also recorded these species, including:

- Australian Bustard (*Ardeotis australis*) - Vulnerable
- Brush-tailed Mulgara (*Dasymercus blythi*) - Vulnerable
- Greater Bilby (*Macrotis lagotis*) - Vulnerable

The only threatened species that is considered to be potentially impacted by the proposed Old Pirate bulk sampling program is the Brush-tailed Mulgara (*Dasymercus blythi*). It is recommended that areas proposed to be cleared for the bulk sampling trenches, residue storage facility, trial process plant and road corridors are inspected for burrows by an experienced ecologist, prior to vegetation clearing. These surveys will determine their presence and density within the Old Pirate Site. Ideally, areas should be surveyed to inform ABM Resources on the best location for infrastructure to reduce impact on Mulgara (*Dasymercus blythi*). These techniques would also detect Greater Bilby (*Macrotis lagotis*) signs; however the surveys conducted to date at Old Pirate suggest that Greater Bilby do not occur within the proposed area of disturbance.

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- Appendix B – Images of fauna recorded during the dry season field surveys for the Old Pirate project area.
- Appendix C – Acoustic Bat Analysis for the Old Pirate prospect.
- Appendix D – EPBC search for the Old Pirate prospect.

## Acknowledgements

We wish to thank the Central Land Council for allowing us access to the area to conduct the survey and providing key contacts. This survey would not have been possible without the help of Chris, Robert and Sebastian of ABM Resources who provided much support and help during the entire survey. Thanks also to Steven Richards of the Museum and Art Gallery for some photographs used in this report.

# 1 Introduction

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ABM Resources NL (“ABM”) is a mineral exploration company that currently holds tenements covering 30,000km<sup>2</sup> in the Tanami-Arunta and Central Australia regions. Primarily their focus is copper and gold, however if other minerals are present and prove economic they may warrant further exploration of their tenements.

EcOz Environmental Services was contracted by ABM to undertake a dry season fauna survey of the Old Pirate project area, specifically in relation to the proposed bulk sampling project. This report presents information from the dry season survey only. A wet season flora and fauna survey was conducted in April 2012 by GHD, which also included vegetation mapping. The GHD wet season survey results have been included in species totals and discussions within this report.

## 1.1 Survey Focus Area

The dry season fauna survey targeted the Old Pirate project area which is within EL28322 (Figure 1). The Old Pirate project is part of the Bonanza sub-project, which is the current focus of ABM’s greater Tanami Project.

## 1.2 Scope of Work

The objectives for assessing the terrestrial ecology of the Old Pirate project area were to:

- Describe and characterise the existing terrestrial vertebrate biodiversity within the focus areas for development that may be affected by disturbance
- Identify the potential environmental impacts of the development on the identified environmental values and assess the associated level of risk
- Describe threatened species that may potentially be impacted by the development

This fauna assessment is intended to provide the detailed baseline information underpinning management decisions only, and does not address potential ecological impacts nor recommend specific mitigation measures. However, the report does provide general recommendations that can inform management decisions and measures to minimise impacts on significant species. Detailed management measures associated with the proposed development should be addressed within the Mining Management Plan, as that report includes specific details of the proposed activities. This fauna assessment describes the regional context of the project area, followed by a separate assessment of the ecology in proximity to the project sites. Conclusions are provided in relation to matters of conservation significance identified from desktop research and field investigations, with particular consideration for priority species that may require management actions beyond the general minimal impact standards.



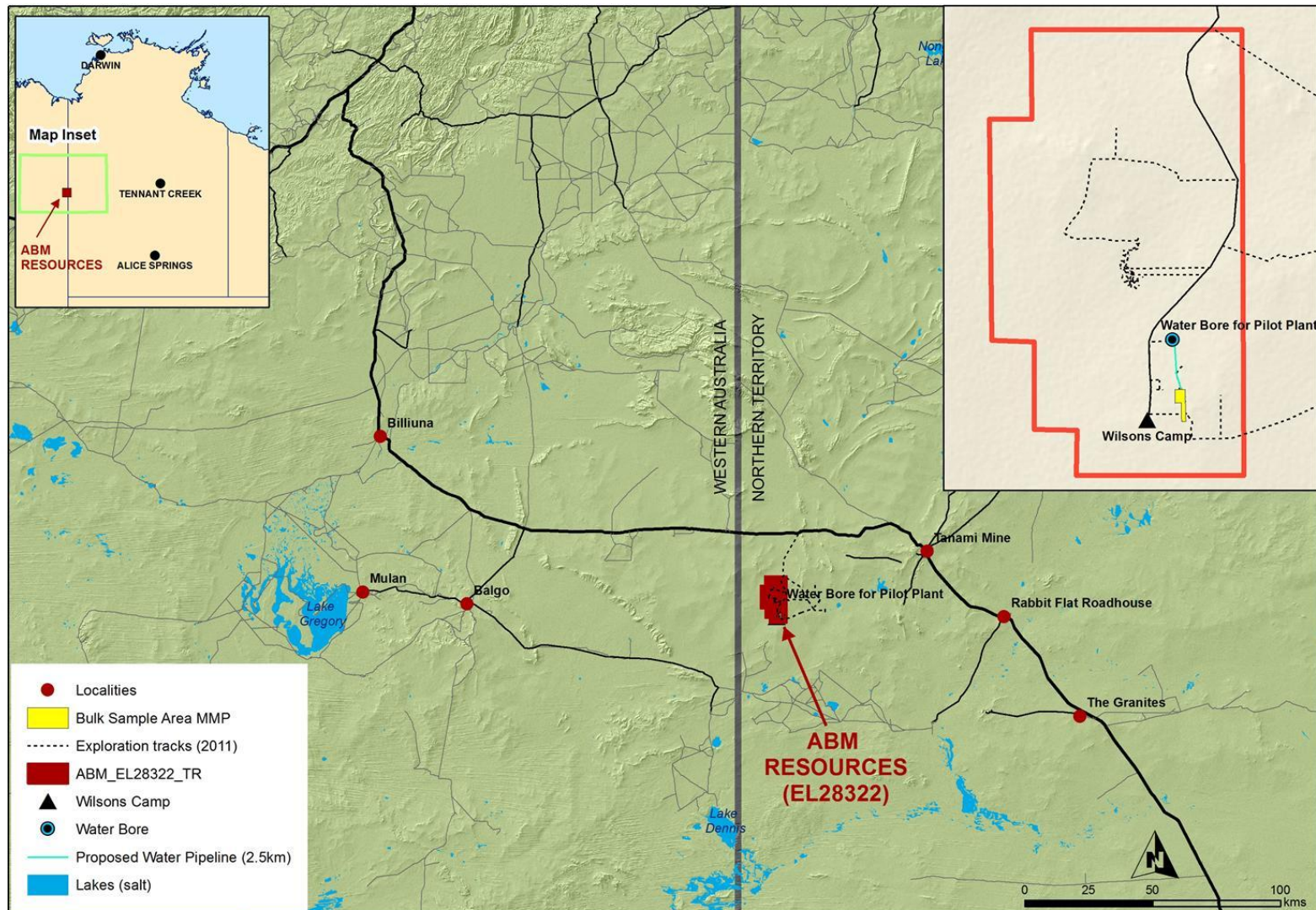


Figure 1. Map of the Old Pirate project area.

## 2 Desktop Review

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### 2.1 Methodology

Prior to designing and conducting an on-ground survey, the most up-to-date understanding of the ecological context for the project area was established through collating information from previous studies and existing datasets. The data enquiry included broad scale reviews of available data pertaining to climate, geomorphology, land systems, land units, vegetation mapping, existing flora and fauna records, known distributions and preferred habitats for flora and fauna species, as well as the current status of disturbance in the region. The resources used are referenced in each subsection.

A review of flora and fauna which are recorded to occur or predicted to occur within the proposed disturbance areas was compiled from the following sources:

- Northern Territory Fauna Atlas (Department of Land Resource Management) (LRM)
- Atlas of Living Australia ([www.ala.org.au](http://www.ala.org.au)) (ALA)
- EPBC Protected Matters Search Tool (<http://www.environment.gov.au/epbc/pmst/index.html>)

Database searches covered the full extent of the potential impact zones (Figure 2).

### 2.2 Climate

The Tanami region has a typical Northern Australian climate with most rainfall events occurring during a 'wet season' between November and April. The summers are hot with temperatures in excess of 40°C and winters are usually mild although nights are cold with occasional overnight minimum temperatures below 0°C. The closest weather station is located at Rabbit Flat, which is approximately 90km to the east of the Old Pirate project. Average annual maximum temperature is 33.6°C, average annual minimum temperature is 16.6°C. Average annual rainfall is 430.7mm (Figure 3).

### 2.3 Land Systems

A "land system" is an area, or group of areas, throughout which there is a recurring pattern of topography, vegetation, and soils (Christian & Stewart, 1953).

The Tanami Desert comprises predominantly semi-arid sand plain. Moderate relief in the form of low hills and rocky outcrops occurs sporadically throughout the Tanami. The relief rarely contains incised drainage. Flat sand-plains predominate but are punctuated by high ranges of both basement complexes and younger sedimentary successions, particularly further south in the Arunta (e.g. Mt Doreen, Reynolds Range, Harts Range). Incised drainage systems are common in these areas of higher relief.

The Old Pirate project occurs within the Coolindie Land System (Figure 4), which is described as level to undulating plains with red sands.

Land systems (scale at 1:250K) provide a general overview of what habitat types occurs within each of the prospects (note that this mapping has not been ground-truthed and is therefore only indicative at this stage). This information (along with vegetation types described in Section 2.4) has been used to determine the likelihood of threatened species occurring in the prospect areas (see Section 2.8).



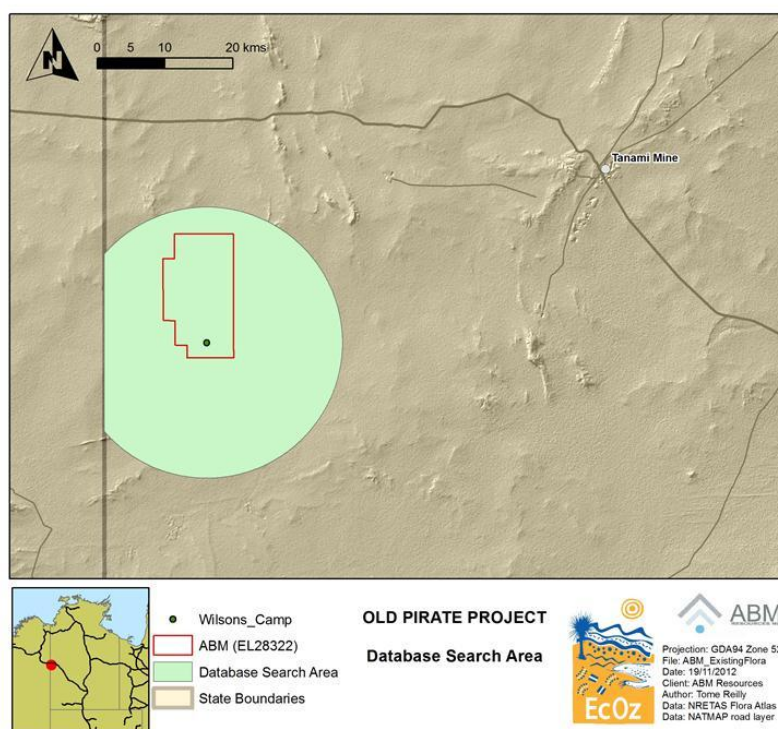


Figure 2. Extent of search area for the desktop study.

### Rabbit Flat Averages 1969-1998

Source : Bureau of Meteorology

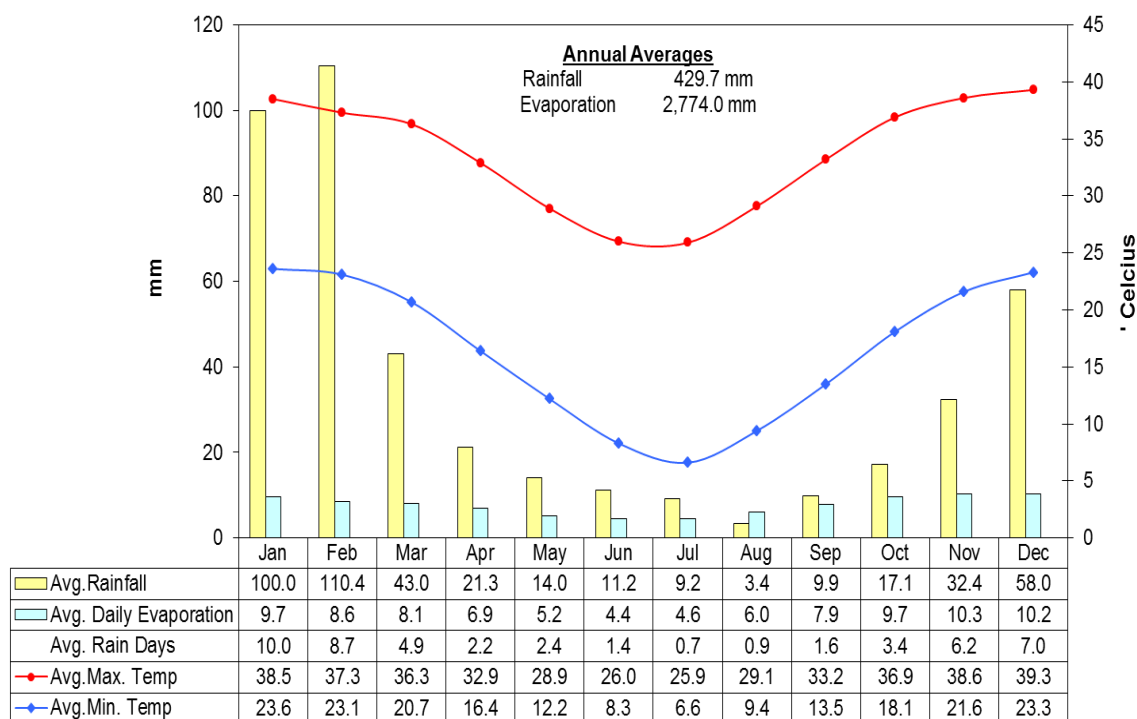


Figure 3. Graphical presentation of weather from Rabbit Flat (Weather Station 015666).

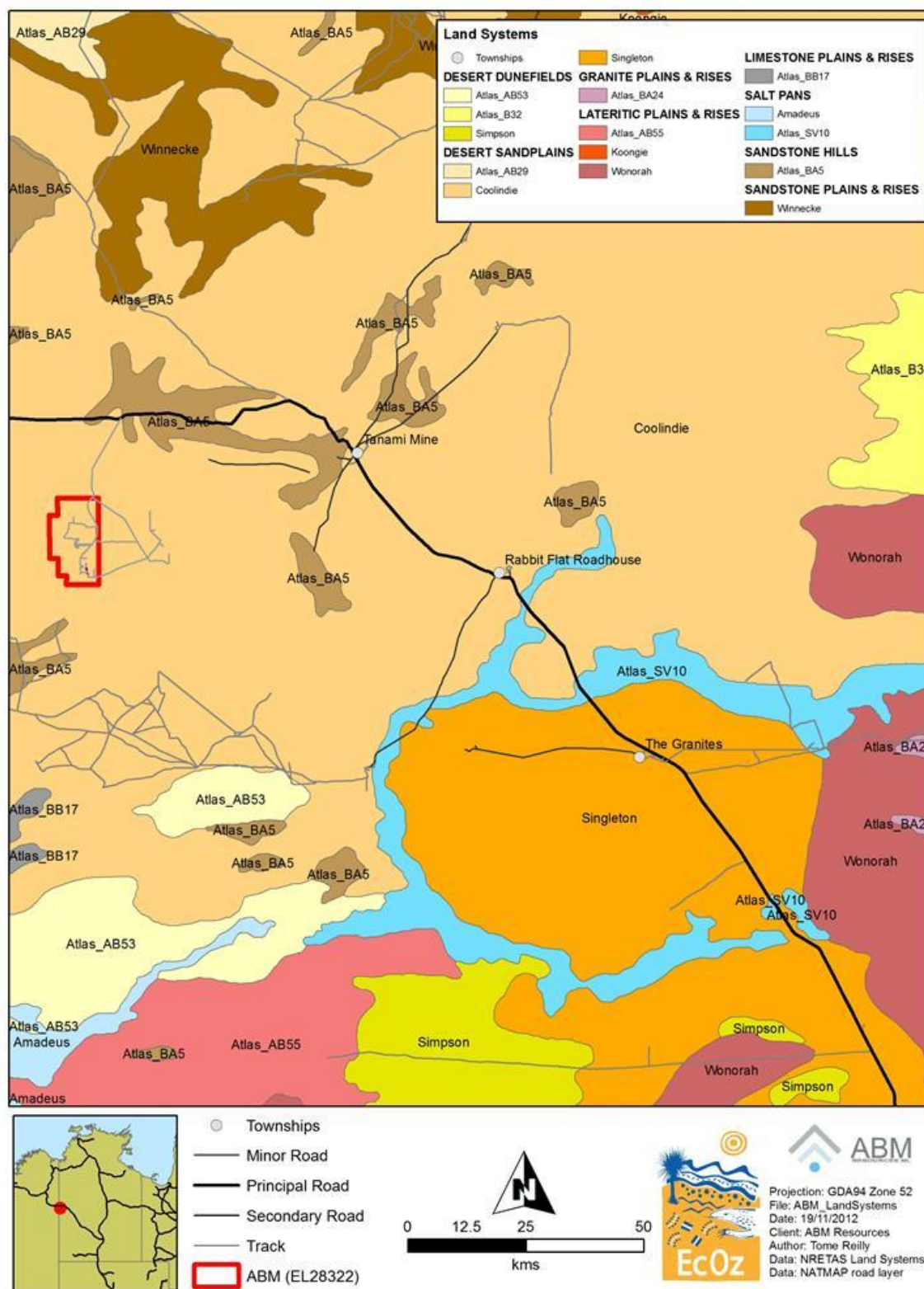


Figure 4. Land Systems of the project area and surrounds.

## 2.4 Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into units of broadly similar landform, geology and biodiversity (Baker *et al.* 2005). The project falls within the Tanami Bioregion (Figure 5. Bioregions and SOCS of the Northern Territory). This bioregion covers all of ABM tenements of the Tanami project and has an area of approximately 258,224km<sup>2</sup>. The terrain is mostly flat red sand plains with exposed rock occurring at hills and ranges within the area. The dominant vegetation is hummock grassland with paths of open *Eucalyptus* forests on a grassey understory.

Despite the arid climate, this bioregion is home to two nationally significant wetlands: Lake Surprise (Yinapaka) and the Lake Gregory area. Additionally there are a range of smaller wetlands over 20 km away.

The majority of the bioregion appears in good condition with little major development. Development in the area is mostly associated with cattle production and mining. Current threats to the bioregion are changed fire regimes and the introduction of exotic plants and animals.

Fourteen threatened species have been recorded in the region, including Greater Bilby (*Macrotis lagotis*), Brush-tailed Mulgara (*Dasycercus blythi*), and one historical record of the Night Parrot (*Pezoporus occidentalis*). This bioregion has experienced some of highest extinction rates for native mammals, with thirteen species now classified as extinct.

The Tanami bioregion includes the catchments of the Barkly Basin, Georgina River, Mackay Basin and the Wison Basin. At the present time, there has not been a formal assessment of the conservation status of ecosystems in this bioregion (Source: Department of Land Resource Management).

## 2.5 Sites of Conservation Significance

Part of the project area occurs close to the South-west Tanami Site of Conservation Significance (SOCS) (Figure 5. Bioregions and SOCS of the Northern Territory) (Ward & Harrison, 2009). This area is recognised as being a stronghold for the Greater Bilby (*Macrotis lagotis*), Brush-tailed Mulgara (*Dasycercus blythi*), Crest-tailed Mulgara (*Dasycercus cristicauda*) and Great Desert Skink (*Liopholis kintorei*). This SOCS also supports several ephemeral wetlands and one plant species (*Marsilea latzii*) that is unique to the area. Due to the Tanami Palaeodrainage System and the relative absence of exotic animals and plants, this area is known to have a high concentration of threatened species (Harrison *et al.* 2009).

## 2.6 Vegetation Types

Based on the National Vegetation Information System 2005 (NVIS 2005), Figure 6 shows the vegetation types for the Old Pirate prospects and surrounding areas. These vegetation types are described in Table 1. Vegetation description of the Old Pirate prospect (NVIS 2005). As with the land systems, vegetation mapping provides a general overview of what may occurs at each of the prospects, noting that this mapping has not been ground-truthed and is therefore only indicative at this stage. This information has been used to determine the likelihood of threatened species occurring in the prospect areas (Section 2.8).

Specifically for the Old Pirate Site GHD (2012) found four types of vegetation present (Figure 7).

- *Aristida holathera*, *Triodia schinzii* and *T. intermedia* low open tussock/hummock grassland with *Corymbia candida* low open woodland.
- Mid open *Triodia basedowii* hummock grassland with *Eucalyptus brevifolia* low open woodland with mid sparse *Acacia lysiphloia* shrubland.
- *Triodia basedowii* and *T. intermedia* mid open hummock grassland with *Acacia minutifolia* and *A. adoxa* var. *adoxo* low open shrubland.
- Mid open *Triodia intermedia* and *T. schinzii* hummock grassland with *Eucalyptus brevifolia* low open woodland with low sparse *Acacia acradenia*, *A. sp.* "Urandangi", and *Senna sericea*.



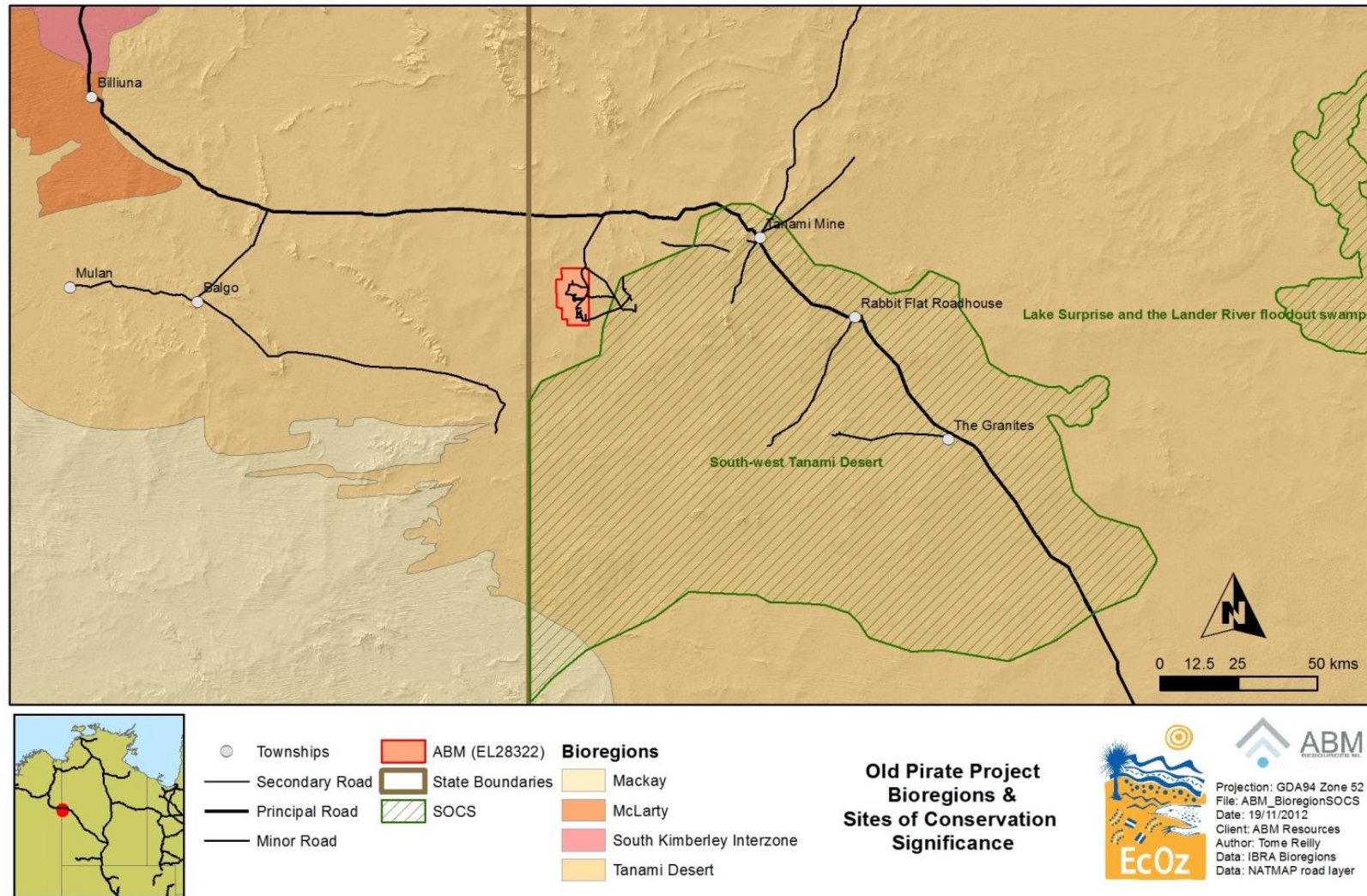


Figure 5. Bioregions and SOCS of the Northern Territory.

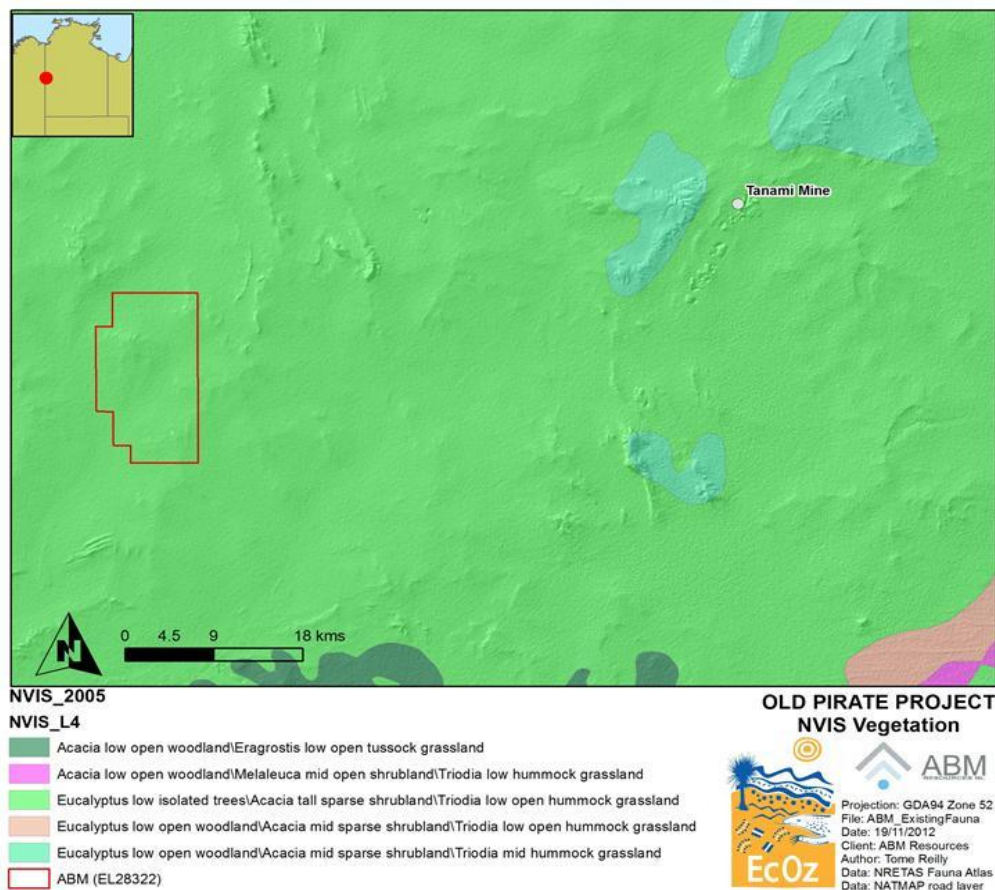
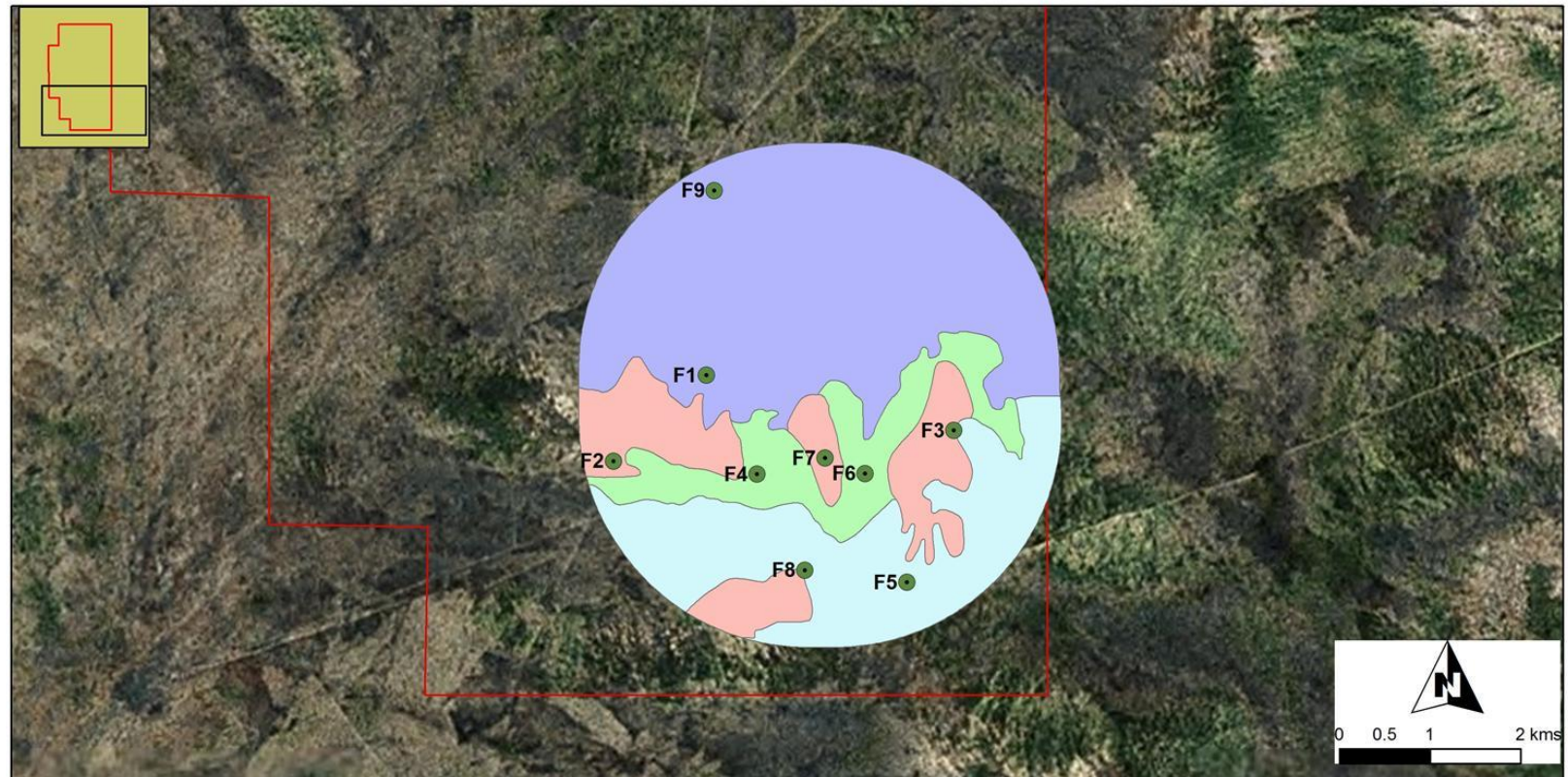


Figure 6. Vegetation types of the project area and surrounds.

Table 1. Vegetation description of the Old Pirate prospect (NVIS 2005).

ID	NVIS Level 4	COMMUNITY
348	Eucalyptus low open woodland\Acacia mid sparse shrubland\Triodia low hummock grassland	UPPER: <i>Corymbia dichromophloia</i> , <i>Corymbia ferruginea</i> , <i>Eucalyptus brevifolia</i> MID: <i>Acacia alleniana</i> , <i>Acacia lysiphloia</i> , <i>Grevillea parallela</i> GROUND: <i>Aristida holathera</i> , <i>Triodia pungens</i>
362	Acacia low open woodland\Melaleuca mid open shrubland\Triodia low hummock grassland	UPPER: <i>Acacia kempeana</i> , <i>Grevillea juncifolia</i> , <i>Grevillea stenobotrya</i> MID: <i>Eucalyptus microtheca</i> , <i>Melaleuca lasiandra</i> , <i>Melaleuca glomerata</i> GROUND: <i>Eragrostis falcata</i> , <i>Triodia pungens</i> , <i>Triodia schinzii</i>
410	Acacia low open woodland\Eragrostis low open tussock grassland	UPPER: <i>Eucalyptus microtheca</i> MID: <i>Acacia victoriae</i> , <i>Carissa lanceolata</i> GROUND: <i>Eragrostis eriopoda</i> , <i>Eragrostis falcata</i> , <i>Eragrostis xerophila</i>
418	Eucalyptus low open woodland\Acacia mid sparse shrubland\Triodia low open hummock grassland	UPPER: <i>Acacia torulosa</i> , <i>Corymbia deserticola mesogeotica</i> , <i>Eucalyptus setosa</i> MID: <i>Acacia stipuligera</i> , <i>Brachychiton paradoxus</i> GROUND: <i>Eragrostis eriopoda</i> , <i>Triodia pungens</i> , <i>Triodia schinzii</i>
868	Eucalyptus low isolated trees\Acacia tall sparse shrubland\Triodia low open hummock grassland	UPPER: <i>Corymbia opaca</i> , <i>Eucalyptus pruinosa</i> , <i>Eucalyptus setosa</i> MID: <i>Acacia stipuligera</i> , <i>Grevillea wickhamii</i> GROUND: <i>Triodia pungens</i> , <i>Triodia schinzii</i> , <i>Yakirra australiensis</i>





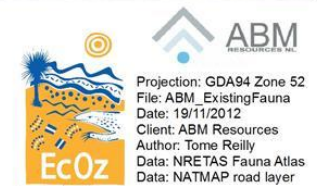
- ABM (EL28322)  
GHD Fauna Survey Sites

#### GHD\_Vegetation

#### Vegetation

- Aristida holathera, Triodia schinzii and T. intermedia low open tussock/hummock grassland with Corymbia candida low open woodland
- Mid open Triodia basedowii hummock grassland with Eucalyptus brevifolia low open woodland with mid sparse Acacia lysiphloia shrubland
- Mid open Triodia intermedia and T. schinzii hummock grassland with Eucalyptus brevifolia low open woodland with low sparse Acacia acradenia, Senna sericea and A. sp. Urandangi shrubland
- Triodia basedowii and T. intermedia mid open hummock grassland with Acacia minutifolia and A. adoxa var. adoxa low open shrubland

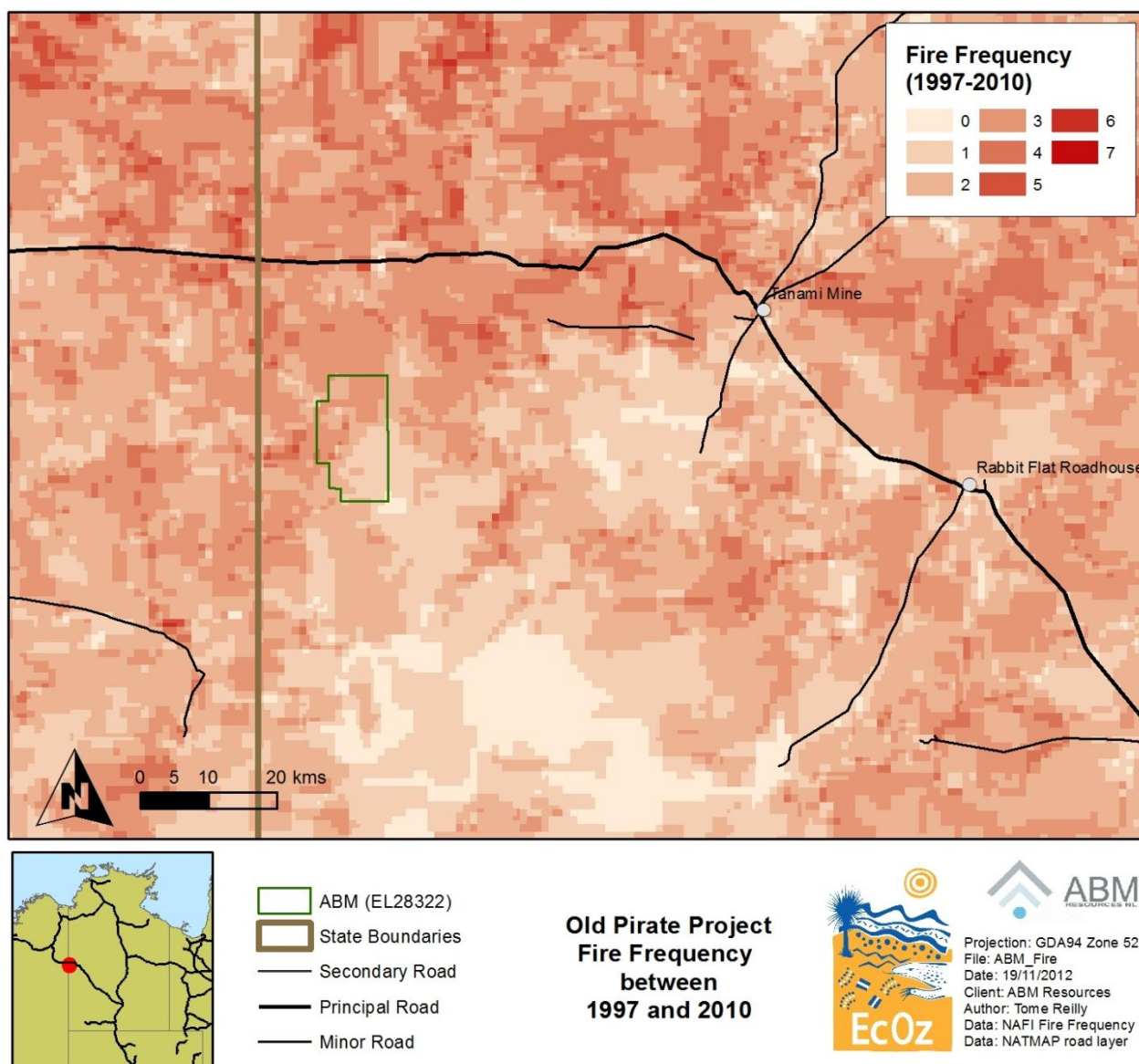
#### OLD PIRATE PROJECT GHD Vegetation Description



**Figure 7. Detailed vegetation description of Old Pirate prospect by GHD (2012).**

## 2.7 Fire Activity

The Old Pirate project area (located in the south western corner of EL28322) experienced a low fire frequency regime between 1997 and 2012, according to fire hot spot data supplied by North Australia Fire Information NAFI website (Figure 8). The data shows that only one fire occurred within that period, although it was observed during the field survey that a fire has since occurred within the project area that appears to have impacted on the vegetation and habitat characteristics of the area. This is consistent with the wet season fauna survey which noted recent fires in the Old Pirate prospect (GHD, 2012). This fire would have had a moderate to high fuel load due, to low fire frequency in the previous 10 year period. The data also shows that fire tends to be more frequent to the north of Old Pirate, which may be due to vegetation type or proximity to human traffic.



**Figure 8. Fire frequency of the Old Pirate project area.**

## 2.8 Biodiversity

The Tanami Desert is known as “one of the most important biological areas in Australia particularly as it provides a refuge for several of Australia’s rare and endangered species” (Gibson, 1986). Drawing on this theme, the area was highlighted in Morton *et al.* (1995) as a refuge for biological diversity in arid and semi-arid Australia. This diversity was initially thought to be related to the presence of palaeodrainage habitat which supports richer vegetation than the surrounding area. However, a more recent study suggested that diversity is high throughout the Tanami, and species richness is probably determined more by local seasonal factors (Paltridge & Southgate, 2001).

### 2.8.1 Existing Fauna & Flora Records

Prior to the large scale biological surveys by Gibson (1986), specific records were mostly non-existent due to the fact that most early explorers tended to skirt around the edge of the Tanami. In the 1960’s, major biological surveys were undertaken in an area previously known as the Tanami Desert Wildlife Sanctuary. Later surveys in the 1970’s and 1980’s were mostly focussed on the study of rare and endangered wildlife in the area (Gibson, 1986).

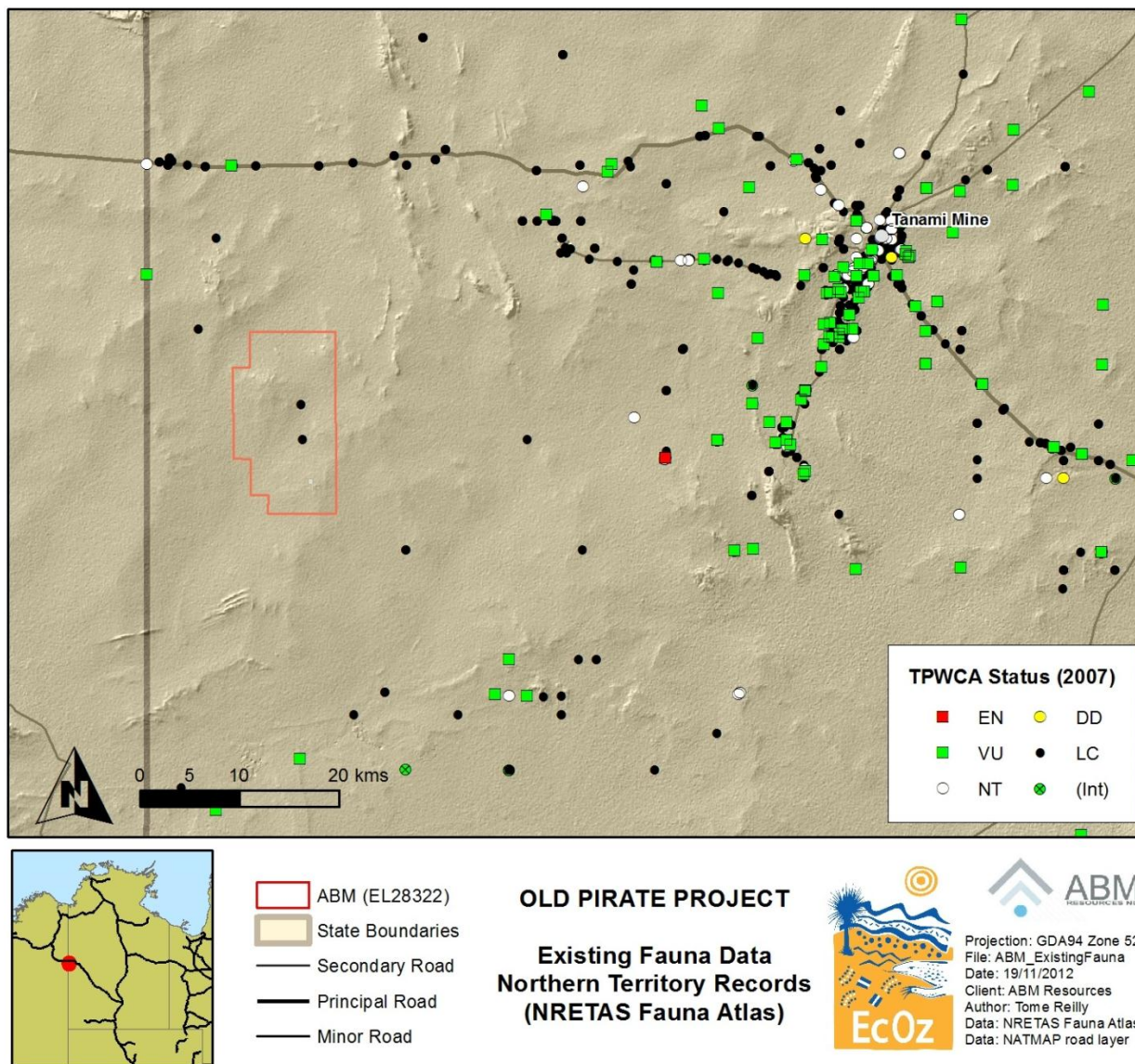
A flora and fauna survey was conducted by GHD Consultants of the Old Pirate project area in April 2012 (commissioned by ABM), although this data has yet to be included in the NT Fauna Atlas database (which is mapped in Figure 9).

Fauna (Figure 9) and Flora (Figure 10) Atlas records for the local area were examined and highlighted that the majority of species records and survey effort is concentrated around Tanami Mine and The Granites, which are located 120 km from the project area. Very little survey effort has occurred within 20km of the Old Pirate project area. It should be noted that sometimes many records are allocated to a single coordinate, which skews the interpretation of the map provided in Figures 9 and 10.

It should also be noted that The Granites, Tanami Mine, and the Central Land Council are also involved in the Tanami Regional Biodiversity Monitoring Program (RBM Program). This program targets land systems and land units in close proximity to the mining or exploration areas with the aim of monitoring impact on species biodiversity over time. It may therefore be useful for ABM to approach Newmont and CLC to discuss the possibility of including sites within EL28322.

There were also several environmental studies commissioned by Normandy in the mid to late 1990s in the vicinity of EL28322 (Preece, 1995; EcOz, 1996).





**Figure 9. NT ATLAS MAP – Fauna.**

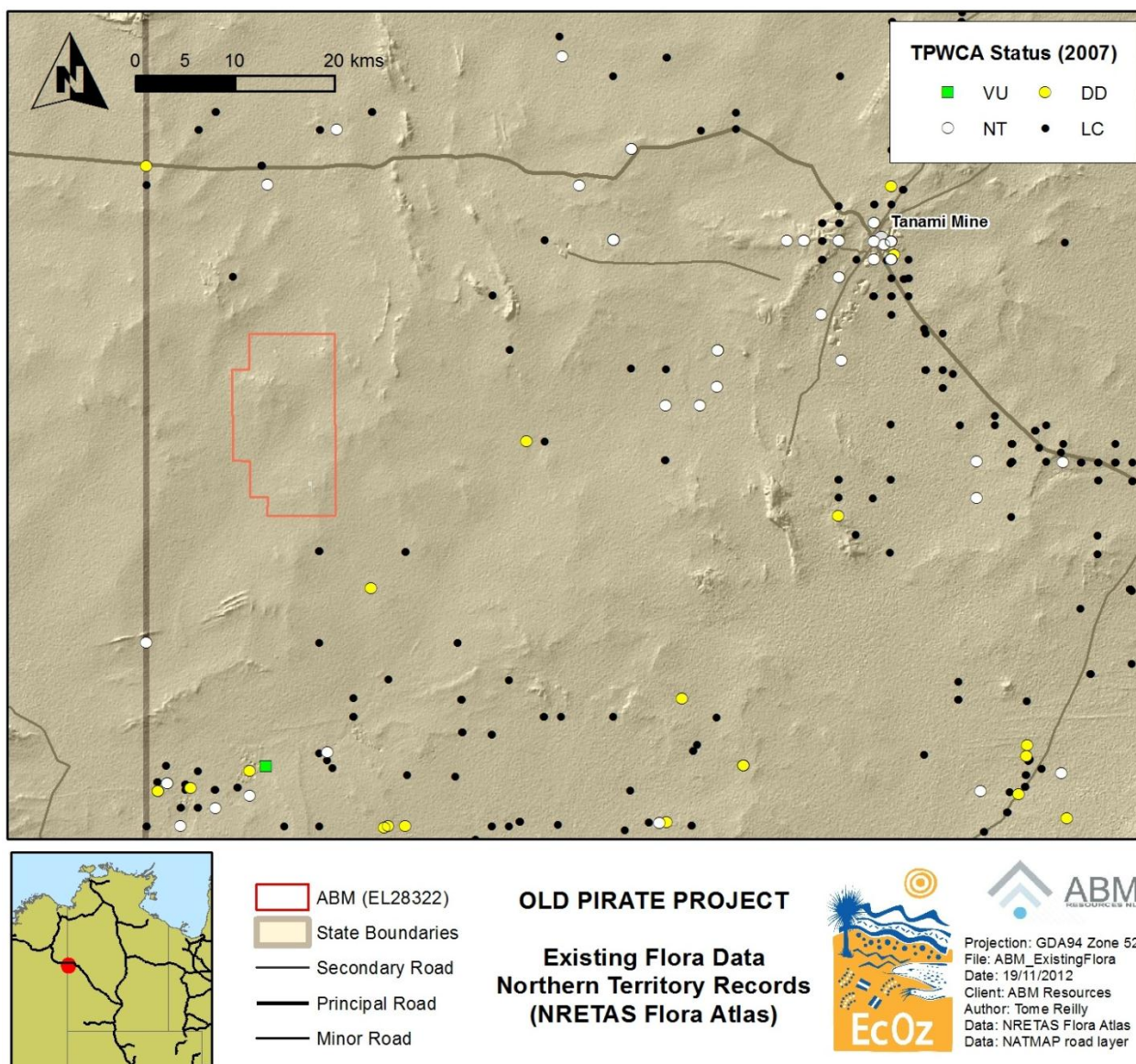
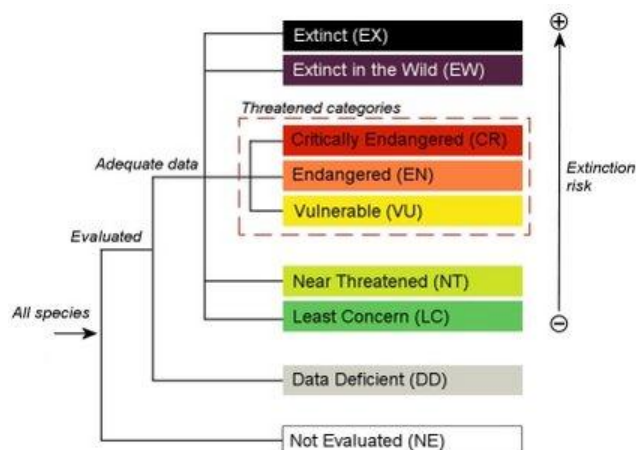


Figure 10. NT ATLAS MAP – Flora.



## 2.8.2 Threatened Species

The International Union for the Conservation of Nature (IUCN) nominates a set of criteria used to identify species at risk to extinction used to define categories of risk (Figure 11).



**Figure 11. The IUCN Red List of categories of risk for threatened species.**

(Source: [http://www.eoearth.org/article/IUCN\\_Red\\_List\\_Categories\\_and\\_Criteria](http://www.eoearth.org/article/IUCN_Red_List_Categories_and_Criteria))

These criteria and categories are used by both the NT Government to identify threatened species and habitat which are listed under the Territory Parks and Wildlife Conservation Act (TPWC), and the Commonwealth Government to identify nationally threatened species under the Environmental Protection and Biodiversity Act (EPBC). The focus of this report is on the former and so for the purpose of this report flora and fauna species are identified as threatened if listed as such under the TPWC Act.

### Threatened Fauna and Flora

Based on existing records and a review of the biology of the state and Commonwealth-listed threatened species, approximately 21 threatened species could exist at the Old Pirate project area (Table 2). Likelihood of occurrence was determined based on the criteria listed below which are based on a combination of available records and ecological knowledge of the area. These likelihood categories are also used by the EPBC Act, and has therefore been adopted in attempt to make similar comparisons to those listings.

- Likely – These species are listed if suitable habitat and records exist near the area.
- May – These species are listed if suitable habitat and records for the bioregions exist.
- Unlikely – These species are listed if no suitable habitat was present, are unknown from the area, or are locally extinct.

The threatened species that may be present fall into the following categories under the TPWC Act (Table 2).

- Extinct – Nine species (all unlikely to occur within the project area)
- Endangered – Two species (both unlikely to occur within the project area)
- Vulnerable – Ten species. (four unlikely; three may, three likely to occur within the project area)

**Table 2. Summary of Threatened Species that could occur within the Old Pirate project area.**

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>BIRDS</b>					
Australian Bustard <i>Ardeotis australis</i>		VU	<p><b>Habitat:</b> This species occurs in relatively open country with a preference for grasslands (Ziembicki 2007). Throughout its range it has also adapted to some types of crop cultivation (Downs &amp; Speedie 1982).</p> <p><b>Distribution:</b> The Australian Bustard is widespread in Australia and considered to be generally scarce in the Northern Territory. This is probably due to localised fluctuations that probably occur due to climatic variables (Ziembicki 2007).</p>	<p>Previously the widespread decline of this species was attributed to a range of factors, but little information exists regarding these supposed threats (Ziembicki 2007). Within the Northern Territory it is speculated that hunting may be a greater threat to this species than before (Ziembicki 2007).</p> <p>Proposed downgrade of TPWC status to Least Concern.</p>	Likely
Emu <i>Dromaius novaehollandiae</i>		VU	<p><b>Habitat:</b> Due to this species large range it is found in a range of habitats, but prefers grasslands and open woodland (Morcombe 2004).</p> <p><b>Distribution:</b> The Emu is widespread throughout Australia and appears to be scarcely populated in the drier desert and top end regions of the Northern Territory (Marchant &amp; Higgins 1990).</p>	<p>Decline in Emu populations in the Northern Territory is presumable linked to changed fire regimes which can change food supplies and destroy incubating eggs (Taylor &amp; Woinarski 2006).</p> <p>Proposed downgrade of TPWC status to Near Threatened</p>	May
Princess Parrot <i>Polytelis alexandrae</i>	VU	VU	<p><b>Habitat:</b> This species occurs in the swales between sand dunes with a shrub layer of vegetation and scattered trees (Pavey, 2006a)</p> <p><b>Distribution:</b> In the Northern Territory this species is found in the southern section of the Tanami Desert. It also occurs patchily throughout the arid interior of Australia (Pavey, 2006a).</p>	<p>At the present time there is no known cause in the decline of this species. It is proposed that introduced herbivores and changes in the fire regime are probably causes in the decline (Pavey, 2006a).</p>	Unlikely

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>BIRDS</b>					
Australian Painted Snipe <i>Rostratula australis</i>	VU	VU	<p><b>Habitat:</b> Nomadic. Inhabits fringes of permanent and temporary wetlands, swamps and inundated grasslands (Taylor <i>et al.</i> 2007).</p> <p><b>Distribution:</b> This species is scattered across Australia with no predictable occurrence (Rogers 2001). In the Northern Territory it is known from a range of localities with no known resident sites (Taylor <i>et al.</i> 2007).</p>	The main threat to this species is the loss of wetlands from degradation by cattle; however within the Northern Territory there is no substantial data to assess this (Jaensch, 2003).	Unlikely
<b>MAMMALS</b>					
Burrowing bettong (inland) <i>Bettongia lesueri graii</i>	EX	EX	<p><b>Habitat:</b> This species historically lived in dune and sandplain habitat where it excavated large burrows that can still be found today (Pavey, 2006b)</p> <p><b>Distribution:</b> Historically this species was widespread throughout arid Australia, currently it is extinct on the mainland with two island subspecies occurring off Western Australia (Pavey, 2006b).</p>	This species is known to be extinct in the Northern Territory since the 1950's. The decline in this species is thought to be associated with introduced carnivorous mammals (Pavey, 2006b).	Unlikely
Brush-tailed bettong <i>Bettongia penicillata</i>	EX	EX	<p><b>Habitat:</b> This species originally lived in spinifex desert grasslands, but also occurred in forest habitats (Pavey, 2006c).</p> <p><b>Distribution:</b> Historically this species was found in the Great Sandy and Tanami Deserts in the Northern Territory (Finlayson, 1961; Burbidge <i>et al.</i> 1988). Currently it is now only found in dry sclerophyll forests in south-western Western Australia (Pavey, 2006c).</p>	This species is known to be extinct in the Northern Territory since the 1950's. The decline in this species is thought to be associated with introduced carnivorous mammals, habitat degradation, and a changed fire regime (Pavey, 2006b).	Unlikely

**Table 2 (continued). Summary of Threatened Species that could occur within the Old Pirate project area.**

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>MAMMALS</b>					
Pig-footed Bandicoot <i>Chaeropus ecaudatus</i>	EX	EX	<b>Habitat:</b> This species is presumed to have been a plains dweller, but due to its extinction nothing is known (Pavey, 2006d). <b>Distribution:</b> This species once had a wide range in the arid interior of Australia (Pavey, 2006d).	The Pig-footed Bandicoot is declared extinct in the Northern Territory. The decline is thought to be attributed to predation by introduced predators, habitat change, and changes in the fire regime (Pavey, 2006d).	Unlikely
Brush-tailed Mulgara <i>Dasymercus blythi</i>	VU	VU	<b>Habitat:</b> This species has been found in a wide array of arid habitats but is more likely to be encountered in mature hummock grassland of Spinifex (Pavey <i>et al.</i> 2006a). <b>Distribution:</b> Due to considerable taxonomic confusion the exact distribution of this species and <i>D. cristicauda</i> is not well known in the Northern Territory (Pavey <i>et al.</i> 2006a) Confirmed records include the Simpson and Tanami Deserts with	At the present time it is unknown what factors are causing a decline in this species. It is likely that habitat degradation caused by a change in fire regimes and the introductions of herbivorous mammals are likely causes (Pavey <i>et al.</i> 2006a).	Likely
Crest-tailed Mulgara <i>Dasymercus cristicauda</i>	EN	VU	<b>Habitat:</b> This species is known to prefer sand dune habitats that are vegetated with canegrass and spinifex (Masters, 1997). <b>Distribution:</b> Due to considerable taxonomic confusion the exact distribution of this species and <i>D. blythi</i> is not well known in the Northern Territory. The majority of the records are from the Simpson Desert with confirmed historical records from Charlotte Waters and Crown Point in the Northern Territory (Pavey <i>et al.</i> 2006b).	At the present time it is unknown what factors are causing a decline in this species. It is likely that habitat degradation caused by a change in fire regimes and the introductions of herbivorous mammals are likely causes (Pavey <i>et al.</i> 2006b).	Unlikely

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>MAMMALS</b>					
Western quoll <i>Dasyurus geoffroii</i>	VU	EX	<p><b>Habitat:</b> This species is known to inhabit mallee shrublands and jarrah woodlands of south-western Western Australia (Pavey, 2006e).</p> <p><b>Distribution:</b> This species once had an extensive range from western Queensland and New South Wales to West Australia where it now only occurs in the southwest of this state. Historically it occurred throughout the arid interior of the Northern Territory in a range of habitats (Pavey, 2006e)</p>	This species is known to be extinct in the Northern Territory since the 1960's. The decline in this species is thought to be associated with habitat alteration caused by changes in the fire regime. Additionally competition with introduced carnivorous mammals may also have been a factor (Pavey, 2006e).	Unlikely
Golden Bandicoot <i>Isodon auratus</i>	VU	EN	<p><b>Habitat:</b> Historically this species occupied desert country in a range of habitats. On Marchinbar Island it is associated with heath and shrub land (Southgate <i>et al.</i> 1996).</p> <p><b>Distribution:</b> This species was once widespread across the Northern Territory, but is now known only from Marchinbar Island (Palmer &amp; Woinarski, 2006).</p>	At the present time no single factor is known to have caused the decline in this species. The decline in this species is thought to be predation by introduced carnivorous mammals. Changed fire regimes may also affect this species (Palmer & Woinarski, 2006).	Unlikely
Mala <i>Lagorchestes hirsutus</i>	EN	EX	<p><b>Habitat:</b> This species was known to inhabit a broad range of woodlands and spinifex grassland. Studies from the last wild population in the Tanami Desert found that Mala were only in a very specialised spinifex habitat (Lundie-Jenkins, 1993)</p> <p><b>Distribution:</b> The Mala only occurs on Trimouille Island, Western Australia as the last wild colony was killed by a wildfire in 1992 (Pavey, 2006f).</p>	The Mala is Extinct in the Wild in the Northern Territory. It is presumed that this species decline is linked to the effects of introduced carnivorous and herbivorous mammals and a changed fire regime (Pavey 2006f).	Unlikely
Greater Bilby <i>Macrotis lagotis</i>	VU	VU	<p><b>Habitat:</b> This species is found in hummock grasslands on sandy soils with a preference for drainage lines (Southgate, 1990).</p> <p><b>Distribution:</b> Historically this species was widespread in arid Australia. Currently in the Northern Territory it is most abundant in the Tanami Desert (Pavey, 2006g).</p>	The decline in this species is thought to be attributed to predation by introduced carnivorous mammals, competition with introduced herbivorous mammals and changed fire regimes (Southgate, 1987; Southgate & Carthew, 2006; Pavey 2006g).	Likely



**Table 2 (continued). Summary of Threatened Species that could occur within the Old Pirate project area.**

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>MAMMALS</b>					
Lesser Bilby <i>Macrotis leucura</i>	EX	EX	<p><b>Habitat:</b> This species occupied spinifex and canegrass grassland associated with sandplain and dune habitats (Burbidge et al. 1988; Johnson &amp; Southgate, 1990).</p> <p><b>Distribution:</b> This species was once known to inhabit two areas in the arid interior of Australia. In the Northern Territory it was known from the Territory side of the Great Sandy Desert (Johnson &amp; Southgate, 1990).</p>	This species appears to have become extinct in the Northern Territory since the 1960's. The decline in this species is thought to be associated with habitat alteration caused by changes in the fire regime. Additionally predation and competition by introduced carnivorous and herbivorous mammals may also have been a factor (Pavey, 2006h).	Unlikely
Southern Marsupial Mole <i>Notoryctes typhlops</i>	EN	VU	<p><b>Habitat:</b> This species is found in sandy deserts where it is mostly associated with dunes, sandy plains and river flats (Pavey, 2006i).</p> <p><b>Distribution:</b> This species occurs in central Western Australia, northern South Australia and southern Northern Territory. Within the Northern Territory it has been found as far north as Barrow Creek and appears to not appear in the Simpson Desert (Pavey, 2006i).</p>	Due to its secretive nature and apparent decline this species may not be that uncommon as some recent surveys have found the species to be common in some areas. Proposed threats to this species include predation by introduced mammalian carnivores, soil compaction, and changes to overall food abundance due to changed fire regimes and grazing (Pavey, 2006i).	May
Crescent Nail-tailed Wallaby <i>Onychogalea lunata</i>	EX	EX	<p><b>Habitat:</b> The biology of this species is restricted to aboriginal knowledge that recorded this species inhabiting woodland habitats where it ate grass and sheltered under trees during the day (Burbidge, 1988)</p> <p><b>Distribution:</b> Historically this species occupied arid inland areas of the Northern Territory, South Australia, and Western Australia (Pavey, 2006j).</p>	This species appears to have become extinct in the Northern Territory since the 1960's. The decline in this species is thought to be associated with habitat alteration caused by changes in the fire regime. Additionally predation and competition by introduced carnivorous and herbivorous mammals may also have been a factor (Pavey, 2006j).	Unlikely

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>MAMMALS</b>					
Desert bandicoot <i>Perameles eremiana</i>	EX	EX	<p><b>Habitat:</b> The biology of this species is restricted to aboriginal knowledge that recorded this species inhabiting sandplain and dune environments with supporting grassland (Burbidge, 1988).</p> <p><b>Distribution:</b> Historically this species was widespread in arid Australia. Within the Northern Territory it formerly occurred in the Tanami Desert, Uluru area, and MacDonnell Ranges (Pavey, 2000k)</p>	This species is known to be extinct in the Northern Territory since the 1960's. The decline in this species is thought to be associated with habitat alteration caused by changes in the fire regime. Additionally predation by introduced carnivorous mammals may also have been a factor (Pavey, 2006k).	Unlikely
Black-footed Rock Wallaby <i>Petrogale lateralis</i>	VU	NT	<p><b>Habitat:</b> This species occurs in upland rocky areas with associated steep slopes (Pavey, 2006l).</p> <p><b>Distribution:</b> In the Northern Territory this species is mostly found in the MacDonnell Ranges, but also occurs throughout the arid southern end of the Northern Territory (Pavey, 2006l).</p>	The decline in this species is known to be associated with predation from introduced carnivorous mammals. Additionally the degradation of habitats by introduced herbivorous mammals is also a factor (Pavey, 2006l).	Unlikely
Red-tailed Phascogale <i>Phascogale calura</i>	EN	EX	<p><b>Habitat:</b> This species is now restricted to pockets of woodland in south-western Western Australia (Pavey, 2006m). Historically this species occupied hilly country where it sheltered in hollow trees (Burbidge <i>et al.</i> 1988)</p> <p><b>Distribution:</b> This species once had an extensive range in the Northern Territory, occurring in the arid interior to as far north as Tennant Creek (Parker, 1973; Burbidge <i>et al.</i> 1988)</p>	This species is known to be extinct in the Northern Territory since the 1950's. The decline in this species is thought to be associated with habitat alteration caused by changes in the fire regime. Additionally predation by introduced carnivorous mammals may also have been a factor (Pavey, 2006m).	Unlikely
Central Rock-rat <i>Zyomys pedunculatus</i>	EN	EN	<p><b>Habitat:</b> This species is known to inhabit a range of grasslands and woodlands in the MacDonnell Ranges (Pavey, 2007n)</p> <p><b>Distribution:</b> Historically this species was once widespread in the arid regions of the Northern Territory and Western Australia (Baynes &amp; Johnson, 1996). Currently it has been rediscovered in the MacDonnell Ranges at a few sites (Pavey, 2007n).</p>	At the present time no single factor is known to have caused the decline in this species (Cole, 2000). The decline in this species is thought to be predation by introduced carnivorous mammals. Changed fire regimes may also affect this species (Pavey, 2007n).	Unlikely

Threatened Species	EPBC Status	TPWC Status	Habitat & Distribution	Main Threat and Threatened Species Status	Likelihood of presence
<b>REPTILES</b>					
Great Desert Skink <i>Liopholis kintorei</i>	VU	VU	<b>Habitat:</b> This species occurs in hummock grassland and specifically in the Tanami desert it occupies paleodrainage lines (Pavey, 2006o). <b>Distribution:</b> This species occurs in the western deserts of the Northern Territory and South Australia and parts of the Gibson and Great Sandy Desert in Western Australia (Pavey, 2006o).	At the present time there does not appear to be a single factor associated with the decline of this species. Potential threats could include habitat destruction, predation from feral animals, and changed fire regimes (Pavey, 2006o).	May
Floodplain Monitor <i>Varanus panoptes</i>	-	VU	<b>Habitat:</b> Broad range of habitats from riparian to savannah woodlands (Christian 2004). <b>Distribution:</b> This species is found across northern Australia with a disjunct population in Western Australia (Christian 2004).	This species experiences significant declines due to cane toad poisoning (Doody <i>et al.</i> 2009).	Unlikely

### 2.8.3 Introduced Species

A large range of introduced species have been previously recorded from this bioregion (Table 3) (Baker *et al.* 2005). Feral animal species are known to cause various impacts to the environment (Table 3) with the Feral Cat (*Felis catus*), European Rabbit (*Oryctolagus cuniculus*) and European Red Fox (*Vulpes vulpes*) listed as a Key Threatening Process under the EPBC act.

**Table 3. Introduced species that may occur near the Old Pirate project area.**

Introduced Species	Status	Recorded Impacts
Dog <i>Canis lupus</i>	Widespread	Known to prey on many species of native animals (Corbett, 2007)
Arabian Camel <i>Camelus dromedaries</i>	Widespread	Known to cause an impact to native vegetation (Dorges & Heucke, 2007).
Feral Donkey <i>Equus asinus</i>	Uncommon	Known to cause extensive erosion (Choquenot, 2007).
Feral Horse <i>Equus caballus</i>	Uncommon	Known to damage native plants and the shelters of native animals (Berman, 2007).
Feral Cat <i>Felis catus</i>	Widespread	Known to prey on many species on native animals (Denny, 2007).
House Mouse <i>Mus musculus</i>	Widespread	Vector for some diseases (Singleton, 2007) but there does not appear to be any documented threats to biodiversity from this species
European Rabbit <i>Oryctolagus cuniculus</i>	Uncommon	Known to cause excessive damage to native plants (Williams & Myers, 2007).
European Red Fox <i>Vulpes vulpes</i>	Present	Known to prey upon a range of native species (Catling & Coman, 2007).

## 3 Terrestrial Fauna Survey

### 3.1 Methodology

The methods for fauna survey (including habitat descriptions) followed the *Northern Territory Survey Methods for Flora and Fauna Surveys Used for Standard Biodiversity Unit Survey Sites* (an unpublished report of NRETAS, 2008). EcOz also maintains regular communication with NT Government specialists to ensure that our survey method is consistent and up to date with other research and surveys in the Northern Territory. Applying standard approaches permits some degree of relating species presence with particular habitat types. It also allows for explicit assumptions about the likely diversity present in similar habitats which have not been surveyed, and allows some comparison with surveys conducted in different locations which have also been assessed using the same standard.

The survey involved a three night trapping and searching program (26<sup>th</sup> -28<sup>th</sup> September) by three ecologists from EcOz. Sites were set within a 50m by 50m quadrat (or similar in transect formation). Where possible, two areas of the same habitat type, located at least 500m apart, were surveyed to account for variability with the same 'category' of habitat. This methodology is a standard approach for fauna surveys in the northern bioregions of the Northern Territory. Fauna survey techniques are detailed in sections below.

All surveys were undertaken under Wildlife permit no. 43782, which require animal ethics approval and entire species datasets to be provided to the NT Government for inclusion in the Flora and Fauna Atlas.

#### 3.1.1 Survey Timing

In order to account for seasonal changes in species diversity, the survey was conducted during the late dry season (September 2012) to complement the wet season survey dataset, which followed a period of consistent summer rainfall (GHD, April 2012) (Figure 12). This dry season survey had 0 mm of rainfall in the preceding 5 months, whilst the wet season survey had a total of 295.6 mm of rainfall in the 7 months prior to that survey.

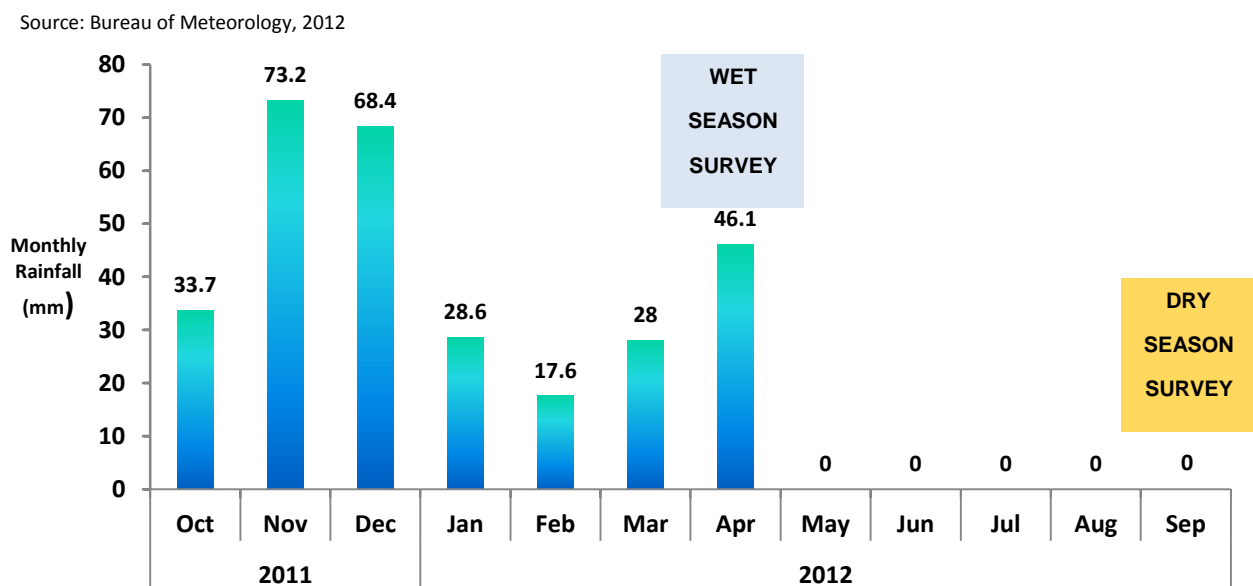


Figure 12. Monthly Rainfall at Rabbit Flat since September 2011.

### 3.1.2 Site Selection

Site selection aimed to represent the variation in habitat and vegetation types within the proposed development zones of the Old Pirate project, such as the bulk sampling trenches, residue storage facility/trial processing area, access roads and camp. Existing vegetation mapping from the wet season survey and a review of recent aerial imagery assisted with the pre-selection of survey sites.

The previous wet season survey did not select sites that specifically targeted the bulk sampling program, although it did cover the main habitat and vegetation types in the local area to gain in a representative account of species at that time of year. Therefore, this dry season survey was used to try to capture seasonal variability in fauna species assemblages and also refine the survey data to the specific area of interest (i.e. Old Pirate).

The dry season survey included 7 'primary' survey sites and 5 'secondary' survey sites (Figure 13 & 14). Primary survey sites includes the full suite of trapping, habitat descriptions and active search methods, while the secondary survey sites only included brief habitat descriptions and active searching.

### 3.1.3 Site Layout

The layout of traps at each survey quadrat is based on the standard NT fauna survey guidelines which involves a 50m x 50m quadrat (or equivalent) comprising:

- Twenty Elliott traps
- Four cage traps
- Four pitfall traps, with 10m of drift fence
- Eight funnel traps, set along pitfall drift fences

Pitfall traps were 20L white plastic buckets which were dug to ground level and set with 10m of drift-fence. Where possible, the pits were located across different microhabitats within the quadrat. Funnel traps were set on the end of the drift fence. Silver reflective thermafoil (roof insulation) were set over pits and funnel traps to protect animals from dehydration and predation from raptors. The pits and funnels were opened for the duration of the survey (three nights and three days) and were checked early each morning and mid-afternoon.

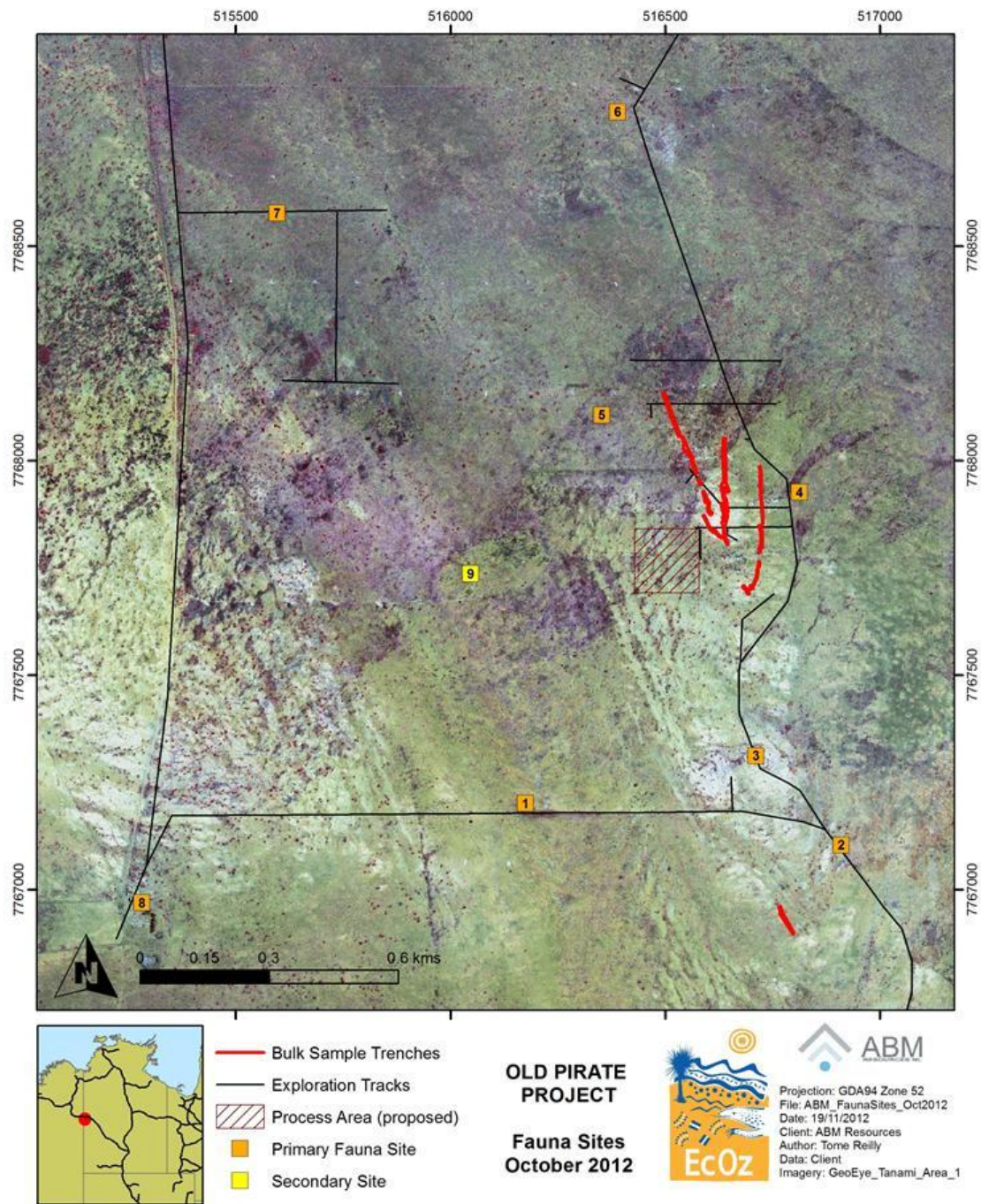
The Elliott and cage traps were baited each afternoon, opened overnight and closed for the duration of the day. Trapping occurred for a three night period, and the bait used was a mixture of oats, peanut butter, and sardines in oil. Bait was removed from traps during the day to reduce ant attraction to the trapping area.

All trapped animals were identified and released near the capture point. The purpose of this survey was to investigate species diversity rather than population size so the mark capture recapture method was not used. Genetic samples were acquired for species which were of special note.

### 3.1.4 Bird Survey

Birds were surveyed within a 100x100m area, with the trapping quadrat being central. Bird counts were carried out over 15 minute blocks using binoculars and call recognition during the early morning (6am – 9:30am), late afternoon (3:30pm – 5pm) and one night (after 7:30pm). Only birds within the quadrat were counted as using the survey site – birds merely flying across or overhead or situated nearby were counted as incidental records. Raptors were included in the bird count if they were hunting overhead.





**Figure 13. Fauna Survey Sites – October 2012**



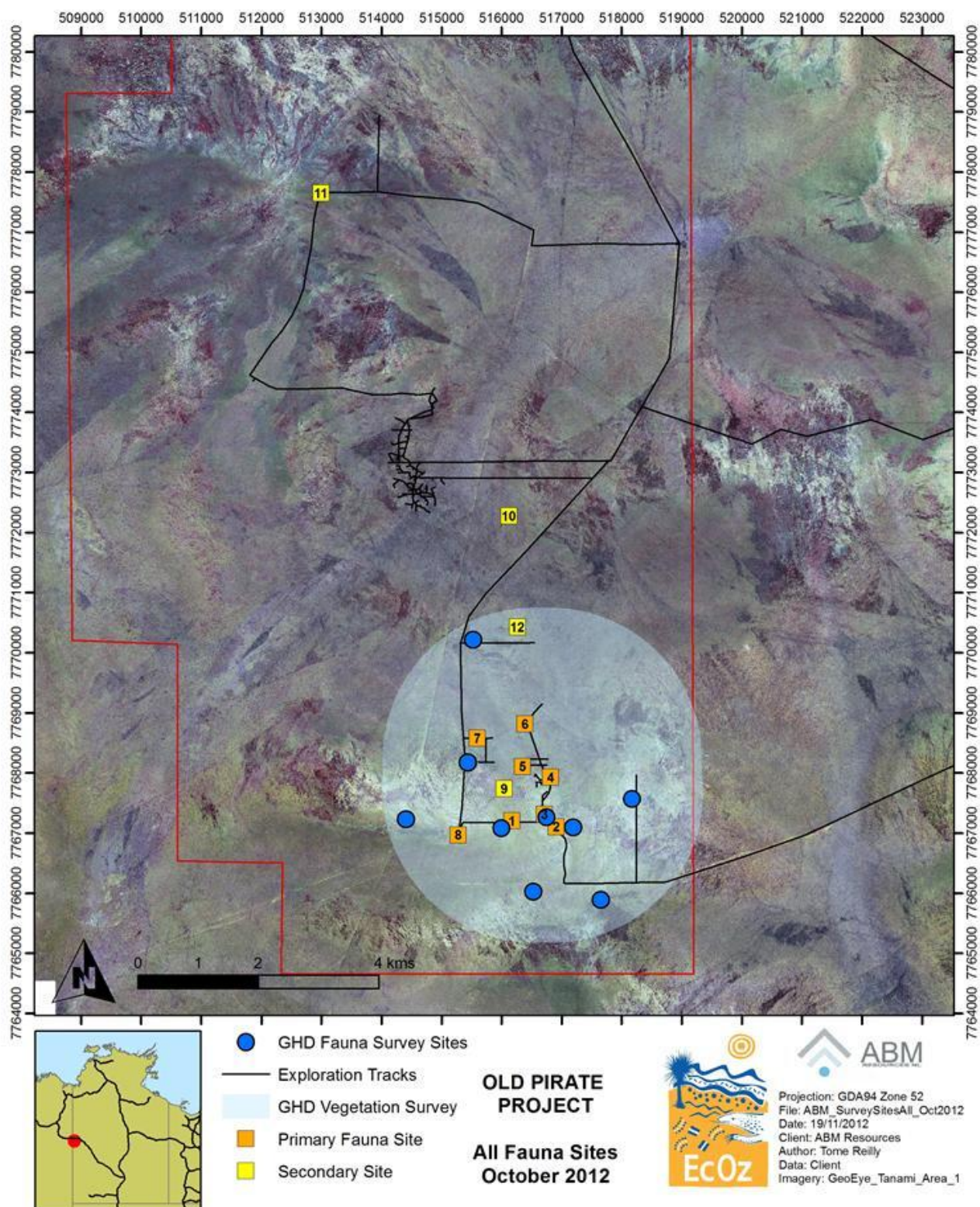


Figure 14. All Survey Sites (full and secondary sites) – October 2012

### 3.1.5 Bat Survey

Bat species present were assessed by using Anabat SD1 Bat Detector, which was set up to record data either overnight or for the early part of the evening (for one night only) at a central location within three of the survey areas.

Dr. Kyle Armstrong from Specialised Zoological was contracted to analyse all bat call sequences and provide a summary report noting bat species presence.

### 3.1.6 Active Searching

Survey sites were actively searched five times for reptiles, mammals, and their scats and signs, including three daytime searches (morning, midday, and late afternoon) and two nocturnal searches.

Active searches lasted for 20 minutes and involved:

- Turning rocks and logs, raking through leaf litter and grass, looking under bark, behind trees, in crevices, etc.;
- Recording the number of individuals of each species; and
- Recording scats, bones and other signs where they could be confidently attributed to species.

Opportunistic observations made while travelling between quadrats were also recorded in an 'incidentals' list.

### 3.1.7 Targeted surveys

Based on the results of the desktop review and local traditional knowledge, additional survey effort was directed towards the location of Greater Bilby (*Macrotis lagotis*) and Brush-Tailed Mulgara (*Dasycercus blythi*). This effort involved the following methods

- Spotlighting around areas that may be suitable for these species.
- Any active burrows that were found during active searches were surveyed using camera 'traps' (i.e. motion-activated with infra-red for night photography).
- Road transects through the Old Pirate site were driven at night.

### 3.1.8 Nomenclature

Nomenclature and classification of fauna species refers to the Classification of Wildlife of the NT – January 2007 (NRETAS). At the time of compiling this report, the Northern Territory listings of threatened species was under review and at the stage of being finalised.

### 3.1.9 Data Limitations

- The results of these surveys are only a snapshot in time, and do not allow for temporal variations or species migrations;
- Sampling, as against censussing, is logistically necessary due to limited human resources. Moreover, a larger degree of sampling is required to account for all the above mentioned variations with a high level of confidence;
- Sampling is logistically necessary due to resources – can never capture the full range of variations.
- Scats cannot always be correctly attributed to species, however where they can be confidently identified, they provide an accurate indication of the presence and habitat preferences of certain species (Telfer *et al.* 2006);
- Detection of nocturnal species by spotlight potentially only detects about 25% of the animals present (e.g. Goldingay & Sharpe 2004), and is affected by environmental factors (Wayne *et al.* 2005).

Specific survey conditions can be selected to improve spotlight detection efficiency (Wayne *et al.* 2005);

- Read & Moseby (2001) concluded that environmental factors affect capture rates. Unfortunately, planning logistics for fauna surveys such as this around specific environmental conditions is very difficult. Planning to survey in the Dry season allows the best chance of favourable conditions;
- The trapping and search methodologies utilised in this study predominantly targeted only threatened species identified during desktop surveys and therefore did not necessarily provide an unbiased or complete indication of species diversity within an area or allow for other threatened species not identified on the database (Moseby & Read 2001; Cunningham *et al.* 2005; Thompson *et al.* 2005);
- Fauna and Flora Atlas records are biased toward previous NT Government survey sites and accessible sites often recognised for their unique biodiversity. Therefore, a lack of records at any particular site is more likely to indicate that the area has not been previously surveyed rather than indicate that various species are not present in the area.

## 3.2 Survey Results

One standard fauna survey was conducted during the late dry season period (September 2012). This aimed to capture the species assemblages at this location. A total of seven trapping sites were established during these surveys (1-7) (Table 4), all targeting habitat proposed to be disturbed by road works operations, drilling, infrastructure. Four additional sites (8-12) (Table 4) were visited to record opportunistic fauna and vegetation type data. Note that site 8 only included Elliott trapping (as this was established at camp).

The field surveys of the proposed project areas recorded a total of 57 terrestrial vertebrate species, comprising of, 20 reptiles, 27 birds, and 10 mammals (Appendix A). The majority of species were identified through trapping, active search techniques, and incidental observations. Summary descriptions by faunal group are provided below.

The majority of species recorded during the survey are common and generally widespread throughout similar habitat in the region (based on an earlier survey by GHD Consultants). Three threatened species were identified during the survey of the Old Pirate prospect. Two of these were specifically found in the Old Pirate prospect

- Australian Bustard (*Ardeotis australis*) – Vulnerable.
- Brush-tailed Mulgara (*Dasymercus blythi*) – Vulnerable.

Additionally one species was found adjacent to the Old Pirate prospect.

- Greater Bilby (*Macrotis lagotis*) – Vulnerable.

### 3.2.1 Reptiles

A total of 20 reptile species were recorded during the survey, mainly from pit traps, funnel traps and active searches. Geckoes (four species), pygopods (two species), skinks (seven species) dragons (four species) and monitors (three species) were well-represented in regards to diversity, habitat and abundance. The spinifex grass plains were home to large populations of *Ctenotus pantherinus*, *Ctenophorus isolepis* & *Ctenophorus nuchalis*. Nocturnal searches revealed *Strophurus ciliaris* and *Lucasium stenodactylum* to be present at most sites, with over 150 sightings of *S. ciliaris* being recorded during the 3 night survey.

Notable results from the reptile surveys were:

- No threatened species were recorded.
- One Tanami Ctenotus (*Ctenotus tanamiensis*) was captured at Site 5 (Appendix B). The species was described in 1970 and is endemic to the Tanami Desert (Storr, 1970). It is uncommon and prefers sand plain habitats with an understory of hummock grasses (Horner, 1992).
- One Lined Earless Dragon (*Tympanocryptis lineata*) was captured by hand at Site 4 (Appendix B). This specimen was interesting as it displayed characters also associated with the Centralian Earless Dragon (*Tympanocryptis centralis*). Further research found that this population of *T. lineata* could be an undescribed species, for which the name *macra* is available (Wilson & Swan, 2010)
- No introduced reptile species were recorded.

### 3.2.2 Birds

A total of 27 bird species from 19 families were recorded during the survey (Appendix A).

Notable results from the bird surveys were:

- The Australian Bustard (*Ardeotis australis*) was recorded at Site 1,4,6, and 9. This species is listed as Vulnerable in the Northern Territory.
- One notable sighting of a Black Falcon (*Falco subniger*) was recorded at Site 8. This species is usually seen preying on flocks of smaller birds that have been attracted to waterholes (Gibson, 1986).

### 3.2.3 Mammals





A total of 10 mammal species from 4 families were identified during the survey (Appendix A)





Notable results from the mammal surveys were:

- One adult female Brush-tailed Mulgara (*Dasymercus blythi*) was captured at Site 7 (see Appendix B for photo). This species is listed as Vulnerable in the Northern Territory. Adjacent to the Elliott trap it was captured in was an active burrow system (see Appendix B for photo).
- The Western Chestnut Mouse (*Pseudomys nanus*) was recorded at Sites 1, 3, 4 and 7. This species is listed as Near-Threatened in the Northern Territory.
- Three active Bilby (*Macrotis lagotis*) burrows were found north of Old Pirate in the Buccaneer area (Site 10) (see Appendix B for photo). This species is listed as Vulnerable in the Northern Territory and EPBC. These were monitored with camera traps which did not record any Bilby present during our visit, but one Sand Goanna (*Varanus gouldii*) and Spinifex Hopping Mouse (*Notomys alexis*) were photographed near the burrows (Appendix B) .
- One bat species, Gould's Wattled Bat (*Chalinolobus gouldii*) was identified from acoustic recordings.
- One introduced species was recorded – House Mouse (*Mus musculus*).







**Table 4. Habitat descriptions for each fauna site.**

<p><b>Site 1</b> (20°11.554S, 129°09.289E)</p> 	<p><b>Vegetation Description:</b> Sparse Acacia shrubland over Spinifex grass (<i>Triodia</i> spp.).</p> <p><b>Landform:</b> Flat sand plain</p> <p><b>Soil:</b> Reddish brown sand, with some surface clay (cracking)</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> No weeds observed</p> <p><b>Ferals:</b> Cat prints</p> <p><b>Termite mounds:</b> Common small domes</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> Not present within site</p> <p><b>Mid:</b> 10% cover, height 1 – 2 m; <i>Acacia tenuissima</i> (2), <i>A. lysiphloia</i> (3), <i>A. cowleana</i> (3), <i>A. cuthbertsonii</i> (4), <i>Grevillea wickhamii</i> (3), <i>Senna oligophylla</i> (4), <i>S. glutinosa</i> (4)</p> <p><b>Lower:</b> 60% cover, height &lt;1 m; <i>Triodia basedowii</i> (1), <i>T. intermedia</i> (3), <i>Eulalia aurea</i> (3), <i>Corchorus sidoides</i> (3), <i>Pterocaulon serrulatum</i> (4), <i>Solanum centrale</i> (4), <i>Aristida inaequiglumis</i> (4), <i>Cassipoupa filiformis</i> (3), <i>Gossypium australis</i> (4), <i>Swainsona</i> sp (4), <i>Panicum decompositum</i> (4).</p>
<p><b>Site 2</b> (20°11.607S, 129°09.711E)</p> 	<p><b>Vegetation Description:</b> Spinifex Grassland (<i>Triodia</i> spp.) with isolated Snappy Gum trees</p> <p><b>Landform:</b> Mid-slope with stoney soils, some low outcropping</p> <p><b>Soil:</b> Reddish brown sand, high gravel and stone content</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> No weeds observed</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Sparse (dome)</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> 5% cover, height 3 – 4 m; <i>Eucalyptus brevifolia</i> (1), <i>E. pachyphylla</i> (3)</p> <p><b>Mid:</b> 10% cover, height 1 m; <i>A. cowleana</i> (4), <i>Senna oligophylla</i> (3), <i>Dodonea viscosa</i> (4)</p> <p><b>Lower:</b> 85% cover, height &lt;1 m; <i>Triodia basedowii</i> (1), (2), <i>Ptilotus exaltatus</i> (4), <i>Senna oligophylla</i> (4), <i>Corchorus sidoides</i> (3), <i>Acacia adoxa</i>? (4)</p>
<p><b>Site 3</b> (20°11.494S, 129°09.597E)</p> 	<p><b>Vegetation Description:</b> Spinifex Grassland (<i>Triodia</i> spp.) with isolated Snappy Gum trees</p> <p><b>Landform:</b> Low rocky quartzite ridge (up to 2m), outcropping</p> <p><b>Soil:</b> Reddish brown soils, high gravel &amp; stone content, loose rocks</p> <p><b>Fire:</b> No recent fire scars</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> Non recorded</p> <p><b>Termite mounds:</b> Sparse (dome)</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> 5% cover, height 2 – 3 m; <i>Eucalyptus brevifolia</i> (1)</p> <p><b>Mid:</b> 5% cover, height 1 – 2 m; <i>Eremophila latrobei</i> (3), <i>Acacia</i> ? (3), <i>Senna oligophylla</i> (3)</p> <p><b>Lower:</b> 30% cover, height &lt;0.5 m; <i>Triodia</i> sp (1), <i>Eriachne mucronata</i> (3), <i>Ptilotus exaltatus</i> (4),</p>
<p><b>Site 4</b> (20°11.161S, 129°09.655E)</p> 	<p><b>Vegetation Description:</b> Spinifex Grassland (<i>Triodia</i> spp.) with isolated Rough-leaved cabbage Gum</p> <p><b>Landform:</b> Flat sand plain</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Sparse (dome)</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> 5% cover, height 3 – 6 m; <i>Corymbia aspera</i> (2), <i>C. opaca</i> (4), <i>Eucalyptus brevifolia</i> (3).</p> <p><b>Mid:</b> &lt;5% cover, height 1 – 2 m; <i>Grevillea wickhamii</i> (4), <i>Acacia cowleana</i> (4), <i>A. lysiphloia</i> (3), <i>Acacia tenuissima</i> (4), <i>Hakea coriacea</i> (4).</p> <p><b>Lower:</b> 75% cover, height 0.5m; <i>Triodia pungens</i> (1), <i>Acacia adoxa</i> (2), <i>Dodonea viscosa</i> (4), <i>Keradrinia</i> sp. (4).</p>

<p><b>Site 5</b> (20°11.063S, 129°09.391E)</p> 	<p><b>Vegetation Description:</b> Spinifex grassland with Acacia shrubs and isolated Snappy Gum</p> <p><b>Landform:</b> Flat sand plain</p> <p><b>Soil:</b> red sands</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> common (dome)</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> 1% cover, height 3 – 5 m; <i>Eucalyptus brevifolia</i> (3), <i>Hakea lorea</i> (3)</p> <p><b>Mid:</b> 10% cover, height 1 – 2 m; <i>Acacia lysipholia</i> (2), <i>A. cuthbertsonii</i> (4), <i>A. tenuissima</i> (3), <i>A. adsurgens</i> (4), <i>Grevillea wickhamii</i> (3), <i>Hakea macrocarpa</i> (3),</p> <p><b>Lower:</b> 50% cover, height &lt;1 m; <i>Triodia pungens</i> (1), <i>Triodia intermedia</i> (2).</p>
<p><b>Site 6</b> (20°10.681S, 129°09.411E)</p> 	<p><b>Vegetation Description:</b> Spinifex Grassland (<i>Triodia</i> spp.) with isolated Rough-leaved cabbage Gum</p> <p><b>Landform:</b> Flat Sand Plain</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Sparse and small</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> 5% cover, height 2 – 5 m; <i>Corymbia aspera</i> (1), <i>Eucalyptus pachyphylla</i> (4), <i>E. brevifolia</i> (4), <i>Corymbia opaca</i> (4)</p> <p><b>Mid:</b> 5% cover, height 1 – 2 m; <i>Corymbia aspera</i> (2), <i>Grevillea wickhamii</i> (4), <i>Senna glutinosa</i> (4)</p> <p><b>Lower:</b> 30% cover, height &lt;1 m; <i>Triodia pungens</i> (1), <i>T. intermedia</i> (3), <i>Eulalia aurea</i> (3), <i>Eragrostis sp</i> (3), <i>Senna notabilis</i> (4), <i>Cymbopogon oblectus</i> (4), <i>Shizacarium fragile</i> (3), <i>Sida spp.</i> (3), <i>Acacia adoxa</i> (4), <i>Ptilotus sessiliformis</i> (4), <i>Halgoris sp.</i> (4).</p>
<p><b>Site 7</b> (20°10.809S, 129°08.956E)</p> 	<p><b>Vegetation Description:</b> Spinifex Grassland (<i>Triodia</i> spp.) with isolated Rough-leaved cabbage Gum</p> <p><b>Landform:</b> Red Sand Plain</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Burnt last year, moderate impact</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Sparse, small domes</p> <p><b>Other Notes:</b> n/a</p>	<p><b>Upper:</b> &lt;5% cover, height 2 – 7 m; <i>Corymbia aspera</i> (2)</p> <p><b>Mid:</b> 5% cover, height 1 – 2 m; <i>Grevillea wickhamii</i> (3), <i>Acacia lysipholia</i> (3), <i>A. adsurgens</i> (3), <i>A. cuthbertsonii</i> (2), <i>A. ancistrocarpa</i> (3), <i>Hakea coriacea</i> (4), <i>Dodonea viscosa</i> (4), <i>Eremophila latrobei</i> (4)</p> <p><b>Lower:</b> 60% cover, height 1m; <i>Triodia intermedia</i> (1), <i>T. pungens</i> (2), <i>Acacia adoxa</i> (2), <i>Paranurachne muelleri</i> (4), <i>Cymbopogon oblectus</i> (4),</p>
<p><b>Site 8</b> (20°11.708S, 129°08.754E)</p> 	<p><b>Vegetation Description:</b> Wilsons Camp</p> <p><b>Landform:</b> cleared area for exploration camp</p> <p><b>Soil:</b> red earth</p> <p><b>Fire:</b> N/a</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> None recorded</p> <p><b>Other Notes:</b> Buildings, sample bags, water tanks, and other infrastructure</p>	<p><b>Upper:</b> N/a</p> <p><b>Mid:</b> N/a</p> <p><b>Lower:</b> N/a</p>



<p><b>Site 9</b> (20°11.264S, 129°09.216E)</p> 	<p><b>Vegetation Description:</b> Isolated Mulga patch (totally burnt and suffering high fire impact).</p> <p><b>Landform:</b> Slight depression</p> <p><b>Soil:</b> Red clayey sands</p> <p><b>Fire:</b> Recent, High impact. Many Mulga have not recovered.</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Common (dome)</p> <p><b>Other Notes:</b> Some Mulga were moderately sized, however there were no large cracks or large trunks present.</p> <p><b>Upper:</b> 20% cover, height 4– 5 m; <i>Acacia aneura</i> (1),</p> <p><b>Mid:</b> 20% cover, height 1 – 2 m; <i>Acacia tenuissima</i> (3), <i>A. lysipholia</i> (3), <i>A. ancistrocarpa</i> (3), <i>A. cowleana</i> (4), <i>Senna helmsii</i> (4), <i>S. oligophylla</i> (3), <i>Grevillea wickhamii</i> (4).</p> <p><b>Lower:</b> 45% cover, height &lt;1 m; <i>Triodia pungens</i> (1), <i>T. basedowii</i> (2), <i>Eulalia aurea</i> (2), <i>Corchorus</i> sp. (3), <i>Aristida inaequalis</i> (3).</p>
<p><b>Site 10</b> (20°08.801S, 129°09.254E)</p> 	<p><b>Vegetation Description:</b> Soft Spinifex Grassland (<i>Triodia pungens</i>)</p> <p><b>Landform:</b> Very broad and undescrpt palaeochannel</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Recent (within one year)</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Common (dome)</p> <p><b>Other Notes:</b> Bilby warrens (x3) were located and camera traps set at entrance to detect what fauna were using then for shelter.</p> <p><b>Upper:</b> None</p> <p><b>Mid:</b> <i>Grevillea wickhamii</i> (3)</p> <p><b>Lower:</b> <i>Triodia pungens</i> (1)m, <i>Senna</i> spp. (4)</p>
<p><b>Site 11</b></p> 	<p><b>Vegetation Description:</b> Spinifex grassland with various scattered shrubs. Isolated Snappy Gum.</p> <p><b>Landform:</b> Flat Sand Plan</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Recent (this year)</p> <p><b>Weeds:</b> None observed</p> <p><b>Ferals:</b> None observed</p> <p><b>Termite mounds:</b> Common is surrounding habitat</p> <p><b>Other Notes:</b> Rubbish associated with airstrip, and also gable markers</p> <p><b>Upper:</b> <i>Eucalyptus brevifolia</i> (4)</p> <p><b>Mid:</b> <i>Acacia hilliana</i> (3)</p> <p><b>Lower:</b> <i>Triodia pungens</i> (1)</p>
<p><b>Site 12</b> (20°09.806S, 129°09.340E)</p> 	<p><b>Vegetation Description:</b> Soft Spinifex Grassland (<i>Triodia pungens</i>) with scattered Blue Mallee</p> <p><b>Landform:</b> Flat sand plain</p> <p><b>Soil:</b> Red sands</p> <p><b>Fire:</b> Recent (with a year)</p> <p><b>Weeds:</b> None recorded</p> <p><b>Ferals:</b> None recorded</p> <p><b>Termite mounds:</b> Sparse (low domes)</p> <p><b>Other Notes:</b></p> <p><b>Upper:</b> <i>Eucalyptus gamophylla</i> (2)</p> <p><b>Mid:</b> <i>Eucalyptus gamophylla</i> (3)</p> <p><b>Lower:</b> <i>Triodia pungens</i> (1)</p>

## 4 Conclusions

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### 4.1 Fauna

The combined desktop and field studies yielded 105 terrestrial vertebrate species present in the overall area (Appendix A). As expected, the dry season survey yielded fewer records (57 versus 93) than the previous wet season survey by GHD (2012). Australian deserts are typically classified as infertile and unproductive with a great degree of variability in rainfall (Morton, 1990). The Tanami Desert is known for being an environment characterised by highly patterned plant productivity and unpredictable climate (Paltridge & Southgate, 2001). During the dry season, lower temperatures, humidity and rainfall have been shown to be a factor affecting the trapping success and overall abundance of terrestrial vertebrates in arid areas (Paltridge & Southgate, 2001; Read & Moseby, 2001), thus the lower dry season species count was expected.

Of the original 21 threatened and one proposed species highlighted in the desktop review (Table 2), three were found to be present at the site. Of the three listed species recorded on site, the Greater Bilby (*Macrotis lagotis*) and Brush-tailed Mulgara (*Dasycercus blythi*) are EPBC-listed species. Australian Bustard (*Ardeotis australis*) is listed as Vulnerable by the TPWC ACT, respectively. The Wet Season study by GHD also recorded these species from the Old Pirate site.

### 4.2 Threatened Species Recommendations

As both the Wet and Dry seasons surveys have confirmed the presence of three listed threatened species, EcOz recommends the following.

#### **Brush-tailed Mulgara (*Dasycercus cristicauda*)**

A targeted Brush-tailed Mulgara survey should be conducted to determine their presence and density on the Old Pirate Site, specifically in relation to trench locations, proposed infrastructure and roads. These surveys should follow the guidelines outlined in DSEWPAC (2011). Of these guidelines, the following are ideally suited for detection at the Old Pirate Site:

- Daytime searches for burrows and pop-holes, particularly those with freshly excavated earth, tracks and scats.
- If any signs are found, the area should be searched by spotlight and camera traps should be placed at the entrance of any active burrows found.
- Elliott trapping surveys using a mixture of rolled oats, peanut butter and tuna oil for bait.
- Baited camera traps can be placed in suitable habitat as this species is easily separated from other sympatric species.
- Consultation with local people, particularly investigating potential Indigenous knowledge of this species' presence in an area.

#### **Greater Bilby (*Macrotis lagotis*)**

During the survey, no evidence of the presence of Greater Bilby (*Macrotis lagotis*) was observed in the proposed bulk sampling area. However, due to this species being observed in other areas of the exploration lease, there is a chance that they could occur in the Old Pirate project area. The following survey is recommended that can be run concurrently with the targeted Brush-tailed Mulgara Survey (*Dasycercus blythi*).



A targeted Greater Bilby survey should be conducted to determine their presence and density on the Old Pirate Site, specifically in relation to bulk sampling trenches, process plant and roads. These surveys should follow the guidelines outlined in DSEWPAC (2011). Of these guidelines, the following are ideally suited for detection at the Old Pirate site:

- Daytime searches for burrows, tracks, scats and diggings. Such as surveying systematic transects.
- If any signs are found, the area should be searched by spotlight and camera traps should be placed at the entrance of any active burrows found.
- Consultation with local people, particularly investigating potential Indigenous knowledge of this species' presence in an area.

If either Brush-tailed Mulgara (*Dasyurus cristicauda*) or Greater Bilby (*Macrotis lagotis*) is discovered to inhabit an area that is to be disturbed (with no alternative management available) it is recommended that ABM Resources commits to developing a Mulgara and Bilby Translocation Plan. This plan will specifically address the following prior to commencement of any works in these areas

- Baseline estimation of resident populations.
- Suitable relocation sites that are managed for the presence of feral animals.
- Methods and timing suitable for the translocation of these species..
- An ongoing monitoring program of translocated individuals.
- Permits and Ethics Approval.

#### **Australian Bustard (*Ardeotis australis*)**

At the present time this species is listed as Vulnerable under the TPWC Act. A review by the Department of Land Management has recommended that this species be downlisted to Least Concern. It is in our opinion that the current works in the Old Pirate project area will not directly affect the resident population of Australian Bustard. This species is more mobile than the other threatened species and thus are able to escape areas that may be cleared or otherwise disturbed.

### **4.3 Additional Recommendations**

It is also recommended that ABM should approach Newmont and the CLC to discuss involvement in the Tanami Regional Biodiversity Monitoring Plan (RBM Program). This program was established to obtain base-line data for assessing the cumulative impacts of mining operations on biodiversity on Aboriginal lands in the Tanami region. As the area that ABM Resources has in lease is relatively unsurveyed this would be a welcome addition to the program.

## 5 References

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## Appendix A – Fauna Records recorded during the desktop and field surveys for the Old Pirate project area.

ALA – Atlas of Living Australia  
 LRM – Land Resource Management (Flora and Fauna Database)  
 GHD – Wet Season Survey  
 EcOz – Dry Season Survey

SPECIES		ALA	LRM	GHD	ECOZ
<b>BIRDS</b>					
<b>ACANTHIZIDAE</b>					
<i>Smicronis brevirostris</i>	Weebill			X	
<b>ACCIPITRIDAE</b>					
<i>Accipiter cirrhocephalus</i>	Collated Sparrowhawk			X	
<i>Accipiter fasciatus</i>	Brown Goshawk			X	X
<i>Circus assimilis</i>	Spotted Harrier			X	X
<i>Elanus axillaris</i>	Black-shouldered Kite			X	X
<i>Milvus migrans</i>	Black Kite			X	
<b>ANATIDAE</b>					
<i>Anas gracilis</i>	Grey Teal				X
<b>ARTAMIDAE</b>					
<i>Artamus cinereus</i>	Black-faced Woodswallow			X	X
<i>Artamus personatus</i>	Masked Woodswallow			X	X
<i>Cracticus nigrogularis</i>	Pied Butcherbird			X	
<b>CAMPEPHAGIDAE</b>					
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike			X	
<i>Lalage sueurii</i>	White-winged Triller			X	
<b>COLUMBIDAE</b>					
<i>Geopelia cuneata</i>	Diamond Dove			X	
<i>Geopelia striata</i>	Peaceful Dove				X
<i>Ocyphaps lophotes</i>	Crested Pigeon			X	
<b>CORVIDAE</b>					
<i>Corvus bennettii</i>	Little Crow			X	
<i>Corvus orru</i>	Torresian Crow				X
<b>ESTRILDIDAE</b>					
<i>Emblema pictum</i>	Painted Finch			X	
<i>Taeniopygia guttata</i>	Zebra Finch			X	X
<b>EUROSTOPDIDAE</b>					
<i>Eurostopodus argus</i>	Spotted Nightjar			X	X
<b>FALCONIDAE</b>					
<i>Falco berigora</i>	Brown Falcon			X	X
<i>Falco cenchroides</i>	Nankeen Kestrel			X	
<i>Falco longipennis</i>	Australian Hobby			X	
<i>Falco subniger</i>	Black Falcon			X	X
<b>GLAREOLIDAE</b>					
<i>Stiltia isabella</i>	Australian Pratincole			X	






SPECIES	ALA	LRM	GHD	ECOZ
<b>HALYCONIDAE</b>				
<i>Todiramphus pyrrhopygus</i>	Red-backed Kingfisher		X	
<b>MALURIDAE</b>				
<i>Amytornis striatus</i>	Striated Grasswren		X	
<i>Malurus lamberti</i>	Variegated Fairy-wren		X	X
<i>Malurus leucopterus</i>	White-winged Fairy-wren		X	
<b>MEGALURIDAE</b>				
<i>Cincloramphus cruralis</i>	Brown Songlark		X	
<i>Cincloramphus mathewsi</i>	Rufous Songlark		X	
<i>Eremiornis carteri</i>	Spinifexbird		X	X
<b>MELIPHAGIDAE</b>				
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		X	X
<i>Epthianura tricolor</i>	Crimson Chat		X	
<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater		X	X
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater			X
<i>Lichenostomus virescens</i>	Singing Honeyeater		X	X
<i>Manorina flavigula</i>	Yellow-throated Miner		X	
<i>Melithreptus gularis</i>	Black-chinned Honeyeater		X	X
<b>MOTACILLIDAE</b>				
<i>Anthus novaeseelandiae</i>	Australasian Pipit		X	
<b>NECTARINIIDAE</b>				
<i>Dicaeum hirundinaceum</i>	Mistletoebird		X	
<b>OTIDIDAE</b>				
<i>Ardeotis australis</i>	Australian Bustard		X	X
<b>PACHYCEPHALIDAE</b>				
<i>Colluricincla harmonica</i>	Grey Shrike-thrush		X	
<i>Oreoica gutturalis</i>	Crested Bellbird		X	X
<i>Pachycephala rufiventris</i>	Rufous Whistler		X	
<b>PARDALOTIDAE</b>				
<i>Pardalotus rubricatus</i>	Red-browed Pardalote		X	X
<b>PHASIANIDAE</b>				
<i>Coturnix ypsilophora</i>	Brown Quail		X	
<b>PODARGIDAE</b>				
<i>Podargus strigoides</i>	Tawny Frogmouth		X	X
<b>PSITTACIDAE</b>				
<i>Melopsittacus undulatus</i>	Budgerigar		X	X
<b>PSITTACULIDAE</b>				
<i>Barnardius zonarius</i>	Australian Ringneck		X	
<b>RHIPIDURIDAE</b>				
<i>Rhipidura leucophrys</i>	Willie Wagtail		X	X
<b>STRIGIDAE</b>				
<i>Ninox novaeseelandiae</i>	Southern Boobook			X
<b>TURNICIDAE</b>				
<i>Turnix velox</i>	Little Button-quail		X	X

SPECIES		ALA	LRM	GHD	ECOZ
<b>MAMMAL</b>					
<b>CAMELIDAE</b>					
<i>Camelus dromedarius</i>	One-humped Came			X	
<b>CANIDAE</b>					
<i>Canis lupus</i>	Dingo			X	X
<b>DASYURIDAE</b>					
<i>Dasycercus blythi</i>	Brush-tailed Mulgara			X	X
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart			X	X
<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart			X	X
<b>EMBALLONURIDAE</b>					
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat			X	
<b>FELIDAE</b>					
<i>Felis catus</i>	Cat			X	
<b>MOLOSSIDAE</b>					
<i>Chaerephon jobensis</i>	Northern Freetail Bat			X	
<b>MURIDAE</b>					
<i>Mus musculus</i>	House Mouse				X
<i>Notomys alexis</i>	Spinifex Hopping-mouse	X	X	X	X
<i>Pseudomys desertor</i>	Desert Mouse			X	
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse			X	X
<i>Pseudomys johnsoni</i>	Central Pebble-mound Mouse			X	
<i>Pseudomys nanus</i>	Western Chestnut Mouse			X	X
<b>THYLACOMYIDAE</b>					
<i>Macrotis lagotis</i>	Bilby			X	X
<b>VESPERTILIONIDAE</b>					
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			X	X
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			X	
<b>VESPERTILIONIDAE</b>					
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat			X	
<i>Scotorepens greyii</i>	Little Broad-nosed Bat			X	
<i>Vespadelus baverstocki</i>	Inland Forest Bat			X	
<i>Vespadelus finlaysoni</i>	Inland Cave Bat			X	
<b>REPTILE</b>					
<b>AGAMIDAE</b>					
<i>Ctenophorus isolepis</i>	Military Dragon			X	X
<i>Ctenophorus nuchalis</i>	Central Netted Dragon				X
<i>Diporiphora winneckei</i>	Canegrass Dragon			X	
<i>Pogona minor</i>	Dwarf Bearded Dragon			X	X
<i>Tympanocryptis lineata</i>	Lined Earless Dragon				X
<b>ELAPIDAE</b>					
<i>Pseuduechis australis</i>	Mulga Snake			X	
<i>Suta punctata</i>	Little Spotted Snake			X	
<b>GEKKONIDAE</b>					
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko			X	
<i>Gehyra variegata</i>	Tree Dtella			X	X



SPECIES		ALA	LRM	GHD	ECOZ
<i>Lucasium stenodactylum</i>	Crowned Gecko				X
<i>Nephurus laevis</i>	Smooth Knob-tailed Gecko	X	X		
<i>Rhynchoedura ornata</i>	Beaked Gecko			X	X
<i>Strophurus ciliaris</i>	Spiny-tailed Gecko			X	X
<b>PYGOPODIDAE</b>					
<i>Delma borea</i>	Rusty-topped Delma			X	X
<i>Delma butleri</i>	Unbanded Delma				X
<i>Lialis burtonis</i>	Burton's Legless Lizard		X		
<b>PYTHONIDAE</b>					
<i>Aspidites melanocephalus</i>	Black-headed Python	X	X	X	
<b>SCINCIDAE</b>					
<i>Carlia triacantha</i>	Three-Spined Rainbow Skink			X	X
<i>Cryptoblepharus metallicus</i>	Metallic Snake-eyed Skink			X	
<i>Ctenotus helenae</i>	Helen's Ctenotus			X	X
<i>Ctenotus pantherinus</i>	Leopard Ctenotus			X	X
<i>Ctenotus piankai</i>	Pianka's Ctenotus			X	X
<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus			X	
<i>Ctenotus tanamiensis</i>	Tanami Ctenotus			X	X
<i>Lerista bipes</i>	Two-Toed Lerista	X	X	X	X
<i>Menetia greyii</i>	Grey's Menetia			X	X
<b>SCINCIDAE</b>					
<i>Proablepharus reginae</i>				X	
<i>Tiliqua multifasciata</i>	Centralian Blue-tongued Lizard			X	
<b>VARANIDAE</b>					
<i>Varanus acanthurus</i>	Ridge-tailed Monitor			X	X
<i>Varanus eremius</i>	Rusty Desert Monitor			X	X
<i>Varanus gouldii</i>	Sand Goanna				X
<b>Total Species</b>		<b>4</b>	<b>5</b>	<b>92</b>	<b>56</b>

**Appendix B – Photographs of fauna recorded during the dry season field surveys for the Old Pirate project area.**

	
<p>Tanami Ctenotus (<i>Ctenotus tanamiensis</i>)</p>	<p>Lined Earless Dragon (<i>Tympanocryptis lineata</i>)</p>
	
<p>Brush-tailed Mulgara (<i>Dasycercus blythi</i>)</p>	<p>Brush-tailed Mulgara (<i>D. blythi</i>) burrow system</p>
	
<p>Sand-plain Gecko (<i>Lucasium stenodactylum</i>)</p>	<p>Spinifex Hopping Mouse (<i>Notomys alexis</i>)</p>





Central Netted Dragon (*Ctenophorus nuchalis*)



Spiny-tailed Gecko (*Strophurus ciliaris*)



Greater Bilby (*Macrotis lagotis*) warrens found north of the Old Pirate project area.



Sand Goanna (*Varanus gouldii*) caught by camera trap focused on a Bilby Warren



Spinifex Hopping Mouse (*Notomys alexis*) caught by camera trap focused on a Bilby Warren



## **Bat call identification from the Tanami Desert, NT**

Type: Acoustic analysis

Prepared for: EcOz Environmental Consultants

Date: 6 November 2012

Job No.: SZ287

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## SUMMARY

Bat identifications made from acoustic recordings are provided from the Tanami Desert, Northern Territory. One species of bat was identified as being present: Gould's wattled bat *Chalinolobus gouldii* (Table 1). The identification was unambiguous. Details supporting the identification are provided (a representative call sequence portion; Figure 1), as recommended by the Australasian Bat Society (ABS 2006). Further data are available should verification be required.

## METHODS

Recordings were made with a Wildlife Acoustics Song Meter SM2BAT bat detector set to record full spectrum signals in WAC0 format; trigger 6 dB above background; 48 dB gain; and set to turn on automatically at sunset and off at sunrise. For analysis, WAC0 format files were converted to WAV format files in Kaleidoscope version 0.1.8, and then each WAV file was opened and inspected in Cool Edit 2000 software. Species were identified based on information in Churchill (2008), and nomenclature follows Armstrong and Reardon (2006).

## REFERENCES

- ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]
- Armstrong, K. and Reardon, T. (2006). Standardising common names of bats in Australia. *The Australasian Bat Society Newsletter* 26: 37–42.
- Churchill, S.K. (2008). *Australian bats*. 2<sup>nd</sup> ed. Allen and Unwin, Crows Nest, NSW.



**TABLE 1.** Species identifications, with the degree of confidence indicated by a code. Date and unit serial number correlates with site.

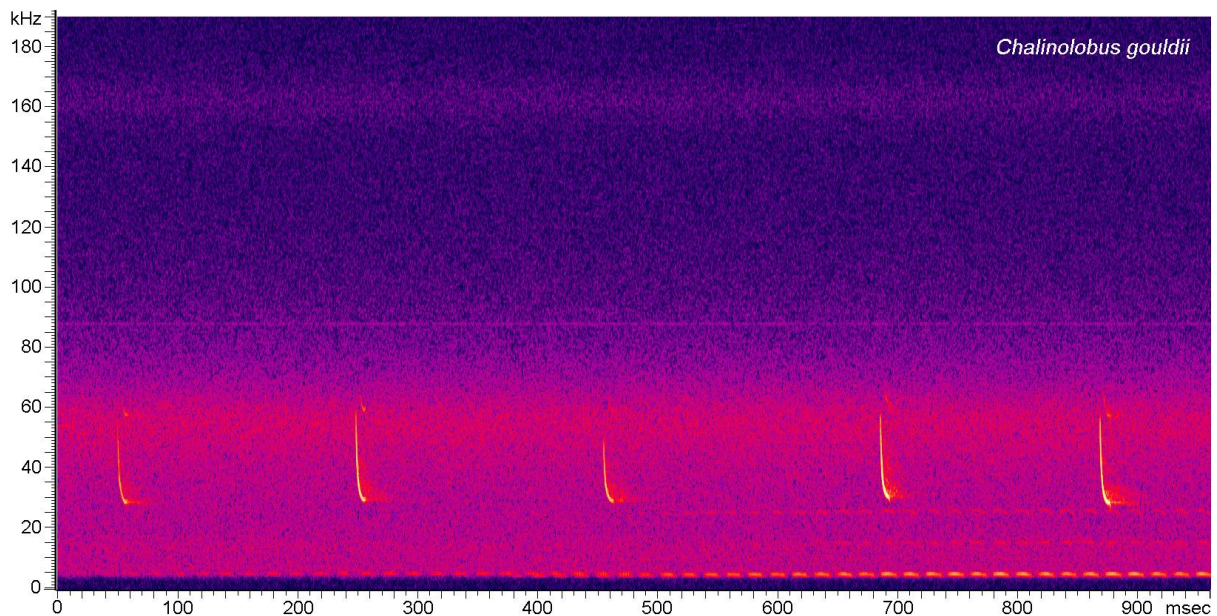
	<i>C. gouldii</i>
Date	
Serial 4185	
26/09/2012	◆
27/09/2012	◆
Serial 4186	
26/09/2012	—
27/09/2012	—

**Definition of confidence level codes:**

— Not detected.

◆ Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

**NC Needs Confirmation.** Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. If this is a species of conservation significance, further survey work might be required to confirm the record.



**FIGURE 1.** Representative call sequence portions of the species identified. Frequencies below 5 kHz and their upper harmonics derive from a cricket.



# EPBC Act Protected Matters Report

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

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

Information 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>

Report created: 28/11/12 10:59:09

[Summary](#)

[Details](#)

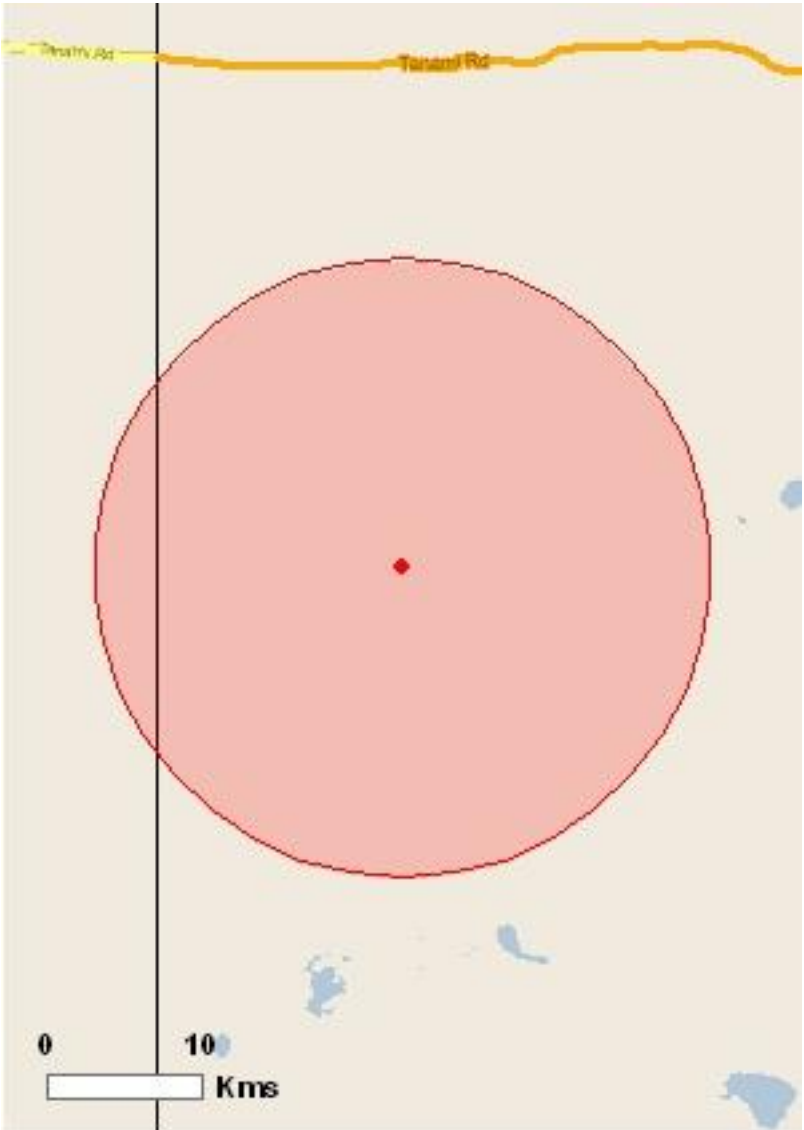
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



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[Buffer: 20.0Km](#)



## Summary

### Matters of National Environment 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>

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Areas:</a>	None
<a href="#">Threatened Ecological Communities:</a>	None
<a href="#">Threatened Species:</a>	5
<a href="#">Migratory Species:</a>	9

## 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>

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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>.

<a href="#">Commonwealth Lands:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	7
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves:</a>	None

## Extra Information

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

<a href="#">Place on the RNE:</a>	None
<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	4
<a href="#">Nationally Important Wetlands:</a>	None

## Details

### Matters of National Environmental Significance

Threatened Species		[ <a href="#">Resource Information</a> ]
Name	Status	Type of Presence
BIRDS		
<a href="#">Rostratula australis</a>		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
MAMMALS		
<a href="#">Dasycercus cristicauda</a> Mulgara [328]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Macrotis lagotis</a> Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Zyzomys pedunculatus</a> Central Rock-rat [68]	Endangered	Species or species habitat may occur within area

REPTILES		
<a href="#">Liopholis kintorei</a> Great Desert Skink, Tjakura, Warrarna, Mulyamiji [83160]	Vulnerable	Species or species habitat may occur within area

Migratory Species

[ [Resource Information](#) ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat may occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area

Migratory Terrestrial Species		
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area

Migratory Wetlands Species		
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat may occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[ <a href="#">Resource Information</a> ]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence



Name	Threatened	Type of Presence
Birds		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat may occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species		[ <a href="#">Resource Information</a> ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,		
Name	Status	Type of Presence
Mammals		
<a href="#">Felis catus</a> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<a href="#">Oryctolagus cuniculus</a> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<a href="#">Vulpes vulpes</a> Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
<a href="#">Cenchrus ciliaris</a> Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area

# Coordinates

-20.19532 129.14615

## 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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

## Acknowledgements

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

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)

- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

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

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

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