

Appendix D – Biodiversity Management Plan



Arafura Resources Limited

Nolans Project

Biodiversity Management Plan

March 2016

Document Status

Version	Author	Reviewer	Approved by	Date	Status

Amendments

Section	Details

Audit Summary

Date	Auditor	Details

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1. Introduction

1.1 Background and Purpose

The Nolans Project (the Project), undertaken by Arafura Resources Limited (Arafura Resources), targets the Nolans Bore mineral deposit for rare earth elements, approximately 135 km north west of Alice Springs, Northern Territory (NT). The Project involves several key activities during construction and operations which have the potential to impact upon biodiversity. These include:

- Clearing of vegetation and fauna habitat;
- Planned and/or unplanned fire;
- Collisions between fauna and traffic;
- Storage and use of potentially hazardous substances;
- Introduction and/or spread of weeds (covered in the Weed Management Plan); and
- Increase in population size of native and/or non-native predators.

The Biodiversity Management Plan (BMP) has been developed to provide a clear and concise outline of the actions and methods required to mitigate likely impacts on biodiversity including:

- Procedures to be adopted during vegetation clearing, including wildlife rescue procedures;
- Weed and feral animal management; and
- Mitigation of potential impacts on rare, threatened species.

The BMP forms part of the Environmental Management Plan for the Project and is considered to be a working document. It will be updated following formal assessment of the EIS by the NT EPA, and by Department of Mines and Energy through the mine authorisation process.

1.2 Objectives

The objective of this BMP is to reduce the impact of the Project activities on biodiversity at and surrounding the Project through:

- Identifying the key biodiversity issues that require control measures;
- Developing strategies to manage impacts on biodiversity and implementing those strategies;
- Assigning responsibilities for impact monitoring and management;
- Providing sufficient information to assist with auditing the implementation of the BMP; and
- Establishing a biodiversity monitoring program and management measures.

1.3 Associated Management Plans

Biodiversity management refers specifically to flora (vegetation, excluding weeds) and fauna (wildlife, including native and non-native animals). In addition to this BMP, the management of biodiversity is addressed in several other sub-management plans including:

- Air and Dust Management Plan;
- Erosion and Sediment Control Plan;
- Fire Management Plan;
- Weed Management Plan;

- Mine Closure Plan; and
- Non-mineralised Waste Management Plan.

1.4 Legislation, Guidelines and Recovery and Abatement Plans

Acts, guidelines and Plans relating to the management of flora and fauna within and around the study area include:

- Legislation
 - NT *Bushfires Act 1980*;
 - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
 - NT *Environmental Offences and Penalties Act 1996*;
 - NT *Mining Management Act 2001*;
 - National *Environment Protection Council (Northern Territory) Act 1994*;
 - NT *Territory Parks and Wildlife Conservation Act* (TPWC Act) 2006; and
 - NT *Weed Management Act 2001*.
- Guidelines
 - Northern Territory Survey Methods for Flora and Fauna Surveys Used for Standard Biodiversity Unit Survey Sites;
 - Survey Guidelines for Australia's Threatened Mammals. EPBC Act Survey Guidelines 6.5; and
 - Survey Guidelines for Australia's Threatened Reptiles: Guidelines for Detecting Reptiles Listed as Threatened Under the EPBC Act.
- Recovery and Abatement Plans
 - Threat Abatement Plan for Predation by Feral Cats;
 - Threat Abatement Plan for Predation by the European Red Fox;
 - Threat Abatement Plan for Competition and Land Degradation by Rabbits;
 - Threat Abatement Plan to reduce the Impacts on Northern Australia's Biodiversity by the Five Listed Grasses;
 - National Recovery Plan for the Greater Bilby (*Macrotis lagotis*);
 - Recovery Plan for the Great Desert Skink (*Egernia kintorei*) – Note: *Egernia kintorei* is a taxonomic synonym for *Liopholis kintorei*; and
 - Recovery Plan for Five Species of Rock Wallabies: Black-Footed Rock Wallaby (*Petrogale lateralis*), Rothschild Rock Wallaby (*P. rothschildi*), Short-Eared Rock Wallaby (*P. brachyotis*), Monjon (*P. burbidgei*) and Nabarlek (*P. concinna*) 2012-2022.

1.5 Previous Investigations

This BMP has been prepared on the basis of biodiversity information obtained from the EIS studies. A summary of previous investigations is provided in Table 1-1.

Table 1-1 Summary of biodiversity investigations relevant to the study area

Date	Reference	Description
4 – 7 May 2006	Low Ecological Services	Flora and fauna survey of mine site only.
21 – 24 November 2006	Low Ecological Services	Flora and fauna survey of mine site.
30 August – 8	GHD	Baseline Fauna survey of mine site and a proposed haul route (note: haul route no longer included in proposed

Date	Reference	Description
September 2010		project footprint).
8 – 9 December 2011	GHD	Targeted Black-footed Rock-wallaby (MacDonnell Ranges race) survey of mine site only.
27 April – 3 May 2015	GHD	Baseline Fauna survey of current study area incl. mine site, processing site, accommodation facility, access roads, utilities corridor (potable water pipeline, water supply pipeline, power line corridor) and borefield area.
21 – 23 July 2015	GHD	Targeted survey of the borefield area to detect presence of any threatened species including the Great Desert Skink, Brush-tailed Mulgara and Greater Bilby.
23 – 26 July 2015	GHD	Targeted surveys for Black-footed Rock-wallaby in the eastern end of the Reynolds Range, Hann Range, Reaphook Hills and outcrops in between.

2. Existing Conditions

2.1 Vegetation

2.1.1 Bioregion

The Project is located within the Burt Plain Bioregion which is characterised by plains and low rocky ranges with extensive areas of mulga and other acacia woodlands. The bioregion covers an area of 73,605 square kilometres which represents approximately 5% of the Northern Territory (NRETAS 2005).

Potential and existing threats to biodiversity in the bioregion include the introduction and proliferation of introduced flora and fauna, fire, erosion, land clearing, pastoralism and mining (Neave *et al.* 2006).

There are fifteen declared weed species currently listed under the NT Weed Management Act which are known to occur within the bioregion. Other exotic plants species, most notably Buffel and Couch grass, also pose significant threats to some habitats (Neave *et al.* 2006).

2.1.2 Values

Ecological values known to occur within the Project area are described in detail in the Flora and Vegetation Assessment Report (GHD 2015c). In summary, the key ecological values include:

- Extensive areas of native vegetation, comprising 14 native vegetation communities;
- Diversity of native flora species; and
- Habitat for mammals, birds, reptiles and invertebrates, including known and potential habitat for threatened fauna species.

Native Vegetation

The native vegetation communities recorded within Project area include:

- Riparian woodland along water courses and drainage channels;
- Mulga shrubland on sandy red earths over spinifex;
- Mulga shrubland on sandy red earths over tussock grasses;
- Mulga shrubland on sandy red earths over chenopods;
- Mixed woodland over tussock grasses on alluvial plains;
- Mixed Woodland over spinifex on alluvial plains;
- Mixed Woodland over a highly disturbed understorey dominated by Buffel Grass (*Cenchrus ciliaris*);
- *Triodia schinzii* hummock grassland on red clayey sands;
- Hakea/Senna shrubland on calcareous alluvial plains and low rises;
- Eucalyptus (mallee)/*Acacia kempeana* shrubland with *Triodia* on rocky slopes;
- *Acacia*/*Triodia* shrubland on rocky outcrops;
- *Acacia*/Senna shrubland on rocky gneiss or schist outcrops with no spinifex;
- *Acacia kempeana* and/or Mulga shrubland on gravel;
- Claypans with chenopods and herbs;
- Cottonbush chenopod shrubland on highly erodible duplex soils;

- *Triodia basedowii* hummock grassland on sand plains;
- Senna shrubland on quartz; and
- Coolabah swamp associated with claypans.

The dominant vegetation types within the Study area are Mulga shrublands, which occur on alluvial fans and plains containing clayey red earths and *Triodia* hummock grasslands which grow on sandy plains.

Vegetation across the Study area is generally in good condition with little anthropologic disturbance and high species richness. In more fertile riparian areas and associated floodplains there is clear evidence of impacts associated with cattle grazing including weed invasion, reduction in ground cover species richness and soil erosion. In particular there is a high abundance of the invasive Buffel Grass (*Cenchrus ciliaris*). There are also several areas that have been cleared within the mine site and borefields area during geotechnical and hydrological investigations at the site.

The condition of native vegetation varies from large tracts of intact and high quality remnant vegetation which contain very few isolated environmental weeds, through to large areas that have dense infestations of introduced species, in particular Buffel Grass (*Cenchrus ciliaris*).

One of the exotic species recorded within the Project area Caltrop (*Tribulus terrestris*) is listed as a Class B (spread must be controlled) and Class C (not to be introduced to the NT) noxious weed under the Weed Management Act.

Caltrop (*Tribulus terrestris*) is a spreading annual or bi-annual herb. This species was found in low abundance throughout all vegetation types within the study area. It is likely that this species is spread by cattle and vehicle movement.

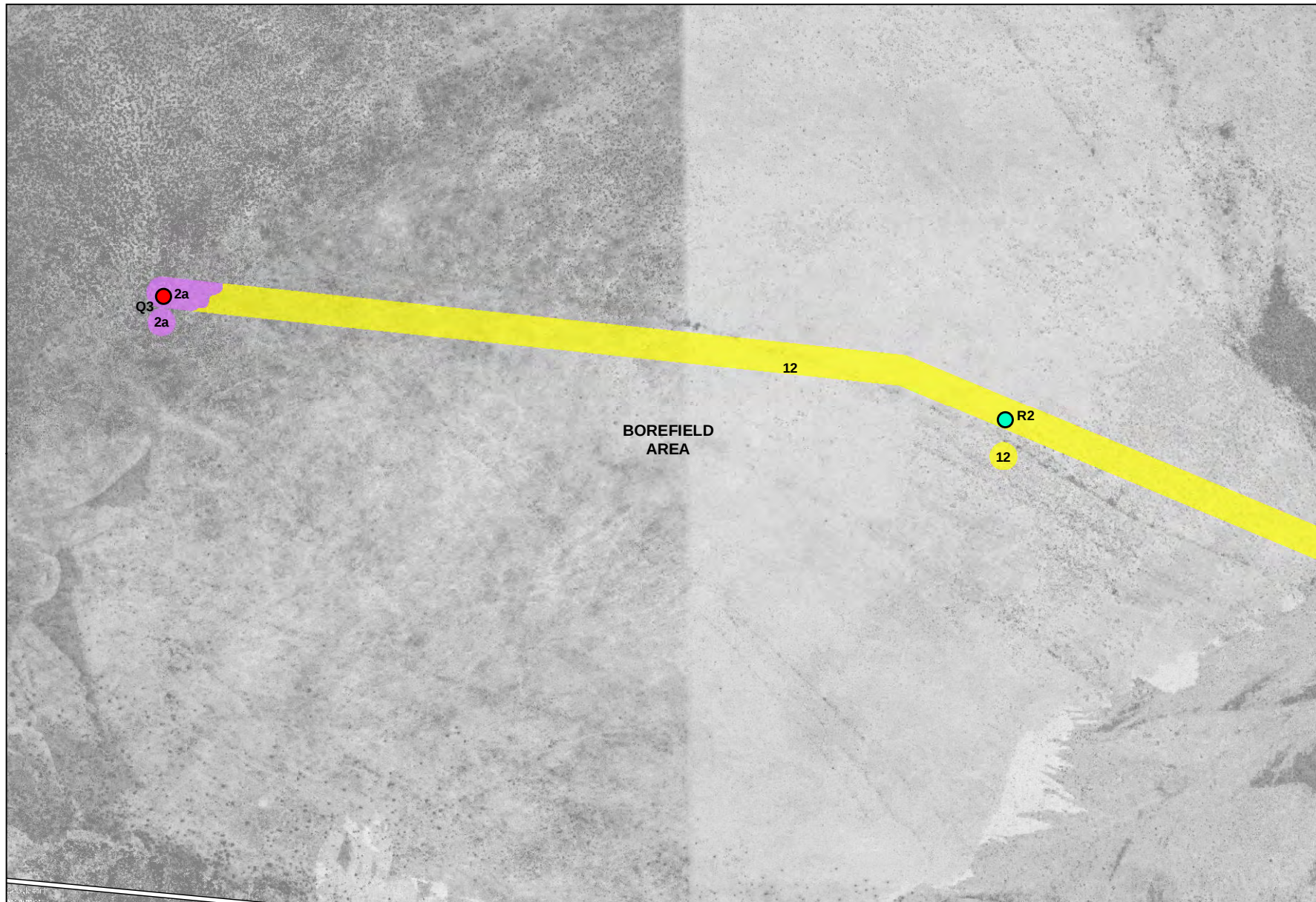
Overall there is a low to moderate level of infestation of exotic species within the Study area with the most prevalent species being Buffel Grass (*Cenchrus ciliaris*). This species was recorded predominantly within floodplain and riparian vegetation types and in areas that have been disturbed by cattle and/or by exploration tracks.

Flora

A combined total of 326 flora species, comprising 319 native species and 14 exotic species were recorded within the Study area during the 2010, 2011 and 2015 survey periods. This represents approximately 28 percent of all flora species known to occur in the Burt Plain Bioregion.

The Poaceae (grass family, 73 species, 67 native; 6 exotic), Fabaceae (pea family, 40 species, 39 native, one exotic), Chenopodiaceae (32 native species) and Malvaceae (25 native species) were the most species-rich families recorded.

Flora species recorded within the Study area and their associated vegetation communities are relatively common in the region with the exception of a few species. No threatened plants were recorded within the Study area. Three species recorded within the Study area are listed as near threatened (NT) and three species are listed as data deficient (DD) under the TPWC Act. An additional 11 species are noted to have bioregional significance.



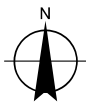
Vegetation Community

1	Riparian woodland along water courses and drainage channels
2a	Mulga shrubland on sandy red earths over spinifex
2a / 2b	Mulga shrubland on sandy red earths over tussock grasses / Mulga shrubland on sandy red earths over spinifex
2b	Mulga shrubland on sandy red earths over tussock grasses
2b / 3 a	Mulga shrubland on sandy red earths over tussock grasses / Mixed woodland over tussock grasses on alluvial plains
2c	Mulga shrublands on sandy red earths over chenopods
3a	Mixed Woodland over tussock grasses on alluvial plains
3a / 12	Mixed woodland over tussock grasses on alluvial plains / Cottonbush chenopod shrubland on highly erodible duplex soils
3b	Mixed woodland over spinifex on alluvial plains
3b / 2b	Mixed woodland over spinifex on alluvial plains / Mulga shrubland on sandy red earths over tussock grasses
3c	Mixed woodland over a highly disturbed understorey dominated by <i>Cenchrus ciliaris</i>
5	Hakea/Senna Shrubland on Calcareous Alluvial Plains and Low Rises
6	Eucalyptus (mallee)/Acacia kempeana/Triodia Shrubland on Rocky Slopes
7	Acacia/Triodia shrubland on rocky outcrops
8	Acacia/Senna shrubland on rocky gneiss or schist outcrops with no spinifex
9	Acacia kempeana and /or mulga shrubland on gravel
10	Claypans with chenopods and herbs
11	Cottonbush chenopod shrubland on highly erodible duplex soils
12	<i>Triodia basedowii</i> hummock grassland on sandplains
13	Senna shrubland on quartz
14	Coolabah swamp associated with claypans

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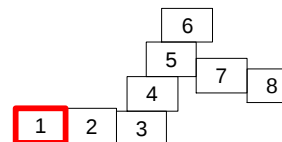
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LEGEND

- Checksites
- Quadrats 2015
- Quadrats 2011
- Existing Roads
- Site Boundaries



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Date | 03 Dec 2015

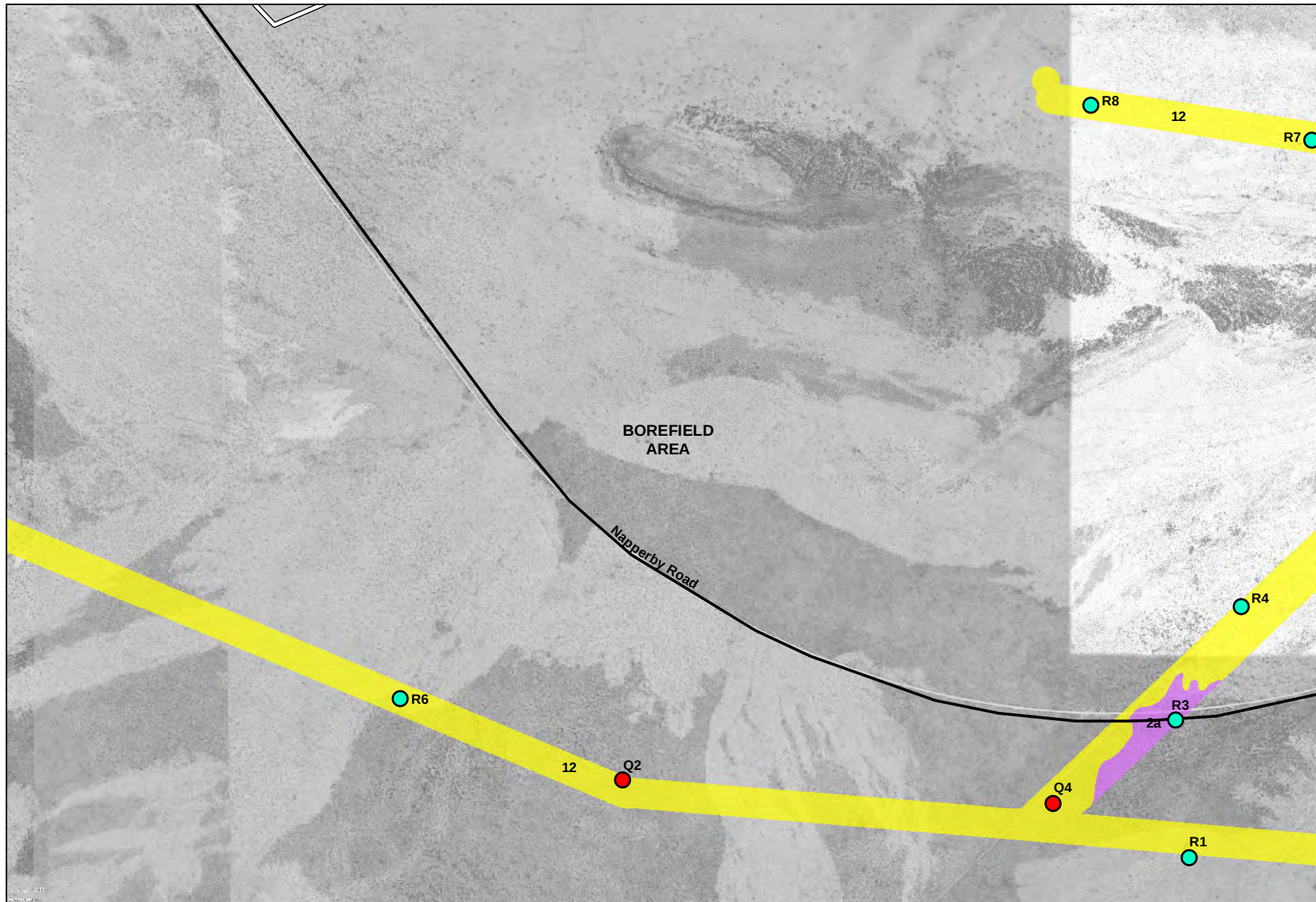
Figure 2-1 (Page 1 of 8): Vegetation Mapping

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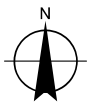
Vegetation Community

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| 1 | Riparian woodland along water courses and drainage channels |
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| 14 | Coolabah swamp associated with claypans |

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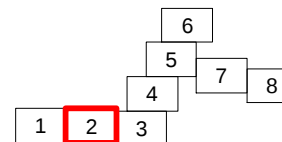
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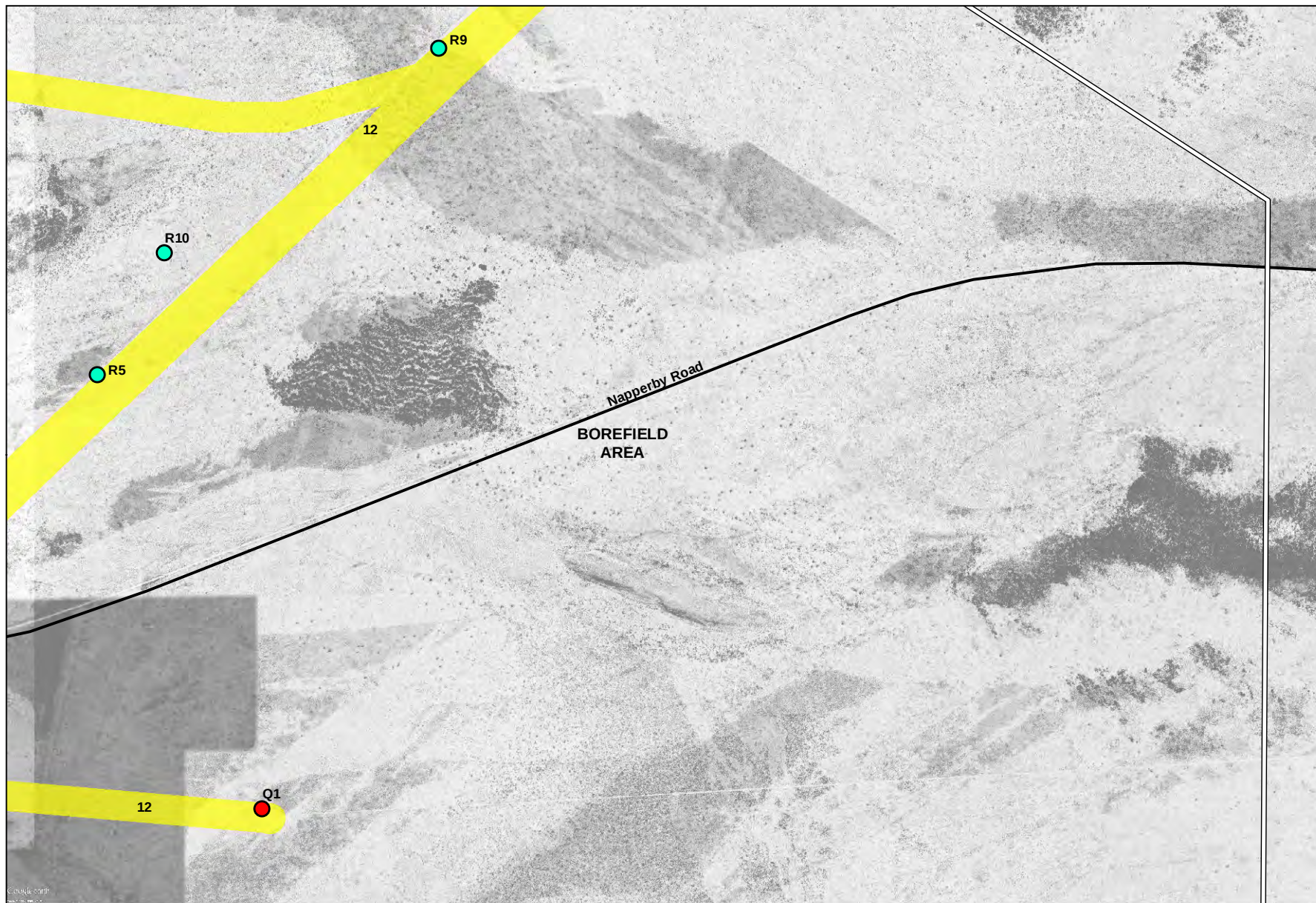
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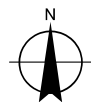


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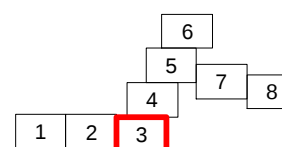
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LEGEND

● Checksites
● Quadrats 2015
● Quadrats 2011

Existing Roads
 Site Boundaries



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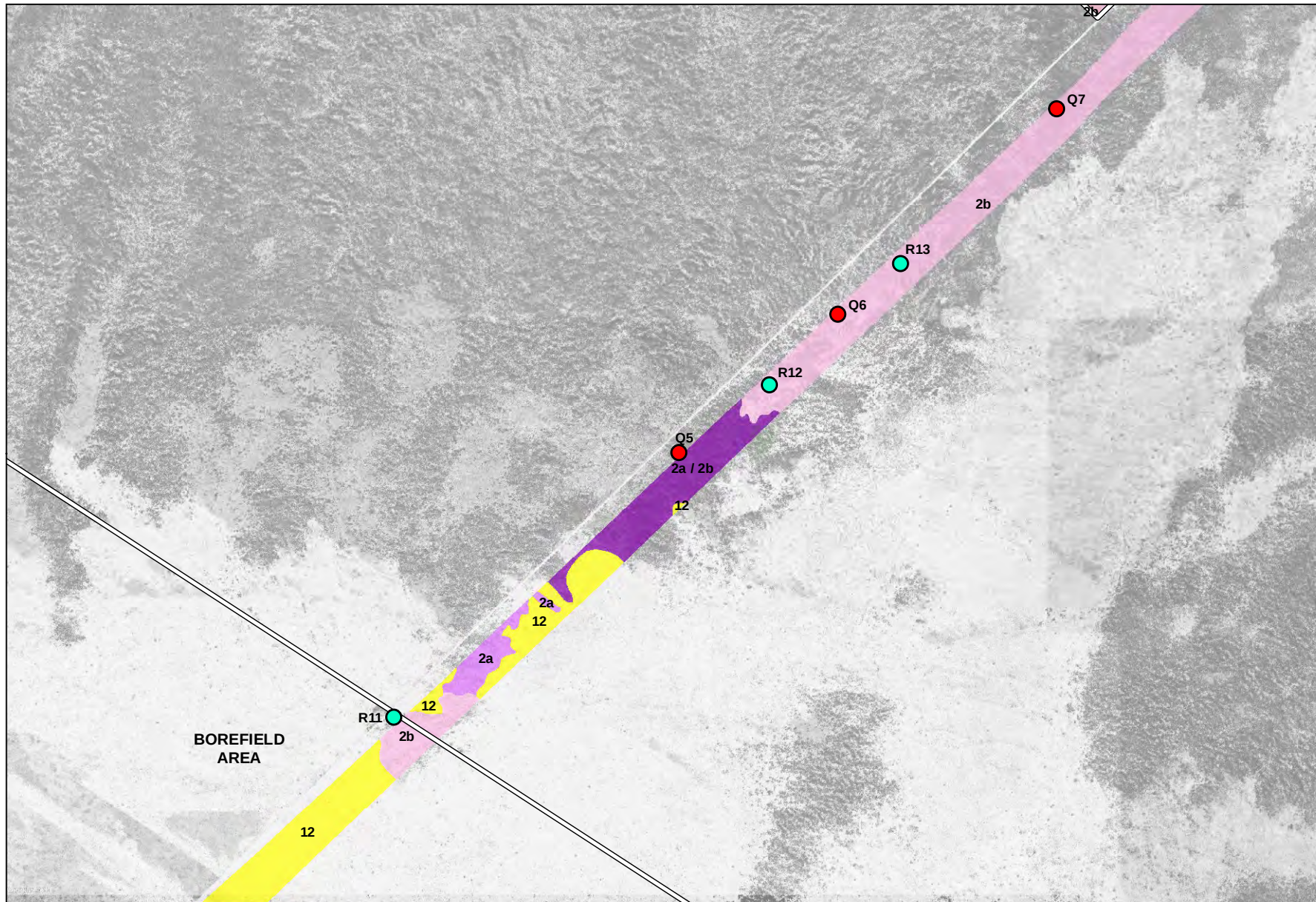
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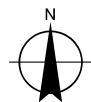


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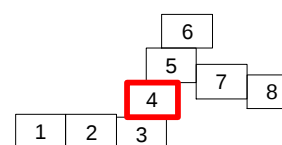
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- Checksites
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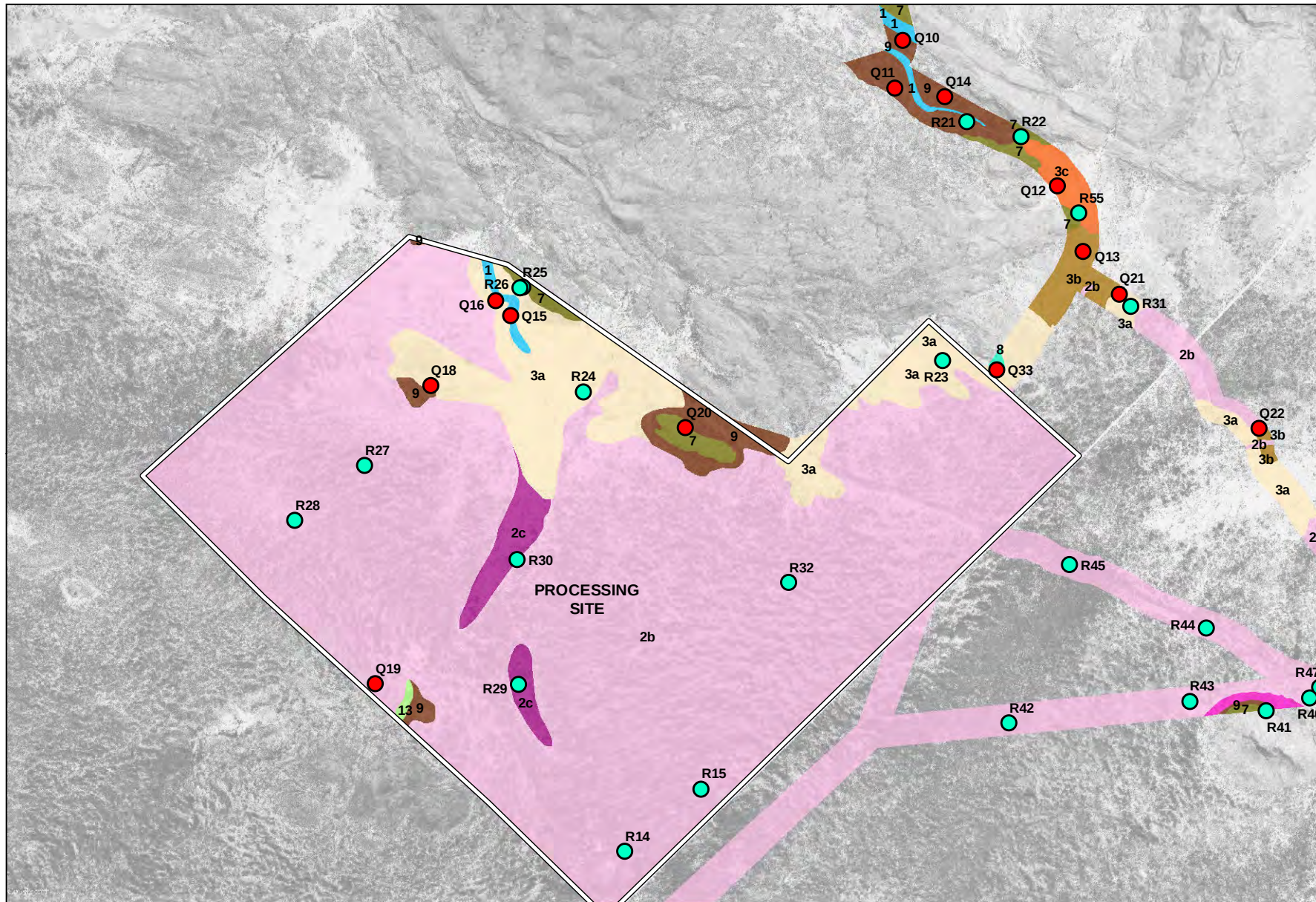
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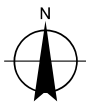


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2b / 3 a	Mulga shrubland on sandy red earths over tussock grasses / Mixed woodland over tussock grasses on alluvial plains	
2c	Mulga shrublands on sandy red earths over chenopods	
3a	Mixed Woodland over tussock grasses on alluvial plains	
3a / 12	Mixed woodland over tussock grasses on alluvial plains / Cottonbush chenopod shrubland on highly erodible duplex soils	
3b	Mixed woodland over spinifex on alluvial plains	
3b / 2b	Mixed woodland over spinifex on alluvial plains / Mulga shrubland on sandy red earths over tussock grasses	
3c	Mixed woodland over a highly disturbed understorey dominated by <i>Cenchrus ciliaris</i>	
5	Hakea/Senna Shrubland on Calcareous Alluvial Plains and Low Rises	
6	Eucalyptus (mallee)/Acacia kempeana/Triodia Shrubland on Rocky Slopes	
7	Acacia/Triodia shrubland on rocky outcrops	
8	Acacia/Senna shrubland on rocky gneiss or schist outcrops with no spinifex	
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10	Claypans with chenopods and herbs	
11	Cottonbush chenopod shrubland on highly erodible duplex soils	
12	<i>Triodia basedowii</i> hummock grassland on sandplains	
13	Senna shrubland on quartz	
14	Coolabah swamp associated with claypans	

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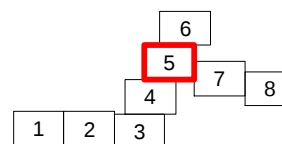
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Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53



LEGEND

- Checksites
- Quadrats 2015
- Quadrats 2011
- Existing Roads
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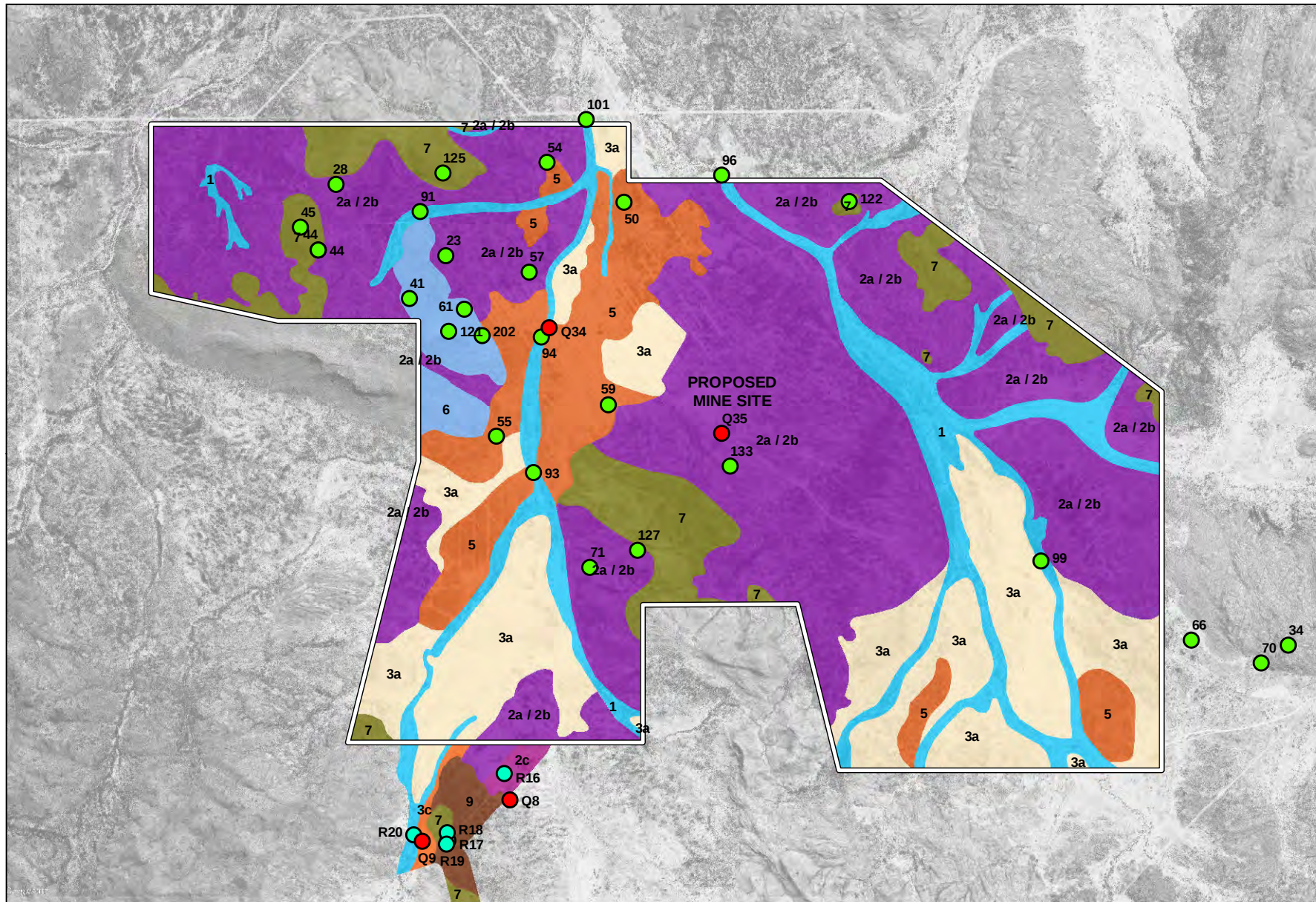
Figure 2-1 (Page 5 of 8): Vegetation Mapping

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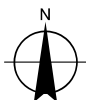


Vegetation Community		
1	Riparian woodland along water courses and drainage channels	
2a	Mulga shrubland on sandy red earths over spinifex	
2a / 2b	Mulga shrubland on sandy red earths over tussock grasses / Mulga shrubland on sandy red earths over spinifex	
2b	Mulga shrubland on sandy red earths over tussock grasses	
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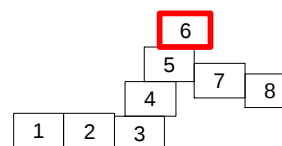


Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53



LEGEND

- Checksites
- Quadrats 2015
- Quadrats 2011
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Figure 2-1 (Page 6 of 8): Vegetation Mapping

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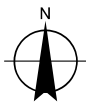
Vegetation Community

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| | 1 | Riparian woodland along water courses and drainage channels |
| | 2a | Mulga shrubland on sandy red earths over spinifex |
| | 2a / 2b | Mulga shrubland on sandy red earths over tussock grasses / Mulga shrubland on sandy red earths over spinifex |
| | 2b | Mulga shrubland on sandy red earths over tussock grasses |
| | 2b / 3 a | Mulga shrubland on sandy red earths over tussock grasses / Mixed woodland over tussock grasses on alluvial plains |
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| | 12 | <i>Triodia basedowii</i> hummock grassland on sandplains |
| | 13 | Senna shrubland on quartz |
| | 14 | Coolabah swamp associated with claypans |

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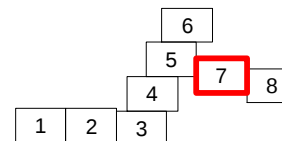


Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53



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Nolans Project
Flora and Vegetation Survey

Job Number	4322301
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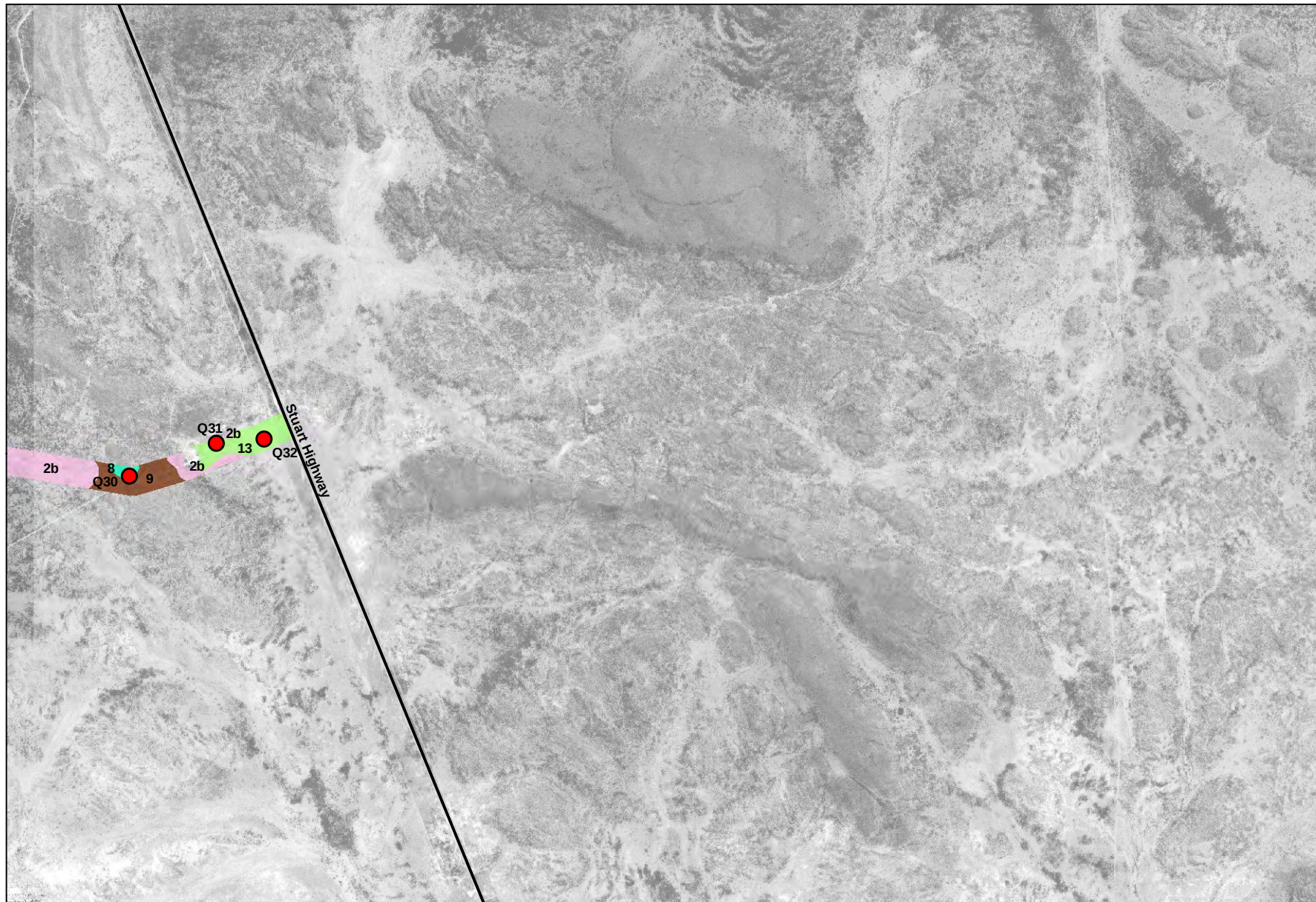
Figure 2-1 (Page 7 of 8): Vegetation Mapping

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Vegetation Community

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| | 1 | Riparian woodland along water courses and drainage channels |
| | 2a | Mulga shrubland on sandy red earths over spinifex |
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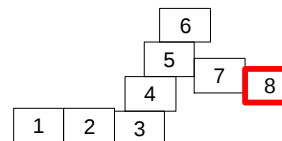
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Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53



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Job Number	4322301
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Date	03 Dec 2015

Figure 2-1 (Page 8 of 8): Vegetation Mapping

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2.2 Terrestrial Fauna

2.2.1 Introduction

Like many other parts of the Australian continent, the Burt Plain Bioregion has suffered a substantial reduction in its mammal fauna over the last century. Introduced predators are widespread and at least 15 of the 54 indigenous mammal species recorded from the bioregion are extinct or no longer occur in the bioregion. Several others have suffered significant population declines.

Much of the bioregion has been impacted by grazing livestock, feral animals and weed infestations. The local area around the Nolans site has been used as grazing land for many years. There is evidence of clearing and disturbance associated with livestock, particularly in the vicinity of Nolans Bore, which was for a long time the only stock watering point in a 15 km² area. As a consequence, vegetation in and around the bore has suffered significant long term degradation.

2.2.2 Biodiversity Overview

Four fauna habitats dominate the study area including

- Mulga woodland;
- Spinifex grassland on sandplain;
- Rocky rises; and
- Acacia and mallee shrubland/woodland.

All of these habitats support diverse fauna assemblages, particularly Mulga woodland, which supports large species numbers of mammals and birds, and Spinifex grassland on sandplain, which supports large species numbers of mammals and reptiles. A large proportion of fauna in the study area, particularly reptiles and mammals, are highly specific to particular habitats. Spinifex grassland on sandplain and rocky habitats had the highest levels of habitat specificity, particularly with reptiles.

A total of 174 native terrestrial fauna species were recorded during baseline survey of the Nolans site, including 25 mammals, 103 birds, 41 reptiles, three frogs and two invertebrates. Survey results included:

- Twenty-five native and five non-native mammal species were identified within the Study area, including Short-beaked Echidna and Dingo;
- Five species of macropod including Black-footed Rock-wallaby, Euro, Red Kangaroo, Northern Nailtail Wallaby and Spectacled Hare-wallaby;
- Seven species of native small mammal including Brush-tailed Mulgara, Fat-tailed Dunnart, Stripe-faced Dunnart, Lesser Hairy-footed Dunnart, Fat-tailed Pseudantechinus, Sandy Inland Mouse and Spinifex Hopping-mouse;
- Potentially 11 species of microchiropteran (insectivorous) bat;
- Six species of non-native mammals included Cattle, Camel, Cat, European Rabbit, House Mouse and Red Fox; and
- 103 native (and zero non-native) bird species, 41 native (and zero non-native) reptile species and three native (and zero non-native) frog species were identified.

2.2.3 Threatened Species

Threatened fauna species¹ are those that are known or considered likely to occur within the study area and that are listed as threatened (or a related category) under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and/or Northern Territory's *Territory Parks and Wildlife Conservation (TPWC) Act 2000*.

Twelve threatened fauna species that do or could occur within the study area including:

- Six mammals;
- Five birds; and
- One reptile.

Nine of the 12 species were recorded in the study area during the 2010/11 and/or 2015 field assessments. The three species that have not been detected (Southern Marsupial Mole, *Notoryctes typhlops*; Greater Bilby, *Macrotis lagotis*; and Princess Parrot, *Polytelis alexandrae*) are included because they are listed under the EPBC Act.

Six of the threatened species identified for the study area are listed as *Vulnerable* or *Endangered* (under the EPBC Act). Three of these (Brush-tailed Mulgara, Black-footed Rock-wallaby and Great Desert Skink) were detected during this assessment.

One of these species (Black-footed Rock-wallaby) is typically restricted to rocky habitats, such as those which occur near the mine site.

Three species (Brush-tailed Mulgara, Southern Marsupial Mole and Great Desert Skink) are restricted to sandy habitats, such as those which occur in the borefield area and along the southern extent of the proposed water supply pipelines.

The Bilby and the Princess Parrot are considered more likely to occur within the sandy habitats of the borefield, although neither was found during survey. The bilby (a burrowing species) is probably more likely to use sandy habitats (rather than rocky habitats or habitats with heavier clay soils), which are more conducive to digging.

A summary of threatened species at the extent of occurrence in the Project area are provided in Table 2-1.

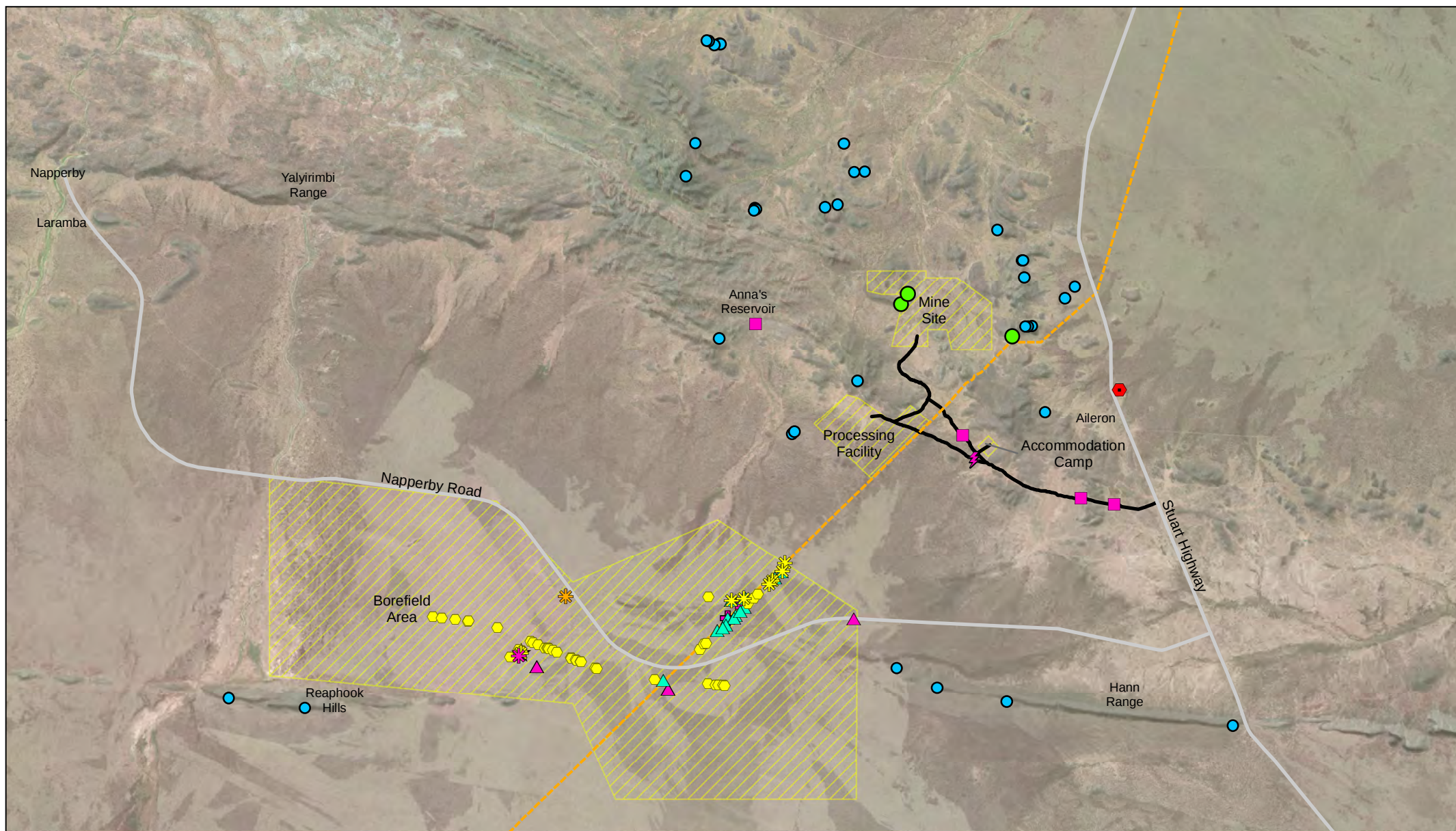
Table 2-1 Threatened Fauna Species

Name		Status		Area Identified ^A	Extents
Common	Scientific	EPBC	TPWC		
Mammals					
Brush-tailed mulgara	<i>Dasycercus blythi</i>	VU	VU	Borefield area	Likely to occur across much of the sandplain habitat in the south of the Study area (i.e. the borefield area).
Black-footed Rock-wallaby (MacDonnell Ranges race)	<i>Petrogale lateralis</i>	VU	NT	Mine Site and Borefield	Mine site and scattered outcrops in the borefield. Species restricted to steep rocky habitats, particularly the larger rocky outcrops and ranges.
Southern Marsupial Mole	<i>Notoryctes typhlops</i>	EN	VU	(Not detected)	May occur across much of the sandplain habitat in the south of the Study area, but likely to be in very low density and barely detectable.
Greater Bilby (Bilby)	<i>Macrotis lagotis</i>	VU	VU	(Not detected)	Potentially suitable habitat occurs across much of the Study area, but particularly in the southern areas that are dominated by sandplain.

¹ This BMP is limited to threatened fauna species and does not include fauna communities, because no threatened fauna communities are identified for the study area.

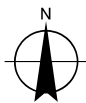
Name		Status		Area Identified ^A	Extents
Common	Scientific	EPBC	TPWC		
Spectacled Hare-wallaby	<i>Lagorchestes conspicillatus</i>	-	NT	Borefield area	Detected by tracks only, which require confirmation. May occur across much of the sandplain habitat in the south of the Study area.
Northern Nailtail Wallaby	<i>Onychogalea unguifera</i>	-	NT	Processing Site	Detected by tracks and scats only, which require confirmation. Could occur anywhere in open woodland or shrubland.
Birds					
Princess Parrot	<i>Polytelis alexandrae</i>	VU	VU	(Not detected)	Potentially suitable habitat occurs across much of the Study area, particularly in the southern areas that are dominated by sandplain.
Emu	<i>Dromaius novaehollandiae</i>	-	NT	Borefield area	Detected by tracks. Likely to occur across the entire Study area.
Australian bustard	<i>Ardeotis australis</i>	-	NT	Haul route (2010)	Seen in open grassland, but species known to use other habitats also. Likely to occur across the entire Study area.
Flock bronzewing	<i>Phaps histrionica</i>	-	NT	Haul route (2010)	Seen in sandplain habitat along the haul route, but this is not necessarily its preferred habitat. May occur across the entire Study area.
Bush Stone-curlew	<i>Burhinus grallarius</i>	-	NT	Processing site and Mine site	Suitable habitat occurs across much of the Study area.
Reptiles					
Great Desert Skink	<i>Liopholis kintorei</i>	VU	VU	Borefield area	Detected by motion-sensing camera at burrow/latrine system. May occur across much of the sandplain habitat in the south of the Study area.

Note: ^A Identified in GHD 2010 and/or 2015 field surveys
EN = Endangered, VU = Vulnerable, NT = Near Threatened.



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Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53



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| ▲ Australian Bustard, 2015 | ✚ Emu, 2015 | ✱ Great Desert Skink (DLRM) | ▲ Emu |
| ● Black-footed Rock-wallaby, 2010 | ✱ Great Desert Skink, 2015 | ● Malleefowl (DLRM) | ● Black-footed Rock-wallaby, 2015 |
| ★ Brush-tailed Mulgara, 2015 | ⚡ Northern Nailtail Wallaby, 2015 | ✱ Bustards | — Roads |
| ■ Bush Stone-curlew, 2015 | ✱ Spectacled Hare-wallaby, 2015 | ● Mulgara Burrows | — Gas Pipeline |
| | | | — Access Roads |
| | | | ▨ Study Area |



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Environmental Impact Statement

Job Number | 4322301
Revision | A
Date | 15 Oct 2015

Figure 2-2: Threatened and near threatened fauna observations within the project area

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Data source: GA - Imagery (2008), Roads, Gas Pipeline (2015). GHD - Fauna Survey Sites, Proposed Mine Site, Proposed Treatment Plant, Proposed Accommodation Village, Borefield Area (2015). Created by: CM

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3. Biodiversity Management

3.1 Approach

The general approach for management of biodiversity before, during and after Project construction and operations is as follows:

- **Key Activities, Risks and Impacts:** A summary of the key activities being undertaken during the management period. The potential environmental impacts and residual risk levels are identified for each environmental aspect.
- **Objective:** The guiding environmental management objective(s) and activities that apply to the element.
- **Mitigation Measures:** The procedures to be employed to ensure that the relevant objectives are met.
- **Trigger, Action, Response Plan (TARP).** The actions to be implemented in the case of non-compliance. This includes strategies of remediation and the person(s) responsible for the actions.

3.2 Key Activities, Risks and Impacts

The key activities and potential impacts to biodiversity are provided in Table 3-1. The residual risk level identified is the risk remaining once management and mitigation measures are implemented. The risk matrix is provided in Appendix C.

Table 3-1 Key Activities, Risks and Impacts

Activity	Potential Environmental Impact	Residual Risk			
		Consequence	Likelihood	Risk	
Clearing of habitat	• Killing/injuring fauna; • Displacement of fauna; • Disruption to nesting/roosting/ foraging habitats and/or behaviour; • Reduction of area of fauna habitat available; • Habitat fragmentation and edge effects; • Creation of barriers to movement; • Creation of corridors and conduits for detrimental species' movement or invasion (e.g. predators accessing new areas); • Increase in dust; • Erosion and sedimentation resulting from disturbed soils; • Degradation of surface water quality due to erosion of soils and landforms; • Increased weed establishment; and • Increased use of the area by non-native predators (e.g. cats, foxes), by creation of access tracks into new areas.	<u>In rocky areas:</u> • Black-footed Rock-wallaby.	Insignificant	Unlikely	Low
		<u>In sandplain and mulga woodland areas:</u> • Brush-tailed Mulgara; • Southern Marsupial Mole; • Greater Bilby; • Spectacled hare-wallaby; • Northern Nailtail Wallaby; • Princess Parrot; • Emu; • Australian Bustard; • Flock Bronzewing; • Bush Stone-curlew; and • Great Desert Skink.	Insignificant	Unlikely	Low
Dust-generating activities (e.g., habitat clearing, drilling, blasting, excavation, haulage and movement of vehicles, handling of materials)	• Dust deposition on vegetation leading to sub-optimal foraging; and • Dust deposition/sedimentation in waterways leading to degradation of surface water quality.	Potentially all species in all habitats.	Insignificant	Rare	Low
Activities generating noise and vibration (e.g., habitat clearing, drilling, blasting, excavation, haulage and movement of vehicles, handling of materials)	• Displacement of fauna; and • Disruption to nesting/roosting/foraging behaviour.	Potentially all species in all habitats.	Insignificant	Rare	Low

Activity	Potential Environmental Impact		Residual Risk		
			Consequence	Likelihood	Risk
Use of permanent/long-term lighting	- Local displacement of fauna (i.e. fauna move away from lit areas); - Attraction of and enhanced mortality of insects; - Increased susceptibility of fauna to predation; - Disruption to nesting/roosting behaviour; - Disorientation of nocturnal birds and bats; - Alteration of bird calling behaviour; - Attraction, disorientation and altered breeding behaviour of amphibians; and - Altered activity rhythms (e.g. small mammals).	Nocturnal fauna, particularly: - Brush-tailed Mulgara; - Black-footed Rock-wallaby; - Greater Bilby; - Spectacled hare-wallaby; - Northern Nailtail Wallaby; and - Bush Stone-curlew.	Insignificant	Rare	Low
Activities that could start an unplanned wildfire (e.g. hot work)	- Killing/injuring fauna; - Displacement of fauna; - Disruption to nesting/roosting/foraging habitats and/or behaviour; - Reduction of area of fauna habitat locally and/or regionally; - Habitat fragmentation; - Subsequent erosion and sedimentation resulting from loss of vegetation; and - Degradation of surface water quality due to erosion of soils and landforms.	All species in all habitats.	Moderate	Unlikely	Medium
Habitat rehabilitation	Inappropriate rehabilitation could lead to the introduction and/or spread of weeds, leading to: - Local decline in habitat quality; - Displacement of fauna from habitats as habitat quality deteriorates; - Invasion of fauna species that are attracted to the weed species (e.g., cattle with buffel grass); and - Changes in fuel load, resulting in changes to fire frequency and intensity.	Potentially all species in all habitats.	Minor	Unlikely	Low

Activity	Potential Environmental Impact		Residual Risk		
			Consequence	Likelihood	Risk
Refuse/garbage management and storage	Inappropriate/inadequate refuse/garbage management could lead to increases in populations of vermin (non-native rats and mice) leading to: - Increases in the local populations of predators (particularly Red Fox and Cat, but also the native Dingo), leading to increased predation pressure on native fauna; and - Increased competition with aggressive and dominating vermin (e.g., House Mouse, Black Rat).	Potentially all species in all habitats, particularly: <u>In rocky habitats:</u> - Black-footed Rock-wallaby. <u>In sandplain habitats:</u> - Brush-tailed Mulgara; and - Great Desert Skink.	Moderate	Unlikely	Medium
Construction of roads, hard stands or embankments	- Habitat fragmentation; - Creation of barriers to movement; - Creation of corridors and conduits for detrimental species' movement or invasion (eg predators accessing new areas); - Erosion and sedimentation resulting from disturbed soils; - Alteration to surface water flows; - Contamination of surface water bodies; - Degradation of surface water quality due to erosion of soils and landforms; and - Increased weed establishment.	All species, but to a minor degree.	Insignificant	Unlikely	Low
Storage of contaminated water (e.g. tailings)	Poisoning of fauna from drinking contaminated water, leading to: - Killing/harming fauna; - Disruption of breeding success; and - Knock-on effects, by attracting predators/scavengers to ill/dead fauna.	All species, but to a minor degree.	Insignificant	Rare	Low

Activity	Potential Environmental Impact		Residual Risk		
			Consequence	Likelihood	Risk
Activities impacting on the water table or surface water	Lowering or contamination of the water table, leading to: - Decline in availability of riparian vegetation resulting in loss of habitat for riparian species; - Shorter inundation period in waterbodies; - Impacts on vegetation that rely on groundwater or surface water flows, leading to reduction in available fauna habitat; - Contamination of ephemeral waterways resulting in impacts on ecosystem health; - Unnatural inundation of fauna habitats; - Progressive water table drawdown from unsustainable groundwater extraction rates from the Southern Basins Borefield; and - Contaminated water in mine void results in long-term source of contaminant. Alteration of surface water flows, leading to: - Increased erosion and sedimentation; - Detrimental changes in turbidity; - Detrimental changes in water chemistry; - Altered hydrology and hydroperiod; and - Contamination of surface water sources.	Potentially all species, but to a minor degree.	Insignificant	Rare	Low
Haulage and movement of vehicles	- Injury and death from collisions with vehicles; - Subsequent breeding failure caused by death of naïve young fauna, or adult fauna that have dependent offspring; - Potential spills of chemicals or pollutants, including toxic contaminants; and - Dust and Noise.	<u>Vehicle movements at night, particularly within the borefield area</u> - Black-footed Rock-wallaby; - Brush-tailed Mulgara; - Greater Bilby; - Spectacled Hare-wallaby; - Northern Nailtail Wallaby; - Bush Stone-curlew; and - Great Desert Skink.	Minor	Unlikely	Low

Activity	Potential Environmental Impact		Residual Risk		
			Consequence	Likelihood	Risk
		<u>Vehicle movements at night</u> - Southern Marsupial Mole; - Princess Parrot; - Emu; - Australian Bustard; and - Flock Bronzewing.	Insignificant	Rare	Low
		<u>Vehicle movements by day</u> - Brush-tailed Mulgara; - Princess Parrot; - Emu; - Australian Bustard; - Flock Bronzewing; and - Great Desert Skink.	Minor	Unlikely	Low
		<u>Vehicle movements by day</u> - Black-footed Rock-wallaby; - Greater Bilby; - Southern Marsupial Mole; - Spectacled Hare-wallaby; - Northern Nailtail Wallaby; and - Bush Stone-curlew.	Insignificant	Rare	Low

3.3 Objective

Biodiversity management objectives have been established and are detailed in Table 3-2.

Table 3-2 Biodiversity Management Objectives

Objective	Target	Indicator
Establish and maintain awareness and importance of protecting biodiversity across the Project.	All onsite personnel (including Contractors) to undertake site induction which will include a summary of the Project biodiversity.	Percentage of personnel who completed the site induction.
Minimise the extents of vegetation clearance and undertake in accordance with the Ground Disturbance Permit system.	Zero incidents of clearing outside Project footprint and approved borrow pit locations.	Number of incidents of clearing outside of approved clearance areas.
Minimise injury or death to native fauna from Project activities.	All vehicles to adhere to establish Project speed limits. Zero incidents of native fauna injury or death from Project activities. Implement system for the management of injured and dead fauna.	Number of incidents involving native fauna injury or death from Project activities. Management of injured and dead wildlife system in place.
Implement Pest Monitoring Plan – Cat, Fox and Dingoes	No change in the feral cat/fox population and no more than a 50% increase in the dingo population.	Percentage increase in population sizes
Undertake population Monitoring for Black-footed Rock-wallaby and the species in sandplain habitats.	Below moderate change for Black-footed Rock-wallaby and small change for sandplain habitats threatened species.	Percent decrease in population sizes.

3.4 Mitigation Measures

Mitigation measures have been developed to minimise potential impacts associated with biodiversity. The mitigation measures, appropriate timing and assignment of responsibilities are provided in Table 3-3.

Table 3-3 Mitigation Measures

ID	Mitigation Measures	Purpose/Objective	Timing	Responsibility
General – for all activities at all times				
FF1	Site induction will include the following components for biodiversity management: - Summary of biodiversity at the Project including ecologically sensitive areas and threatened fauna; - Identification of potential impacts to biodiversity from the Project activities; - Requirement to enter and exit site through recognised vehicle access points, and to travel around site using existing/approved roads and tracks only; - Requirement for speed restrictions across the Project; and - No work to be undertaken without an approved Ground Disturbance Permit.	- Raise awareness of threats to biodiversity; - Educate personnel on ways to avoid impacts; and - Educate personnel on procedure to follow in the event of vehicle injuring or killing fauna.	Prior to work commencing	Environmental Officer
FF2	No work undertaken within 200 m of the Great Desert Skink warren recorded within the Borefield.	Avoid known habitat for EPBC listed reptile.	At all times	All personnel
FF3	Implement all aspects of the Environmental Management Plan including the following sub-plans: - Air and Dust Management Plan; - Erosion and Sediment Control Plan; - Fire Management Plan; - Weed Management Plan; - Mine Closure Plan; and - Non-mineralised Waste Management Plan.	-	At all times	HSEC Manager and Area Managers
FF4	Seal/cover open holes, pits, trenches (e.g. monitoring bores, production wells, exploration bores) when not manned to prevent ground-dwelling fauna from falling in.	Reduce impacts on fauna.	At all times	All personnel
Clearing of vegetation				
FF5	Prior to clearing a Ground Disturbance Permit is required to be issued by the HSEC Manager (Appendix B).	Obtain authorisation.	Prior to clearing	All personnel
FF6	Use previously disturbed areas before clearing vegetation from undisturbed areas.	Minimise new clearing of habitat.	At all times	Area Managers
FF7	Minimise ground disturbance at all locations and specifically at/near riparian zones.	Minimise dust, erosion, sedimentation, habitat loss.	At all times	Area Managers
FF8	Maximum clearing easements for haul roads and access roads will be complied with.	Minimise habitat loss.	Road construction	Area Managers
FF9	Consider applying a cool, well-managed fuel-reduction burn to all habitats to be cleared (but not beyond), to encourage fauna to flee prior to clearing. The specifics of fuel-reduction burns to be determined in consultation with relevant stakeholders prior to fire being lit.	Reduce impacts on fauna.	Prior to clearing	HSEC Manager, in collaboration with NT DLRM and local stakeholders

ID	Mitigation Measures	Purpose/Objective	Timing	Responsibility
FF10	Qualified ecologist will be present during clearing of the Borefield where mulgara burrows have been mapped, to capture/translocate animals unable to escape.	Move fauna from harm's way.	During clearing	HSEC Manager, using qualified ecologists
FF11	Clearly mark areas of land to be cleared and areas to be retained (No-Go areas), so that impacts do not extend any further than necessary into important habitat.	Minimise habitat loss.	Prior to clearing during all phases of project	Area Managers
FF12	If possible, plan to clear vegetation progressively and incrementally as needed, rather than through large-scale clearing in advance.	Reduce impacts on fauna.	Design phase, prior to clearing	Area Managers
FF13	Rehabilitate/stabilise cleared land progressively as activities are completed (which forms part of the Closure and Rehabilitation Plan).	Reduce impacts of dust.	As activities are completed	Area Managers
Noise				
FF14	Where possible, high-impact noise (e.g. blasting) will be limited to daylight hours.	Reduce impacts on nocturnal fauna.	At all times	Area Manager
Light				
FF15	Implement a light reduction strategy during the detailed design phase including: - Limit artificial light to areas where it is essential; - Turn off lights when not required; - Avoid the flood of light into natural habitats and limit the escape of light into surrounding areas of fauna habitat (i.e. using shields/deflectors); - Ensure that artificial lighting is not directed upwards or laterally (i.e. should be directed towards the ground); - Use lower (i.e. closer to the ground) rather than higher lighting installations; - Use lower wavelengths of light wherever possible i.e. red/yellow lights; - Use light intensities that are as low as possible without reducing safety or efficiency; and - Avoid painting large structures bright or reflective colours and minimise use of bright or reflective construction materials and finishes for large structures.	Reduce impacts on nocturnal fauna.	At all times	Area Managers
Unplanned Wildfire				
FF16	Carefully plan and identify where high-risk activities can take place.	Minimise risk of wildfire.	As required	Area Managers
FF17	Maintain adequate fire breaks around high-risk areas/activities.	Minimise risk of wildfire.	At all times	Area Managers
FF18	Implement active fire management, using localised cool-season control burns within 100 m of mine activities and roads to reduce fuel loads.	Minimise risk of wildfire.	As required	HSEC Manager, in collaboration with NT DLRM and local stakeholders
Pest animals				
FF19	As part of the Waste Management Plan, implement sound waste (garbage) management to limit invasion/colonisation by Black Rat (<i>Rattus rattus</i>).	Minimise potential impacts of vermin and pest predators.	At all times	Environmental Officer
FF20	General site wastes will be managed to prevent/reduce interaction with fauna. Waste management includes: - Regular burning of the landfill; - Fencing installed surrounding the landfill to restrict interaction with fauna;	Avoid population increase in pest predators.	At all times	Area Managers

ID	Mitigation Measures	Purpose/Objective	Timing	Responsibility
	- Waste storage outside of the landfill is to be situated in bins with lids secured; - Waste oils and/or hazardous substances will be kept in sealed containers and/or covered; and - All domestic waste outside the landfill/waste-storage facility is to be stored in vermin-proof bins with lids secured.			
FF21	Implement a Pest Monitoring Plan to monitor feral cat and fox populations to determine if control measures are required. The plan is summarised in Table 4-2.	Minimise potential impacts of pest predators	Timing and frequency to be determined by results of pest-animal monitoring	Area Managers
Surface and Groundwater				
FF22	Reduce attractiveness (to wildlife) of the Residue Storage Facility, Flotation Tailings Storage Facility, Sediment Basins and Process Water Ponds through the implementation of Best Practice Guidelines for Reducing Impacts of Tailings Storage Facilities on Avian Wildlife (DME, 1998).	Minimise impacts on fauna.	Design, construction and operational phases	Area Manager
FF23	Fence off tailings storage facilities to prevent ground-based fauna from accessing the water.	Minimise impacts on fauna.	Construction	Area Manager
Haulage and Vehicle Movement				
FF24	Keep the proposed road network to a minimum and upgrade and utilise existing vehicle tracks. Ensure that all vehicles travel on these designated roads, and not on secondary or short-cut roads/tracks.	Minimise impacts on fauna.	Design, construction and operational phases	Area Managers
FF25	Implement and enforce speed restriction controls for all roads across the entire study site.	Minimise impacts on fauna.	Construction and operational phases	Area Managers
FF26	Implement slower speed limits for all vehicles moving at night in sensitive habitat areas, to reduce the likelihood of roadkill.	Minimise impacts on fauna	Construction and operational phases	Area Managers
FF27	Upgrade high-use areas to be safer for vehicles and fauna (e.g. no blind curves, wider shrub-free verges).	Minimise impacts on fauna.	Design and construction phases	Area Managers
FF28	If injured fauna is encountered, assess the situation and potential requirement to euthanize and/or contact Wild Care Alice Spring for advice: - M: 0419 221 128 - E: wildcareasp@gmail.com	Minimise impacts on fauna.	Construction and Operation	All personnel; Environmental Officer
FF28	If dead animals are found on/beside roads, the Environmental Officer is to be notified immediately to remove the carcass a minimum of 20 m into adjacent land.	Minimise impacts on fauna.	Construction and Operation	All personnel; Environmental Officer
Inspection and Monitoring				
FF30	Threatened species monitoring program including the Black-footed Rock-wallaby	Determine Projects impact	Annual	Environmental Officer

ID	Mitigation Measures	Purpose/Objective	Timing	Responsibility
	Plan and Sandplain Habitats Plan detailed in Table 4-5 and Table 4-6 respectively.	on threatened species.		
FF31	Pest Monitoring Plan including monitoring pest species population and determine if additional measures are required. The Plan is detailed in Table 4-2.	Determine Projects impact on pest species.	Annual	Environmental Officer
FF32	Pest management is accordance with the Pest Animal Management Plan detailed in Table 4-4.	Bait and trapping to remove known pests.	Continual	Environmental Officer
FF34	Regular assessment of compliance with Ground Disturbance Permits.	Ensure permit and system is being complied with.	As required	Environmental Officer
FF35	Fauna Sighting and Fatality Register to be maintained (Appendix A).		As required	Environmental Officer

3.1 Trigger, Action and Response Plan

The Trigger, Action and Response Plan (TARP) outlines remedial actions and responses to the situation. The TARP is provided in Table 3-4.

Table 3-4 Trigger, Action and Response Plan

Responsibility	Situation		
	Normal	Level 1	Level 2
	Site activities are being managed in accordance with mitigation measures and no incidents have occurred.	Areas of vegetation to be cleared will be outside of Project boundary / existing disturbance.	Vegetation cleared outside of approved boundary.
Site Personnel	Comply with: • Site Induction requirements. • Vehicle and Equipment Hygiene Procedures. • Ground Disturbance Permit Procedures.		• Stop work and inform the Environmental Officer of additional disturbance.
Environmental Officer	Undertake walkovers / inspection of work areas.	• Assess requirement to clear outside of Project boundary. • Areas to be cleared outside of existing disturbance will be flagged to prevent over clearing. • Ensure top soil and seed bank are reserved to facilitate rehabilitating the area. • Survey additional disturbance. • Ensure sufficient erosion and sediment control measures are used.	• Provide guidance on rehabilitation of additional disturbance. • Survey additional disturbance. • Ensure sufficient erosion and sediment control measures are used. • Undertake investigation into disturbance incident.
Area Managers	Ensure the Biodiversity Management Plan is being implemented by all Site Personnel.		• Assess the ground disturbance incident and undertaken relevant corrective measures.
	Fauna observed and behaving normally.	Native fauna observed in the area of the landfill, construction and/or operational activities.	Native fauna injured or killed due to Project activities.
Contractor	Continue to operate diligently in accordance with site induction flora and fauna components.	• Encourage or wait for native fauna to vacate construction areas. • Report sighting to the Environment Officer.	• Report to Area Supervisor. • If fauna is killed, remove from road at least 20 m into adjacent bush land.

Responsibility	Situation		
	Normal	Level 1	Level 2
Environmental Officer	-	Enter sighting into Fauna Sighting and Fatality Register (Appendix A).	- If fauna is injured, assess the situation and potential requirement to euthanize and/or contact Wild Care Alice Springs for advice: M: 0419 221 128 E: wildcareasp@gmail.com - If fauna is killed, remove from road at least 20 m into adjacent land. - Record incident in Fauna Sighting and Incident Register (Appendix A). - Determine if species is a threatened species and if the death activates additional contingency measures. Record death within Fauna Sighting and Fatality Register (Appendix A) or record as an environmental incident in the case of a threatened species death.
Area Managers	Ensure the Biodiversity Management Plan is being implemented by all Site Personnel.		Assist the Environmental Officer in addressing potential installation of contingency measures.

4. Monitoring and Threat Abatement Program

4.1 Purpose and Approach

Monitoring programs will be established in ways that allow baseline information to be compared against subsequent repeat surveys. If monitoring indicates that the current mitigation efforts are inadequate then revised or increased mitigation measures will be implemented to protect biodiversity.

4.1.1 Commonwealth Threat Abatement Plans

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), threat abatement plans establish a national framework to guide and coordinate Australia's response to key threatening processes. The plans identify research, management and other actions needed to ensure the long-term survival of native species and ecological communities affected by key threatening processes. Threat abatement plans directly relevant to fauna at the Project include:

- Threat abatement plan for predation by European red fox – 2008; and
- Threat abatement plan for predation by feral cats – 2015.

Threatened species considered to be at high risk of predation by feral Cat and/or Red Fox identified for this project are Black-footed Rock-wallaby, Brush-tailed Mulgara and Great Desert Skink.

Accordingly, monitoring at the Project will focus on these threatened species and the threats posed by cats and foxes.

4.2 Assessment Criteria

Monitoring of threatened species and management of pest species population density within the Project area will be undertaken at regular intervals as detailed in Table 4-2 to Table 4-6. The data will be utilised to determine if the population has increased, decreased or remained unchanged and can be assessed against historical data to indicate trends.

Triggers and responses will be determined by predicted 'levels of acceptable change'. The accepted levels of change are determined by known species characteristics and for this program include three scenarios as follows:

- Known to Fluctuate
 - If a species/community is known to fluctuate broadly in numbers or activity patterns, then a higher level of change (as determined through monitoring) is acceptable, because that level of change may simply reflect natural fluctuations
- Generally Consistent
 - If a species/community is known to remain consistent in numbers or activity patterns, then a lower level of change is acceptable, because any change at all may indicate that the project is having an effect.
- Unknown
 - If the populations or activity levels of a species/community are not understood adequately to determine the natural levels of variability, then the less known about the dynamics of a species/community, the smaller the level of change that should be accepted until more can be learned.

With the understanding of species characteristics, levels of acceptable change have been developed for each monitoring and management plan. A summary of acceptable levels of changes and associated definitions are provided in Table 4-1.

Table 4-1 Levels of Acceptable Change

Acceptable level of change	When to apply
No increase	When the species/community being investigated is known to have naturally very small variation in population size or activity patterns. Thus, detection of any deleterious change (as found through monitoring) suggests that the project may be having an effect.
Small change	When the species/community being investigated is known to have naturally small variation in population size or activity patterns. Thus, detection of small deleterious change (as found through monitoring) suggests that the project may be having an effect.
Moderate change	When the species/community being investigated is known to have naturally moderate variation in population size or activity patterns. Thus, small changes (as found through monitoring) may simply reflect natural variation, and more substantial changes would need to be detected to suggest that the project may be having an effect.
Large change	When the species/community being investigated is known to have naturally high variation in population size or activity patterns (e.g. boom-bust or irruptive species). Thus, even moderate changes (as found through monitoring) may simply reflect natural variation, and large consistent long-term changes would need to be detected to suggest that the project may be having an effect.

4.3 Management Plans

Monitoring plans have been established to determine if mitigation measures at the Project are sufficient. The plans include:

- Pest Monitoring Plan – Cats, Foxes and Dingoes (Table 4-2);
- Register – Cats, Foxes and Dingoes (Table 4-3);
- Pest Animal Management Plan (Table 4-4);

Threatened Species Monitoring – Black-footed Rock-wallaby (

- Table 4-5); and
- Threatened species monitoring – Sandplain habitats (Table 4-6).

Table 4-2 Pest Monitoring Plan

Program		Pest Monitoring Plan – Cats, Foxes and Dingoes
Objective		Establish baseline and subsequent comparative data on population sizes of feral predators and dingoes to inform control program.
Survey Effort	Survey	Establish baseline data by undertaking a motion-sensing camera survey prior to construction, using site occupancy as the measure of predator populations. Cameras to be deployed for a minimum of 28 nights.
	Operation	Establish 30 baited camera stations that can be repeatedly used including: • 10 sites within 100 m of proposed mine activities (particularly around the landfill); • 10 sites approximately 1 km from mine activities; and • 10 sites more than 5 km from mine activities.
	Timing	Annual (during operation)
	Personnel	Qualified ecologists.
Trigger Points	Cats / Foxes	Acceptable level of change: No increase Any increase in population size is likely to be detrimental to biodiversity. Action required if >10% increase in numbers of individuals detected across two surveys.

	Dingoes	Acceptable level of change: Moderate change Dingoes are native predators and their presence is likely to limit the population size of other predators (cats and foxes). Therefore, dingo presence and increase in population is acceptable. However, over-abundance of dingoes is likely to be detrimental to threatened species. Action required if >50% increase in abundance across two surveys.
Contingency		Implement or increase predator control program as required. Increase cat/fox control efforts, through trapping, poisoning, shooting. Make sure predator control method does not result in the unintentional capture or death of threatened fauna species.

Table 4-3 Register

Program		Register – cats, foxes, rabbits and dingoes
Objective		Provide additional information on feral predator and pest animal populations, in conjunction with monitoring program.
Method	Survey	Predator and pest-animal sightings are to be recorded in the Fauna Sighting and fatality Register (Appendix A) to be established and maintained. Input will be opportunistic, however all personnel will be encouraged to report all sightings of cats (including colour and identifying markings, if possible), foxes, rabbits and dingoes.
	Timing	Continually.
	Personnel	All personnel.
Trigger Points	Cats / Foxes / Rabbits	Acceptable level of change: No increase Any increase in population size is likely to be detrimental to biodiversity. Additional mitigation action required if the Fauna Sighting and fatality Register (Appendix A) indicates an increase in sightings in a particular area (e.g. more often per week, larger numbers per night, more individuals in an area). Action required if >10% increase in numbers of individuals detected across a six month period.
	Dingoes	Acceptable level of change: n/a Fauna Sighting and fatality Register not to be used to guide response actions for dingoes.
Contingency		Implement or increase predator and pest-animal control program as required (e.g. if there is a notable increase in sightings of non-native predators in the study area). Increase cat/fox/rabbit control efforts, through trapping, poisoning, shooting, in consultation with DLRM and CLC. Make sure predator/pest control method does not result in the unintentional capture or death of threatened fauna species.

Table 4-4 Pest Animal Management Plan

Program		Pest Animal Management Plan (Bait and Trapping Plan)
Objective and approach		Implement a pest eradication/control program targeting foxes, cats and rabbits across the Project and non-native rats and mice at the Mine Site and Accommodation Village to minimise potential impacts of vermin and pest predators.
Target species		- Non-native rats/mice (e.g., <i>Rattus rattus</i>, <i>Mus musculus</i>); - European Rabbit; - Red Fox; - Feral Cat; and - Dingo (if overabundant).
Rats / Mice	Methods	Poisoned baits in and under buildings and within the confines (fences) of the landfill facility.
	Timing	All year.
	Location	Offices and accommodation areas across the Project and around the landfill facility.
Rabbits	Methods	Warren fumigation and/or ripping. Prior to control methods being used on a suspected rabbit warren, motion-sensing cameras must be deployed at warren entrances for at least 30 days during the warmer months (October to March) to make certain that the burrows aren't used by Mulgaras or

		Great Desert Skinks, or any other threatened fauna species. If any burrow is found to support a native threatened species, then fumigation and warren ripping are not suitable. Other rabbit-control methods are to be established (e.g., trapping, shooting).
	Timing	All year, as required. The need for rabbit control will be informed by the Fauna Sighting and fatality Register (Appendix A), and the results of other fauna monitoring (e.g. use of motion-sensing cameras).
	Location	Across Study area, particularly in sandplain areas where the impact of rabbits on native threatened species has the potential to be greater.
Cats / Foxes	Methods	Range of methods to be trialled upon the outset of the Project to determine the most effective and efficient method. Possible methods include: • Poisoned baiting; • Trapping (e.g., cage trapping); • Shooting; and • Grooming traps (innovative new passive baiting and trapping methods that target cats (http://www.ecologicalhorizons.com/initiatives). Grooming Traps may provide a long-term tool to control trap- or bait-shy cats in areas of high conservation value (e.g. in areas of known Black-footed Rock-wallaby habitat).
	Timing	Annually, and more frequently if required on the basis of monitoring results.
	Location	Mine Site and broader project area. Focus efforts initially in and around the mine site and landfill facility where non-native rats and mice are most expected to attract non-native predators. Expand area of control if any of the fauna monitoring or Fauna Sighting and fatality Register (Appendix A) data suggest that predator numbers have increased in areas away from the Mine Site.
Dingoes	Methods	Dingoes are native predators and are not expected to require regular or frequent active population control measures. However, if the mine activities promote an increase in non-native rats and mice, allowing dingo populations to get unnaturally large to the point where they threaten native fauna also, then control measures may be required. Possible methods include: • Poisoned baiting; or • Shooting. Control of dingo populations, if required, is expected to involve removal of relatively small numbers of individuals, rather than broadscale population control and would be undertaken in consultation with regulatory authorities.
	Timing	As needed, on the basis of monitoring results.
	Location	Across mine site and broader project area, as required.
Personnel		Environmental Officer
Contingency		Implement or increase predator and pest-animal control program as required. Make sure predator and pest-animal control method does not result in the unintentional capture or death of threatened fauna species.

Table 4-5 Threatened Species Monitoring – Black-footed Rock-wallaby

Program		Threatened Species Monitoring – Black-footed Rock-wallaby
Objective		Assess the potential impact from the Project on Black-footed Rock-wallaby through: • Documenting the persistence of the local rock-wallaby population; • Understanding changes in habitat use near the mine site; • Evaluating the effectiveness of predator control measures; and • Evaluating the effectiveness of vehicle movement restrictions.
Method	Survey	Aerial and motion camera surveys.
	Locations	Marginally rocky habitat, rocky outcrops near the mine site and in surrounding rocky areas (landscape context).
	Timing	Annual.
	Personnel	Qualified ecologist.
Trigger Points		Acceptable level of change: moderate change Additional mitigation action required if: • Rock-wallabies are not detected in rocky outcrop near the mine site and in the preceding year rock-wallabies are killed on the roads in the study area; • Predator monitoring shows that numbers of predators in the study area over the

	preceding 12 months increased (cat and fox) or increased greatly (dingo); or Wildfire in rocky areas during the preceding 12 months and no rock-wallabies are detected in nearby rocky areas.
Contingency	Mitigation measures include: - Increase cat/fox control efforts (trapping, poisoning, shooting) if predator numbers have increased; - Broaden fire breaks in high risk areas to prevent future fires, if fire may have been responsible, and - Reduce vehicle speeds or access in high-risk areas if roadkill may have been the cause.

Table 4-6 Threatened Species Monitoring – Sandplain Habitats

Program		Threatened species monitoring – Sandplain Habitats
Objective		To document the persistence of known threatened species in the vicinity of the mine, and to evaluate the effectiveness of predator control measures.
Method	Survey	Motion-sensing camera surveys within known threatened species habitat for Brush-tailed Mulgara and Great Desert Skink including two cameras at known warrens. Transect surveys searching for warrens within known threatened species habitat for Great Desert Skink. Camera surveys will comprise five 400m camera transects, each comprising 5 cameras at 100m intervals and be left insitu for 28 nights during Great Desert Skink active season.
	Locations	Sandplain Habitat.
	Timing	Annual.
	Personnel	Qualified ecologists.
Trigger Points		Acceptable level of change: small change Additional mitigation action required if: >20% decrease in numbers of Great Desert Skink and/or Mulgara and in the preceding year an incident of roadkill is recorded; - Predator monitoring shows that numbers of predators in the study area over the preceding 12 months increased (cat and fox) or increased greatly (dingo); or - Wildfire in the sandplain habitat during the preceding 12 months and no Great Desert Skink and/or Mulgara are detected.
Contingency		Mitigation measures include: - Increase cat/fox control efforts (trapping, poisoning, shooting) if predator numbers have increased; - Broaden fire breaks in high risk areas to prevent future fires, if fire may have been responsible, and - Reduce vehicle speeds or access in high-risk areas if roadkill may have been the cause.

5. Previous Period Performance

No data is available for the previous reportable period.

Appendices

Appendix A – Fauna Sighting and Fatality Register

Fauna Sighting and Fatality Register

Table A1 Fauna Sighting and Fatality Register

Date (--/--/--)	Time (--:--)	Animal (Type / Name)	Number	Condition (Sighting, Injured, Dead)	Conservation Status (Native, Migratory, Feral, Introduced, Threatened, Unknown)	Location (Reference to infrastructure or Haul Road chainage)	Interaction Details (Summary of interaction including how fauna was injured or killed by Project activities and measures taken)

Appendix B – Ground Disturbance Permit System

Ground Disturbance Permit Instructions

Instructions for Filling in the Ground Disturbance Permit Form

1. Section 1 Application

Upon completion of design or instruction from Arafura Resources the applicant is to complete and submit Section 1 a minimum of 72 hours prior to ground disturbance. No ground disturbance is to be undertaken prior to approval. The applicant is required to complete, sign and submit the form to the HSEC Manager or representative. The form requires the following details:

- **Applicant:** Contractor or supervisor responsible for the work area.
- **Arafura Area Manager/Supervisor:** Arafura Resources company representative responsible for the works area.
- **Summary of Clearing Request:**
 - **Contractor(s):** Applicant Company and any subcontractors to be used are summarised including roles and contact details.
 - **Purpose:** Summary of works and its relation to the Project.
 - **Related Infrastructure:** Detail what infrastructure will be constructed post clearing (i.e. drill pad, ROM Pad, etc).
 - **Location:** Brief description of the location for ground disturbance in relation to layouts provided in Figure 1 to Figure 6.
 - **Tenement / Lease:** Detail which lease(s) the disturbance is situated on.
 - **Clearing Summary:** Equipment to be utilised, process to be followed (i.e. vegetation removal, topsoil strip, etc) and location of stockpiles.
 - **Proposed Clearing Dates:** Dates for clearance to occur and timings (i.e. day shift 06:00 to 18:00).
 - **Area:** Details of total area to be cleared as part of this permit.
 - **High Risk Locations:** Summary of high risk locations at or adjacent to proposed ground disturbance including Aboriginal Area Protection Authority (AAPA) Restricted Works Area (RWA), heritage locations and/or identified threatened species or sensitive vegetation (see Figure 1 to Figure 6).

2. Section 2 - Review

Section 2 provides a framework for the disturbance to be assessed against to ensure compliance with Project approvals including the Cultural Heritage, Weed and Biodiversity Management Plans.

The application will be assessed by the HSEC Manager or representative. The assessment will determine if the disturbance is approved as part of the existing approvals and if it is compliant with the Cultural Heritage, Biodiversity and Weed Management Plans. Should insufficient detail have been provided within Section 1, the application will be returned to the Applicant with a request for more information.

3. Section 3 – Approval

Section 3 provides approval to an applicant to undertake the disturbance and describes associated approval conditions. The approval will be provided with a unique identification number and will be signed by the HSEC Manager or representative, applicant and Arafura Area Manager / Supervisor.

4. Section 4 – Ground Disturbance

Section 4 will capture the disturbance process including duration and a summary of the works. The summary will include conditions encountered, animals observed or translocated, stockpile locations and weed status.

Ground Disturbance Permit

Section 1 - Application

This form must be completed before any work commences. Applicant to complete and provide to the HSEC Manager or representative a minimum of 72 hours prior to ground disturbance.

Applicant		Arafura Area Manager/Supervisor	
Name		Name	
Position		Position	
Employer		Contact No.	
Contact No.			

Summary Ground Disturbance Request			
Contractor(s) Entities			
Purpose Rationale or reason for clearing.			
Related Infrastructure Type of infrastructure to be constructed as covered by this Ground Disturbance Permit.			
Location Location description and coordinate references (specify GPS georeference used).			
Tenement / Lease Detail lease ID and confirm it is on lease.			
Clearing Summary Equipment, process and stockpile locations (vegetation and soil).			
Date(s) and Time(s) for Proposed Clearing and Work Activity Duration of clearing and works.			
Area (Ha) Append Map			
High Risk Locations AAPA Restricted Work Areas, Creeks/Rivers, Threatened Species (see Figure 1 to Figure 6).			
High Risk Control Measures Installation of additional flagging tape and / or spotter.			
Request Submission			
Applicant Signature		Date	

Section 2 - Review

HSEC Manager or representative to review ground disturbance request and determine if it is within the lease, approved through the EIS and/or high risk control measures are sufficient.

Review	
Area of Disturbance	
Is disturbance authorised under Mining Management Plan?	
Is the disturbance within the tenement / lease? If not, provide justification/relevant approvals.	
Will the work impact activities off lease?	
Detail potential impact on pre-established monitoring locations (boreholes, survey stations or surface water monitoring locations)?	
Confirm area to be disturbed will be / has been flagged?	
Confirm clearing extents are restricted to six weeks work in December, January and February and eight weeks for alternative months (in accordance with the Erosion and Sediment Control Plan) If clearing is for larger areas >than eight/six weeks work inform the Applicant this is to be restricted and a new permit should be applied for.	
Confirm disturbance will not impact on buried or overhead services (culverts)?	
Cultural Heritage	
Is the disturbance outside of AAPA Restricted Work Areas (RWA)? No works are to occur within RWAs without written approval from AAPA.	
Is the disturbance within close proximity (i.e. 50 m) of an RWA? < 50m additional flagging and a spotter are required.	
Will the disturbance impact identified cultural heritage? Assess if cultural heritage can be avoided in unison with Applicant. If not: 1) Complete Heritage Branch 'Application to Carry Out Work on Heritage Plan or Object'; 2) Wait for Heritage Branch work approval; and 3) Notify traditional owners of disturbance dates and invite to supervise works.	

Flora and Fauna	
Have flora and fauna surveys been undertaken across the disturbance? No works are to occur without flora or fauna survey being undertaken to identify threatened species.	
Have threatened species been identified in the disturbance footprint? If so, a qualified ecologist is to be present onsite to capture and translocate animals encountered.	
Has a site walkover identified any indication of threatened species? If so, a qualified ecologist is to be present onsite to capture and translocate animals encountered.	
Have weeds been identified within the disturbance footprint? If so, weeds are to be removed prior to vegetation clearance.	
Where will vegetation stockpiles from the disturbance be located? Include vegetation stockpile locations within Weed Management Plan and weed infestation monitoring/control programs.	
Excess Material Management	
Where will soil stockpiles from the disturbance be located? Stockpiles to be kept at designated topsoil storage locations to facilitate erosion and sediment control management.	
Will stockpile material type and volumes be recorded? Contractor and/or HSEC Manager or representative to record volumes and materials for future reference and assist in rehabilitation of site.	
Survey Management	
Has the disturbance been scheduled for survey? Survey data required to facilitate annual closure estimation. HSEC Manager or representative to organise survey of the disturbance.	

Section 3 – Approval

Disturbance Approval				GDP No.	
Conditions of Approval					
Clearing Date(s)					
HSEC Manager		Signature		Date	
Arafura Area Manager / Supervisor		Signature		Date	

Applicant Acceptance				
Applicant		Signature		Date

Section 4 – Works Summary

Contractor or Arafura Area Manager / Supervisor to provide clearance dates and summary of any issues/recommendations for future disturbances. **The Ground Disturbance Permit is to be returned to the HSEC Manager or representative when works are complete for inclusion in the Ground Disturbance Database.**

Ground Disturbance			
Start	Finnish		
Date		Date	
Time		Time	
Summary of Disturbance Conditions encountered, animals observed or translocated and weed status.			
Survey Data Extents of disturbance and location.			

This figure has been removed to respect and protect the cultural sensitivities of the area following consultation with the Central Land Council and Traditional Owners.

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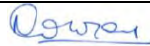
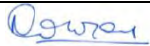
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		Name	Signature	Name	Signature	Date
Rev.0	A Koscielski	N Conroy		N. Conroy		15/03/16

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Appendix C – Risk Matrix

An environmental risk assessment was undertaken for the Nolans Project and associated construction, operation and closure. The risk assessment identified the risk source (hazard and event), receptors and potential impact. The consequence and likelihood were determined using the descriptions identified in Table C1 and Table C2 respectively. The risk matrix is provided in Table C3.

Table C1 Consequence Description

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Air	Air quality	No measurable air quality impacts or exceedance of air quality standards.	Local short term and approaching exceedance of air quality standards.	Local minor long term, or widespread minor short term or exceedance of air quality standards.	Widespread (regional) major short term exceedance of air quality standards.	Regional long term change in air quality or exceedance of air quality standards.
Air	Noise	Applicable standards / guidelines met at all sensitive receptors at all times.	Isolated and temporary increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor.	Short term, local increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor.	Long term, local increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor.	Long term, regional increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor.
Biodiversity	Listed Flora Species	Minor local habitat modification and/or lifecycle disruption for a listed species.	Moderate local habitat modification and/or lifecycle disruption for a listed species.	Substantial local habitat modification and/or lifecycle disruption for a listed species.	Moderate regional habitat modification and/or lifecycle disruption for a listed species.	Substantial regional habitat modification and/or lifecycle disruption for a listed species.
Biodiversity	Listed Threatened Fauna Species	No loss of individuals of listed fauna species.	Minor local decrease in size of population(s) of listed fauna species.	Moderate local decrease in size of population(s) of listed fauna species.	Substantial local decrease in size of population(s) of listed fauna species.	Moderate or substantial regional decrease in size of population(s) of listed fauna species.
Biodiversity	General flora and fauna	Insignificant or imperceptible effects.	Local short term decrease in abundance of some species with no lasting effects on local population.	Local long term decrease in abundance of some species resulting in some change to community structure.	Regional decrease in abundance of some species resulting in some changes to community structure.	Regional loss of numerous species resulting in the dominance of only a few species.
Historic and cultural heritage	Aboriginal and cultural heritage	Minor repairable damage to more common structures or sites. No disturbance of historic and / or cultural heritage sites.	Moderate or repairable damage or infringement to sensitive structures or sites of cultural significance or sacred value.	Considerable damage or infringement to sensitive structures or sites of cultural significance or sacred value.	Major damage or infringement to sensitive structures or sites of cultural significance or sacred value.	Irreparable and permanent damage to sensitive structures or sites of cultural significance or sacred value.

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Human health and safety	Safety	Low level short term subjective inconvenience or symptoms. Typically a first aid and no medical treatment.	Reversible / minor injuries requiring medical treatment, but does not lead to restricted duties. Typically a medical treatment.	Reversible injury or moderate irreversible damage or impairment to one or more persons. Typically a lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons.	Multiple fatalities or permanent damage to multiple people.
Human health and safety	Health	Reversible health effects of little concern, requiring first aid treatment at most.	Reversible health effects of concern that would typically result in medical treatment.	Severe, reversible health effects of concern that would typically result in a lost time illness.	Single fatality or irreversible health effects or disabling illness.	Multiple fatalities or serious disabling illness to multiple people.
Radiation	Occupational exposure	<1 mSv/y Measurable increase in radiation dose with outcomes below public dose limit.	<5 mSv/y Measurable increase in radiation dose with outcomes remaining below dose constraints.	>5 mSv/y and <20 mSv/y Measurable increase in radiation dose with outcomes between dose constraint and dose limit (averaged over five years).	>20 mSv/y and <50 mSv/y Measurable increase in radiation dose with outcomes between dose limit (averaged over five years) and maximum annual dose.	>50 mSv/y Measurable increase in radiation dose with outcomes greater than the maximum annual dose.
Radiation	Public exposure	No change from background. Dose not discernible above natural background.	<0.3 mSv/y Measurable increase in radiation dose with outcomes below public dose constraint.	>0.3 mSv/y and <1 mSv/y Measurable increase in radiation dose with outcomes between dose constraint and dose limit (averaged over five years) for public.	>1 mSv/y and <5 mSv/y Measurable increase in radiation dose with outcomes between dose limit (averaged over five years) and maximum annual dose for public.	>5 mSv/y Measurable increase in radiation dose with outcomes greater than the maximum annual dose for public.
Radiation	Environmental impact	ERICA RQ < 0.1	ERICA RQ >0.1 and <1.0	ERICA RQ >1.0 plus justification	ERICA RQ >1.0 and no justification	ERICA RQ > 10.0

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Socio-economic	Community	Local, small-scale, easily reversible change on social characteristics or values of the communities of interest or communities can easily adapt or cope with change.	Short-term recoverable changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change.	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has some capacity to adapt and cope with change.	Long-term recoverable changes to social characteristics and values of the communities of interest or community has limited capacity to adapt and cope with change.	Irreversible changes to social characteristics and values of the communities of interest or community has no capacity to adapt and cope with change.
Socio-economic	Visual and landscape	Almost imperceptible or no visual change from sensitive receptors or places of cultural and natural value. No loss of / or change to features or characteristics of the landscape.	Minor visual change from sensitive receptors or places of cultural and natural value. Minor loss or alteration to key landscape characteristics, or introduction of elements that may be visible but not uncharacteristic.	Moderate visual change from sensitive receptors and places of cultural and natural value. Discernible changes in the landscape due to partial loss or change to characteristics of the landscape.	Significant visual change from sensitive receptors and places of cultural and natural value. Discernible change which is out of scale with the landscape, at odds with landform and will leave an adverse impact.	Catastrophic visual change from sensitive receptors and places of cultural and natural value. A substantial change to the landscape due to total loss of elements or characteristics, causing the landscape to be permanently changed and its quality diminished.
Transport	Traffic and transport operations and conditions	Negligible adverse impact on traffic and transport conditions. No perceptible deterioration of road integrity.	Detectable adverse changes in traffic and transport condition (decrease in Level of Service) at one or two locations at any one point in time during the construction period or at a single location during operations. Seasonal, local deterioration of road integrity.	Detectable adverse change in traffic and transport conditions (decrease in Level of Service) at multiple locations. Short term, local deterioration of road integrity.	Traffic and transport congestion and delays exceed acceptable levels at multiple locations. Short term, regional deterioration of road integrity.	Traffic and transport congestion and delays severely restrict the safe operation and efficiency of the transport network. Long term, regional deterioration of road integrity.

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Transport	Road safety	No increase in vehicle incidents along relevant haulage routes above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of five per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of ten per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of twenty per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of greater than twenty per cent above historical baseline trend.
Water	Surface water	Minimal contamination or change with no significant loss of quality.	Local minor short term reduction or change in water quality. Local contamination or change that can be immediately remediated.	Local minor long term or widespread minor short term or local major short term reduction or change in water quality. Local contamination or change that can be remediated in long term.	Widespread (regional) major short term reduction or change in water quality. Local contamination or change that cannot be remediated in long term. Widespread contamination or change that can be remediated.	Regional long term reduction or change in water quality. Widespread contamination or change that cannot be immediately remediated.
Water	Groundwater	Negligible change to groundwater regime, quality and availability.	Changes to groundwater regime, quality and availability but no significant implications.	Changes to groundwater regime, quality and availability with minor groundwater implications for a localised area.	Groundwater regime, quality or availability significantly compromised.	Widespread groundwater resource depletion, contamination or subsidence.

Table C2 Likelihood Description

Likelihood	Rare	Unlikely	Moderate	Likely	Almost Certain
Description	The event may occur only in exceptional circumstances. This event is not expected to occur except under exceptional circumstances (up to once every 100 projects of this nature).	The event could occur but is improbable. This event could occur up to once every 10-100 projects of this nature.	The event could occur but not expected. This event could occur up to once every 10 projects of this nature.	The event will probably occur in most circumstances. This event could occur up to once during a project of this nature.	The event is expected to occur in most circumstances. This event could occur at least once during a project of this nature.
Chance of Occurring (%)	0 - 1%	2 - 10%	11 - 50%	51 - 90%	> 91%

Table C3 Risk Matrix

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	High	Extreme
	Possible	Low	Medium	Medium	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Rare	Low	Low	Low	Medium	Medium

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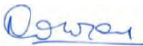
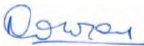
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