Desktop Flora and Fauna Assessment - Southern Cross Bore Project, EL28045

For Davenport Resources Limited

Prepared by: Low Ecological Services P/L

March 2017

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FRONTISPIECE

Top: Calcareous hills in EL28045, bottom left: *Ficus platypoda* (rock fig) fruit, bottom middle: *Danaus petilia* (lesser wander) larvae. Bottom right: *Danaus petilia* (lesser wander) adult.

DISCLAIMER

This document has been prepared by Low Ecological Services (LES) for Davenport Resources Limited in accordance with an agreement with Davenport Resources Limited. LES has prepared this document using the skill and care expected from professional scientists to provide factual and technical information and reasonable solutions to identified risks. It does not constitute legal advice.

ACKNOWLEDGEMENTS

LES acknowledges the assistance of Des Nelson, botanist, who identified plant samples from the site visit.

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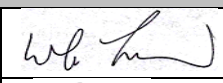
Originator:	Low Ecological Services		29/3/17
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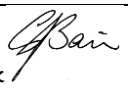
Administrator:	Davenport Resources		30/3/17
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Date	Revision	Prepared by	Reviewed by	Comments
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EXECUTIVE SUMMARY

Low Ecological Services (LES) have been engaged to complete an up to date flora and fauna desktop report for Davenport Resources Limited to satisfy a request for additional current information (MR2016/0486 Section 4.5) from the Northern Territory (NT) Department of Primary Industries and Resources (DPIR). EL 28045, the Southern Cross Bore Project is located 75 km north east of Alice Springs on The Garden Station. The total area of EL 28045 is 7225 ha. Exploration activities will be focused in the north eastern area of EL 28045, where exploration activities have been undertaken by the previous lease holders.

This report focuses on flora and fauna species of conservation significance listed in the NT legislation the Territory Parks and Wildlife Conservation Act (TPWC Act) and Commonwealth legislation the Environmental Protection and Biodiversity Conservation Act (EPBC Act). 'Threatened species' include those listed as Vulnerable (VU), Endangered (EN) or Critically Endangered (CE) under the TPWC Act or EPBC Act. 'Other species of conservation significance' include those listed as Data Deficient (DD), NE (Not Evaluated) or Nt (Near Threatened) under the TPWC Act.

Literature and database searches were undertaken and experience in the area used to gain an understanding of the ecological context of the landscape in EL 28045. Given a lack of existing flora and fauna records in the area, a one day walkover survey was conducted on 3rd March by two Low Ecological Services staff, to ground truth land unit mapping and search for suitable habitat and signs of targeted threatened species.

Existing environment

EL 28045 lies within MacDonnell Ranges Bioregion and the Hartz Range sub-bioregion (Australian Government Department of Sustainability, 2011). The surface hydrology of EL 28045 consists of one major ephemeral watercourse, the Gillen Creek. Soils are are Rudosols. A variety of land forms occur in EL28045 and land unit mapping of The Garden Station by Jessop, (1996) maps a total of 14 land units over the lease. Vegetation in EL 28045 area has been mapped in the Vegetation Survey of the Northern Territory (Wilson, et al., 1990). The vegetation across the EL28045 is broadly characterised by *Acacia* tall open shrubland over *Eriachne* tussock grassland. Mapping obtained from the North Australia and Rangelands Information website (North Australia and Rangelands Fire Information, 2017) shows that most of EL 28045 is long unburnt and one quarter of the lease was burned in 2012 and 2013.

Sites of conservation significance and sites of botanical significance

Sites of Conservation Significance (SoCS) and Sites of Botanical Significance (SoBS) are recognised by the NT Government as important places for conservation of biodiversity. EL 28045 is located entirely within the Greater MacDonnell Ranges SoCS. There are no SoBS within EL 28045.

Flora species of conservation significance

Based on the results of database searches, four flora species of conservation significance could potentially occur in the area within a 20 km buffer of EL 28045. These species are listed in the table below along with their status under the TPWC Act and EPBC Act and their likelihood of occurring within EL 28045. There was one threatened species with a high likelihood of occurring, *Minuria tridens* (minnie daisy), which was recorded during the site visit. The species occurs high on limestone and

calcrete hills and as exploration activities will not be taking place in these areas, exploration is highly unlikely to impact the species.

Flora species of conservation significance identified by the desktop study as potentially occurring within EL28045 and their likelihood of occurrence

Threatened species: VU: vulnerable, EN: Endangered.
Other species of conservation significance: DD: data deficient, Nt: near threatened.

Scientific Name	Common name	TPWC	Source		NT Flora Atlas	Likelihood of occurrence
			EPBC	PMST		
Aristida strigosa	wiregrass	DD	-	-	X	High
Minuria tridens	minnie daisy	VU	VU	X		High
Macrozamia macdonnellii	MacDonnell ranges cycad	Nt	VU	X		Low
Olearia macdonnellensis	aromatic daisy	EN	VU	X		Low

Introduced flora species

The LES site visit found one weed species Declared under the Weeds Managaement Act (WM Act), rubber bush (Class B and Class C). A further four introduced plants, although not Declared under the WM Act, were recorded in EL 28045. These are blackberry nightshade (*Solanum nigrum*), buffel grass (*Cenchrus ciliaris*), couch grass (*Cynodon dactylon)* and spiked malvastrum (*Malvastrum americanum*).

Fauna species of conservation significance

Database searches revealed 23 fauna species of conservation significance occur, once occurred or could potentially occur within a 20 km buffer of EL28045. These species are listed in the table below along with their status under the TPWC Act and EPBC Act and their likelihood or occurring within EL 28045. Threatened species with a high likelihood of occurring within EL28045 include *Granulomelon gilleni* (Gillen Creek land snail), *Semotrachia esau* (land snail) and *Petrogale lateralis* MacDonnell Ranges race (Black-footed rock-wallaby). As *Granulomelon gilleni* and *P. L. lateralis* inhabit rocky hills, exploration activities are unlikely to disturb the species. There is little information published on *S. esau*, however there is a record of the species within the lease and suitable habitat occurs, therefore it is recommended further searches are undertaken for the species.

Ten migratory and/or marine species were listed by the Department of Environment and Energy (DoEE) Protected Matters Search Tool (PMST) as having habitat potentially suitable for the listed species occurring with EL28045. Wetlands with EL28045 are ephemeral so for a number of the listed species, there is a moderate likelihood of occuring after high rainfall only. There there is no critical habitat for any of these migratory species within the lease.

Introduced fauna species

Database searches revealed nine introduced fauna species could potentially occur within EL 28045. These include *Bos Taurus* (domestic cattle), *Camelus dromedarius* (camel), *Canis lupis familiaris* (domestic dog), *Equus asinus* (donkey), *Equus caballus* (horse), *Felis catus* (cat), *Mus musculus* (house mouse), *Oryctolagus cuniculus* (rabbit), *Vulpes vulpes* (red fox). All nine introduced species have a high likelihood of occurring within EL 28045.

Fauna species of conservation significance identified by the desktop study as potentially occurring within EL28045 and their likelihood of occurrence

Threatened Species: VU: vulnerable, EN: endangered, CE: critically endangered
Other species of conservation significance: Nt: near threatened, DD: Data deficient
*likelihood of occurring after high rainfall

Group	Species name	Common name	Status		DoEE PMST	NT Fauna Atlas	Likelihood of occurrence
			TPWC	EPBC			
Bird	*Ardeotis australis*	Australian bustard	Nt			X	High
	Burhinus grallarius	bush-stone curlew	Nt			X	High
	Calidris ferrigunea	curlew sandpiper	VU	VU	X	X	Moderate*
	Calyptorhynchus banksii samueli	red-tailed black-cockatoo (central Australia)	Nt			X	High
	Conopophila whitei	grey honey eater	DD			X	High
	Dromaius novaehollandiae	emu	Nt			X	High
	Erythrotriorchris radiatus	red goshawk	VU	VU	X		Moderate
	Falco hypoleucos	grey falcon	VU			X	High
	Lophoictinia isura	square-tailed kite	Nt			X	High
	Pezoporus occidentalis	night parrot	CE	EN	X		Low
	Polytelis alexandrae	princess parrot	VU	VU	X	X (1894)	Moderate*
	Pyrrholaemus brunneus	red throat	Nt			X	High
	Rostratula australis	Australian painted snipe	VU	EN	X		Moderate*
Invertebrate	*Croitana aestiva*	desert sand-skipper	EN	EN	X		Low
	Semotrachia esau	land snail	VU			X	High
	Granulomelon gilleni	Gillen Creek land snail	VU			X	High
Mammal	*Antechinomys laniger*	kultar	Nt			X	High
	Macrotis lagotis	greater bilby	VU	VU	X	X (1961)	Low
	Petrogale lateralis MacDonnell Ranges race	black-footed rock-wallaby	Nt	VU	X	X	High
	Rattus villosissimus	long-haired rat	Nt			X	Moderate
	Trichosurus vulpecula vulpecula	common brushtail possum (southern NT)		EN		X	Moderate
	Zyzomys pedunculatus	central rock-rat	EN	EN	X		Low
Reptile	*Liopholis slateri slateri*	Slater's skink	VU	EN	X		Low-Moderate

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1 INTRODUCTION

Low Ecological Services (LES) have been engaged to complete an up to date flora and fauna desktop report for Davenport Resources Limited to satisfy a request for additional information (MR2016/0486 Section 4.5) from the Northern Territory (NT) Department of Primary Industries and Resources (DPIR) prior to proposed exploration drilling on EL 28045.

1.1 Project location

EL 28045, the Southern Cross Bore Project is located 75 km north east of Alice Springs in the Strangways Ranges, on the Garden Station (Figure 1). The total area of EL 28045 is 7225 ha. The lease is accessed from The Pinnacle Road off the Artlunga Tourist Drive. The Gillen Creek runs north through the lease.

1.2 Project description

Exploration activities will be focused in the north eastern area of EL 28045, north of Southern Cross Bore on the eastern side of The Pinnacle Road, where exploration activities have been undertaken by the previous lease holders.

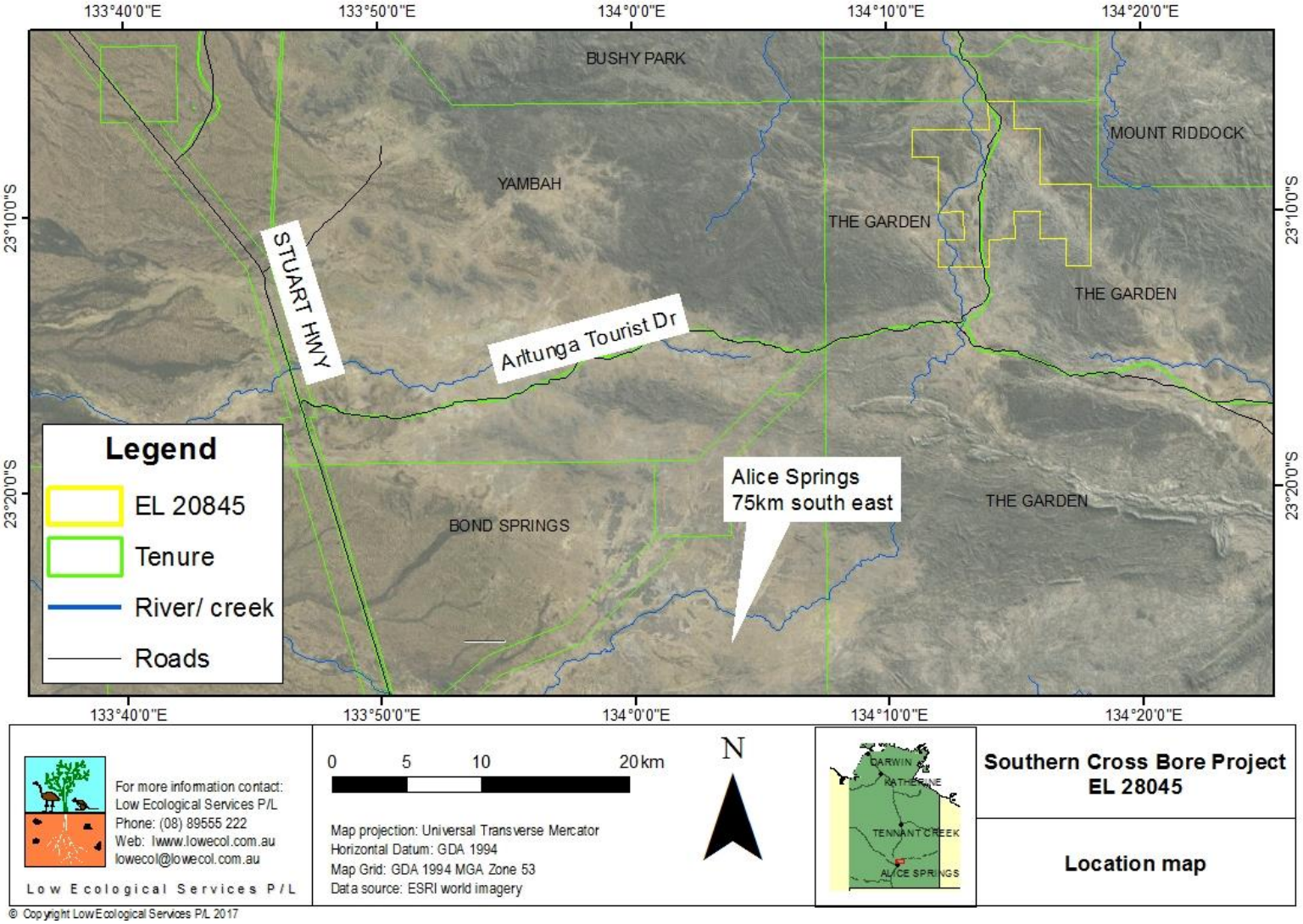

Figure 1 EL 28045 location map

1.3 Legislative context

1.3.1 Commonwealth legislation

Environmental Protection and Biodiversity Conservation Act

The EPBC Act is the Australian Government's key piece of environmental legislation which came into force on July 16, 2000. The objective of the EPBC Act is to provide for the protection of matters of national environmental significance (MNES) and to promote the conservation of biodiversity. The EPBC Act focuses Australian Government interests on the protection of MNES, with the states and territories having responsibility for matters of state and local significance. The EPBC Act identifies MNES as:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mining); and
- A water resource, in relation to coal seam gas development and large coal mining development.

This report assess the likelihood that MNES would be affected by the Southern Cross Bore Project.

1.3.2 State legislation

Northern Territory Parks and Wildlife Conservation Act 2000

The NT *Parks and Wildlife Conservation Act 2000* (TPWC Act) is "an Act to make provision for and in relation to the establishment of Territory Parks and other Parks and Reserves, and the study, protection, conservation and sustainable utilisation of wildlife". Under the TPWC Act, all threatened species are classed as protected wildlife. The Act includes 'Principles of Management', which require that a threatened species be managed in a manner that "maintains or increases their population or the extent of their distribution at or to a sustainable level.

This report assesses the likelihood that flora and fauna listed under the TPWC Act occur within the Proposal area, the potential the Southern Cross Bore Project impacting the flora and fauna and management techniques to mitigate the potential for disturbance.

Weeds Management Act 2001

The *Weeds Management Act 2001* (WM Act) is administered by the NT Department of Environment and Natural Resources (DENR). The objective of the Act is to prevent the spread of weeds in to and out of the NT and to ensure that the management of weeds is an integral component of land management in accordance with the Alice Springs Regional Weed Management Plan 2013 – 2018 (Department of Land and Resource Management Weed Management Branch, 2013) or any other strategy adopted to control weeds in the NT.

If a weed species is 'declared' under Section 7 of the Act, the mining operator is required to comply with the following action;

- Class A: To be eradicated;
- Class B: Growth spread to be controlled; and
- Class C: Introduction to the NT is to be prevented.

A Weed Management Plan (WMP) has been prepared by Low Ecological Services (LES) (2017) for Davenport Resources Limited to ensure declared weeds are managed according to the WM Act.

Other legislation

Other legislation that may be applicable to the Proposal includes:

General:

- *Mineral Titles Act 2016*; and
- *Northern Territory Environmental Protection Authority Act 2012.*
- Environmental Assessment Act 1982 and Environmental Assessment Administrative Procedures 1984
- Mining Management Act 2001

Land Use:

- *Planning Act 2016*;
- *Aboriginal Land Act 2013*;
- *Crown Lands Act 2014.*
- *Soil Conservation and Land Utilization Act 2016*;
- *Bushfires Act 2014*; and
- *Pastoral Land Act 2016.*

Cultural and Heritage:

- *Northern Territory Aboriginal Sacred Sites Act 2013*; *and*
- *Heritage Act 2016.*

Water Quality and Biodiversity Conservation:

- *Water Act 2016*;
- *Biological Control Act 2016*;
- *Public and Environmental Health Act 2016*; and

Air Quality, Noise and Waste Management:

- *Waste Management and Pollution Control Act 2016*; and
- *Public and Environmental Health Act 2016*.

Safety and Environmental Compliance:

- *Work Health and Safety (National Uniform Legislation) Act 2016*;
- *Environmental Offences and Penalties Act 2011*;
- *Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2016*; and

- *Dangerous Goods Act 2012.*

2 METHODOLOGY

2.1 Desktop review

Literature and database searches were undertaken to gain an understanding of the ecological context of EL 28045. Data collated from database searches provided information on the fauna and flora species known to occur in the region, particularly those of conservation significance. GIS mapping was undertaken to provide an overview on soils, vegetation and habitats of the Proposal area and surrounds.

A database review including GIS mapping was undertaken using several data sources to provide an ecological context of the landscape, vegetation, habitats and climate of the Proposal area. The sources include:

- Land Resources of the Garden Station (Jessop, 1996);
- Digital Atlas of Australian Soils (Northcote, K. H., et al, 1968);
- NTVIS - NT Data Compilation for the National Vegetation Information System to determine vegetation communities present;
- Vegetation Survey of the Northern Territory Australia: Notes to accompany 1: 100, 000 Map Sheets (Wilson, et al., 1990);
- Northern Australia Fire Information (North Australia and Rangelands Fire Information, 2017); and
- Aerial photographs and satellite imagery.

Database searches were undertaken to provide lists of species of conservation significance that occur or are likely to occur in the vicinity of the lease. The Commonwealth Government Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST). The PMST identifies Matters of National Significance that may occur in the area. A PMST search was conducted for EL28045 including a 20 km buffer. The DoEE PMST report can be viewed in Appendix 1.

The same area was searched on the NT Species Atlas (maintained by the DENR) and includes the NT Fauna Atlas, NT Flora Atlas, Sites of Conservation Significance (SoCS) and Sites of Botanical Significance (SoBS). The NT Fauna and Flora Atlas search provided lists of existing records of threatened and introduced fauna and flora species. A search of Sites of Conservation Significance (SoCS) and Sites of Botanical Significance (SoBS) was also undertaken to find the closest SoCs and SoBs to the Proposal.

A literature review provided information on the species occurring or potentially occurring in EL 28045. Information was collated to assess the potential for species of conservation significance to occur within the lease areas and surrounds, and the likelihood that proposed operations would impact on these species of conservation significance. Sources of literature reviewed include:

- Species Profile and Threats Database (DoE, 2015) for information about species listed in the EPBC Act – Information sheets, survey guidelines, recovery plans, and Threat Abatement Plans for Key Threatening Processes;
- NT Threatened Species fact sheets published by the DENR; and
- Scientific literature (various referenced sources).

2.2 Walkover survey

Given the lack of existing flora and fauna records in the area, a one day walkover survey was conducted on 3rd March by two Low Ecological Services staff, to ground truth land unit mapping and search for suitable habitat and signs of threatened species. Landscape and soil descriptions, secondary sign and bird surveys were carried out at seven sites in total. One site was located in most of the prominent land units present in EL 28045. Survey site locations and the path taken during the survey is presented in Figure 2.

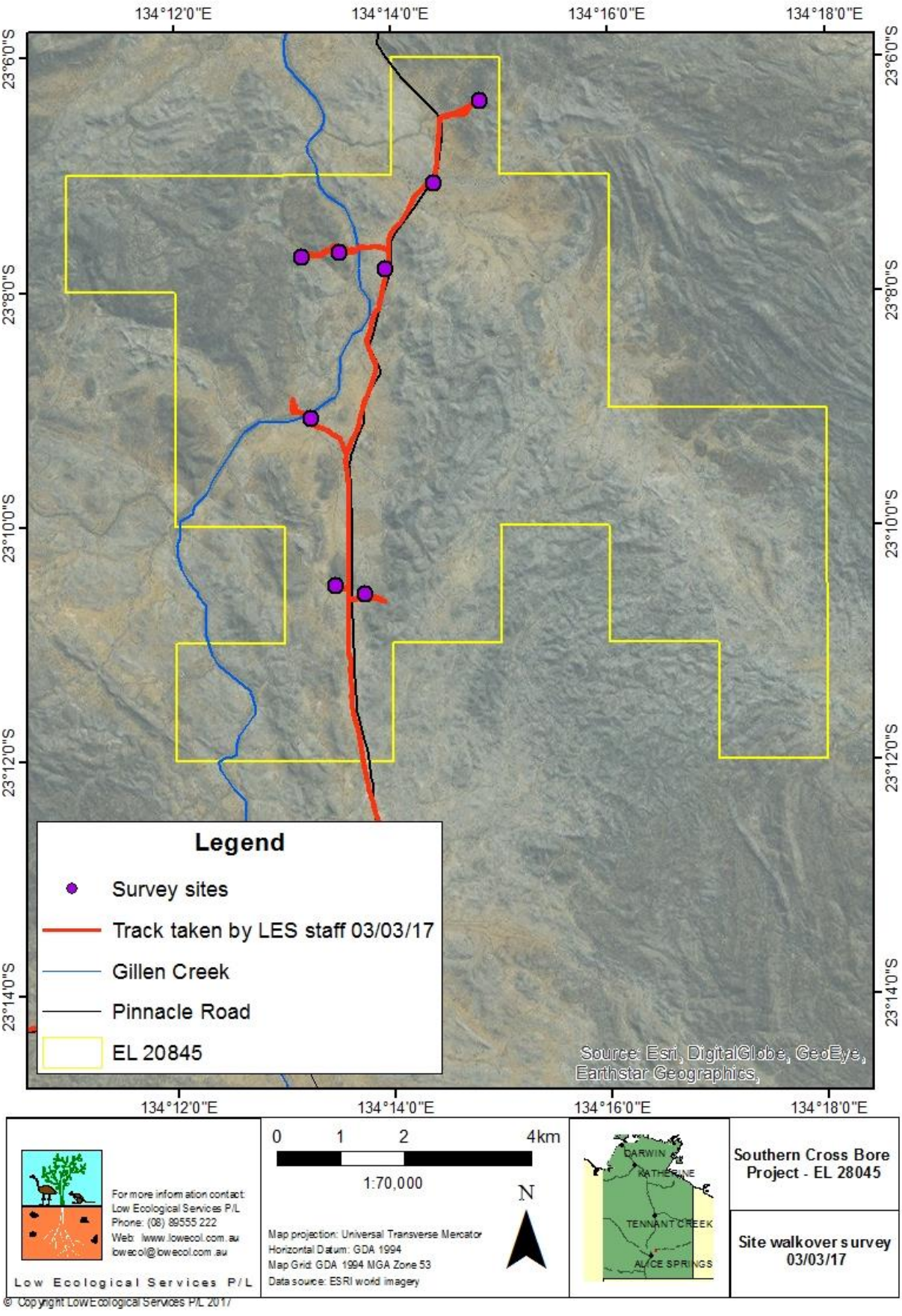

Figure 2 Location survey sites and path taken during survey on 3rd March 2017

3 EXISTING ENVIRONMENT

3.1 Bioregion

The Interim Biogeographic Regionalisation of Australia (IBRA) divides Australia into geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. EL 28045 lies within MacDonnell Ranges Bioregion and the Hartz Range sub-bioregion (Australian Government Department of Sustainability, 2011).

The MacDonnell Ranges Bioregion covers the uplands, east, west and south west of Alice Springs is characterised by sandstone and quartzite ranges with gaps and gorges. Plant communities vary from low open woodlands to sparse shrub lands and hummock grasslands (Australian Government Department of Sustainability, 2011). This bioregion contains a very high plant species diversity with 65% of central Australian plant species present. The gaps and gorges are especially important in that they provide a wetter microclimate which allows relict plant species to persist and some annuals to survive severe droughts (Australian Government Department of Sustainability, 2011). However, there are no prominent gaps and gorges within EL 28045.

3.2 Hydrology

The surface hydrology of EL 28045 consists of one major watercourse, the Gillen Creek. The Gillen Creek is ephemeral and high rainfall events can result in large flows and associated flooding onto surrounding flood outs. The head of the rivers is located in the Winnecke area on the north flank of the MacDonnell Ranges and flows north to the Sandover River. Heavy rains in the head water catchment can result in significant down stream flows affecting the area. Gillen Creek is fed from smaller stream order creek lines and drainage lines in the area. Figure 3 below shows the surface hydrology for EL 28045. Creek lines and drainage depressions provide important water sources for biodiversity during wet periods. There is one existing bore on EL 28045, Southern Cross Bore.

There are no aquatic ecosystems within the Proposal area. According to the BoM's *Atlas of Groundwater Dependent Ecosystems* (GDE) (2017), there are no GDEs and there is a 'low potential for groundwater interaction' in the lease (Bureua of Meteorology, 2017). The nearest GDE is located approximately 250 km west of the Proposal area.

There are no Nationally Important Wetlands within the Proposal area. There are no Ramsar Wetlands or Wetlands of National Significance located within the Proposal area.

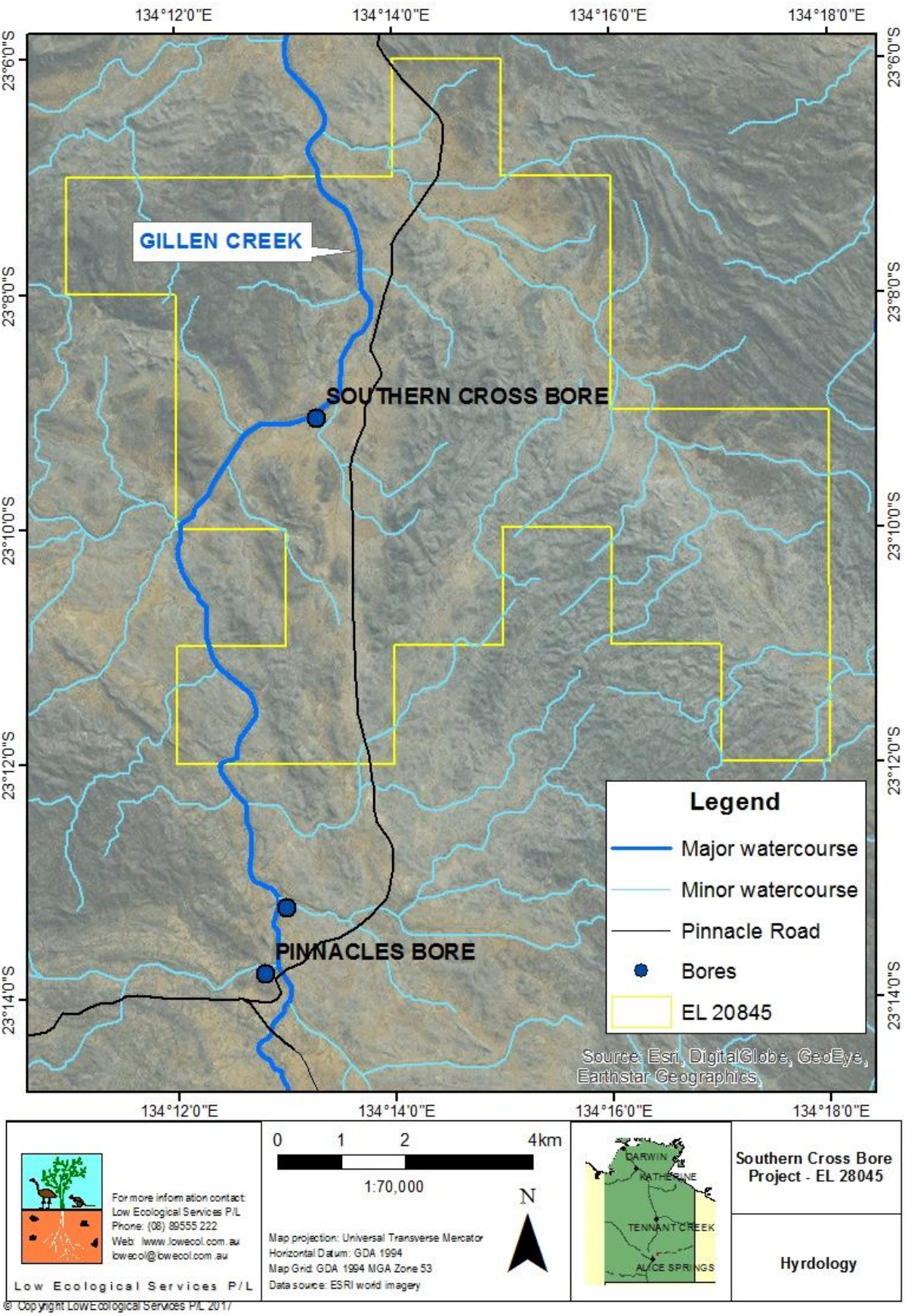

Figure 3: **Surface hydrology map including ephemeral rivers and watercourse and drainage lines**

3.3 Soils

Soil types in EL 28045 have been mapped using the Atlas of Australian Soils (Northcote, K. H., et al, 1968). However, the currently accepted classification system is the Australian Soil Classification (ASC) (Isbell & National Committee on Soil and Terrain, 2016). A conversion from the Atlas of Australian Soils to Australian Soil Classification was developed by Ashton & McKenzie (2001). EL 28045 is on Rudosols (predominately BA29, with small areas of BA30). Soils in the area are highly erodible. Table 1 provides a map of the Australian Soil Atlas over EL28045 and the map units are described along with the ASC conversion in Figure 4.

Table 1: Description of soil types in the Proposal area

Map unit	Australian Soils Atlas Description (Northcote, K. H., et al, 1968)	ASC Conversion (Ashton & McKenzie, 2001)
BA29	Rugged mountain ranges on gneisses and schists; some basic intrusives; some bold quartzite and sandstone ridges; very extensive areas of bare rock; only small valley plains: chief soils are shallow stony sands. Associated in the valleys are small areas of a variety of soils including deep ironstone gravelly sands, red-brown siliceous loams, and non-calcareous massive yellow acidic earth.	Rudosol: Soil with negligible (rudimentary) pedologic organisation apart from (a) minimal development of an Al horizon or (b) the presence of less than 10% of B horizon material (including pedogenic carbonate) in fissures in the parent rock or saprolite. The soils are apedal or only weakly structured in the A1 horizon and show no pedological colour changes apart from the darkening of an A1 horizon. There is little or no texture or colour change with depth unless stratified or buried soils are present.
BA30	Low but bold rocky hills on gneiss and schist with intervening valley plains: chief soils are shallow sands and loams with frequent rock outcrops. Associated are massive neutral earth, red sands, and deep firm red siliceous sands in the valleys; and red duplex soils, massive neutral earths, and firm white calcareous sands on foot slopes.	

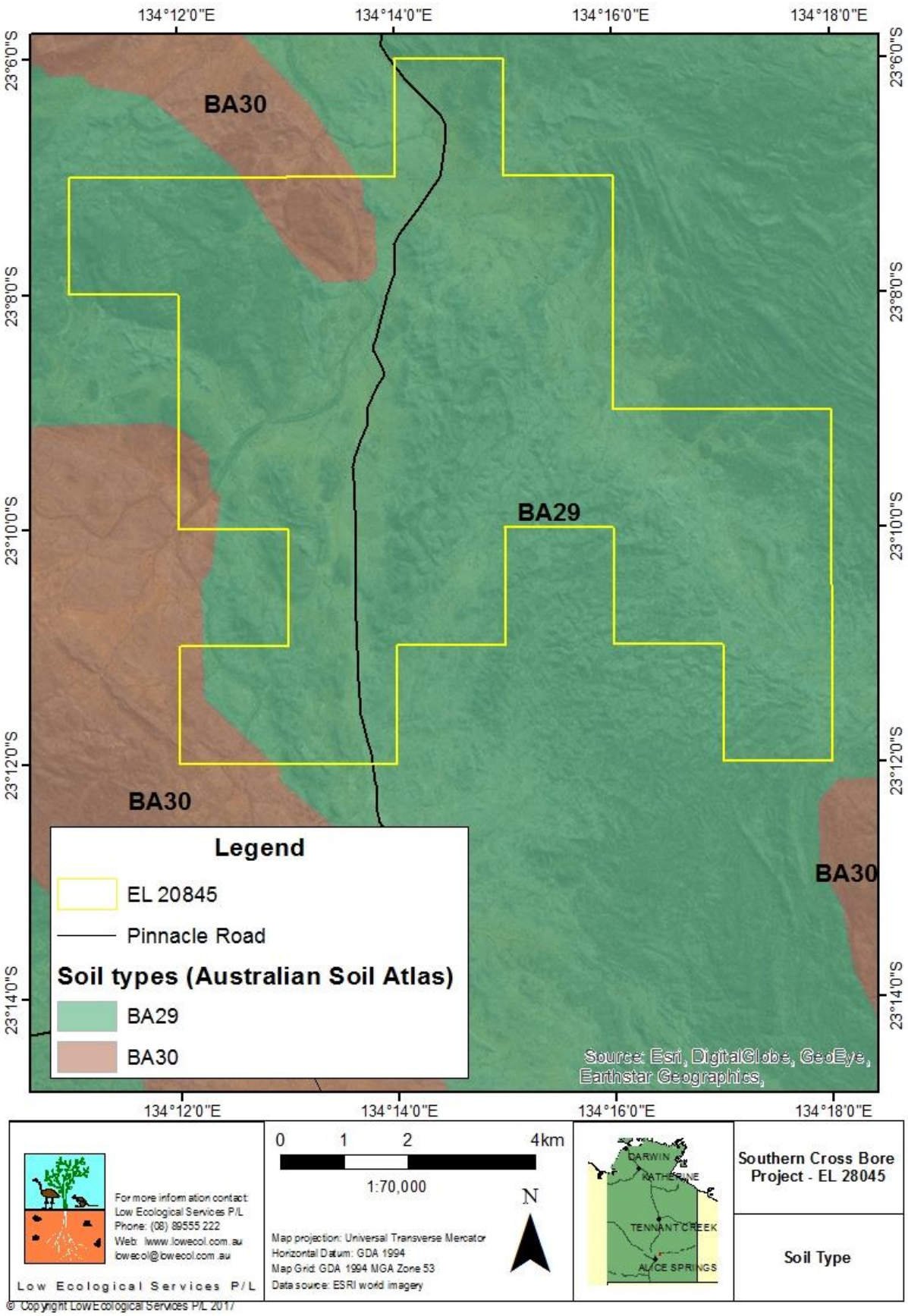

Figure 4: Soil types mapped over the EL 28045 (Northcote, K. H., et al, 1968)

Refer to Table 1 for soil type descriptions

3.4 Land units

Land unit mapping of The Garden Station by Jessop, (1996) is available at a scale of 1:50 000. A total of 14 land units have been mapped over EL 28045. The dominant land units in the proposed exploration area are 2.1, 3.1 and 5.2. Table 2 summarises the land systems in EL 28045 which are shown in Figure 5.

Table 2: Description of land units in the Proposal area (Jessop, 1996)

Land Unit	Description	Photograph
2.1	Granulite ridges with abundant outcrop; lithosols; tall open shrubland of mulga and witchetty bush over mountain wanderrie, kangaroo grass, cotton panic grass, woollyoat grass and forbs.	
3.1a	Calcareous pyramidal hills with abundant outcrop; lithosols; tall open shrubland of witchetty bush and whitewood over oval-leaf cassia, finger panic grass, rough threeawn, oatgrass, woollyoat grass and forbs.	
2.3	Large granite hills; lithosols; tall open shrubland of isolated mulga and witchetty bush over annual grasses and forbs.	-
2.5	Linear ridge crests with abundant outcrop; lithosols; low open woodland of mulga, witchetty bush and dead finish over cotton panic grass, mountain wanderrie and kangaroo grass.	-
3.1b	Calcareous low hills with sparse stone cover; calcareous red earths; mid-high open woodland of whitewood, long leaf corkwood, bloodwood, ironwood and beefwood over witchetty bush and very sparse woollybutt wanderrie and forbs.	

Land Unit	Description	Photograph
3.3	Low hills with rock outcrop supporting an open woodland of mulga and witchetty bush over very sparse woollyoat grass, rough threeawn and forbs.	
4.2	Calcareous rises with sparse stone cover; red calcareous soils; low open woodland of mulga, witchetty bush and or whitewood over oval-leaf cassia, silver cassia, cotton panic grass, rough three awn, erect kerosene grass and forbs.	
4.3	Calcareous rises with dense stone cover, low hills and ridges; red calcareous soils; open hummock grassland of buck spinifex with very sparse red mallee and Thozet's box.	-
4.5	Gravelly quartz rises; red earths; low open woodland of mulga over sparse witchetty bush, perennial grasses (cotton panic grass, rough threeawn) five minute grass and forbs.	-
5.1	Colluvial fans with granulite gravels; lithosols; a sparse tussock grassland of curly windmill grass and erect kerosene grass with isolated mulga.	-
5.2	Level to gently undulating plains with sparse gravel; red calcareous soils; isolated mulga and red mallee over sparse *Eremophila* spp., sparse perennial grasses and caustic weed.	

Land Unit	Description	Photograph
6.2	Level to gently undulating plains on calcareous rock; red calcareous soils; low very open woodland of ironwood over Acacia bush, witchetty bush, turpentine bush, perennial grasses (curly windmill grass, wire grass) annual grasses (oatgrass, and five minute grass) and a variety of forbs.	
7.1a	Level floodplains; red alluvial soils; low open woodland of ironwood and river red gum over wire grasses and forbs or river red gum and fork-leaved corkwood over mulga grass, button grass, woollyoat grass, five-minute grass and forbs.	
7.4	Floodplains and flood outs; sandy alluvial soils; sparse corkwood over kerosene grass.	-

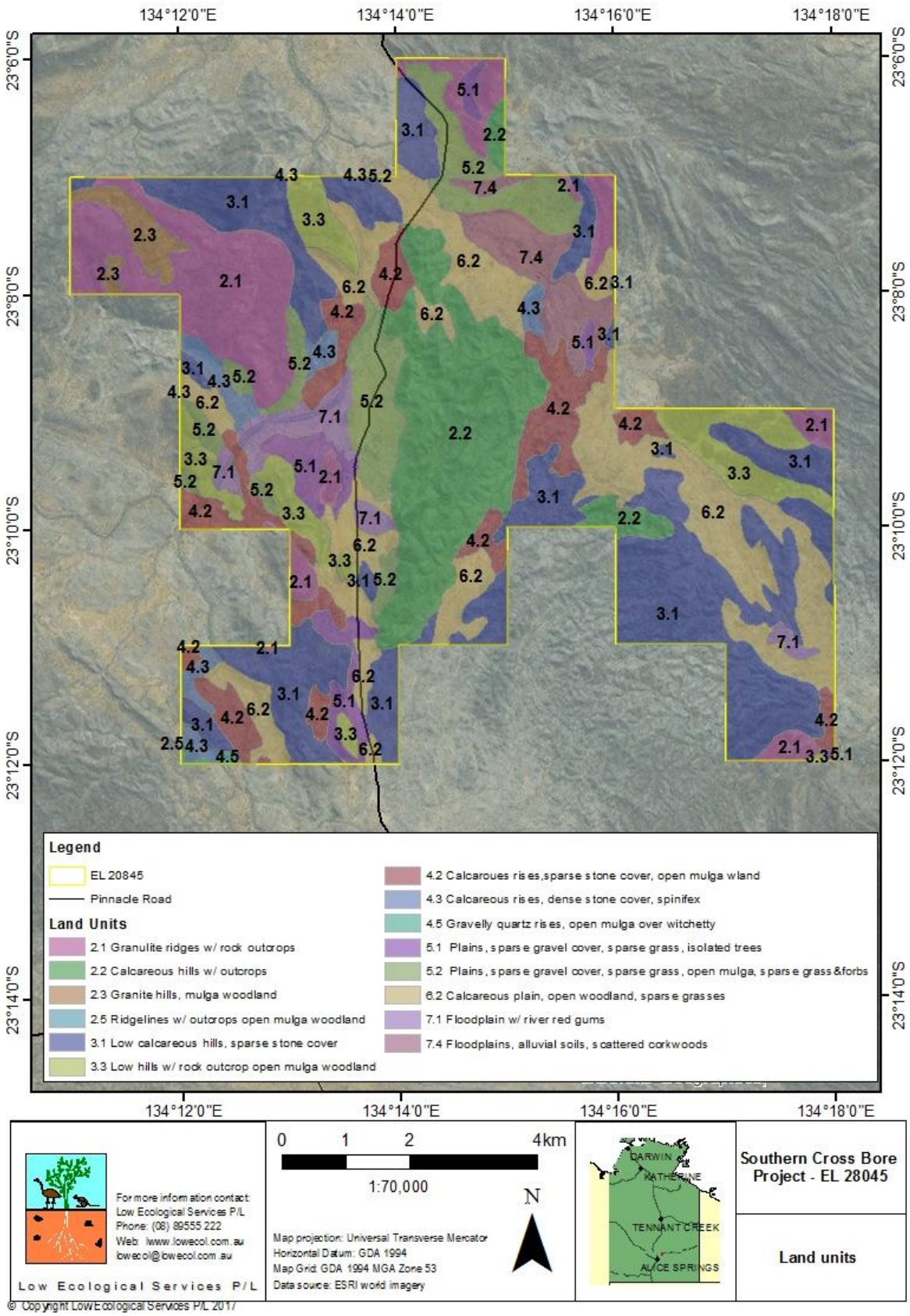

Figure 5: Land units mapped over EL 28045 (Jessop, 1996)

Refer to Table 2 for Land system descriptions

3.5 Vegetation types

Vegetation in EL 28045 area has been mapped at a scale of 1: 1, 000 000 in the Vegetation Survey of the Northern Territory (Wilson, et al., 1990). EL 28045 is characterised by *Acacia* tall open shrubland/*Eriachne* tall open tussock grassland (vegetation units 66 and 68). This vegetation community is common in arid central Australia. Table 3 describes vegetation types mapped in Figure 6. There are no threatened ecological communities or sensitive or significant vegetation communities in the EL 28045.

Table 3: Description of vegetation types in the Proposal area as mapped by Wilson, *et. al*., (1990)

Vegetation unit	Fine vegetation Classification	Fine Vegetation Description
66	*Acacia* tall open shrubland\ *Eriachne* low sparse tussock grassland.	*Acacia aneura, Acacia kempeana, Corymbia opaca* over *Enneapogon avenaceus,* tussock grass, forbs, fern.
68	*Acacia* tall open shrubland*eriachne* low open tussock grassland	*Acacia kempeana, Acacia cuthbertsonii, Acacia aneura* over ground covers *Eriachne mucronata, Enneapogon polyphyllus, Hybanthus aurantiacus,* tussock grass, forbs.

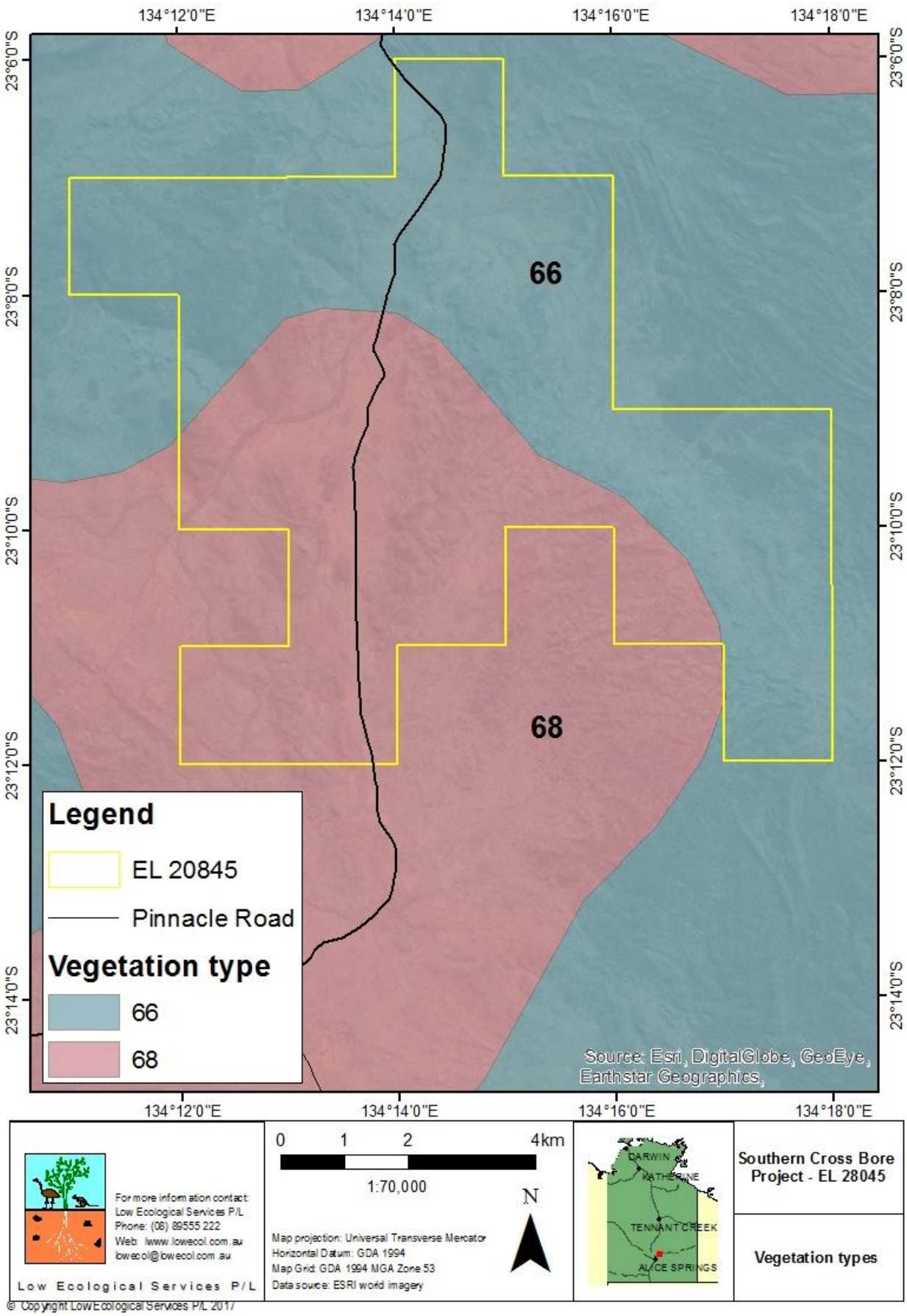

Figure 6: Vegetation types in the Proposal area as mapped by (Wilson, et al., 1990)

3.6 Fire history

Mapping obtained from the North Australia and Rangelands Information website (North Australia and Rangelands Fire Information, 2017) shows that most of EL 28045 is long unburnt. An area of 1800 ha in the eastern portion of was last burnt in 2013 and 352 ha in the far west was last burnt in 2012 (Figure 7).

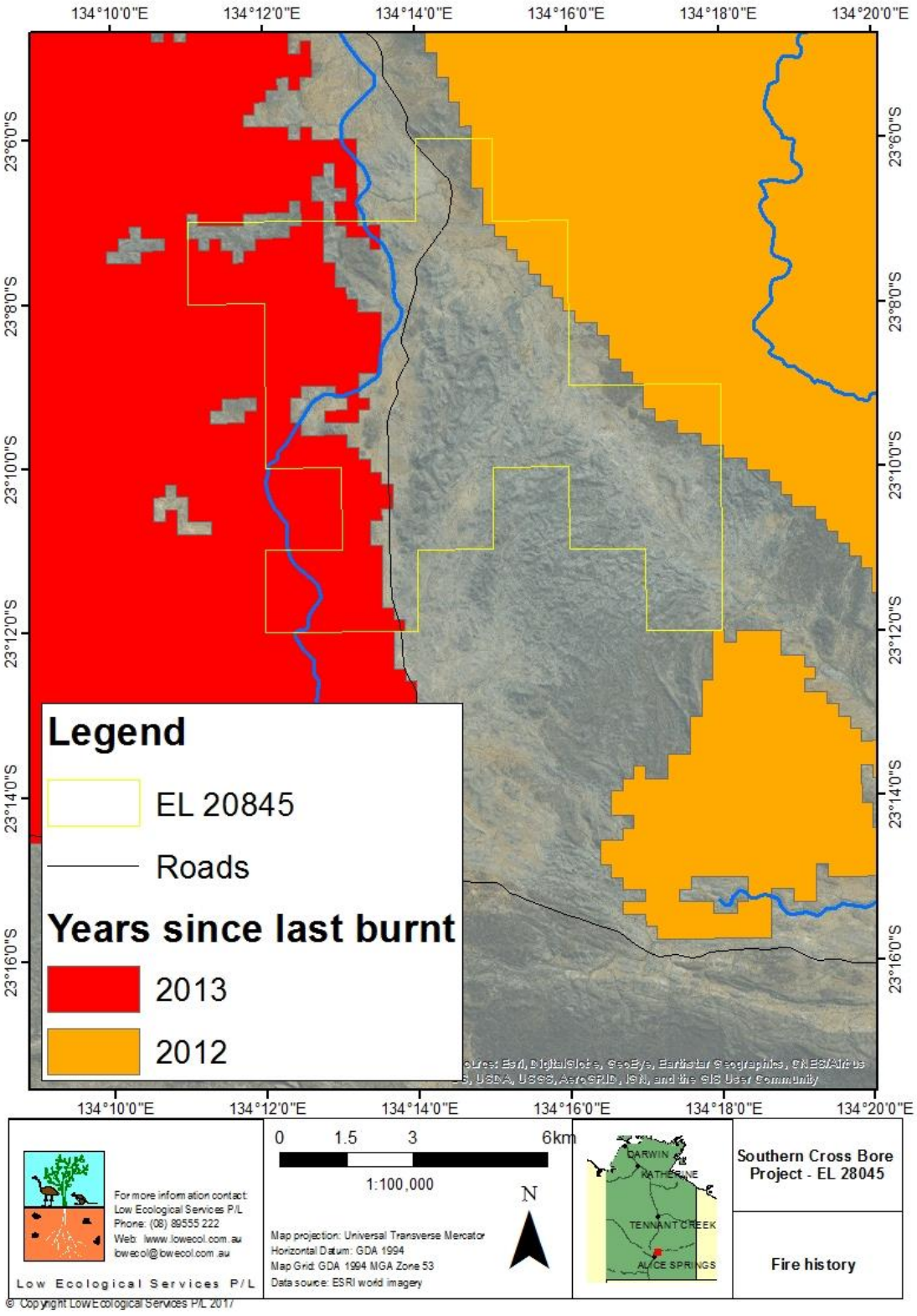

Figure 7: Fire history in EL28045 (North Australia and Rangelands Fire Information, 2017)

3.7 Sites of Conservation Significance and Sites of Botanical Significance

SoCS and SoBS are recognised by the NT Government as important places for conservation. There is a variety of reasons why an area may be of conservation significance for biodiversity, including wetland values, importance to migratory species, habitat for threatened species and hot-spots for endemicity (Northern Territory Department of Natural Resources, 2009). EL 28045 is located entirely within the Greater MacDonnell Ranges SoCS. There are no SoBS within EL 28045. The closest SoBS is the Mueller Creek Catchment SoBS is located 1.5 km north west. Figure 8 provides a map of the SoCS and SoBS in the vicinity of the lease.

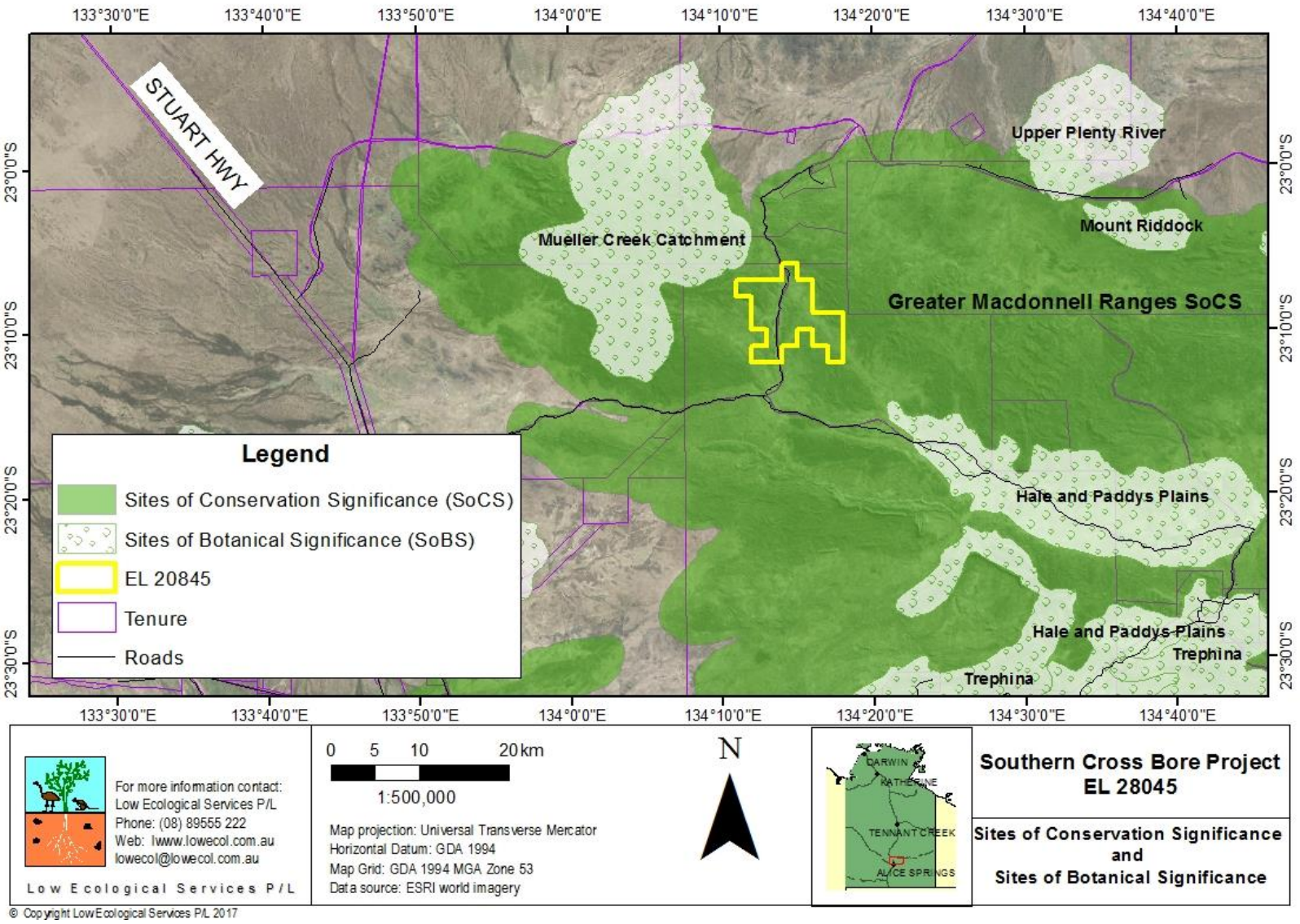

Figure 8: SoCS and SoBS located in the vicinity of EL 28045

4 FLORA

4.1 Flora species of conservation significance

Based on the results of database searches, four species of conservation significance occur or could potentially occur within a 20 km buffer of EL 28045. The DoEE PMST identified three threatened species to potentially occur in this area (Figure 4). There were few records in the NT Flora Atlas due to a lack of surveys conducted in the area. The NT Flora Atlas identified one record of *Aristida strigosa*, listed as Data Deficient (DD) under the TPWC Act. Table 4 shows these species and their likelihood of occurrence within EL 28045. Flora species of conservation significance have been mapped in Figure 9. A complete plant list from the site visit can be viewed in Appendix 2. 'Threatened species' include those listed as Vulnerable (VU), Endangered (EN) or Critically Endangered (CE) under the TPWC Act or EPBC Act. 'Other species of conservation significance' include those listed as DD, NE (Not Evaluated) or Nt (Near Threatened).

There is one threatened species with a high likelihood of occurring, *Minuria tridens* (Minnie daisy), which was recorded during the site visit. The species occurs high on sandstone, Limestone and calcreate hills and as exploration activities will not be taking place in these areas, exploration will not impact the species.

Table 4: **Flora species of conservation significance identified by the desktop study as potentially occurring within EL28045 and their likelihood of occurrence**

Threatened species: VU: Vulnerable, EN: Endangered
Other species of conservation significance: DD: Data Deficient, Nt: Near Threatened.

Scientific Name	Common name	TPWC	Source		NT Flora Atlas	Likelihood of occurrence
			EPBC	PMST		
Aristida strigosa	wiregrass	DD	-	-	X	High
Minuria tridens	minnie daisy	VU	VU	X		High
Macrozamia macdonnellii	Macdonnell ranges cycad	Nt	VU	X		Low
Olearia macdonnellensis	aromatic daisy	EN	VU	X		Low

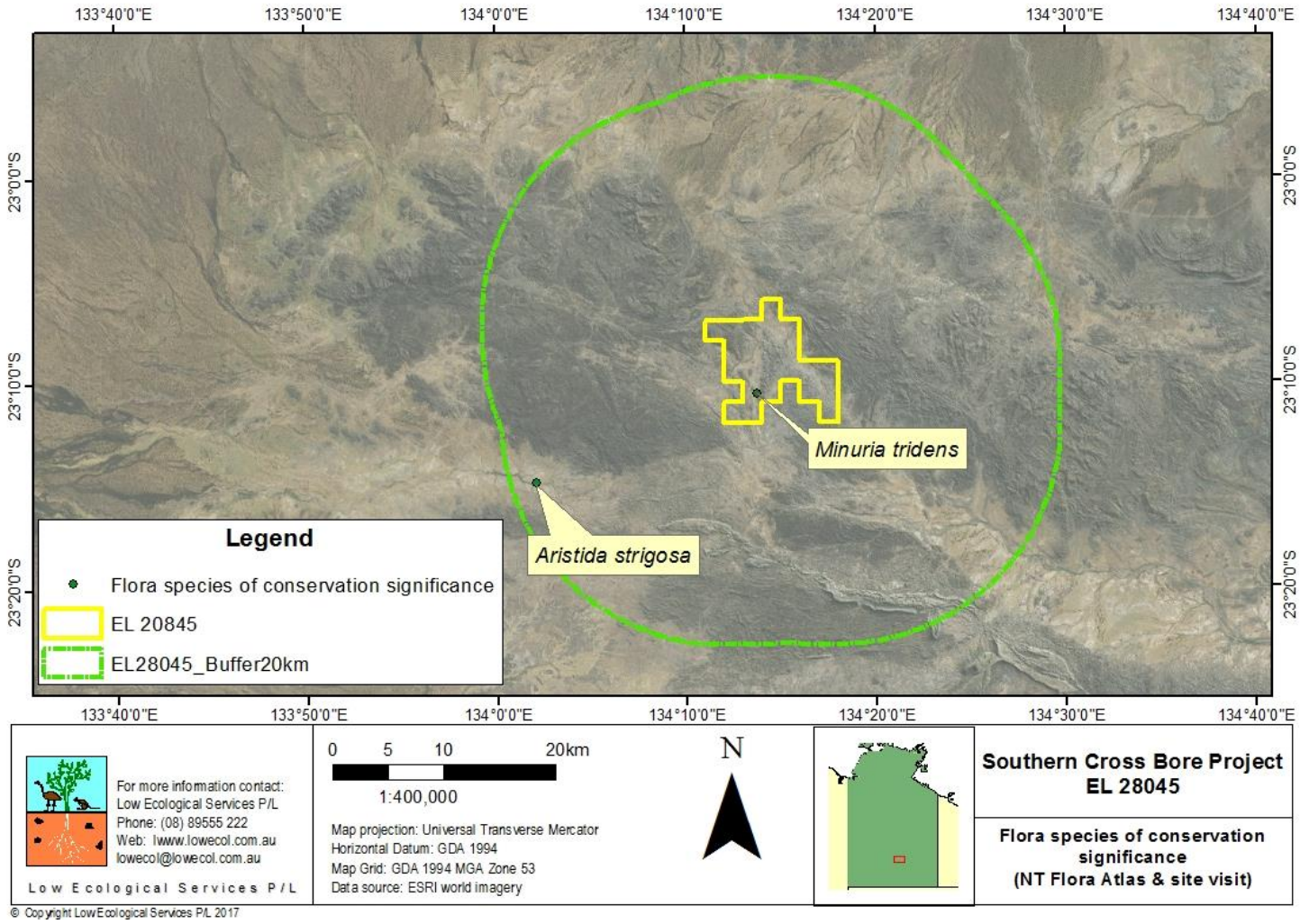

Figure 9: Location of records of flora species of conservation significance identified by the NT Fauna Atlas in the Proposal area

4.1.1 Threatened species

***Macrozamia macdonnelii* (MacDonnell ranges cycad)**

Macrozamia macdonnelii is a dioecious cycad to over 2 m tall. The population is mostly confined to the MacDonnell Ranges Bioregion, with one population on Mt. Hay, 10 km north in the Burt Plain Bioregion and a possible disjunct population on Mount Leichhardt. The species is more common in the West MacDonnell Ranges and to a lesser extent in the East MacDonnell Ranges (Kerrigan, et al., 2006). *Macrozamia macdonnelii* occurs predominately in steep sheltered areas on rocky sandstone ranges or hills composed of neutral or acidic rocks in which there is sufficient ground moisture seepage (Northern Territory Herbarium, 2013).

Macrozamia macdonnelii is listed as Nt under the TPWC Act and Vulnerable (VU) under the EPBC Act. Cycads are not included in the NT Flora Atlas. The Only known population in the East MacDonnell Ranges is at the eastern end of Harts Range, where it has been very stable for about fifty years since discovery. Due to the remote possibility of suitable habitat occurring within EL 28045, there is a low likelihood of *M. macdonellii* occurring.

***Minuria tridens* (minnie daisy)**

Minuria tridens is a perennial daisy up to 30 cm high, mostly restricted to the MacDonnell Ranges Bioregion, with one other record in the Simpson-Strzelecki Dunefields Bioregion. It occurs on sandstone hills, rises and ranges and is associated with dolomite, limestone and calcrete. It is typically found on southerly aspects in low shrublands dominated by species such as *Acacia kempeana*, *Senna artemisioides* and/or *Indigofera leucotricha*. *Triodia* species are usually absent (Nano, et al., 2012). The species occurs mostly in relatively shady locations with relatively high soil moisture eg. Gorges, but also can occur on more exposed hillsides, however these populations are generally less dense (Nano, et al., 2012).

During the site visit, *M. tridens* was recorded within EL 28045 approximately 2.7 km south east of Southern Cross Bore at survey site 3.1a with in land unit 3.1 – Calcarous hills with open shrubland (Figure 10). A sample was taken and identification confirmed by consultant botanist Des Nelson. One plant was recorded high on a hill within differentially eroded chalcedonic limestone outcrop (Figure 10). The location was exposed, lacking shade and west facing. Dominant vegetation was *Acacia aneura* (Mulga) over sparse shrubs (*Eremophila* spp., several subspecies of *Senna artemisioides* and *I. leucotricha*) and tussock grasses. The nearest record of the species in the NT Flora Atlas is approximately 40 km south at Trephina Gorge. This record on EL 28045 would be the northern most record of the species. As the proposed exploration activities will not occur on rocky hills, exploration activities will not disturb *M. tridens*.

Figure 10: *Minuria tridens* on a calcareous hill 2.7km south east of Southern Cross Bore

***Olearia macdonellensis* (aromatic daisy)**

Olearia macdonellensis is a sticky, aromatic shrub up to 1.2 m high. The species is confined to the MacDonnell Ranges Bioregion, where it occurs in isolated populations in the central western MacDonnell Ranges. There is a possible recording of a disjunct sub-population in the central east MacDonnell Ranges, however the exact location is unknown, targeted searches have been unsuccessful and the population may be considered to be extant (Nano, et al., 2012a). The species has been recorded in gullies, slopes and drainage lines of variable aspects in areas protected from fires. Records are generally under an overstorey of trees, notably *Eucalyptus trivalvis* and other species including *Acacia aneura.*

Olearia macdonellensis is listed as EN under the TPWC Act and VU under the EPBC Act. The nearest record of *O. macdonellensis* in the NT Flora Atlas is approximately 140 km south west in the West MacDonnell Ranges. Although suitable habitat is present in EL 28045, there is a low likelihood of the species occurring within the lease.

4.1.2 Other species of conservation significance

***Aristida strigosa* (wire grass)**

Aristida strigosa is a perennial tussock grass up to 90 cm high. The species is usually common on low rocky hills and plateaux and increases in density under pastoral grazing as it is low in palatability. *Aristida strigosa* grows on shallow soils, often in erosion gullies and similar habitats, sometimes densely enough to be locally dominant.

Aristida strigosa is listed as DD under the TPWC Act however, the species is widespread and common in central Australia. According to the NT Fauna Atlas, there is one record of *A. strigosa* located in the 20 km buffer of EL 28045 (Figure 9). Due to the proximity of this record and vast availability of suitable habitat across EL 28045, there is a high likelihood of *A. strigosa* occurring within EL 28045.

4.2 Introduced and weed species

A desktop survey revealed four introduced species occur or potentially occur in the area. The NT Flora Atlas identified two weeds species recorded within a 20 km buffer of EL 209845, rubber bush (*Calotropis procera*) and spiked malvastrum (*Malvastrum americanum*). The DoEE PMST identified two environmental weeds as potentially occurring in the vicinity of EL 28045, parkinsonia (*Parkinsonia aculeata*) and buffel grass (*Cenchrus ciliaris*).

A site visit on 3rd March 2017 found one Declared weed species, Rubber bush (Class B and Class C) (Figure 11). A further four introduced plants, although not Declared under the WM Act, were recorded in EL 28045. These are blackberry nightshade (*Solanum nigrum*), buffel grass (*Cenchrus ciliaris*) (Figure 12), couch grass (*Cynodon dactylon)* and spiked malvastrum (*M. americanum*). Parkinsonia was not recorded within EL 28045. Table 5 shows the existing and potential weeds on EL 28045.

Table 5: Existing and Potential weeds identified within EL 28045

Species name	Common name	WoNS or Declared under WM Act	Source	Location and prevalence in EL 28045
Calotropis procera	rubber bush	Declared Class B & Class C	• NT Flora Atlas • Recorded on ground	Common in and on the bank of the Gillen Creek
Cenchrus ciliaris	buffel grass	-	• DoEE PMST • Recorded on ground	Buffel grass is widespread. During the visit after good rains, there was a dense coverage along Gillen Creek, drainage lines/ areas and other scattered occurrences within the lease
Cynodon dactylon	couch grass	-	• Recorded on ground	Forms a high percent of ground cover on the banks of the Gillen Creek and is restricted to well-watered creek banks.
Malvastrum americanum	spiked malvastrum	-	• Recorded on ground • NT Flora Atlas	Widespread across the site and central Australia, particularly in disturbed areas around watering points, yards and along the roadside.
Parkinsolia aculeata	parkinsonia	WoNs Declared Class B & Class C	• DoEE PMST	Not recorded in EL 28045
Solanum nigrum	blackberrry nightshade	-	• Recorded on ground	Low numbers of Blackberry nightshade occur small populations in scattered locations on the banks of Gillen Creek.

Figure 11: Rubber bush (*Calotropis procera*) by the Gillen Creek, near Southern Cross Bore

Figure 12: A dense coverage of Buffel grass (*Cenchrus ciliaris*) by the The Pinnacles Drive with EL 28045

5 FAUNA

5.1 Fauna species of conservation significance

Database searches revealed 23 fauna species of conservation significance occur or could potentially occur within a 20 km buffer of EL 28045. The NT Fauna Atlas includes 16 fauna species of conservation significance occur. However, a number of the records from the Atlas are pre-1970. 13 threatened fauna species were identified by the DoEE PMST as potentially occurring or having suitable habitat within the Proposal area. Seven of these species are listed under the EPBC Act as VU and six as EN. 23 species listed under the TPWC Act have been recorded in the NT Fauna Atlas within a 20 km buffer of EL 28045 (Table 6). One is DD, eight are Nt, nine are VU, two are EN and one is CE. One threatened fauna species was recorded on ground during the site visit, *Granulomelon gilleni* (Gillen Creek land snail). Figure 13 provides a map of threatened species from the NT Fauna Atlas and Low Ecological site visit within and in the vicinity of EL 28045. A list of all fauna recorded during the site visit can be found in Appendix 3.

Threatened species with a high likelihood of occurring within EL 28045 include *Granulomelon gilleni* (Gillen Creek land snail), *Semotrachia esau* (land snail) and *Petrogale lateralis* MacDonnell Ranges race (Black-footed rock-wallaby). As *Granulomelon gilleni* and *P. l. lateralis* inhabit rocky hills, exploration activities are unlikely to disturb the species. There is little information published on *S. esau*, however there is a record of the species within the lease and suitable habitat occurs, therefore it is recommended further searches are undertaken for the species.

Table 6: **Fauna species of conservation significance identified by the desktop study as potentially occurring within EL28045 and their likelihood of occurrence**

Threatened species: VU: Vulnerable, EN: Endangered, CE: Critically Endangered.
Other species of conservation significance: Nt: Near threatened, DD: Data Deficient.
*likelihood of occurring after high rainfall.

Group	Species name	Common name	Status		DoEE PMST	NT Fauna Atlas	Likelihood of occurrence
			TPWC	EPBC			
Bird	*Ardeotis australis*	Australian bustard	Nt			X	High
	Burhinus grallarius	bush-stone curlew	Nt			X	High
	Calidris ferrigunea	curlew sandpiper	VU	VU	X	X	Moderate*
	Calyptorhynchus banksii samueli	red-tailed black-cockatoo (central Australia)	Nt			X	High
	Conopophila whitei	grey honey eater	DD			X	High
	Dromaius novaehollandiae	emu	Nt			X	High
	Erythrotriorchris radiatus	red goshawk	VU	VU	X		Moderate
	Falco hypoleucos	grey Falcon	VU			X	High
	Lophoictinia isura	square-tailed kite	Nt			X	High
	Pezoporus occidentalis	night parrot	CE	EN	X		Low
	Polytelis alexandrae	princess parrot	VU	VU	X	X (1894)	Moderate*
	Pyrrholaemus brunneus	red throat	Nt			X	High
	Rostratula australis	Australian painted snipe	VU	EN	X		Moderate
Invertebrate	*Croitana aestiva*	desert sand-skipper	EN	EN	X		Low
	Semotrachia esau	Land snail	VU			X	High
	Granulomelon gilleni	Gillen Creek land snail	VU			X	High
Mammal	*Antechinomys laniger*	kultar	Nt			X	High
	Macrotis lagotis	greater bilby	VU	VU	X	X (1961)	Low
	Petrogale lateralis MacDonnell Ranges race	black-footed rock-wallaby	Nt	VU	X	X	High
	Rattus villosissimus	long-haired rat	Nt			X	Moderate
	Trichosurus vulpecula vulpecula	common brushtail possum (southern NT)		EN		X	Moderate
	Zyzomys pedunculatus	central rock-rat	EN	EN	X		Low
Reptile	*Liopholis slateri slateri*	Slater's skink	VU	EN	X		Low - Moderate

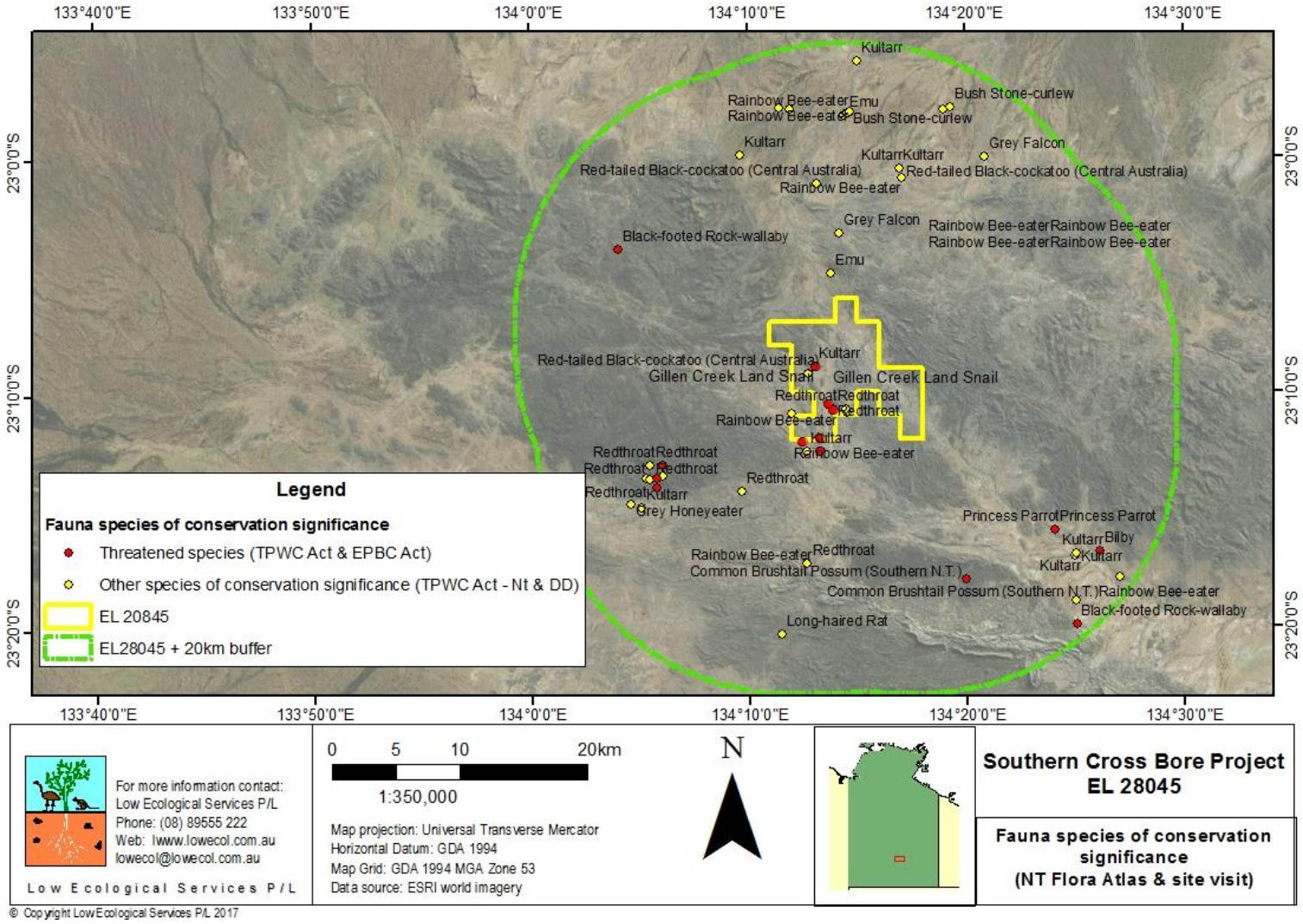

Figure 13: Records of threatened fauna listed under EBPC Act and TPWC Act Atlas within a 20 km buffer of the disturbance area (NT Flora Atlas).

5.1.1 Threatened species

Calidris ferruginea (Curlew sandpipier)

Calidris ferruginea is a small, slim sandpiper with a slender, decurved bill. *Calidris ferruginea* breed in central and eastern Siberia (Russia). After breeding, they migrate south annually to Africa, southern Asia and Australasia. In Australia, *C. ferruginea* occur around the coasts and are also quite widespread inland, though in smaller numbers with scattered records in inland Australia (Garnet, et al., 2010). Records occur in all states during the non-breeding period. These non-breeding birds forage around coastal brackish lagoons, intertidal mud and sand flats, estuaries, saltmarshes and occasionally on inland freshwater wetlands (Garnet, et al., 2010). Records of *C. ferruginea* at Alice Springs and Newhaven Station are presumed to be migrants passing through (Ward, 2012a). The main cause of the decline in the population migrating to Australia is thought to be a loss of habitat to migratory stopping grounds (Rogers, et al., 2010) but habitat degradation has occurred gradually across most of its range (Ward, 2012a).

Calidris ferruginea is listed as VU under the TPWC Act and CE, Migratory (Mi) and Marine (Ma) under the EBPC Act. There no records of *C. ferruginrea* within the 20 km buffer of EL 28045. The nearest records to the lease are 70 km south west in Alice Springs. As wetlands within EL 28045 are ephemeral, there is moderate likelihood of the species occurring after high rainfall.

***Erythrotriorchris radiates* (red goshawk)**

Erythrotriorchris radiates is a large reddish-brown hawk. The species occurs across much of northern Australia, from the south west Kimberley to south eastern Queensland (QLD). Within this range it generally occurs in taller forests characteristic of higher rainfall areas, but there have recently been records from central Australia. *Erythrotriorchris radiates* has a large territory size up to 200 km^2 (Woinarski, 2007). The preferred habitat is tall open eucalypt forest and riparian areas and their diet consists mainly of medium-sized birds (Woinarski, 2007). Threatening processes to *E. radiates* are clearing of preferred habitat for agriculture and some localised problems including to illegal egg-collection, shooting, and fire (Garnet & Crowley, 2010).

Erythrotriorchris radiates is listed as VU under the TPWC ACT and the EPBC Act. The closest records of the species are approximately 180 km south west. Due to the large range of the species there is a moderate possibility of *E. ratiates* occurring in EL 28045.

***Pezoporus occidentalis* (night parrot)**

Pezoporus occidentalis is restricted to arid and semi-arid Australia. The distribution of *P. occidentalis* has not been well documented but records are known from northern Western Australia (WA), South Australia (SA), New South Wales (NSW) and western QLD (Pavey, 2006b). The species was apparently relatively common in central Australia prior to the 1920's; however there are only unconfirmed records post-1950 (Pavey, 2006b). Prior to the discovery of a specimen of *P. occidentalis* in north western QLD in 1990 the species was widely considered to be extinct (Pavey, 2006b) until recently, when small populations of *P. occidentalis* was detected in western QLD in 2013, confirming its persistence (Pyke & Ehrlich, 2014). In March 2017, there was a confirmed sighting of a population south of Broome, WA, suggesting the extant range is greater than previously thought (Jones, 2017).

Records of *P. occidentalis* are primarily from spinifex (*Triodia* sp.) hummock grasslands in stony or sandy areas and chenopod shrublands on floodplains, salt lakes and claypans, likely being more common in the former (Pavey, 2006b; Pyke & Ehrlich, 2014). *Pezoporus occidentalis* roosts and nests within clumps of these plants and feeds on their seeds (Pyke & Ehrlich, 2014). *Pezoporus occidentalis* is nocturnal and Pyke & Ehrlich (2014) suggest that they are sendentary, but may occasionally fly to and from the areas where they spend most of their time close to water sources. Pavey (2006), however, states that *P. occidentalis* appears to be highly nomadic in response to food and water availability, highlighting the lack of consistent information about the ecology of the species. *Pezoporus occidentalis* becomes active during dusk, and generally flies to water before foraging (Pavey, 2006b). The species is said to breed after abundant rainfall, but this is not confirmed. *Pezoporus occidentalis* appears to have suffered widespread decline and local extinction throughout its range beginning prior to the end of the 19th century (Pyke & Ehrlich, 2014). Suggested causes of this decline include overgrazing of vegetation by rabbits, predation by introduced cats and foxes, stock grazing and altered fire regimes (Pyke & Ehrlich, 2014).

The closest record of *P. occidentalis* to EL 28045 is approximately 70 km north east and is and dated 1949. There are small areas of marginally suitable potential habitat within EL 28045 with some small areas dominated by spinifex in land units 4.2 and 4.3 but the species is unlikely to be present as it is generally accepted to be extinct in the region. There is a low likelihood that *P. occidentalis* is present in EL 28045.

***Polytelis alexandrae* (princess parrot)**

Polytelis alexandrae has a patchy and irruptive distribution in the arid zone of WA, NT and SA (Pavey, 2006c; Pavey, et al., 2014). Within the NT, *P. alexandrae* has been recorded from the southern Tanami in the north, south the Yulara and Angas Downs and east to Alice Springs (Pavey, 2006c). The exact distribution within the NT range is unclear as records are irregular and patchy, and there may be long intervals (up to 20 years) between them (Pavey, 2006c). Originally referred to as nomadic or migratory, it is now generally accepted that *P. alexandrae* is irruptive, with a core range that is possibly centred on the Great Sandy Desert or the eastern Gibson Desert and western Great Victoria Desert (Pavey, et al., 2014).

Polytelis alexandrae has been recorded from sandplain environments with vegetation characterised by *Eremophila, Grevillea* and *Hakea* shrubs with scattered trees and less frequently in riverine forest, woodland and shrubland habitats (Pavey, 2006c). *Polytelis alexandrae* forages on the ground and in the foliage of shrubs and trees (Pavey, 2006c; Pavey, et al., 2014). The diet consists of flowers, seeds and other material from a wide range of plants (Pavey, 2006c; Pavey, et al., 2014). *Polytelis alexandrae* breeds in the hollows of *Eucalyptus* trees, predominantly river red gum (*E. camaldulensis*), but also marble gum (*E. gongylocarpa*) and other hollow bearing *Eucalypts* (Pavey, 2006c; Pavey, et al., 2014). Breeding has been observed between August and November and in January in response to a high continuous rainfall event (Pavey, et al., 2014). Possible causes of decline in this species are environmental degradation and habitat homogenisation post-European settlement in the arid zone, which may have been exacerbated by grazing of rabbits and other introduced herbivores and altered fire regimes (Pavey, 2006c). Local impacts to breeding colonies can also occur through the collection of eggs and fledglings from nests for the overseas bird trade (Pavey, 2006c).

The NT Fauna Atlas identifies one record of of *P. alexandrae* 13 km and one approximatly 55 km south east of the boundary however, these both date back to 1894. The closest relatively recent record is

located 62 km south west in Alice Springs in 2011. Areas within the EL 28045, such as sandplain, hills and low ranges and creekline and riverine areas with hollow bearing trees may be suitable habitat for *P. alexandrae*. This species is known to occur irregularly in different areas and is thought to be irruptive and therefore, there is a moderate likelihood that the species will inhabitat EL 28045 when resources are suitable.

***Rostratula australis* (Australian painted snipe)**

The taxonomy of *R. australis* has been unclear in the past. The species has recently been split from *R. benghalensis* (painted snipe), by Lane & Rogers (2000). It is thought that *R. benghalensis* and *R. australia* are geographically separated and that *R. australis* does not migrate outside of Australia (Lane & Rogers, 2000; Baker, et al., 2007).

In the NT, *R. australis* has been recorded on the Barkly Tablelands, at Lake Woods and Sturt Plateau, but may occur in northern NT or on any shallow ephemeral wetlands in central or southern NT (Taylor, et al., 2013). Most records of *R. australis* are from shallow inland wetlands, either fresh or brackish, which may be temporarily or ephemerally filled (Lane & Rogers, 2000). There are no sites where *R. australis* is known to be resident or even regular in occurrence, suggesting the species may be nomadic (Lane & Rogers, 2000). *Rostratula australis* feeds mainly at night on a diet of seed and invertebrates at the waters edge and on mudflats, and nests on the ground (Taylor, et al., 2013). There appears to have been a consistent and dramatic decline of this species since the 1970's particularly in the south eastern inland parts of its range. As most habitat suitable for this species in the NT is located on pastoral land, degradation by cattle may also be an issue, but there is not data with which to assess this (Taylor, et al., 2013).

The closest record of *R. australis* to EL 28045 is approximately 65 km south east, in Alice Springs. Shallow inland wetlands are ephemeral within EL 28045 and therefore the species is only likely to be present during high rainfall periods. There is a moderate likelihood that this species may be present within the lease during times of high rainfall.

***Croitana aestiva* (desert sand-skipper)**

Croitana aestiva is a butterfly endemic to the southern NT, known only from a 1400 km^2 area in the West MacDonnell Ranges as far west as Mt Liebig, 260 km west of Alice Springs (Palmer, et al., 2012). The distribution of *C. aestiva* is driven by the presence of the larval food plant, *Neurachne tenuifolia*, which occupies sheltered slopes and gorges within the Chewings and Heavitree Ranges (Palmer, et al., 2012). Adult emergence and abundance are dependent on rainfall (Palmer, et al., 2012). As the larval food plant *N. tenuifolia* is likely to be intolerant to fire the combination of exotic grass invasion (particularly buffel grass) and altered fire regimes is likely to be a threat to this species (Palmer, et al., 2012).

Croitana aestiva is listed as EN under the TPWC Act and the EPBC Act. It is unknown how far the nearest record of *C. aestiva* is to the proposed disturbance area, as records of this species are not included in the NT Fauna Atlas. As both these species appear to be confined to the West MacDonnel Ranges, there is a low likelihood that *C. aestiva* is present in EL 28045.

***Granulomelon gilleni* (Gillen Creek land snail)**

Granulomelon gilleni is a medium-sized land snail with a shell diameter of 14 – 17 mm and characterised by thick radial ribs and a strongly, evenly elevated apex and spire (Wilson, et al., 2006a). The species has been recorded only from small hills south of Southern Cross Bore in south eastern outliers of Strangways Range (Solem, 1993) . There is little information published on the species. The genus is known to aestivate by sealing to large rock surfaces well above the litter of dirt layer (Solem, 1993). There has been very little monitoring of the species and therefore there is no direct evidence of factors causing decline in the species. Increased fire frequency and intensity may detrimentally affect the species (Wilson, et al., 2006a).

Granulomelon gilleni is listed as VU under the TPWC Act. Several *G. gilleni* shells were recorded in two locations during the one day survey (Figure 14). Site 3.1a is located 3.2 km south east of Southern Cross Bore (23°10'35.74"S, 134°13'43.53"E) and 3.1b is located approx. 2.6km north of southern cross bore (23° 7'43.10"S, 134°13'9.05"E). The shells were found to be in land unit 3.1, high on calcareous hills, under rocky outcrops with small deep crevices. The rock formation is Waite Formation chalcedonic limestone which has differentially erodable layers providing deep crevices for the snails. The locations were characterised by a high vegetation litter cover and fig trees were present nearby. Vegetation was tall open shrubland, with an overstory of *Acacia aneura*, a mid-story consisting of low shrubs *Eremophila* sp. and *Senna artemisioides* subspp. over a ground layer of native tussock grasses (Figure 15). A number of *G. gilleni* shells were also found in the foothills and drainage lines across the EL 28045 however, it is likely these were washed down from the hills. Exploration activities are highly unlikely to disturb *G. gilleni* as activity will not be taking place in the rocky hills.

Figure 14: *Granulomelon gilleni* shells photographed at site 3.1a, south east of Southern Cross Bore

Figure 15: *Granulomelon gilleni* habitat – shells were found under a Waite Formation chalcedonic limestone rock outcrop with small deep crevices.

***Semotrachia esau* (land snail)**

Semotrachia esau is a medium-sized land snail with a shell diameter of 9 – 15 mm. Specimens have been collected from Palm Creek and the Finke River in the Krichauff Ranges with a possible isolated record near the Palmer River (Solem, 1993). There is little published information on the species. Specimens have been collected under fig trees and under mature spinifex (Wilson, et al., 2006). There has been very little monitoring of the species and therefore there is no direct evidence of factors causing decline in the species. Increased fire frequency and intensity may detrimentally affect the species (Wilson, et al., 2006).

Semotrachia esau is listed as VU under the TPWC Act. There is one record of the species within EL 28045, about 1 km north of Southern Cross Bore. Despite efforts, *S. esau* was not recorded during the one day site visit by LES. Due to the record within the site and availability of suitable habitat, there is a high likelihood the species occurs with EL 28045. Although the habitat for the species will not be disturbed by the exploration activity, it is recommended further searches are undertaken for the species.

***Macrotis lagotis* (greater bilby)**

Macrotis lagotis is a nocturnal medium-size marsupial, originally distributed across 70% of the Australian mainland but now restricted to 20% of its former range in south west QLD and an area extending from the western deserts of the NT and Western Australia (WA) north to the Pilbara and Kimberley regions (Pavey, 2006d). *Macrotis lagotis* occurs in a wide variety of habitats that can be classified into three major groups; sparse grassland/forbland on uplands and hills with a low fire frequency, mulga scrub/ woodlands on ridges and rises with an infrequent (20-50 year) fire interval and hummock grassland/ mixed shrub or woodland steppe on plains and alluvial areas with a high (4-10 year) fire frequency (Southgate, 1990b). In the sandy deserts, *M. lagotis* appears to exhibit low site fidelity and high mobility and it is thought that movement of groups is in response to spatial and temporal variability in resource availability (Southgate, et al., 2007). *Macrotis lagotis* is an opportunistic omnivore with a diet consisting of termites, ants, beetles, larvae, grasshoppers, spiders, *Cyperus bulbosus* bulbs, seeds, fruit and fungi (Gibson, 2001; Southgate & Carthew, 2006). Threats to *M. lagotis* include predation by introduced predators, habitat degradation by introduced herbivores, altered fire regimes, drought, road mortality and habitat destruction and degradation resulting from mining and other development (Pavey, 2006d).

Macrotis lagotis is lised as VU under both the TPWC Act and EPBC Act. There is one record of *M. lagotis* within the 20 km buffer of EL 28045 approximately 16 km south west of the lease boundary on The Garden Station however, this record is from 1906 and *M. lagotis* are no longer believed to inhabit this area. There is a small area of habitat available within EL 28045 that is marginally suitable for the species, however, it is generally accepted that *M. lagotis* no longer occurs within this region, and there is a low likelihood that this species is present within the lease.

***Petrogale lateralis lateralis* (black-footed rock-wallaby [MacDonnell Ranges Race])**

The distribution of *P. l. lateralis* spans from the Davenport and Murchison Ranges in the north, east to the Jervois Range, west to the WA border and south to the SA border (Pavey, 2006e). *Petrogale lateralis lateralis* is also present in the Gibson Desert of WA and in the Anangu-Pitjatjantjara land of northern SA (Pavey, 2006e). Geomorphological features favoured by *P. l. lateralis* are steep slopes, cuestas, deep gorges and boulder scree slopes, which are common in quartzite ranges where the majority of *P. l. lateralis* records are from (Gibson, 2000). Individuals emerge late in the afternoon or early evening to feed mainly on grass (Eldridge & Close, 1995). Threats to *P. l. lateralis* include predation by introduced and native predators and competition for food and shelter by introduced herbivores, altered fire regimes, habitat destruction from clearing, mining and quarrying, habitat degradation by invasive weeds, small population sizes and fragmentation, disease, disturbance by tourists, drought and climate change (Pearson, 2013).

Petrogale lateralis lateralis is listed as Nt under the TPWC Act and VU under the EPBC Act. The species is not uncommon within their preffered habitat and are widespread across the area. There is one record of *P. l. lateralis* within EL 28045 and several within the 20 km buffer. Abundant suitable habitat was observed during the site visit. There is a high likelihood that *P. l. lateralis* occurs within EL 28045.

***Trichosurus vulpecula vulpecula* (common brushtailed possum [central Australian population])**

The common brushtail possum is a medium-sized mammal about the size of a domestic cat. Outside the NT, this subspecies occurs across much of the continent, including SA, Victoria (VIC), NSW, southern and southwestern QLD and much of WA, including in urban areas of most capital cities. The subspecies *T. v. vulpecula*, occurs in isolated populations in the southern NT. It formerly had a much more extensive distribution in the NT that included most of the Tanami and Great Sandy Deserts across to the WA border at Lake Mackay and Kintore, south to Charlotte Waters, east to the Todd and Hale River floodouts in the Simpson Desert, and as far north as the Murchinson Ranges (Pavey & Ward, 2012). *T. v. vulpecula* now occupies riverine habitat that is close to rocky outcrops and moist gullies within the ranges or rocky slopes (Kearle, et al., 1992). Tree hollows, tops of dense trees are used for shelter and the diet consists of the flowers, fruits and leaves of a wide range of non-eucalypt species (Foulkes, 2001). The population decline is attributed to a number of factors including drought, habitat degradation as a result of introduced herbivores, hunting, altered fire regimes and predation (Kearle, et al., 1992).

Trichosurus vulpecula vulpecula is listed as EN under the TPWC Act and is not listed under the EPBC Act. There are three records of the species within a 20 km buffer of EL 28045, one in 1996, two in 1995 and one in 1983. There is suitable habitat for the species *T. v. vulpecula* in large, old river red gums on the Gillen Creek and therefore there is a moderate likelihood the subspsecies occurs within the lease.

***Zyzomys pedunculatus* (central rock-rat)**

Zyzomys pedunculatus was considered extinct in 1990 after not being recorded for 30 years (Wurst, 1990 as cited in Nano, *et a*. 2003). The species was rediscovered in a remote area of the West MacDonnell Ranges in 1996 (Nano, et al., 2003). *Zyzomys pedunculatus* is confined to high elevation (>1,000 m) quartzite ridges and mountain peaks in the West MacDonnell Ranges, west of Alice Springs (McDonald, et al., 2013). The species is irruptive, with reproduction and subsequent population peaks driven by dramatic increases in primary productivity (Edwards, 2013). During these times, it may become locally abundant in a wider variety of rocky habitats (Edwards, 2013). The diet of *Z. pedunculatus* includes predominantly seed and leaf, with a small proportion of stem and invertebrates (Nano, et al., 2003). Potential threatening processes impacting *Z. pedunculatus* include predation by dingos and cats and inappropriate fire regimes (McDonald, 2012a).

The closest record of *Z. pedunculatus* to the proposed disturbance area is approximately 120 km south west. *Zyzomys pedunculatus* is currently restricted to rugged quartzite ridges >1,000 m high in the West MacDonnell Ranges. There is no habitat matching this description within EL 28045 and therefore there is a low likelihood that *Z. pedunculatus* would be occur.

***Liopholis slateri slateri* (Slater's skink)**

Liopholis slateri includes two subspecies, *L. slateri slateri* in southern NT and *L. slateri virgata* in northern South Australia (SA) (McDonald, 2012b). *L. slateri slateri* has been recorded from the Finke and MacDonnell Ranges bioregions where it occurs on plains in the valleys of major drainages (Pavey, 2004). At most sites, *L. slateri slateri* inhabits shrubland and open shrubland on alluvial soils close to drainage lines (McDonald, 2012b). The species has also been recorded in an isolated dune supporting shrubland, low rolling calcareous rises with 60% spinifex cover, and on an elevated, narrow, rocky creek-line (Pavey, 2004). *L. slateri slateri* digs complex burrows in the low pedestal of soil that builds up under small shrubs, and occassionally burrows under tussock or hummock grasses or fallen timber (McDonald, 2012b). *L. slateri slateri* is diurnal and crepuscular, and has an insectivorous diet (McDonald, 2012b). Buffel grass invasion and the associated changes in fire regimes are a likely threat to the persistence of *L. slateri slateri* in central Australia (Pavey, 2004; McDonald, 2012b).

L. slateri slateri is listed as VU under the TPWC act and EN under the EPBC Act. The closest occurrence to EL 28045 is approximately 65 km south east of the boundary. As suitable habitat exists with EL 28045, there is a low to moderate likelihood that *L. slateri slateri* is present within the lease.

5.1.2 Other species of conservation significance

***Burhinus grallarius* (bush stone-curlew)**

Burhinus grallarius is distributed across mainland Australia with the exception of the southern inland and Nullarbor regions (Pizzey & Knight, 2012). *Burhinus grallarius* is mainly nocturnal and inhabits open woodland, dry watercourses with fallen branches, leaf litter and sparse grasses, sandplain with spinifex and mallee, coastal scrub, mangrove fringes, golf courses, rail reserves, timber remnants on roadsides, orchards, plantations and urban areas (Pizzey & Knight, 2012). The breeding season of *B. grallarius* is generally from August to January, but can be earlier in northern Australia, and the species nests on bare ground (Pizzey & Knight, 2012).

Burhinus grallarius, listed as Nt under the TPWC Act, is a common and widespread species and there is no critical habitat for the species within EL 28045. The NT Fauna Atlas shows two records of the species within a 20 km buffer of EL 28045. There species can inhabit a wide range of habitats and there is suitable habitat within the lease. Therefore the species has a high likelihood of occurrence in the EL 28045.

***Calyptorhynchus banksii samueli* (red-tailed black-cockatoo)**

The subspecies *C.s b. samueli* occurs in inland NSW, southern QLD, southern NT, northern SA and western WA (Pizzey & Knight, 2012). *Calyptorhynchus banksii samueli* inhabits tall open forests, woodlands, grasslands, scrublands, floodplains, river margins, *E. camaldulensis* along watercourses and wetlands (Pizzey & Knight, 2012). *Calyptorhynchus banksii samueli* breeds between April and July in tree hollows (Pizzey & Knight, 2012).

Calyptorynchus banksii samueli, listed as Nt under the TPWC Act is common in the region. The NT Fauna Atlas identified one record within EL 28045 and several in the 20 km buffer. *C. b. sameuli* has a high likelihood of occurring within the lease.

***Conopophila whitei* (grey honeyeater)**

Conopophila whitei is sparsely distributed across inland Australia from north east SA west through the Pilbara in WA and north to Frewena and Wave Hill, NT (Pizzey & Knight, 2012). *Conopophila whitei* inhabits mature mulga woodland, open mulga with spinifex, tall open A*cacia* scrubland and sandhills with red mulga, canegrass, beefwood and desert bloodwood (Pizzey & Knight, 2012). The species nests in the outer foliage of shrubs approximately 2 m above the ground (Pizzey & Knight, 2012).

Conopophila whitei, listed as Nt under the TPWC Act has a widespread distribution, although it is nomadic and elusive. The NT Fauna Atlas shows two records of *C. whitei* in EL 28045 and two more within the 20 km buffer. Suitable habitat for the species exists within the lease and therefore there is a high likelihood that *C. whitei* is present within EL 28045.

***Dromaius novaehollandiae* (emu)**

Dromaius novaehollandiae was widely distributed across the Australian mainland, but is now mostly absent from closely settled areas (Pizzey & Knight, 2012). *Dromaius novaehollandiae* inhabits plains, scrublands, open woodlands, coastal heaths, alpine pastures, semi-deserts, margins of lakes, and pastoral and cereal growing areas (Pizzey & Knight, 2012). *Dromaius novaehollandiae* breeds between April and October, and nests on the ground (Pizzey & Knight, 2012).

There are two records of *D. novaehollandiae* in the 20 km buffer of EL 28045. *Dromaius novaehollandiae,* listed as Nt under the TPWC Act is widespread across most of Australia and are not uncommon in the region surrounding the lease. There is a high likelihood of the species occurring in EL 28045.

***Falco hypoleucos* (grey falcon)**

Falco hypoleucos is a medium-sized pale falcon. The species occurs in low densities throughout much of arid and semi-arid Australia and has been recorded in all Australian mainland states and territories. *Falco hypoleucos* live in areas of lightly-timbered lowland plains, often on inland drainage systems, where the average annual rainfall is under 500 mm. Threats to *F. hypoleucos* are not clearly defined. Habitat clearing has likely lead to declines in the species' southern and eastern ranges early and

confined them more to the arid parts of its range (Garnet, et al., 2010). In NT, this has probably been less influential. Here, changes in fire-regimes or grazing by herbivores may reduce the availability of nesting trees and appropriate prey species (Ward, 2012b).

Falco hypoleucos is listed as Nt under the TPWC Act. There are two records of the species within a 20km buffer of EL 28045. Given these records and suitable habitat occurring within EL 28045, *F. hypoleucos* has a high likelihood of occurring with EL 28045.

***Lophoictinia isura* (square-tailed kite)**

Lophoictinia isura inhabits heathlands, woodlands, forests, tropical and subtropical rainforests, timbered watercourses, and hills and gorges across much of Australia except the central and inland south (Pizzey & Knight, 2012). *Lophoictinia isura* breeds between July and November and nests high in trees (Pizzey & Knight, 2012).

Lophoictinia isura, listed as Nt under the TPWC Act is rare, sparse and partly migratory (Pizzey & Knight, 2012). There is one record of *L. isura* within the 20 km buffer of EL 28045 in the NT Fauna Atlas. Suitable habitat occurs and therefore there is a high likelihood that *L. isura* will be present in EL 28045.

***Pyrrholaemus brunneus* (redthroat)**

Pyrrholaemus brunneus is distributed across much of inland Australia, inhabiting inland scrubs with mulga and other Acacias, mallee associations with spinifex, eucalypt regrowth, tea-tree, saltbush and bluebush (Pizzey & Knight, 2012). It breeds between August and November and nests in low shrubs, spinifex and occasionally tree hollows (Pizzey & Knight, 2012).

The species is listed as Nt under the TPWC Act, but is widespread and not uncommon. There is one record of *P. brunneus* in EL 28045 in the NT Fauna Atlas and an additional five within the 20 km buffer. Therefore there is a high likelihood the species will occur within the lease.

***Antechinomys laniger* (kultarr)**

Antechinomys laniger is patchily distributed across arid Australia from south western QLD and western NSW, through SA and southern NT to central and south WA (Menkhorst & Knight, 2011). *Antechinomys laniger* inhabits desert plains, stony and sandy land where grasses and small shrubs constitute the main vegetation and *Acacia* scrubland (Valente, 2008). It shelters in logs or stumps, beneath saltbush and spinifex, in deep cracks at the base of *Acacia* and *Eremophila* trees and the burrows of other animals, but it is not known if the species digs its own burrows (Valente, 2008). Pouch young have been recorded between August and November, and populations appear to fluctuate seasonally (Valente, 2008).

The species is listed as NT under the TPWC Act but is not uncommon in the area, particularly during population irruptions. *Antechinomys laniger* has been recorded within EL 28045 and there are a number of recordings within the 20 km buffer. Therefore the species has a high likelihood of occuring with EL 28045.

***Ardeotis australis* (Australian bustard)**

Ardeotis australis is widely distributed across inland Australia, where it is still common away from settlement in parts of inland and northern Australia and WA (Pizzey & Knight, 2012). *Ardeotis australis* inhabits grasslands, spinifex, open scrublands, grassy woodlands, sandhills, pastoral lands, burned ground, and occasionally crops and airfields (Pizzey & Knight, 2012). The species is irruptive and

dispersive in response to rainfall (Pizzey & Knight, 2012). The breeding season of *A. australis* is from August to November in southern Australia and can occur during all months of the year in northern Australia in response to wet seasons (Pizzey & Knight, 2012). *Ardeotis australis* nests on open bare ground by bush, stones and tussock grasses (Pizzey & Knight, 2012).

Ardeotis australis, listed as Nt under the TPWC Act, has a widespread distribution there are two records within the 20 km buffer of EL 28045. The species is expected to occur within EL 28045 and therefore has a high likelihood of occurring within EL 28045.

Rattus villosissimus (long-haired rat)

Rattus villosissimus is endemic to central and northern Australia. The species is irruptive with core populations around Barkly lake system NT and the Channel Country in south west QLD and north eastern SA however, it is found in a far larger area during irruptions (Woinarski & Alpin, 2016). There are no obvious major threats to this *R. villosissimus*. Threats may include habitat degradation by cattle or predation by feral cats (Woinarski & Alpin, 2016).

Rattus villosissimus is listed as Nt under the TPWC Act. There is one record of the species within the 20 km buffer of EL 28045 from 1986. There is a moderate likelihood of *R. villosissimus* occurring within EL 28045 during its irruptive periods.

5.1.3 Migratory and marine species

Ten migratory and/or marine species were identified by the DoEE PMST as potentially occurring with EL28045 (Table 7). Wetlands within EL28045 are ephemeral so for a number of the listed species, there is a moderate likelihood of occuring after high rainfall only. There there is no critical habitat for any of these migratory species within the lease.

Table 7: Fauna species listed as migratory under the EPBC Act as identified by the DoEE PMST and the NT Fauna Atlas as occurring or having potentially suitable habitat within EL 28045

En: Endangered, CE: Critically Endangered, VU: Vulnerable
Mi: Migratory; Ma: Marine
J: Japan-Australia Migratory Bird Agreement; C: China-Australia Migratory Bird Agreement; R: Republic of Korea-Australia Migratory Bird Agreement; B: Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals)
*Likelihood of occurring after high rainfall

Scientific name	Common name	Status		DoEE PMST	NT Fauna Atlas	International Agreements	Likelihood of Occurrence
		EPBC	TPWC				
Apus pacificus	fork-tailed swift	Mi, Ma	-	X		J, C, R	Moderate*
Ardea modesta	eastern great egret	Ma	-	X			Moderate
Ardea ibis	cattle egret	Ma	-	X			Moderate
Caladris ferruginea	curlew sandpiper	CE, Mi, Ma	VU	X		B, C, J, J	Moderate*
Charadrius veredus	oriental plover	Mi, Ma	-	X		B, J, C, R	Moderate*
Glareola maldivarum	oriental pratincole	Mi, Ma	-	X		J, C, R	Moderate*
Merops ornatus	rainbow bee-eater	Ma	-	X	X		High
Motacilla cinerea	grey wagtail	Mi, Ma	-	X		J, C, R	Low
Motacilla flava	yellow wagtail	Mi, Ma	-	X		J, C, R	Low
Rostratula benghalensis (sensu lato)	Painted snipe	EN, Ma,	VU	X			Moderate*

5.2 Introduced fauna species

Database searches revealed nine introduced fauna could potentially occur within EL 28045. Eight species were identified as potentially occurring by the DoEE PMST. The NT Fauna Atlas identified records of nine threatened fauna species occurring within a 20 km buffer of EL the lease (Table 8). All of the listed species have a high likelihood of occurring within EL 28045.

Table 8: **Introduced species identified by the desktop study as potentially occurring within EL28045 and their likelihood of occurrence**

Scientific name	Common name	DOEE PMST	NT Fauna Atlas	Likelihood of occurrence
Bos taurus	domestic cattle	X	X	High
Camelus dromedarius	camel	X	X	High
Canis lupis familiaris	domestic dog	X	X	High
Equus asinus	donkey	X	X	High
Equus caballus	horse		X	High
Felis catus	cat	X	X	High
Mus musculus	house mouse	X	X	High
Oryctolagus cuniculus	rabbit	X	X	High
Vulpes vulpes	red fox	X	x	High

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APPENDICES

Appendix 1 DoEE PMST for EL 28045 including a 20km buffer (Commonwealth DoEE, 2017)

Australian Government
Department of the Environment and Energy

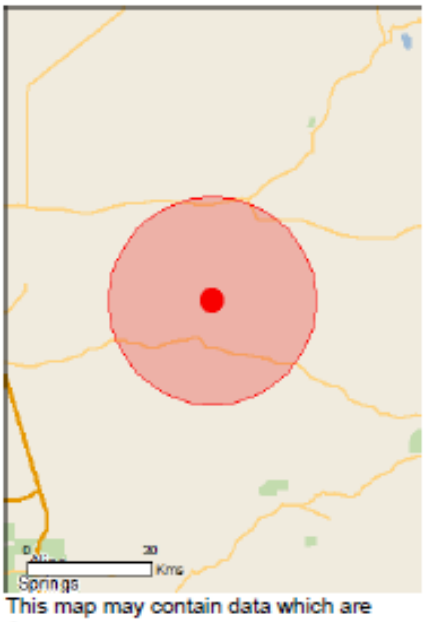
EPBC Act Protected Matters Report

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.

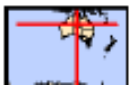
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/03/17 11:17:28



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 25.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	13
Listed Migratory Species:	6

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. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

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.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Insects		
Croitana aestiva Desert Sand-skipper, Aestiva Skipper [26238]	Endangered	Species or species habitat may occur within area
Mammals		
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis MacDonnell Ranges race Warru, Black-footed Rock-wallaby (MacDonnell Ranges race) [66649]	Vulnerable	Species or species habitat likely to occur within area
Zyzomys pedunculatus Central Rock-rat, Antina [68]	Endangered	Species or species habitat may occur within area
Other		
Macrozamia macdonnellii MacDonnell Ranges Cycad [11843]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Minuria tridens Minnie Daisy [13753]	Vulnerable	Species or species habitat may occur within area
Olearia macdonnellensis [14180]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Reptiles		
Liopholis slateri slateri		
Slater's Skink, Floodplain Skink [83163]	Endangered	Species or species habitat may occur within area

Listed 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		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

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, 2001.

Name	Status	Type of Presence
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area

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 and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

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

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

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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.

Coordinates

-23.1583 134.23848

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:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian 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, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia

-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-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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Appendix 2 Flora species recorded during site visit on 03/03/2017

*Denotes species introduced to NT

Species	Common name	Land units recorded
Abutilon otocarpum	desert chinese lantern	2.1, 3.1a, 5.2
Acacia aneura	mulga	2.1, 3.3, 3.1b, 5.2, 6.2
Acacia estrophiolata	ironwood	6.2
Acacia kempeana	witchetty bush	3.1a, 6.2
Acacia tetragonophylla	dead finish	6.2, 3.1a
Acacia victoriae	elegant wattle	5.2
Aristida contorta	bunched Kerosene Grass	5.2, 6.2
Aristida holathera	tall kerosene grass	5.2
Aristida inaequiglumis	unequal threeawn	2.1, 3.1a, 3.3, 3.1b, 4.2
Aristida inaequiglumis	unequal threeawn	3.1a
Boerhavia repleta	tar vine	2.1, 4.2, 6.2
Bonamia media	common bonamia	3.1a
Brachyscome ciliaris	variable daisy	4.2, 6.2
*Calopropis procera**	rubber bush	7.1
Capparis spinose var. *nummularia*	caper bush	3.1a
*Cenchrus ciliaris**	buffel grass	3.1a, 3.3, 4.2, 5.2, 6.2, 7.1
Cheilanthes lasiophylla	wooly cloak-fern	3.1b
Cleome viscosa	tickweed	2.1, 3.1b
Corymbia opaca	desert bloodwood	2.1, 5.2
Cucumis maderaspatanus		7.1
*Cynodon dactylon**	couch grass	7.1
Dactyloctenium radulans	button grass	5.2
Digitaria brownii	cotton panic grass	3.3
Digitaria divaricatissima var. divaricatissima		3.3
Dissocarpus paradoxus	cannonball burr	6.2
Enchylaena tomentosa	ruby saltbush	3.1a, 3.3, 5.2, 6.2
Enneapogon avenaceus	bottle washers	3.1a, 3.3, 4.2, 5.2, 6.2
Enneapogon cylindricus	jointed nineawn	3.1a, 3.3, 3.1b, 4.2
Enneapogon oblongus	rock nine-awn	5.2
Enneapogon polyphyllus		2.1, 3.1a,
Enteropogon acicularis	curly windmill grass	5.2, 6.2
Enteropogon ramosus	creek windmill grass	7.1
Eragrostis eriopoda	woolybutt grass	3.3
Eragrostis falcata	sickle lovegrass	4.2, 6.2
Eremophila christophori	dolomite fuschia bush	3.1b, 5.2
Eremophila duttonii	harlequin fuchsia	6.2
Eremophila freelingii	rock fuschia	2.1, 3.3, 5.2, 62
Eremophila latrobei	native fuschia	2.1, 3.1a, 3.3, 6.2
Eremophila longifolia	long-leaved emu bush	4.2, 5.2, 6.2
Eriachne aristidea	three awn wanderrie	3.3
Eriachne helmsii	woolybutt wanderrie	3.3
Eucalyptus camaldulensis	river red gum	7.1
Eulalia aurea	silky browntop	3.1b
Euphorbia australis	hairy caustic weed	3.1a
Euphorbia drummondii	caustic weed	3.1b, 4.2
Evolvulus alsinoides	slender dwarf morning glory	3.3, 3.1b, 4.2, 4.2
Ficus Platypoda	rock fig	3.3, 3.1b
Goodenia lunata		5.2
Grevillea striata	beefwood	6.2
Hakea lorea	corkwood	3.1b, 5.2
Heliotropium ovalifolium		3.3, 6.2
Hibiscus stuarti ssp. *grandifolius*		2.1
Hybanthus aurantiacus	spade flower	3.1a
Hybanthus aurantiacus	spade flower	3.1b
Indigofera leucotrica	silver indigo	2.1, 3.1a, 3.1b

Maireana villosa	silky bluebush	2.1
Malvastrum americanum	spiked malvastrum	3.1a, 4.2, 5.2, 6.2
Marsdenia australis	bush banana	5.2
Melaleuca glomerata	desert honey-mytrle	4.2, 6.2
Melhania oblongifolia	velvet hibiscus	3.1a, 3.1b, 5.2, 6.2
Minuria tridens	minnie daisy	3.1a
Oxychloris scariosa	winged chloris	
Panicum decompositum var decompositum	native millet	4.2
Panicum laevinode		4.2
Paraneurachne muelleri	spinifex couch	2.1, 3.3, 5.2
Portulaca oleracea	pigweed	2.1. 5.2
Ptilotus macrocephalus	large green pussytails	2.1, 3.1a
Ptilotus obovatus	silvertails	2.1, 3.1a, 3.1b, 3.3, 5.2
Salsola tragus	rolypoly	3.1a, 6.2
Santalum lanceolatum	plum bush	3.1b
Sarcostemma australe	caustic vine	3.1b
Sclerolaena bicornis	goathead burr	3.1a, 5.2, 6.2
Sclerolaena cornishiana	catwheel burr	3.1a, 5.2
Sclerolaena cuneata		6.2
Senecio gregorii		4.2
Senna art. ssp. helmsii	blunt-leaf cassia	2.1, 3.1a
Senna artemisioides ssp. alicia		3.1a, 3.3, 3.1b, 5.2
Senna artemisioides ssp. artemisioides	silver cassia	2.1
Senna artemisioides ssp. filifolia	desert cassia	4.2, 5.2
Senna artemisioides ssp. quadrifolia		2.1, 3.1a
Senna artemisioides ssp. sturtii	grey cassia	5.2
Sida fibulifera	silver sida	2.1. 3.1a, 4.2, 6.2
Sida huckitta		3.1a
Solanum quadriloculatum	wild tomato	2.1, 3.1a, 5.2, 6.2
Sporobolus actinocladus		6.2
Swainsona canescens	grey swainsona	3.1b
Themeda triandra	kangaroo grass	2.1, 3.1a, 3.3, 3.1b, 5.2
Thyridolepis mitchelliana	northern mulga grass	3.3
Tribulus terrestris	caltrop	3.1b
Triodia longiceps	bull spinifex	4.2
Tripogon loliiformis	five-minute Grass	6.2
Triraphis mollis	purple plume grass	3.1a, 3.3, 3.1b, 4.2, 5.2, 6.2
Ventilago viminalis	supplejack	3.1a

Appendix 3 Fauna species recorded during site visit on 03/03/3017

Latin name	Common name	Comment
Birds		
Artamus cinereus	black-faced woodswallow	Observed
Barnardius zonarius	Australian ringneck	Observed
Chlamydera guttata	western bowerbird	Observed. Bower in fig trees.
Coracina novaehollandiae	black-faced cuckoo-shrike	
Cracticus torquatus	grey butcherbird	Observed
Grallina cyanoleuca	magpie-lark	Observed
Lichenostomus penicillatus	white-plumed honey eater	Observed
Manorina flavigula	yellow-throated miner	
Melopsittacus undulatus	budgerigar	Observed
Ninox boobook	boobook owl	Observed in hollow in old river red gum in Gillen Creek.
Ocyphaps lophotes	crested pigeon	Observed
Pomatostomus temporalis	grey crowned babbler	Observed
Taeniopygia guttata	zebra finch	Observed
Falco peregrinus	peregrine falcon	Observed
Invertebrates		
Belenois java	caper white	Observed
Danaus petilia	lesser wanderer	Abundant, particularly in buffel grass. Larvae observed eating rubber bush.
Granulomelon gilleni	Gillen Creek land snail	Shells observed high in calcarours hills below rock outcrops with deep crevices and high vegetation litter cover. Fig trees present in both locations. Shells were also obvserved down below hills and in drainage lines and theses are likely to have washed down.
Junonia villida	meadow argus	Observed
Mammals		
Bos taurus	cattle	Tracks & scats
Canis lupus lupus	dingo	Fresg tracks observed on road
Macropus robustus	euro	Tracks & scats observed
Oryctolagus cuniculus	rabbit	Tracks & scats observed
	mice	Tracks observed
Reptiles		
	dragon	Burrows observed
	small skink	Burrows observed