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Multicom

Saint Elmo Vanadium Mine

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Saint Elmo Vanadium Mine

9 August 2017

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Contents

List of Figures

List of Tables

List of Appendices

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Executive Summary

Multicom Resources Pty Ltd (formerly Wilson Oil Pty Ltd) is an exploration and mining company seeking to develop the Saint Elmo Vanadium Project (SEVP - the Project), approximately 25 km east of Julia Creek, Queensland.

The site is currently used for grazing and is covered by tussock grassland and forbland, characteristic of the Mitchell Grass Downs bioregion. Several watercourses run through the SEVP site, with several rural water storages (dams) located throughout.

Epic Environmental Pty Ltd (Epic) was engaged to undertake a terrestrial ecology assessment of the SEVP. The scope of this assessment was limited to desktop research as well as a March 2017 baseline survey (late wet season) and July 2017 (dry season) targeted field survey. The overall aims of this report are to:

- Document existing ecological values, including habitat quality, and conservation status of regional ecosystems present;
- Develop an inventory of all terrestrial flora and vertebrate fauna known from the SEVP area;
- Identify and summarise the ecology of species confirmed to be or potentially found on-site that are listed under Commonwealth and/or State legislation;
- Identify potential impacts that the proposed mining activities may have on species and/or ecological communities; and
- Make recommendations to mitigate potential impacts.

The ecological survey confirmed two species of National and/or State Significance. Glossy Ibis and Sharp-tailed Sandpiper are listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*. Neither species uses the site for breeding therefore, impacts are likely to be minimal and short-term.

There is a potential for direct and indirect impacts on the Julia Creek Dunnart (*Sminthopsis douglasi*) as a result of the SEVP. No Julia Creek Dunnart were recorded at the SEVP however this does not indicate their absence. Direct threats comprise the loss of habitat or direct mortality of individuals through clearing and excavation works. Indirect threats refer to secondary threats that may occur as a result of the SEVP.

Recommendations to mitigate potential environmental impacts as a result of the construction and operation of SEVP have been made in line with the mining plan. No significant ecological impacts are anticipated as a result of the Project.

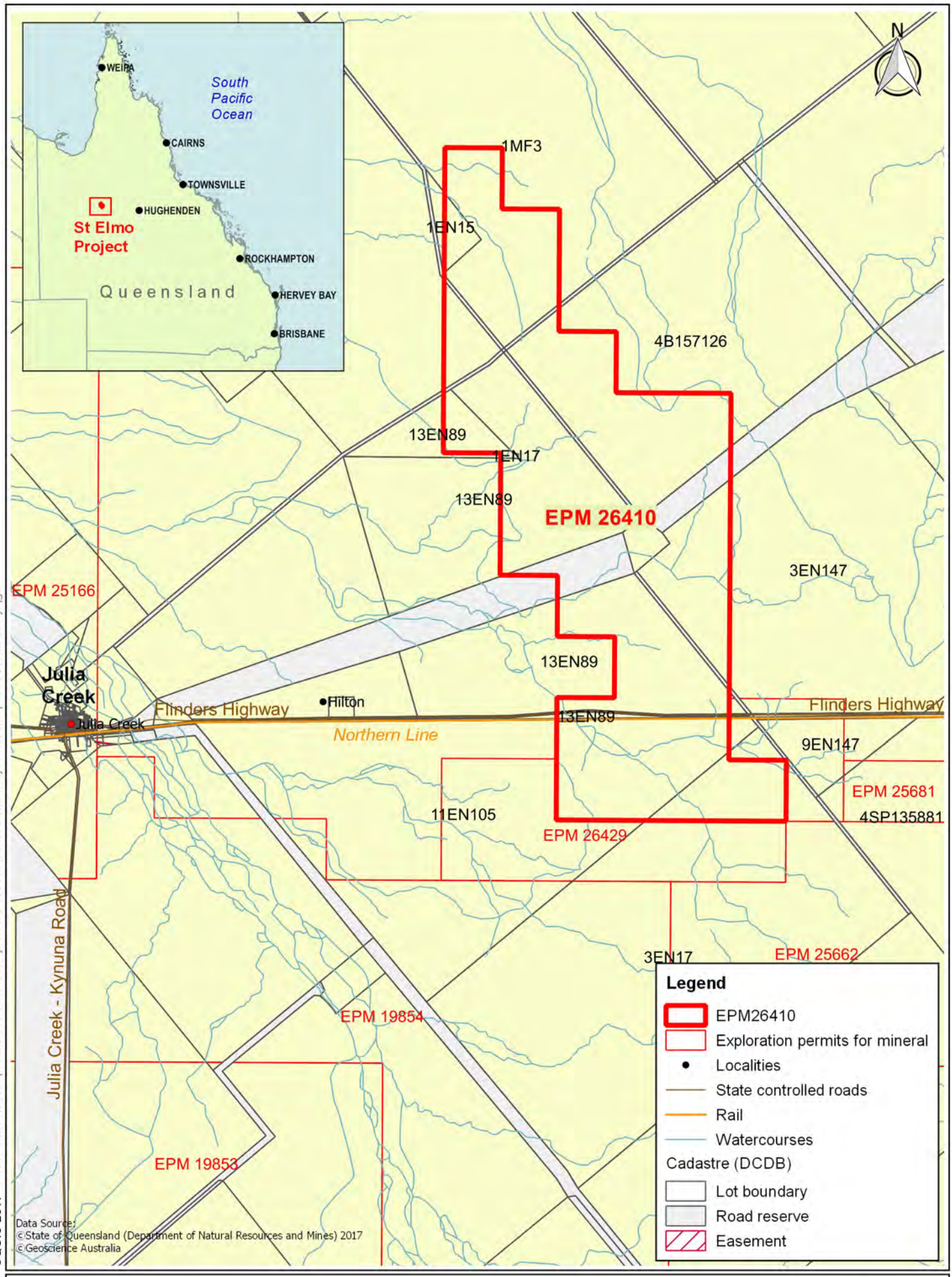
1 Introduction

Multicom Resources Pty Ltd (Multicom) is an exploration and mining company seeking to develop the Saint Elmo Vanadium Project (SEVP - the Project), 15 km east of Julia Creek, Queensland (EPM 26410) (Figure 1).

The area of EPM 26410 is 10,573 ha and measures approximately 20 km in length and 8 km in width at its widest boundary (Figure 2). The total perimeter is 65 km. The indicative mine footprint is estimated at 3,738 ha however it is likely that mining will extend beyond this and throughout the 10,573 ha available within the EPM. Extensive test drilling and metallurgical test work has been completed, identifying significant vanadium deposits close to the soil surface. The Project has a target production of 10,000 tonnes per annum (tpa) of Vanadium Pentoxide (V_2O_5), with the resource exceeding a 30 year mine life. The mine is expected to be a shallow (15 m average) open cut operation that will be progressively rehabilitated over its life.

Prior to government approval for the SEVP, the ecological values of the site, and the potential environmental impacts of the proposed activities, must be assessed. The SEVP area has not previously been the subject of detailed ecological assessments. Epic was engaged to carry out ecological assessments of the site which involved desktop surveys of potential matters of environmental significance, in conjunction with a field survey. The assessment of the ecological values of the site is presented in this report. The overall aims of this report are to:

- Document existing ecological values, including habitat quality, and conservation status of Regional Ecosystems (REs) present;
- Develop an inventory of all terrestrial flora and vertebrate fauna known from the SEVP area;
- Identify and summarise the ecology of species confirmed to be or potentially found on-site that are listed under Commonwealth and/or State regulations;
- Identify potential impacts that the proposed mining activities may have on species and/or ecological communities; and
- Make recommendations to mitigate potential impacts.



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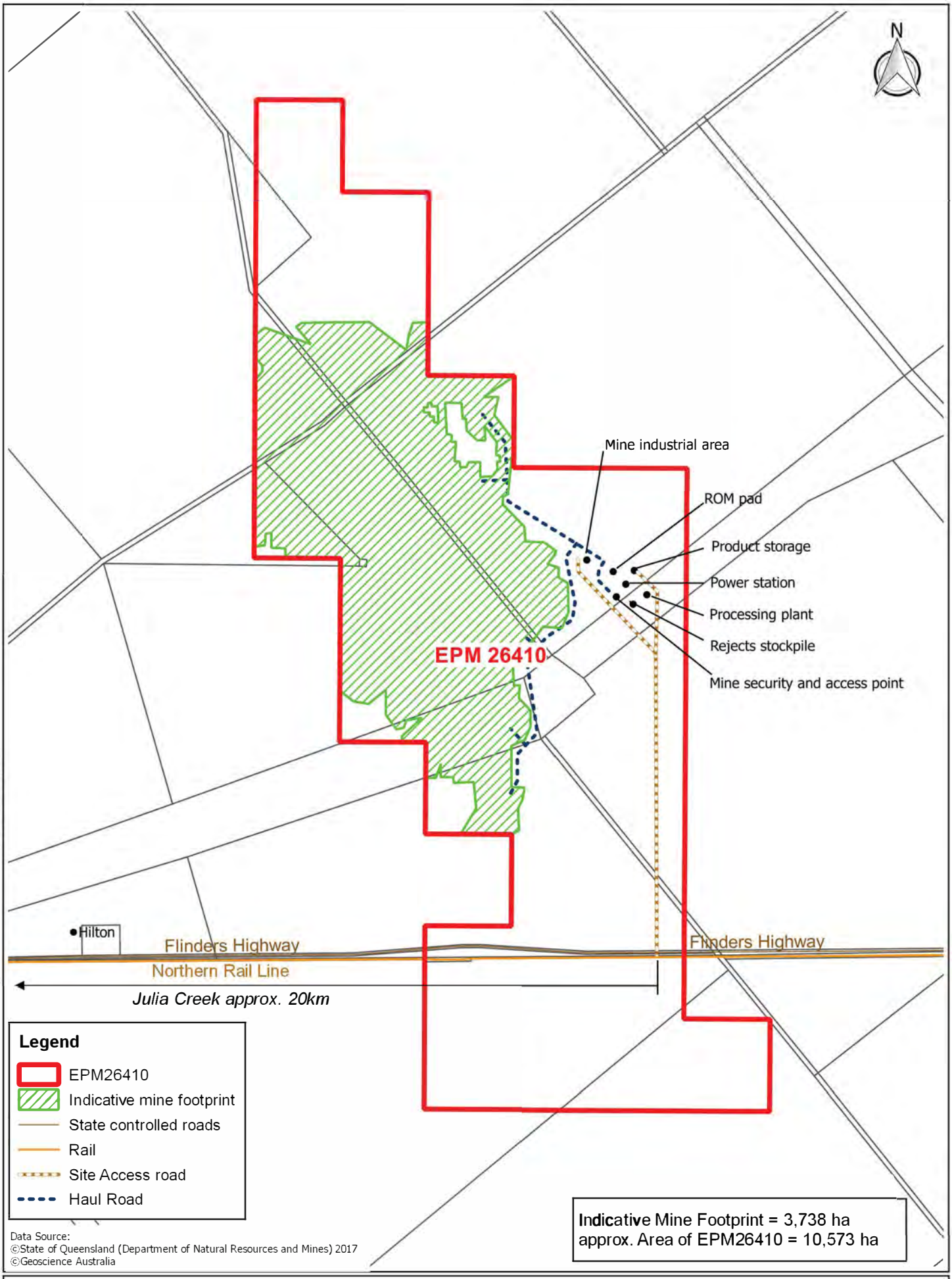
St Elmo Project

Figure 1
Regional Location



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St Elmo Project

Figure 2
Indicative Mine Plan

1.1 Location

The Project is located 15 km east of the township of Julia Creek in Queensland, Australia and falls within the McKinlay Shire Council area. The Project's EPM 26410 is located across several lots, namely:

- Lot 13 on Plan EN89, Freehold;
- Lot 1 on Plan EN15, Lands Lease;
- Lot 1 on Plan MF3, Lands Lease;
- Lot 11 on Plan EN105, Freehold;
- Lot 3 on Plan EN17, Lands Lease;
- Lot 3 on Plan EN147, Lands Lease;
- Lot 1 on Plan EN17, Reserve; and
- Lot 4 on Plan B157126, Lands Lease.

The Project is located in the Mitchell Grass Downs bioregion and is currently comprised of open grassland used for grazing purposes, consistent with the bioregion.

1.2 Ecological Features

The Mitchell Grass Downs bioregion is dominated by Mitchell grass (*Astrebla* spp.) tussock grasslands on rolling plains (downs). The soils are predominantly deep, heavy clays. The plains are interspersed with drainage lines, supporting open grasslands, herblands or eucalypt woodlands and isolated remnant plateaus. Although the nature of the bioregion is still poorly known, 60 REs are currently recognised in the bioregion (REDD V10). Nineteen of the REs are grasslands, typically dominated by Mitchell grass (*Astrebla* spp.) and 30 of the REs are woodlands dominated by either Gidgee (*Acacia cambagei* or *georginae*) or Mulga (*A. aneura*). Eucalypt communities occur on the alluvial plains, and are dominated by Coolabah (*Eucalyptus coolabah*) or River red gum (*E. camaldulensis*).

Desktop analysis of remnant vegetation within the study area and surrounds showed a modified landscape with large areas converted to agricultural purposes (predominately grazing), although large patches of remnant vegetation remain. The site is mapped as containing four REs (QG 2017a):

- RE 4.3.4f: *Eucalyptus coolabah* and/or *E. microtheca* low open woodland. Occurs on drainage lines on *Astrebla* spp. undulating plains and braided channels on alluvial plains.
- RE 4.3.15: *Astrebla squarrosa +/- Dichanthium* spp. *+/- Eulalia aurea* grassland on alluvium. Occurs immediately above drainage lines. Sparsely scattered shrubs and trees may occur along the channels. Soils moderately deep to deep, red and brown clays.
- RE 4.9.1c: *Astrebla* spp., *Iseilema* spp. tussock grassland, commonly with *Panicum decompositum*, *Dichanthium* spp., *Eulalia aurea*, *Chrysopogon fallax* and *Sorghum plumosum*. Emergent *Atalaya hemiglauca* commonly occur. Occurs on level to gently undulating downs.

- RE 4.9.2b: Mixed tussock grassland, with combinations of *Astrebla* spp.*, Aristida latifolia*, *Enneapogon* sp. mixed tussock grassland. Emergent *Atalaya hemiglauca, Ventilago viminalis* and *Corymbia terminalis* commonly occur. Occurs on rises of exposed shale and limestone with rocks to the surface of cracking clay soils.

1.3 Topographical and Water Features

The Project area consists of undulating plains, with no noticeable topographic features. There are several rural water storages within the Project area and two braided drainage lines occur in the southern portion of the site (Figure 3). Part of this network bi-sects the Flinders Highway. There is a small, unnamed creek toward the middle of the EPM.

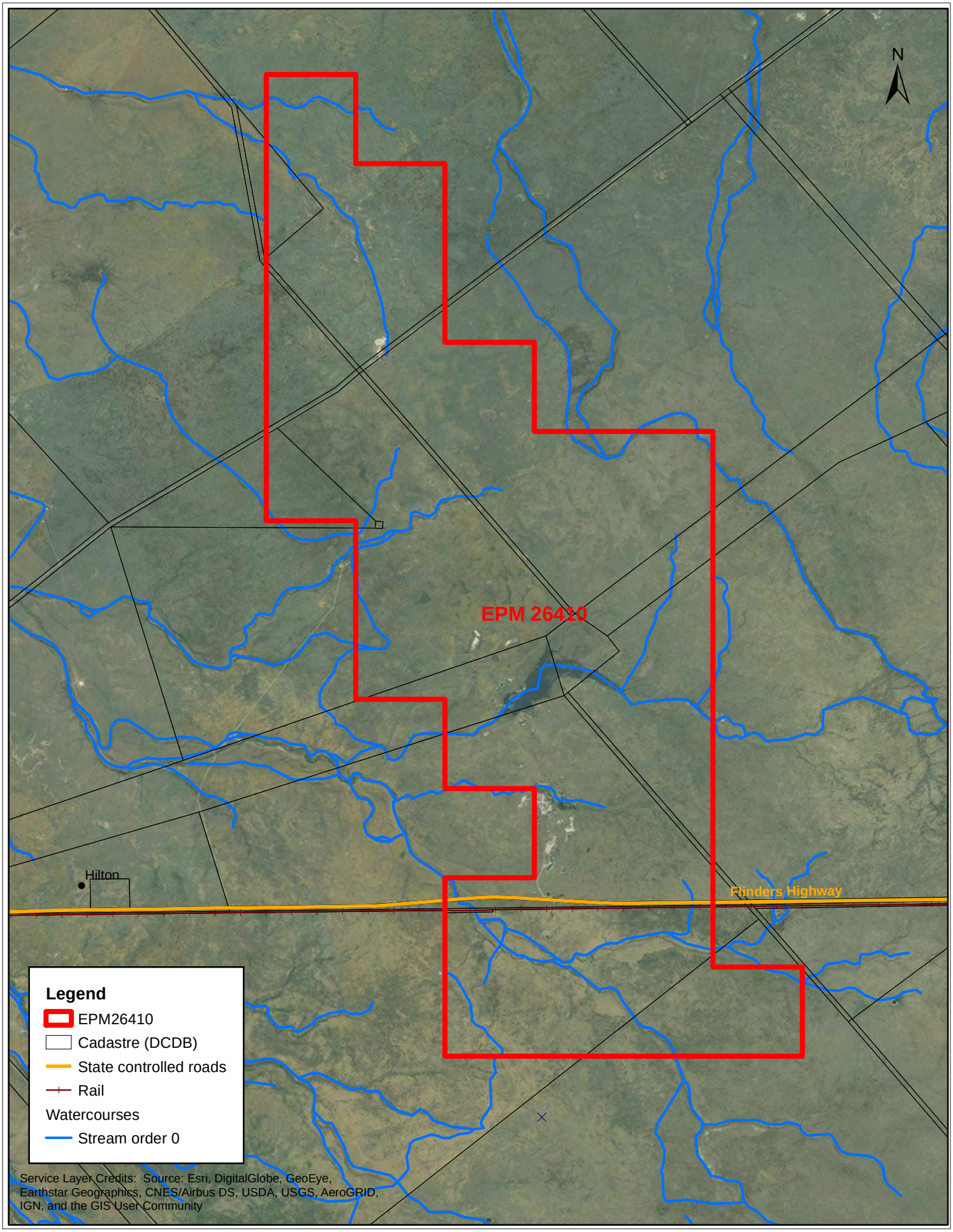
No referrable wetland, or wetland protected area was identified within the study area during the desktop assessment, nor during field assessment.

1.4 Existing Land use

The Project area is largely disturbed and situated across several rural properties. The area has been historically used for cattle grazing on unimproved pastures. Several vehicular tracks and fencing lines occur within EPM 26410.

The site is bisected by the Flinders Highway, and the Great Northern Line rail corridor, both running east-west through the site (Figure 1).

There is a large road reserve that crosses the width of EPM 26410 through the centre, the intent of this road reserve is unclear at the present time.



File Path: C:\GIS\Epic Environmental\Projects\BE170006.01 St Elmo Project \Workspaces\Figure 2 Watercourses

St Elmo Project

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Figure 3
Watercourses

1.5 Proposed Activities

Multicom is seeking to develop the SEVP for the purposes of mining and processing vanadium. The proposed activity involves the development of an intrusive resource harvesting facility, incorporating shallow <20 m deep (strip ratios: 0/1 – 2/1) strip mining practices, in order to obtain access to large known deposits of vanadium.

The Project will be an open cut mine with associated dump and haul operations. A range of ancillary infrastructure will be required to support the mining activity, including:

- Basic administrative and crib facilities;
- Vehicle storage, maintenance and refueling areas;
- Site water storage and management facilities;
- Overburden storage and management areas;
- Ore processing facilities; and
- Site access road, fencing and related security facilities.

This ecological assessment has considered the range of associated infrastructure required for operation of the mine. It is not anticipated that accommodation facilities will be required on-site, with the majority of the operational workforce coming from Julia Creek and surrounds.

1.6 Applicable Legislation

The following subsections summarise the Commonwealth and State legislation protecting the ecological values of the SEVP area.

1.6.1 Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key piece of Commonwealth legislation governing environmental protection in Australia. Administered by the Commonwealth Government Department of the Environment and Energy (DEE), the EPBC Act defines and protects nine matters considered to be of National Environmental Significance (MNES) including:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Listed threatened species and ecological communities;
- Migratory species protected under international agreements;
- Commonwealth marine areas;

- The Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mines); and
- A water resource in relation to coal seam gas development and large coal mining development.

Under Part 3 of the EPBC Act, a person must not undertake an action (e.g. a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things) that will have, or is likely to have, a significant impact on a protected matter, without approval from the Minister for the DEE (the Minister).

EPBC Act Environmental Offsets Policy 2012

The EPBC Act *Environmental Offsets Policy October 2012* (EOP) provides upfront guidance on the role of offsets in environmental impact assessments, and how the DEE considers the suitability of a proposed offset. The EPBC Act Offset Policy aims to improve environmental outcomes through the consistent application of best practice offset principles, provide more certainty and transparency, and encourage advanced planning of offsets.

1.6.2 State

Environmental Protection Act 1994

The objective of the *Environmental Protection Act 1994* (EP Act) is to protect Queensland's environment and to promote ecologically sustainable development. The EP Act defines a General Environmental Duty under which all persons in Queensland have a responsibility to not carry out an activity that causes or is likely to cause environmental harm, and to take all reasonable and practicable measures to prevent or minimise the harm.

The EP Act also regulates Environmentally Relevant Activities (ERAs). ERAs are activities that require an Environmental Authority (EA) prior to activities commencing. Resource activities (mining) are defined under the EP Act as a resource ERA for which an EA is required. It is anticipated that an Environmental Impact Statement (EIS) will be required for the Department of Environment and Heritage Protection (DEHP) to assess the EA and ERAs.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) and the Nature Conservation Regulation 2006 (NC Regulation) regulate the environmental impacts of the mining industry through the requirement for vegetation clearing permits, species management programs and other permits.

A clearing permit is required to clear protected plants unless an exemption applies. In general, clearing of Endangered, Vulnerable or Near Threatened protected plants will require a clearing permit. Clearing permit applications are assessed on a case-by-case basis and approvals will be subject to conditions.

Where mining activities involve tampering with animal breeding places, the tampering may be authorised by application to DEHP through an approved species management program.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of remnant vegetation in Queensland. The VM Act aims to conserve Queensland's biodiversity through vegetation management. The VM Act does not apply on mining leases; however, the assessment of the application for the mining lease will assess the vegetation clearing activities required as part of mining activities at the site.

Biosecurity Act 2014

The *Biosecurity Act 2014* ensures a consistent, modern, risk-based and less prescriptive approach to biosecurity in Queensland. The *Biosecurity Act 2014* provides comprehensive biosecurity measures to safeguard the economy, agricultural and tourism industries, environment and way of life from pests, diseases and contaminants. Decisions made under the *Biosecurity Act 2014* will depend on the likelihood and consequences of risk, allowing for more appropriate management of risks.

1.7 Previous and Similar Studies

The SEVP area has not been previously subjected to a detailed terrestrial ecology assessment. Based on desktop review, two projects (both linear infrastructure) were identified in the vicinity of the SEVP as being relevant and able to inform the SEVP terrestrial ecology desktop research, namely:

- *Environmental Impact Statement for the Northern Gas Pipeline* (Jemena Northern Gas Pipeline Pty Ltd 2016): This EIS included ecological surveys of areas within a 622 km expanse between Mt Isa to Tennant Creek in the Northern Territory. The Northern Gas Pipeline Project is located approximately 150 km west of the SEVP.
- *Environmental Impact Statement for the CopperString Project* (CopperString Pty Ltd 2010): This EIS included ecological surveys of the transmission line from a new substation near Woodstock, south of Townsville, to a new substation south west of Cloncurry. The project area runs approximately 20 km south of the SEVP, parallel to the Flinders Highway.

The relevant ecological sections from the projects were considered during preparation of this ecological assessment report.

1.8 Nomenclature and Taxonomy

Taxonomy of flora presented in this report follows that currently endorsed by the Queensland Herbarium in the Census of Queensland Flora 2013. The taxonomy of birds follows Christidis and Boles (2008), while that of other fauna groups follows that endorsed by the Atlas of Living Australia (ALA 2017).

The common names of many flora and fauna species frequently vary between regions, and many species lack them altogether. For common and scientific names of flora, refer to Appendix A and for fauna species, refer to Appendix B.

The conservation status of Queensland wildlife is prescribed within the *Nature Conservation (Wildlife) Regulation 2006*, following provisions of the NC Act. The conservation status of species at a national level is defined under the EPBC Act.

2 Methods

2.1 Literature Review

Prior to commencing the field survey, desktop assessments were carried out to highlight species and ecological communities of conservation significance that potentially occur within the SEVP area. Flora and fauna of conservation significance in this report include:

- Flora and fauna species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act;
- Flora and fauna species listed as Endangered, Vulnerable or Near Threatened under the NC Act;
- Flora species listed as Endangered, Vulnerable or Near Threatened under the VM Act;
- Fauna species listed as Migratory under the EPBC Act due to their inclusion under one or more of the following:
    - *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention)
    - *China-Australia Migratory Bird Agreement* (CAMBA)
    - *Japan-Australia Migratory Bird Agreement* (JAMBA)
    - *Republic of Korea-Australia Migratory Bird Agreement* (ROKAMBA)

Flora and fauna records listed in publicly available databases were investigated to provide insight into species that are likely to inhabit the SEVP area. These databases included:

- Department of the Environment and Energy Protected Matters Search Tool (records within a 50 km radius of the point -20.609; 141.904);
- Queensland Government Wildlife Online database (records within a 50 km radius around the point -20.609; 141.904);
- Queensland Museum Records;
- Atlas of Living Australia, a web-based search tool that is a partnership between CSIRO, Australian museums, herbaria and other biological collections, and the Australian Government;
- Department of Environment and Heritage Protection certified RE maps;
- Biodiversity Planning Assessment;
- *Environmental Impact Statement for the Northern Gas Pipeline* (Jemena Northern Gas Pipeline Pty Ltd 2016); and
- *Environmental Impact Statement for the CopperString Project* (CopperString Pty Ltd 2010).

2.2 Survey Timing and Conditions

Julia Creek predominantly experiences summer rainfall with high summer temperatures in the wet season, and long periods each winter with little or no rain. This high seasonality of rainfall and extreme temperatures underlies extensive seasonal variability in the presence or detectability of flora and fauna, for example:

- Understorey herbs and grasses are best sampled in the late wet season when flowering and/or fruiting;
- Amphibians are usually inactive in the cooler dry months, and are best sampled at the commencement of summer rains;
- Migratory birds may be present in one season only (winter or summer), depending on species;
- Rodents and other small mammals are best sampled in the early dry season when populations are at their densest (Dickman *et al*. 1999);
- Some burrowing reptiles are most detectable after heavy rain; and
- Many reptiles are most active and most easily detected at the commencement of breeding in spring (Spence-Bailey *et al.* 2010).

To take into account this seasonal variation, the *Terrestrial Vertebrate Survey Guidelines for Queensland* (Eyre *et al*. 2014) recommends undertaking two fauna surveys; one in the early wet season (November-January) and one in the early dry season (May-July). Flora is best surveyed in the late wet season (March-May), when most herbs and grasses are actively flowering and/or seeding.

2.3 March 2017 Survey

The March 2017 survey was undertaken as a baseline survey for the SEVP. The late wet season survey took place from 27 to 31 March 2017 to coincide with maximal plant flowering and fruiting, peak small mammal densities and high levels of reptile activity. A future dry season survey will be completed along with spot surveys where any ambiguity may arise from suboptimal conditions.

During the survey period, the lowest minimum daytime temperature was 21.9°C and the highest maximum temperature was 42.0°C, with maximum daytime temperatures always above 40°C. It was noticeably cold on the night of 30 March, when temperatures dropped to 14.6°C. No rainfall was recorded during the survey period (BOM 2017). Total monthly rainfall for March 2017 was 48.8 mm. However, it is noted that 16.6 mm of rain fell the week prior, on 22 March 2017.

2.4 July 2017 Survey

The July 2017 survey was intended as a targeted survey, specifically targeting Julia Creek Dunnart (*Sminthopsis douglasi*). The mid dry season survey took place from 24 to 29 July 2017, meeting the requirements of the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland.*

During the survey period, the lowest minimum daytime temperature was 18.7°C and the highest maximum temperature was 31.4°C. No rainfall was recorded during the survey period (BOM 2017). Total monthly rainfall for July 2017 was 14.2 mm. However, it is noted that 13.8 mm of rain fell three weeks prior, on 8 July 2017.

2.5 Flora Survey

The flora site survey was undertaken using Regional Ecosystem (RE) code site sheets as a facsimile of Tertiary sites, rather than quaternary or secondary site data. The RE code site sheets were chosen so as to simplify the process for a Property Map of Assessable Vegetation (PMAV) if required later. The types of data collected during the flora survey included:

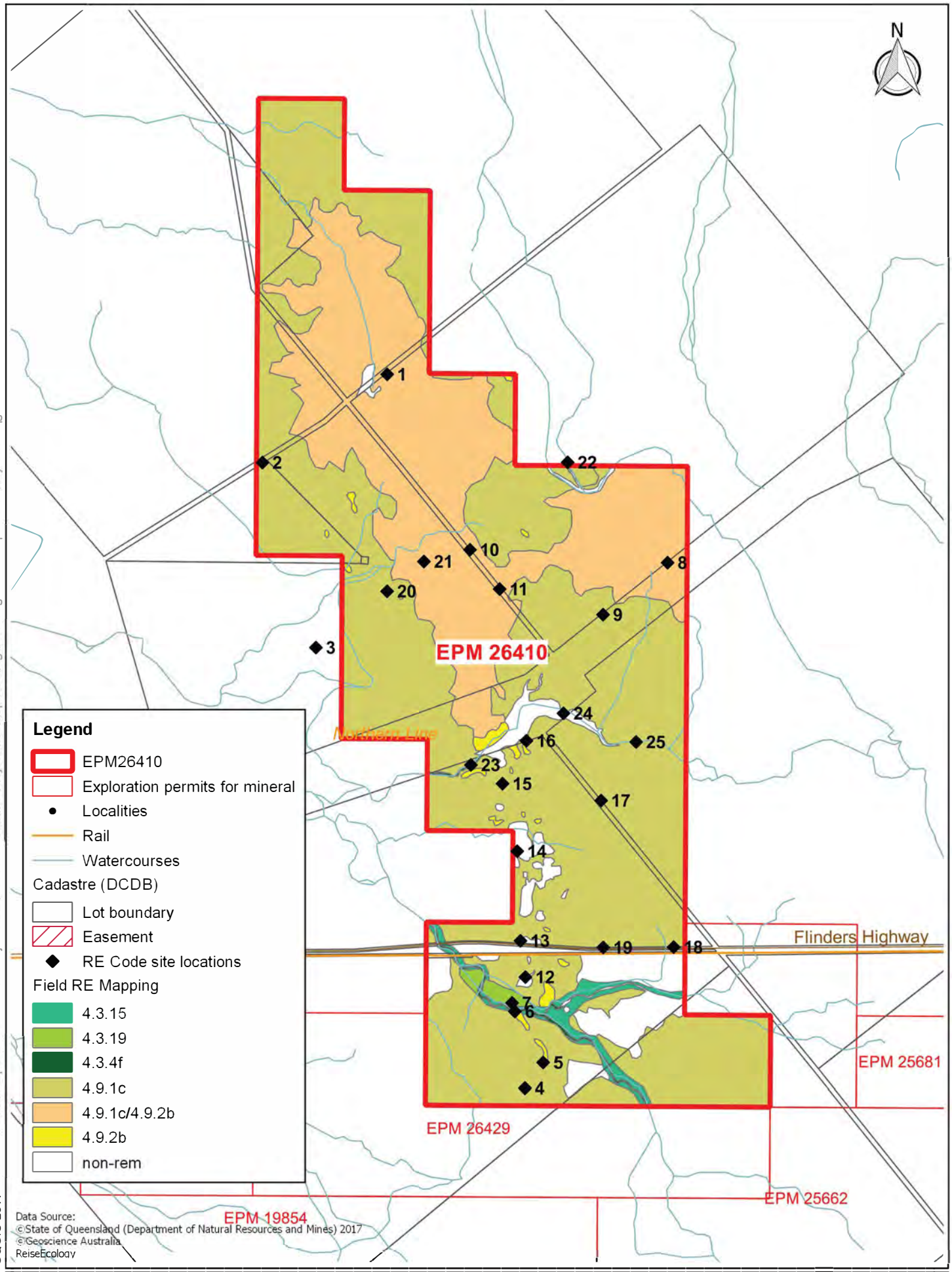
- A GPS-derived position;
- Observations of geology and soil type;
- Land unit types present;
- Dominant floristics within all structural layers including dominance;
- Presence of any threatened / protected species of flora; and
- Estimated height ranges for all vegetation layers including median heights.

All species of flora noted within the SEVP area while moving between sites were identified and recorded. Online databases and reviews of surveys of nearby mining leases highlighted a number of threatened species that may occur on-site. Special effort was made to thoroughly search habitats identified as likely to support species of conservation significance.

2.5.1 Vegetation Mapping

On-ground vegetation mapping surveys included establishing field sites in all regional ecosystem types present whilst attempting to traverse as much of the site as possible to establish changes in vegetation community type and surface geology/soil types using quaternary sites. Notes on condition including the presence of weed species were also undertaken throughout the survey area.

Results from the flora survey were used to produce a vegetation map of the SEVP area (Figure 4). For each mosaic polygon (vegetation blocks containing a mixture of RE types), a field-verified estimation of the percentage of each RE unit present was recorded. This enabled calculation of the total areas covered by each RE within the SEVP area.



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St Elmo Project

Figure 4
Vegetation Map and Survey Sites

2.6 Fauna Survey

The fauna survey catalogued all species of vertebrates, other than fish, recorded within the SEVP area, with particular focus on detecting species of conservation significance. This was achieved through a combination of trapping, remote-sensory cameras, Anabat analysis, visual searches and audio surveys, focusing on habitats considered to be of highest quality.

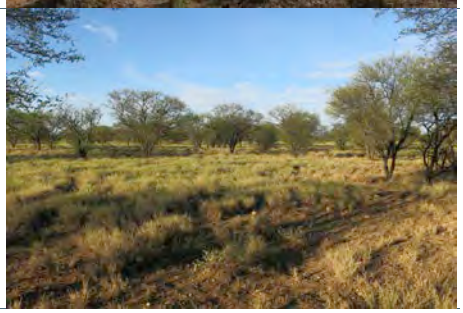
In accordance with the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*, the survey area was stratified into assessment units of environmentally similar habitats that are expected to support similar suites of species. This stratification was carried out to ensure that all habitat types were adequately sampled.

Employment of a variety of survey methods results in the detection of the greatest diversity of wildlife (Garden *et al.* 2007). At each fauna trap site Elliott and funnel traps were deployed and birds, diurnal mammals and reptiles were surveyed (Figure 5). Five target sites were used for Anabat detection and general observation. The methodology employed followed standard survey techniques (Eyre *et al.* 2014), and are described in detail below.

Site descriptions for each trap and target site have been provided in Table 1.

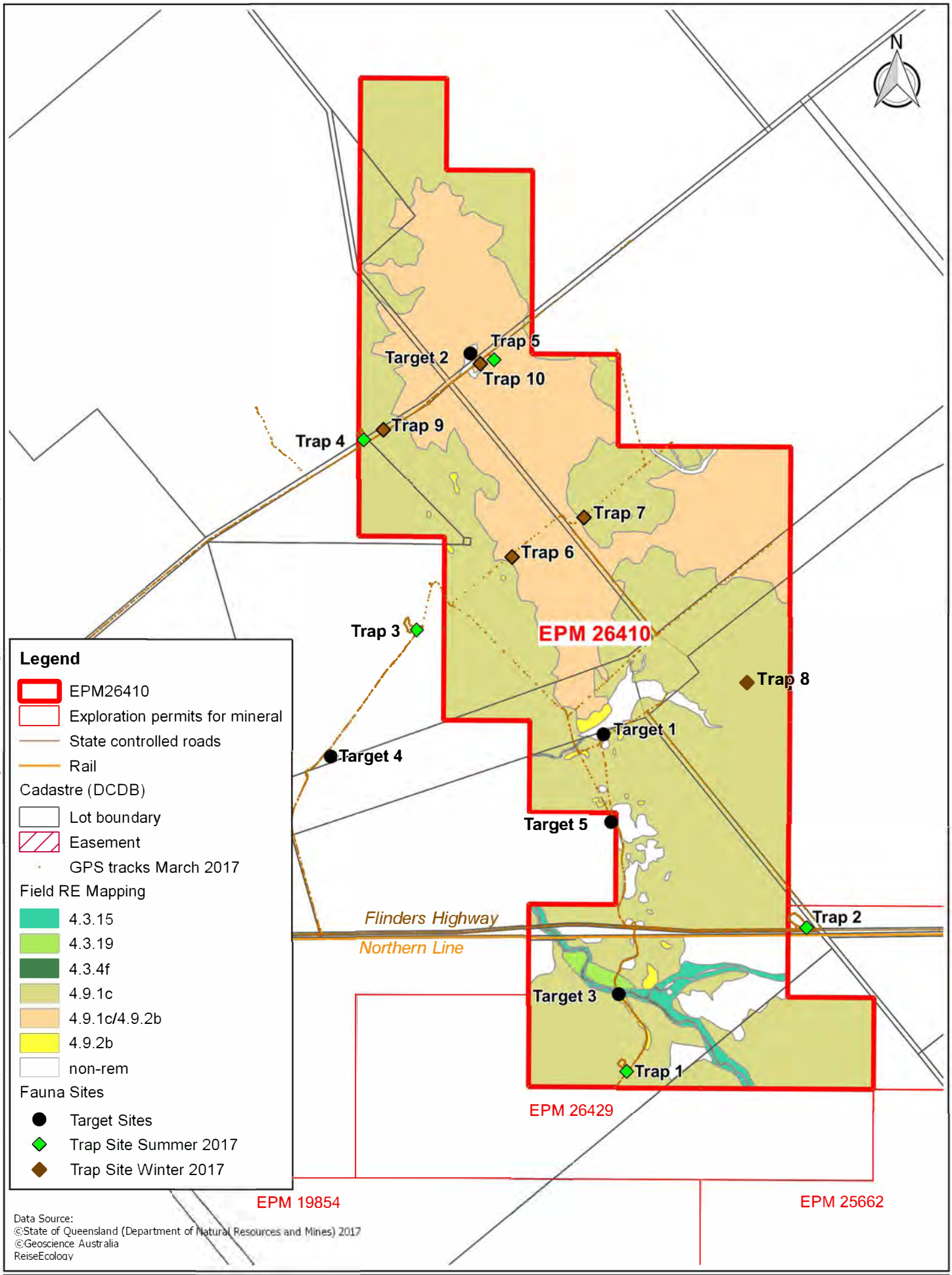
Table 1: Descriptions of Trap and Target Sites

Site	Description/Habitat Type	Photo
Trap Site 1 (March 2017)	Trap Site 1 was located in RE 4.9.1c: *Astrebla* spp., *Iseilema* spp. tussock grassland, commonly with other grasses including *Panicum decompositum*, *Dichanthium* spp., *Eulalia aurea*, *Chrysopogon fallax* and *Sorghum plumosum.* An emergent shrub, *Atalaya hemiglauca*, commonly occurs. The RE occurs on level to gently undulating downs. This RE is considered potential habitat for conservation significant fauna species including Julia Creek Dunnart *Sminthopsis douglasi*, Collett's snake *Pseudechis colletti* and a skink, Black Soil-rises Ctenotus *Ctenotus schevilli* (QG 2017a). The site had only sparse grass cover and some infestation of Prickly Acacia *Vachellia nilotica*, including a number of dead individuals. No *A. hemiglauca* was present in the trapping area.	
Trap Site 2 (March 2017)	Trap Site 2 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to dense and with low-level infestation of Prickly Acacia.	

Site	Description/Habitat Type	Photo
Trap Site 3 (March 2017)	Trap Site 3 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	
Trap Site 4 (March 2017)	Trap Site 4 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to dense and with high-level infestation of Prickly Acacia.	
Trap Site 5 (March 2017)	Trap Site 5 was located in RE 4.9.1c/4.9.2b (see above for description of 4.9.1c). RE 4.9.2b is mixed tussock grassland, with combinations of *Astrebla* spp., *Aristida latifolia*, *Enneapogon* sp. mixed tussock grassland. Emergent *Atalaya hemiglauca*, *Ventilago viminalis* and *Corymbia terminalis* commonly occur. Occurs on rises of exposed shale and limestone with rocks to the surface of cracking clay soils. The site had mostly dense grass cover, with only a few scattered Prickly Acacia within the trapping area.	
Target Site 1 (March and July 2017)	Target Site 1 is a large ephemeral dam surrounded by dense Prickly Acacia and adjacent to cattle yards. Target Site 1 provided resources to a considerable number of birds during the survey period, including a variety of duck and other waterbird species. Target Site 1 had reduced water levels in July. The site still provided water, and was used for bird spotting and Anabat recording.	
Target Site 2 (March 2017)	Target Site 2 is a small quarry with casual water providing ephemeral foraging resources for a variety of waterbirds and a source of drinking water for other species. Target Site 2 is very similar to Target Site 5. Target Site 2 lacked water during the dry season survey.	

Site	Description/Habitat Type	Photo
Target Site 3 (March 2017)	Target Site 3 is a dry shallow creek infested with Prickly Acacia.	
Target Site 4 (March 2017)	Target Site 4 is a small farm dam fringed by trees with ephemeral shallow water nearby.	No photo
Target Site 5 (March 2017)	Target Site 5 is a small quarry with casual water. Target Site 5 was targeted for micro-bats. Target site 5 was dry in July 2017.	
Trap Site 6 (July 2017)	Trap Site 6 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	
Trap Site 7 (July 2017)	Trap Site 7 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	

Site	Description/Habitat Type	Photo
Trap Site 8 (July 2017)	Trap Site 8 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	
Trap Site 9 (July 2017)	Trap Site 9 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	
Trap Site 10 (July 2017)	Trap Site 10 was located in RE 4.9.1c (see above). The site had grass cover varying from sparse to quite dense and with low-level infestation of Prickly Acacia.	



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St Elmo Project

Figure 5
Fauna Survey Sites

2.6.1 Trapping and Survey Techniques

Trapping sites were chosen so that they could be accessed quickly given the 40^{o}C temperature maximums. Sites where the Julia Creek Dunnart *Sminthopsis douglasi* may occur were also selected, while still achieving a spatial spread.

An abundance of grasshoppers was noted during the survey, providing potential food for Julia Creek Dunnart and other small carnivores and possibly reducing the likelihood of capture in an Elliott trap.

Elliott Traps

At each trap site, 20 Type-A Elliott Traps were placed 5-10 m apart and baited with standard small mammal mix (peanut butter, oats, oil and honey). Their exact placement targeted habitats of greatest complexity (vegetation and fallen timber).

Each trap was opened late each afternoon, and checked and closed the following morning before 0800. Traps were operational for four nights per site.

Funnel Traps

Four pairs of funnel traps were placed per trap site. It was intended to arrange funnel traps in two parallel lines either side of a 10 m long drift fence. However, only a single drift fence was used at Trap Site 1 for the March 2017 survey due to equipment failure. The remaining trap sites (Sites 2-5) did not have drift fences. All traps sites in the July 2017 survey had drift fences, with paired funnel traps spaced evenly along the fence. Traps were operational for four consecutive nights at each survey site. Traps were checked and cleared each morning and late afternoon.

Remote Sensory Cameras

Remote-sensory camera 'traps' were used to complement the Type-A Elliott Traps in an effort to detect medium-size and large mammals. At each camera site, one camera trap was angled approximately 45˚ towards the ground. Each camera site was operational for four consecutive days and nights. Five camera sites were sampled during the survey, spanning a range of habitat types.

Bats

Microbat call analysis was recorded using four Anabat SD2 recorders during the March 2017 survey. The July 2017 survey utilised one Anabat SD2 recorder over four nights. The Anabat units were operational for the entire night, ensuring that recording took place during periods of peak activity. The units were set to high sensitivity in an effort to record for the potential presence of Ghost Bat (*Macroderma gigas*) a species listed as Vulnerable under the NC Act and EPBC Act.

Rather than record at systematic fauna survey sites as suggested by Eyre *et al.* (2014), locations for Anabat recording were selected in suitable flyways or near waterbodies where bat activity is typically high (Young and Ford 2000). This potentially increased the number and diversity of bats sampled. Anabat dates and locations have been provided in Table 2. Anabat analysis reports are included in Appendix C.

Table 2: Anabat Site Locations and Trapping Nights

Site	Night (March 2017)			Night (July 2017)			
	27/28th	28/29th	29/30th	24/25th	25/26th	26/27th	27/28th
Trap Site 1	X						
Trap Site 2							
Trap Site 3		X					
Trap Site 4	X						
Trap Site 5		X					
Trap Site 6							
Trap Site 7							
Trap Site 8							
Trap Site 9							
Trap Site 10							
Target Site 1	X		X	X	X	X	X
Target Site 2			X				
Target Site 3							
Target Site 4		X					
Target Site 5			X				
Night Drive (North)		X					
Night Drive (Central)			X				

Birds

Bird species were recorded at each systematic site during the twice-daily visits to check traps. Birds were identified by sight or call. An area with an approximate radius of 100 m around each trap-line was included in these bird censuses. At least two hours of survey effort was devoted to each site.

In addition to censuses of each systematic fauna site, a large number of species were recorded during targeted searches of the entire SEVP area. These targeted surveys were carried out opportunistically in all REs. The timing of the survey was optimal for detecting a broad range of migratory and resident species.

Spotlighting

Spotlighting was undertaken on foot and via vehicle on the nights of 28 – 29th March 2017. Spotlighting was undertaken on calm, warm nights when faunal activity is highest.

Targeted Searches of Shelter Sites

Inspections of potential shelter sites (e.g., fallen timber, riparian zones) were carried out during the day to search for additional species not recorded using other survey techniques. All species of vertebrate observed opportunistically while travelling around the SEVP area were recorded.

2.6.2 Summary of Search Effort

The sampling effort across the SEVP survey is summarised in Table 3**.** Locations of sampling sites are shown in Figure 5**.**

Table 3: Fauna Survey Effort

Survey Technique	Fauna Targeted	Total effort	Unit
Type-A Elliott Trap	Small mammals, reptiles and frogs	8	Trap-nights
Funnel Trap	Reptiles and frogs	8	Trap-nights
Camera Trap	Medium-sized to large mammals, reptiles and birds	8	Trap-nights
Anabat Recorder	Microbats	8	Trap-nights
Diurnal Targeted Searches	Birds and reptiles	8	Trap-nights
Spotlighting	Nocturnal mammals, geckos, owls, frogmouths, nightjars, snakes	2	Trap-nights

3 Results

3.1 Desktop Research

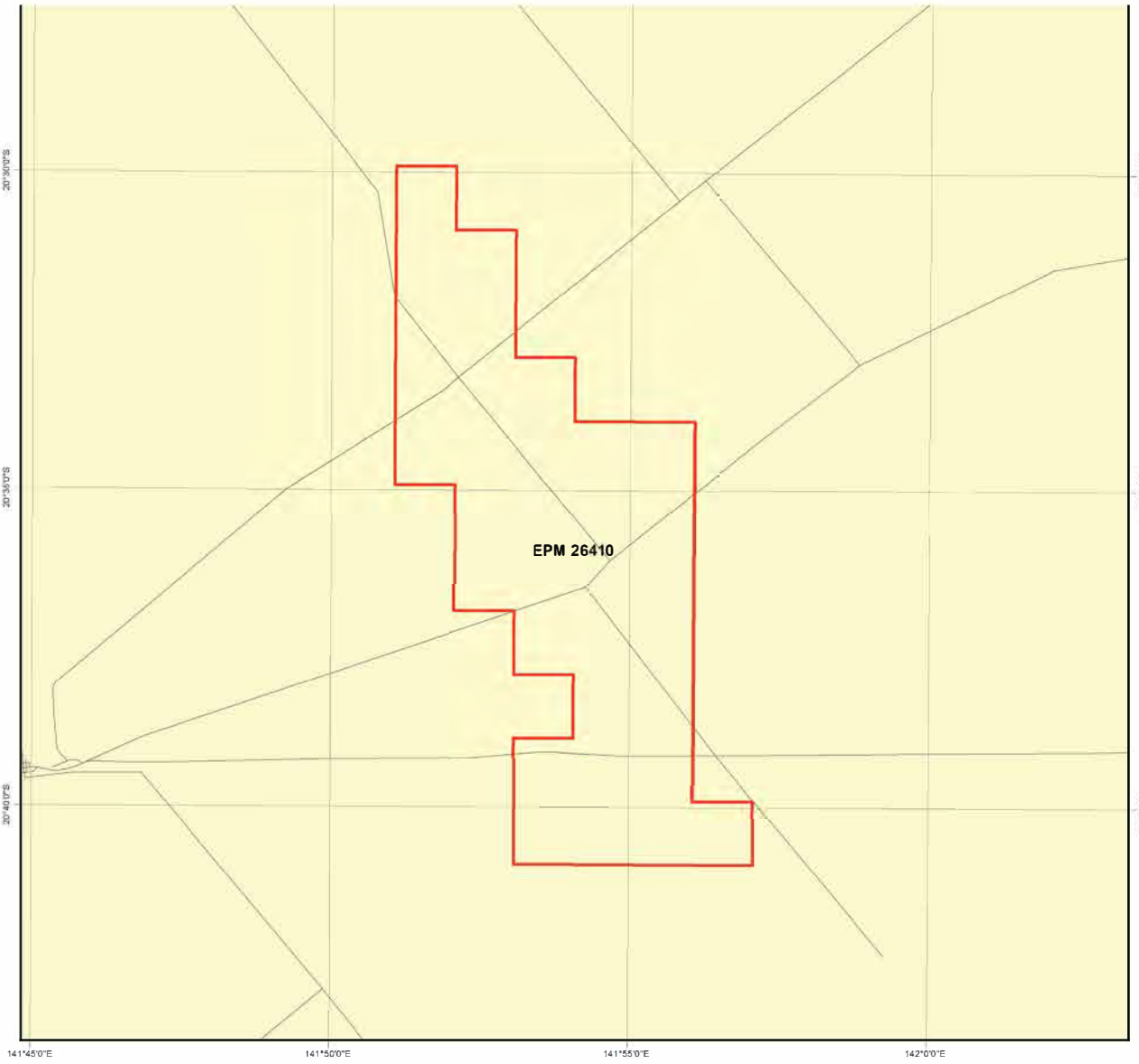
Prior to undertaking the field survey, desktop research was undertaken to ascertain the site condition and likely species present.

3.1.1 Environmentally Sensitive Areas

Activities within Environmentally Sensitive Areas (ESAs) are subject to approval by DEHP. ESAs fall under three categories; Category A and B areas are defined in the EP Regulation 2008, while Category C areas are defined within the Code of Environmental Compliance for Exploration and Mineral Development Projects 2001.

- Category A ESAs include National Parks, Conservation Parks and Forest Reserves under the NC Act
- Category B ESAs include Coordinated Conservation Areas, Wilderness Areas, World Heritage management areas, areas of Critical Habitat for threatened species, Wetlands of International Importance, State Forest Parks or Scientific Areas under the *Forestry Act 1959*, marine plants or Endangered REs
- Category C Environmentally Sensitive Areas may include any of the following environments: Nature Refuges and Resource Reserves, declared Catchment Areas, declared Irrigation Areas, Water Reservoirs and Drainage Areas, River Improvement Areas, State Forest or Timber Reserves, DPI Research Sites, Critical Areas and Public Purpose Reserves, areas subject to a State Planning Policy that designates an area for environmental protection, Coastal Management Districts and land occupied by the Bureau of Sugar Experiment Stations

Using DEHP ESA mapping, it is evident that the SEVP area does not contain any ESAs (Figure 6).



ENVIRONMENTALLY SENSITIVE AREAS - Mining Activities

- Selected Exploration Permit Mineral (EPM)

CATEGORY A
- National Parks
- Conservation Parks
- Forest Reserves
- Wet Tropics World Heritage Area
- Great Barrier Reef Marine Park Area
- Marine Parks other than General Use Zones

CATEGORY B
- World Heritage Areas
- Queensland Heritage Register Places
- Ramsar Sites
- Cultural Heritage Registered Areas and DLA's other than Stanbroke
- Special Forestry Areas
- Fish Habitat Areas
- Koala Plan
- Coordinated Conservation Areas
- Endangered Regional Ecosystems (Biodiversity Status)
- Marine Parks other than General Use Zones

CATEGORY C
- Nature Refuges
- Resources Reserve
- State Forests
- Timber Reserves
- Declared Catchment Areas
- Declared Irrigation Areas
- Drainage Areas
- River Improvement Areas
- Stanbroke DLA
- Coastal Management District
- Dams and Weirs

OTHERS
- Towns
- Roads
- Repealed Wild River Nominated Waterways
- Repealed Wild River Preservation Areas
- Repealed Wild River High Preservation Areas
- Mahogany Glider Habitat
- Directory of Important Wetlands
- Queensland

LOCALITY DIAGRAM

N

0 1,750 3,500 5,250 7,000 8,750 m

External contributors (non-government parties) of the data for this product are: Great Barrier Reef Marine Park Authority

Regional ecosystem mapping (remnant biodiversity status) may incorporate amendments, resulting from property level assessments to the release version of the mapping available on QSpatial.

NOTE TO USER: Themes presented in this map are indicative only. Field survey may be required to verify the 'true' spatial extent and value. Not all environmentally sensitive areas are presented in this map. A user should refer to the particular circumstances relevant to their situation to assess the 'completeness' of themes provided.

The user should note that some boundaries and indicated values are ambient and may change over time (e.g. regional ecosystem boundaries and conservation status, watercourse mapping etc).

The user should be aware that due to multiple overlapping themes/ layers present, some themes/layers may be obscured by others. Ordering in the Legend does not accurately reflect the order by which themes/layers are displayed.

epic ENVIRONMENTAL

St Elmo Project

Figure 6
Environmentally Sensitive Areas

3.1.2 Habitat Values

Habitat Diversity and Connectivity

Most of the site is composed of Remnant vegetation however all of this vegetation is subject to grazing pressure. The SEVP area largely consists of *Astrebla lappacea* dominated tussock grassland. Despite comprising a number of subtly different REs, these grasslands constitute a relatively homogenous habitat type for fauna. A mosaic of other habitat types occurs in small patches around the periphery of several drainage lines throughout the Project area.

Biodiversity Assessment and Mapping

The Queensland Government, in conjunction with expert panels, has developed Biodiversity Planning Assessments for most of the state's bioregions. These assessments identify strategic wildlife corridors, assess the state of wildlife conservation, and indicate priorities for research and conservation efforts within each bioregion.

Aquatic Environment

Apart from amphibians, sampling of aquatic wildlife was beyond the scope of the current terrestrial ecology survey.

There are two braided drainage lines in the southern portion of the site; part of this network bi-sects the Flinders Highway. There is also a small, unnamed creek toward the middle of the EPM.

No referrable wetlands, or wetland protected areas were identified within the study area during the desktop assessment, nor during field assessment.

3.1.3 Matters of National / State Environmental Significance

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a Matter of National Environmental Significance (MNES) are controlled actions, and require approval from the Commonwealth Government. Using the DEE EPBC Act Protected Matters Report (Appendix D), one listed Threatened Ecological Community was identified along with 12 Listed Threatened Species and nine Listed Migratory Species.

Due to the nature of ecological surveys, scarce or cryptic species may go undetected by surveys, even when these employ the full range of trapping techniques. The presence of such species was inferred if there existed nearby records of the species in databases, and suitable habitat was present on-site. The purpose of the likelihood of occurrence assessment (Table 4) was to identify those species that required further consideration.

Species of national and/or state level conservation significance were flagged via database searches (DEE EPBC Act Protected Matters Report, Queensland Government's Wildlife Online and the Atlas of Living Australia (ALA)) as potential inhabitants of the SEVP area. Of these, only some species were considered to possibly utilise the SEVP, based on nearby records and the presence of favourable habitat. All marine listed species were excluded from this likelihood of occurrence table.

Table 4: Likelihood of Occurrence of Conservation Significant Terrestrial Vertebrate Species[1, 2]

Species & Status[3, 4]	Source[5]	Comments
Endangered & Vulnerable Species		
Julia Creek Dunnart *Sminthopsis douglasi* EPBC Act: V NC Act: E	WO, ALA, PMR	**Expected**. There are two ALA records within 3 km, a Queensland Museum specimen, date unknown but published in 1979, and a 2000 DEHP record. Both are from Garoma Station, part of which is in the SEVP. There are 669 WO records within 50 km of the SEVP area, though with details publicly available for only 37 records (QG 2014). None of these is in the SEVP and the closest is the 2000 record above (duplicated datum across databases). The species has a patchy distribution and low abundance. Most survey records indicate the species occurs in small, dispersed populations and local abundance can fluctuate significantly in relation to seasonal conditions (Mifsud 2001 in DERM 2009). The species may be difficult to trap even in areas that it is known to occur. For example, Woolley (1992) reported a trapping success rate never greater than 0.8%, surveys at Lyrian in 1995 failed to capture any individuals despite the species being present in 1992 and 1994 (Mifsud 1999 in DERM 2009) and it took five years of short annual surveys to record the species in Moorrinya National Park (DERM 2009). It is possible that the species does not occur on the SEVP but given the difficulty in demonstrating the presence of Julia Creek Dunnart even from areas it is known to occur, a prolonged survey effort over many years would be required to adequately indicate absence.
Greater Bilby *Macrotis lagotis* EPBC Act: V NC Act: E	PMR	**Not expected**. The closest known record (ALA & WO) is from Elizabeth Springs in 2000, southeast of Boulia and c. 320 km southwest of the SEVP. The species is considered extinct over nearly 99% of its former range in Queensland and is now restricted to southwestern Queensland (McRae 2012).
Ghost Bat *Macroderma gigas* EPBC Act: V NC Act: E	PMR	**Not Expected**. The closest known record (ALA & WO) is from a cave on Chudleigh Park Station in 1996, c. 245 km to the northeast of the SEVP. To the west the closest ALA/WO record is from Esperanza Mine in 1989, c. 275 km west northwest. Most Queensland records are from the Northwest Highlands, Cape York Peninsula and the Mackay region (ALA 2017). Permanent roost and maternity sites are in deep cave systems or large disused mines. Only 14 maternity colonies were known in 2012. Individuals may disperse well away from maternity sites (Worthington Wilmer 2012) but the lack of suitable roosting habitat on the SEVP indicates that the species would not occur other than for possible dispersing individuals. Even that is considered unlikely.
Red Goshawk *Erythrotriorchis radiatus* EPBC Act: V NC Act: E	PMR	**Not expected**. The closest ALA record is from c. 100 km northwest of the site. There are two records with the same co-ordinates, though with errors of 10 and 11.8 km respectively. One is a 1910 specimen from the South Australian Museum and the other is a historical Birds Australia Atlas record. The closest WO records are from west of Georgetown in 1984, c. 250 km to the north and the Gregory River in 1995, c. 340 km to the northwest. Red Goshawk is found in northwestern, northern and eastern Australia in coastal and subcoastal areas (Debus and Czechura 1988; Marchant and Higgins 1993). Occasional records from central Australia may be resident birds but could be dispersing individuals (Aumann 2001). The species occurs in woodlands and forests, particularly tall forests in areas of high rainfall (Woinarski 2007) and, ideally, with intact forest or woodland in a mosaic of vegetation types, particularly riverine forests (Marchant and Higgins 1993). Permanent freshwater is usually present close to tall emergent trees (Czechura 2012). Nests are restricted to trees taller than 20 m and within one km of a watercourse or wetland (Garnett and Crowley 2000). The species typically avoids both very dense and very open habitats (Marchant and Higgins 1993). There is no suitable habitat on site.

Species & Status[3, 4]	Source[5]	Comments
Australian Painted Snipe *Rostratula australis* EPBC Act: E NC Act: V	PMR	**Possible**. The closest WO record is from the Diamantina River near Kynuna in 1994, c. 102 km south of the SEVP. There are also two records from Mount Isa (1961) and nearby Lake Moondarra (1984), c. 235 km west of the SEVP. There is also a historical Bird Atlas ALA record from Cloncurry, c. 140 km west of the SEVP. Australian Painted Snipe occurs in terrestrial shallow vegetated wetlands, usually freshwater but occasionally brackish, including temporarily inundated woodlands and grasslands, swamps, saltmarsh and artificial wetlands such as dams, rice crops, sewage farms and bore drains (Pringle 1987; Marchant and Higgins 1993; Garnett and Crowley 2000). Breeding occurs mainly in the Murray-Darling region and the species requires shallow wetlands with patches of bare mud, dense low cover and sometimes tall dense cover (Rogers *et al.* 2005). There is marginal habitat on site seasonally. It is possible that the species may occur very sporadically as a transient. But it is very unlikely to breed locally or occur for any duration.
Curlew Sandpiper *Calidris ferruginea* EPBC Act: E, M NC Act: V	WO PMR	**Possible**. There is a 2004 Birds Australia ALA record for the Julia Creek sewage ponds, c. 14 km from the SEVP. The next closest known record is from west of Cloncurry in 1977, c. 200 km from the SEVP. Curlew Sandpiper occurs mostly on intertidal mudflats in sheltered coastal areas but also on non-tidal swamps, lakes and lagoons near the coast. It also uses saltworks and sewage ponds. It is recorded on inland waterbodies though less often (Higgins and Davies 1996). Curlew Sandpipers do at times associate with Sharp-tailed Sandpipers and the March 2017 survey record of an individual Sharp-tailed Sandpiper at an ephemeral dam on the SEVP indicates that Curlew Sandpiper could also occur. However, any occurrence is likely to be very occasional and of short duration, most likely on passage.
Masked Owl (northern) *Tyto novaehollandiae kimberli* EPBC Act: V NC Act: V	PMR	**Not expected**. All available WO records are coastal or subcoastal, from the Townsville area and further north. None is within 500 km of the SEVP. Some ALA records in the Northern Territory extend further inland but the closest record is around Borroloola, c. 750 km northwest. Subspecies *kimberli* of the Masked Owl occurs mostly in coastal and upland areas, living in sclerophyll forest and woodland, often near ecotones with open areas (Debus 2012). There is no suitable habitat on site.
Painted Honeyeater *Grantiella picta* EPBC Act: V NC Act: V	PMR	**Not expected**. The closest ALA record is from the Fullarton River in 2003, c. 70 km west of the SEVP. The bird was found in Melaleuca. No WO record was available at the time of writing. Painted Honeyeater occurs from southeastern Australia to northwestern Queensland and the eastern Northern Territory (Higgins *et al*. 2001). Almost all breeding records and the greatest concentrations of individuals occur south of 26°S, i.e. south of the Roma area in Queensland (Higgins *et al*. 2001; Barrett *et al*. 2003). Breeding and north-south movements are closely aligned with fruiting mistletoes (Barea and Watson 2007). Diet consists primarily of mistletoe fruit, mostly *Amyema* species (Garnett *et al*. 2011). The species occurs mainly in dry open woodlands and forests with a strong association with mistletoe (Higgins *et al*. 2001). The species prefers woodlands with many mature trees, as these host more mistletoes (Oliver *et al.* 2003). Woodlands dominated by acacias (e.g., Brigalow *Acacia harpophylla*, Weeping Myall *A. pendula*, Mulga *A. aneura*) are particularly favoured, but the species also occurs in Belah *Casuarina cristata*, Bulloak *Allocasuarina luehmannii*, White Cypress Pine *Callitris glaucophylla* and riparian woodland of River Red Gum *Eucalyptus camaldulensis* (Barea and Watson 2007; Garnett *et al*. 2011; Watson 2012). They also occur on plains with scattered eucalypts and in remnant trees on farmland (Higgins *et al*. 2001, Oliver *et al.* 2003) and in narrow linear strips such as roadsides (Bowen *et al*. 2009). There is no suitable habitat on site.
Yellow Chat *Epthianura crocea crocea* EPBC Act: not listed NC Act: V	WO	**Possible**. Details of WO records are not publicly available for this species, but there is a record within 50 km of the SEVP. There is a Birdlife Australia ALA record of two birds in 2005, c.36 km south of the SEVP, which, given data sharing, is likely to be the WO record. There is also an ALA record c 90 km to the northwest, though this is from 1910. The nominate subspecies of Yellow Chat occurs in low vegetation around ephemeral wetlands, especially floodplains, swamps and bore drains, but also vegetated dams. It also forages in adjacent grasslands. Most records come from bore drains with tall cover such as sedges reeds and rank grasses (Houston 2012). Habitat on site is not especially favourable to the species but it could occur sporadically.

Species & Status[3, 4]	Source[5]	Comments
Gouldian Finch *Erythrura gouldiae* EPBC Act: E NC Act: E	PMR	**Not expected**. Details of WO records are not publicly available for this species. The closest known record is an ALA record from Cloncurry, c. 140 km west of the SEVP. The details of the record are uncertain and it is possibly a record taken from Storr (1973) who states that the northwestern (gulf drainage) population extends south and east to Cloncurry. The closest record to the north is from around Croydon, c. 250 km, and to the east at Torrens Creek, >300 km. The latter record is from 1984. Gouldian Finch occurs in open grassy woodlands, particularly on ridges and foothills. Their distribution appears closely allied to spear-grasses (*Sorghum* spp.). The species moves into flatter terrain with the onset of the wet season, where a variety of perennial grasses are favoured, such as Cockatoo Grass *Alloteropsis semialata* and Golden Beard Grass *Chrysopogon fallax* (Dostine *et al*. 2001; Payne 2010). The species' range has declined substantially since the early 1970s, particularly in north Queensland where only scattered populations remain (Higgins *et al*. 2006b). The 10 locations at which significant populations are known are all in Western Australia and the Northern Territory (O'Malley 2006b). In Queensland, records within the past 25 years have been sporadic and rarely at the same place twice (O'Malley 2006a). There is no recent breeding record for Queensland (Garnett *et al*. 2011; Maute & Legge 2012). There is no suitable habitat on site.
Star Finch (eastern & southern) *Neochmia ruficauda ruficauda* EPBC Act: E NC Act: E	PMR	**Not expected**. The only publicly available WO record is from 1956 on the Connors River, >750 km from the SEVP. There are three ALA records from Cloncurry, c. 140 km west of the SEVP. One of these is from 1976. The other two appear to be historical records, from the 19th century. Star Finches mostly occur in low, dense, damp grasslands and sedgelands fringing watercourses and wetlands. They also occur in open savanna woodlands (Higgins *et al*. 2006b). The Star Finch (eastern) occurs only in central Queensland and is believed to extend north to Bowen, west to beyond Winton and, based on recent records, south to near Wowan, 80 km southwest of Rockhampton. It is possible that the distribution extends farther north to Mount Surprise and the Cloncurry-Mount Isa region, but records from these locations could relate to the subspecies *N. r. subclarescens* (DoE 2017). The recent records from the Rockhampton area are probably of aviary escapees (Higgins *et al*. 2006b). There is no definite record of the nominate race since 1995 and although the population is estimated at less than 50 individuals it may be extinct (Payne 2010; Garnet *et al*. 2011). There is no suitable habitat on site.
Plains Death Adder *Acanthophis hawkei* EPBC Act: V NC Act: V	PMR	**Not expected**. There is no ALA record in Queensland. There is no WO record. Plains Death Adder is known only from the Barkly Tablelands of the Northern Territory and northwestern Queensland around Camooweal. It occurs on black soil plains with Mitchell Grass *Astrebla* spp. (Wells 2002). Death adder taxonomy is very uncertain (Wüster *et al*. 2005), in part because some populations cannot be identified morphologically with any certainty (Wilson 2015). This makes it difficult to define the distributions of various species and subspecies. The closest ALA records of *Acanthophis antarcticus* and *A. rugosus* are from Mount Isa. There is no ALA record of any death adder species within 200 km of the site. Although the habitat present appears suitable for the species at this stage there is no evidence of its presence.
Migratory Species (EPBC Act: M, NC Act: SLC)		
Fork-tailed Swift *Apus pacificus*	WO PMR	**Expected**. There are three ALA records and one WO record for Julia Creek, the latter 1992 record is probably a duplicate of one of the ALA records. The paucity of records is more likely due to a lack of observers when the species is most likely to be present. In Australia, the Fork-tailed Swift is almost exclusively an aerial species, probably even sleeping on the wing, though individuals are occasionally recorded roosting in trees. Foraging occurs over a wide variety of habitats including towns and cities, open areas, farmland, coastal areas and sometimes forest (Higgins 1999).
Glossy Ibis *Plegadis falcinellus*	WO ALA	**Known to occur**. Recorded on site during the March 2017 survey.

Species & Status[3, 4]	Source[5]	Comments
Oriental Plover *Charadrius veredus*	WO PMR	**Possible**. There is an ALA record for the Julia Creek sewage ponds in 2003. Oriental Plover occurs mostly on open grasslands in arid and semi-arid areas. The species prefers flat inland plains, sparsely vegetated with short grass. It also occurs on claypans, sporting fields, lawns, around the margins of terrestrial wetlands and in woodland and heathland that has been recently burnt (Lane 1987; Marchant and Higgins 1993). Generally, the grass cover on the SEVP would be too tall for this species but it could occur after fire.
Latham's Snipe *Gallinago hardwickii*	PMR	**Unlikely**. The closest known record, an ALA record from 1977, is from west of Cloncurry, c. 200 km west of the SEVP. Other records (WO and ALA) in the general area are from further west, around Mount Isa and Lake Moondarra. In Australia, Latham's Snipe occurs in a wide variety of permanent and ephemeral wetlands, preferring open freshwater wetlands with fringing vegetation. The species is also recorded from swamps, billabongs, lakes, edges of creeks and rivers, bogs and some artificial waterbodies (Higgins and Davies 1996). Suitable habitat for this species is likely on site only during periods of temporary inundation.
Common Sandpiper *Actitis hypoleucos*	WO	**Possible**. There is one ALA record for the Julia Creek sewage ponds in 2003. This is presumably the same record as for the 50 km WO search. However, the record does not show up in a download of WO records for the species. Other regional ALA and WO records include Cloncurry and, mostly, Mount Isa and Lake Moondarra. Common Sandpiper occurs on a wide variety of coastal and inland wetlands including around dams, billabongs and claypans (Higgins and Davies 1996). Habitat on site is marginal but the species could occur in transit.
Sharp-tailed Sandpiper *Calidris acuminata*	WO	**Known to occur**. One was recorded on site during the March 2017 survey.
Sanderling *Calidris alba*	WO	**Not expected**. There is an ALA record for the Julia Creek sewage ponds in 2003. This is presumably the same record as for the 50 km WO search. However, the record does not show up in a download of WO records for the species. The next closest known record is from the Bountiful Islands in the Gulf of Carpentaria, more than 450 km to the north. Sanderling is almost always on the coast, mostly on sandy beaches. Inland records are very rare (Higgins and Davies 1996). The Julia Creek record may be a misidentification.
Common Greenshank *Tringa nebularia*	WO	**Unlikely**. There is one ALA record for the Julia Creek sewage ponds in 2003. This is presumably the same record as for the 50 km WO search. However, the record does not show up in a download of WO records for the species. Other regional ALA and WO records are mostly from Mount Isa and Lake Moondarra. Common Greenshank occurs on a wide variety of coastal habitats and inland wetlands. The species prefers sheltered coastal areas, typically with large mudflats, mangroves and saltmarsh (Lane 1987; Higgins & Davies 1996) but also uses permanent and ephemeral terrestrial wetlands including swamps, dams, creeks, inundated floodplains, claypans and sewage ponds (Higgins & Davies 1996). Habitat on site is marginal but the species could occur in transit.
Marsh Sandpiper *Tringa stagnatilis*	WO	**Unlikely**. There is one ALA record for the Julia Creek sewage ponds in 2003. This is presumably the same record as for the 50 km WO search. However, the record does not show up in a download of WO records for the species. Other regional ALA and WO records are mostly from Mount Isa and Lake Moondarra. Marsh Sandpiper occurs on both saline and freshwater habitats (Higgins & Davies 1996). It prefers freshwater wetlands (Pringle 1987) though in southern Australia it occurs frequently on saline inland wetlands, saltworks and sewage ponds (Lane 1987). Habitat on site is marginal but the species could occur in transit.
Oriental Pratincole *Glareola maldivarum*	PMR	**Unlikely**. There are three ALA records between Cloncurry and Julia Creek, one of which is duplicated in WO. It is a historical record. The other two records are from 1967 and 1969, the latter being the closest known record to the SEVP, c. 50 km away. Oriental Pratincole occurs in open country, often near water. It is usually found on plains, floodplains or grassland with little vegetation. It also uses agricultural land, airfields and mudflats and occurs around the margins of wetlands, including artificial waterbodies. The species is widespread north of Julia Creek but occurs only sporadically further south (Lane 1987; Higgins & Davies 1996). Habitat on site is marginal but the species could occur very sporadically in transit.

Species & Status[3, 4]	Source[5]	Comments
Caspian Tern *Hydroprogne caspia*	WO	**Unlikely**. There is one ALA record for the Julia Creek sewage ponds in 2003. This is presumably the same record as for the 50 km WO search. However, the record does not show up in a download of WO records for the species. There are numerous ALA and WO records from Cloncurry, Mount Isa and Lake Moondarra. Caspian Tern mostly occurs in sheltered coastal areas but also on inland waterbodies, mostly dams, lakes and larger rivers. The species does use saltworks and sewage ponds (Higgins & Davies 1996). The fringing Prickly Acacia makes the largest waterbody on site unsuitable. The smaller temporary pools in quarries are probably too small.
Oriental Cuckoo *Cuculus optatus*	PMR	**Not expected**. The closest known records are Lake Moondarra in 2004 and Mount Isa in 1983. Oriental Cuckoo occurs in rainforest, vine thicket and open forest and woodland. The species is often recorded in gardens and plantations (Higgins 1999). There is no suitable habitat on site.
Grey Wagtail *Motacilla cinerea*	PMR	**Not expected**. There is no WO or ALA record within 500 km of the SEVP. Although Grey Wagtail may occur on beaches and rock pools during migration it is more typically associated with fast-flowing rocky streams and waterfalls (Menkhorst *et al*. 2017). There is no suitable habitat on site.
Yellow Wagtail *Motacilla flava*	PMR	**Not expected**. The closest WO or ALA record is from Torrens Creek in 2009, >300 km away. Yellow Wagtail occurs in open areas with low vegetation, especially in cultivation and on lawns, sporting fields and air fields (Higgins *et al*. 2006). Also referred to as Eastern Yellow Wagtail *M. tschutschensis*.

1. The species included in this table are taken from three 10 km radius searches the Atlas of Living Australia (ALA 2017), a 50 km radius Wildlife Online database search (QG 2017b) and an EPBC Act Protected Matters Report with a 50 km buffer.
2. Conservation Significant fauna species are those listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act, Endangered, Vulnerable or Near Threatened under the NC Act and/or Migratory under the EPBC Act.
3. EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth), NC Act = *Nature Conservation Act 1992* (Queensland)
4. E = Endangered, M = Migratory, SLC = Special Least Concern, V = Vulnerable.
5. WO = Wildlife Online, ALA = Atlas of Living Australia, PMR = EPBC Act Protected Matters Report. WO records have been searched beyond the 50 km search radius through the species profile search tool (QG 2014), which generates kml and csv files for some species. Species identified through the initial search where also searched for more widely through the interactive mapping available from ALA (ALA 2017).

3.2 Survey Results

Field survey results have been provided in this section.

3.2.1 Vegetation Communities and Regional Ecosystem Classification

The Herbarium Regional Ecosystem mapping was generally found to be accurate with large areas of the northern area being correctly mapped as a mosaic of RE 4.9.1c and 4.9.2b. Some large and obvious areas of RE 4.9.2b have been mapped out as homogenous polygons where possible. Much of the balance of the central area is correctly mapped as RE 4.9.1c areas immediately south of the highway including the wide road reserve are mapped as non-remnant due to the dominance of introduced grasses and the very dense invasion of Prickly Acacia *Vachellia nilotica* deemed to constitute the ecological dominant layer in these areas.

Riparian areas where land zone 3 is present have been better defined due to an increase in mapping resolution. This has led to the decrease in extent of land zone 3 and the decrease in mapped Coolabah woodland (RE 4.3.4) within this region. Most of the land zone 3 riparian zones being dominated by *Astrebla* grassland (RE 4.3.15) invaded by Prickly Acacia.

3.2.2 Regional Ecosystems

Six REs were recorded within the SEVP (Table 5 and Figure 4). Two of these REs were contained in certified mapping. The remainder occurred in patches that are too small (<4 ha) to be mapped at the scale (1:100,000) applied to certified mapping, or were misidentified from satellite imagery used in the certified mapping. Secondary vegetation assessment site data, supporting the assignment of REs to the vegetation communities present, are presented in Appendix E.

None of the REs recorded on-site are listed as Endangered under the VM Act. Furthermore, none have an Endangered biodiversity status.

Table 5: Regional Ecosystems Recorded within the SEVP Project Area

Regional Ecosystem	Brief Description	VM Act* Status	Biodiversity Status	Total Area (ha)
RE 4.3.15	*Astrebla squarrosa* +/- *Dichanthium spp*. +/- *Eulalia aurea* grassland on alluvium	LC	NC	139
RE 4.3.4f	*Eucalyptus coolabah* and/or *E. microtheca* low open woodland. Occurs on drainage lines on *Astrebla spp.* undulating plains and braided channels on alluvial plains, particularly north-east Riverine wetland or fringing riverine wetland	LC	NC	34
RE 4.3.19	*Dichanthium spp., Eulalia aurea*, *Astrebla spp.* grassland on alluvium	LC	NC	43
RE 4.9.1c	*Astrebla lappacea* +/- *Aristida latifolia* +/- *Panicum decompositum* grassland on Cretaceous sediments	LC	NC	6,647

Regional Ecosystem	Brief Description	VM Act* Status	Biodiversity Status	Total Area (ha)
RE 4.9.2b	Mixed tussock grassland, with combinations of the species *Astrebla spp*., *Aristida latifolia, Enneapogon sp.* mixed tussock grassland. Emergent *Atalaya hemiglauca, Ventilago viminalis* and *Corymbia* terminalis commonly occur. Occurs on rises of exposed Cretaceous shale and limestone with rocks to the surface. Cracking clay soils	LC	NC	68
RE 4.9.1c/4.9.2b	The patches of 4.9.2b that occur within the mosaic of 4.9.1c are slight rises with surface limestone rocks. It was not possible to map them all out without walking the entire polygon therefore this particular polygon needs to remain mixed. RE 4.9.1c Occurs on level to gently undulating downs derived from Cretaceous mudstones (predominantly Allaru Mudstone) in the north of the bioregion (BVG1M: 30b). RE 4.9.2b occurs on rises of exposed Cretaceous shale and limestone with rocks to the surface. Cracking clay soils. (BVG1M: 30b)	LC	NC	2,970

*VM Act = *Vegetation Management Act 1999*; LC = Least Concern, NC = No Concern

Nationally Listed Ecological Communities

The field survey identified that no Threatened Ecological Communities (TECs) protected under the EPBC Act occur within the SEVP area. It is noted however that the EPBC Act Protected Matters Search (Appendix D) identified one TEC, the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin, within a 50 km radius of the SEVP.

3.2.3 Species Diversity

The field survey undertaken in March 2017 detected:

- Seventy-nine (79) species of vascular plant;
- Four (4) species of amphibian;
- Nine (9) species of reptile;
- Sixty-six (66) species of bird; and
- Seven (7) species of mammal.

The field survey undertaken in July 2017 detected many of the above-mentioned species in addition to the following species that were not detected in March 2017:

- Two (2) species of vascular plant;
- One (1) species of reptile;
- Three (3) species of bird; and
- One (1) species of mammal.

Species communities were generally representative of the Mitchell Grass Downs region, with most species widespread across the bioregion. All species recorded in the current survey were already known

to occur within the region. These results were also consistent with the findings from the EISs undertaken for the Northern Gas Pipeline Project and the CopperString Project.

3.2.4 Confirmed Species of National and/or State Significance

A total of 91 fauna species were found within the SEVP area during the March and July 2017 surveys. Of these 91 species, two species of national and/or state-level conservation significance were recorded within the SEVP area; Glossy Ibis (*Plegadis falcinellus*) and Sharp-tailed Sandpiper (*Calidris acuminata*).

Glossy Ibis

EPBC Act: Migratory NC Act: Special Least Concern

The Glossy Ibis (*Plegadis falcinellus*) is considered migratory and nomadic (del Hoyo *et al.* 1992; Marchant and Higgins 1990; Snow and Perrins 1998). The population of Glossy Ibis within Australia is estimated to be approximately 12% of the species' total population (Marchant and Higgins 1990). Within Australia, the species moves in response to good rainfalls, expanding its range, however the core breeding areas used are within the Murray-Darling Basin region of NSW and Victoria, the Macquarie Marshes in NSW, and in southern Queensland.

Major threats to the Glossy Ibis include wetland destruction or degradation, including water diversion and drainage (restricting areas of shallow water) and irrigation. Clearing, grazing, increased salinity, groundwater extraction and invasion by exotic plants and fish species are also threats to the species through habitat modification (DEE 2017).

Sharp-tailed Sandpiper

EPBC Act: Migratory NC Act: Special Least Concern

The Sharp-tailed Sandpiper (*Calidris acuminata*) spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, typically to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats.

An estimated 160,000 Sharp-tailed Sandpipers occupy the East Asian-Australasian Flyway (EAAF). During the non-breeding season, approximately 91% of the EAAF population occurs in Australia and New Zealand (Bamford *et al.* 2008).

In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the

wet season. After rain, they may forage in paddocks of short grass, well away from water. Habitat loss is a major threat to the Sharp-tailed Sandpiper (QG 2014).

3.2.5 Weeds and Pest Animals

Weeds

Eight species of weeds were recorded within the SEVP area (Table 6).

Table 6: Weeds Recorded in the SEVP Area

Family	Species	Common name
Amaranthaceae	*Aerva javanica*	Kopak Bush or Desert cotton
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed
Apocynaceae	*Calotropis gigantea*	Giant Milkweed
Caesalpiniaceae	*Parkinsonia aculeate*†*	Jerusalem thorn or jelly bean tree
Malvaceae	*Sida spinose*	Indian Mallow
Mimosaceae	*Vachellia nilotica*†*	Gum Arabic Tree
Poaceae	*Cenchrus ciliaris*	Buffel grass
Portulacaceae	*Portulaca oleracea*	Pigweed

*Species listed in Biosecurity Act 2014. †WoNS refers to weeds of national significance classified by the Australian Government.

Two introduced plant species detected on-site are declared under the *Biosecurity Act 2014* (Class 3); *Parkinsonia aculeate* and *Vachellia nilotica* are also listed as Weeds of National Significance (WoNS).

Pest Animals

Database searches using the Queensland Government Department of Agriculture and Fisheries Pest Distribution Mapping was undertaken to assess pest animals that may occur within the area (Table 7).

Table 7: Pest Animals

Scientific Name	Common Name	Likelihood of Occurrence[1]
Rhinella marina	Cane Toad	Common and widespread
Felis catus	Feral Cat	Common and widespread
Oryctolagus cuniculus	Rabbit	Occasional and localised
Vulpes vulpes	Fox	Occasional and widespread
Sus scrofa	Pig	Occasional and localised
Camelus dromedarius	Camel	Absent
Passer domesticus	House Sparrow	Common and widespread

1 Derived from Queensland Government Department of Agriculture and Fisheries Pest Distribution Mapping (DAF 2017)

None of these species identified from the desktop assessment was seen at the SEVP. Two pest animals (not identified at the desktop level) was recorded within the SEVP area. Domestic goat (*Capra hircus*) and Dingo (*Canis lupus dingo*) are listed as a Category 3 restricted matter under the *Biosecurity Act 2014*. Goat can also be registered stock in Queensland. Around 10-15 individuals were seen on-site, likely indicating they had previously been stocked on surrounding properties. Goats, like many introduced stock species, can cause damage by trampling and degrading habitat in riparian areas. It is noted that the database search using the Queensland Government Department of Agriculture and Fisheries Pest Distribution Mapping showed that goat was absent from the region. Dingo has been regarded as a

serious predator of domestic stock since early European settlement in Australia. The dingo is a restricted invasive animal under the *Biosecurity Act 2014*.

4 Ecological Impacts of Proposed Activities

4.1 General Impacts

4.1.1 Clearing of Vegetation

The clearing of vegetation is the most significant and direct impact of the SEVP on ecological values of the site. Land clearance is listed as a key threatening process under the EPBC Act. The removal of habitat reduces the size of local populations of flora and fauna dependent on that habitat. These impacts are immediate and significant in the short-term. Impacts may persist in the long-term if habitat created during mine rehabilitation does not closely resemble pre-mining ecosystems. In addition, if sufficient habitat refuges are not maintained locally prior to the maturation of rehabilitated land, local extinction of certain species may occur.

Vegetation will be removed to accommodate mining, demountables, minor roads and other infrastructure associated with the SEVP.

The duration of impact of clearing varies between species, and their ability to colonise rehabilitation areas. The entire SEVP will operate over approximately 30 years, and rehabilitation will commence as soon as practicable and in a progressive manner.

4.1.2 Habitat Fragmentation

Highly fragmented habitats support fewer species than connected blocks of habitat of the same size. This is because fragmentation restricts dispersal of fauna and plant seeds between available habitat. The impacts of habitat fragmentation depend on the degree to which dispersal is inhibited by habitat gaps, the size of the remaining habitat fragments, and ecological attributes of the species.

The size of the SEVP, coupled with the retention of vegetation corridors along drainage lines within the site, means that there are no anticipated impacts of the SEVP through habitat fragmentation.

4.1.3 Direct Mortality

Clearing of vegetation for the SEVP presents a risk of direct mortality or injury to fauna. Fauna of low mobility are at risk of injury or death from heavy machinery during the construction and operation of the SEVP. The small scale and staged expansion of SEVP operations is likely to reduce the risk of these impacts.

In addition, clearing will only occur within designated areas and only during designated time periods. The presence of qualified Wildlife Spotter-Catcher/s during initial clearing will decrease incidences of fauna mortality. Educating employees and contractors on threatened species of fauna and flora identification will further reduce direct mortality as part of the SEVP.

4.1.4 Endangered or Vulnerable Species Expected to Occur

Julia Creek Dunnart

If present, there is a potential for direct and indirect impacts on the Julia Creek Dunnart (*Sminthopsis douglasi*) as a result of the SEVP. Direct threats comprise the loss of habitat or direct mortality of individuals through clearing and excavation works. Indirect threats refer to secondary threats that may occur as a result of the SEVP. Indirect threats associated with the SEVP may include:

- Increased number of feral animals attracted to rubbish;
- Increased chance of wildlife colliding with vehicles;
- Increased number of human-wildlife interactions;
- Increased levels of habitat fragmentation, i.e. changed fauna behaviours in response to human presence and/or physical habitat loss;
- Decreased quality of remaining vegetation due to weed introductions, especially Prickly Acacia; and
- Alteration to fire regimes.

These impacts may result in reductions in local population size and viability should a population be present. These potential impacts were considered as part of the assessment of the MNES significant impact criteria.

4.1.5 Dust

Earthworks and vehicular traffic associated with mining can generate substantial amounts of dust during dry weather. The pronounced wet and dry seasons in northern Australia may make vegetation in these areas less susceptible to the impacts of dust. This is because most or all annual growth occurs during a period of the year when rainfall is highest. This coincides with the time of year when dust is least problematic, as rain inhibits the dispersal of dust in the air, and washes dust from leaves.

The moving nature of the proposed earthworks means that any one block of vegetation will only be exposed to significant levels of dust for a short period. This is unlikely to interrupt growth.

4.1.6 Altered Fire Regimes

Most Australian vegetation types experience regular fires, and fire is important for maintaining structural attributes of vegetation, as well as facilitating seed germination of certain species (Catling *et al.* 2001). Fires of inappropriate intensity or timing can have detrimental impacts on native flora and fauna by:

- Removing fallen timber and low vegetation used as shelter;

- Reducing the density or extent of fire-sensitive flora;
- Temporarily removing seeds, insects and other foods used by fauna;
- Leading to vegetation 'thickening', the unnatural increase in mid-storey vegetation cover in response to infrequent fires, which results in a decrease in understorey density and diversity; and;
- Causing direct mortality to slow-moving fauna.

Fire is generally only possible in the Mitchell Grass Downs bioregion after an adequate wet season which promotes sufficient vegetative growth (QPWS 2012). When burnt with adequate soil moisture, Mitchell grass responds well to fire and is known to seed profusely after recovering from a burn. Despite this, the bioregion is rarely being widely burnt, due to the high fodder value of Mitchell grass species (QPWS 2012). The lack of burning in times of good grass growth, has sometimes led to extreme fire events as well the invasion of some acacia species into the grasslands. Lack of fire, or fire regimes that allow or promote the encroachment of woody species are detrimental to the grazing and biodiversity values of the Mitchell Grass Downs.

In general, the SEVP is not expected to cause substantial changes to local fire regimes. The most likely change is the reduced frequency of fire as a result of fuel reduction from clearing. This is likely to benefit the fire-sensitive vegetation occurring along the periphery of drainage lines. Any change is expected to be short-term, as rehabilitated sites are expected to develop a grass layer with the potential to support fire within the first 1-2 years of development. Active fire exclusion from rehabilitated sites will be practiced for at least ten years, to allow for the establishment of trees and shrubs.

4.1.7 Waste

Mine-affected water has the potential to impact on vegetation health and wildlife. Providing the design and operation of water management infrastructure and chemical/fuel storage facilities are undertaken in accordance with relevant legislation and standards, no impacts from contaminants are anticipated.

4.1.8 Weeds and Pest Animals

Eight weed species and two species of introduced animal were recorded in the SEVP area. The following activities associated with the SEVP have the potential to promote the proliferation of weeds and pests within the SEVP area, or introduce new weeds and pests from surrounding areas:

- Increased vehicular traffic may introduce and spread weed seeds;
- Land clearance favours the establishment of weeds due to increased light and soil disturbance; and
- Inappropriate disposal and storage of putrescible wastes may attract feral animals.

The pests and weeds currently occurring within the SEVP area are not expected to significantly proliferate in response to the mining activities. The major threat is the introduction of new weeds via contaminated vehicles or soils.

4.1.9 Cumulative Impacts

Individual projects may have relatively minor impacts on overall biodiversity whilst regional biodiversity is still mostly intact. However, the cumulative impacts of multiple developments in a small area may be greater than the sum of these impacts considered separately. This is because the threshold amount of habitat required for the local persistence of threatened species may be lost.

Cumulative impacts increase exponentially with successive developments. Consideration of surrounding developments is important when making predictions concerning the long-term conservation of the region's biodiversity values.

Two linear projects are planned within the Julia Creek and Mt Isa region. Consideration of these surrounding developments is important when making predictions concerning the long-term conservation of the region's biodiversity values. The CopperString Project (rail corridor) runs approximately 20 km south of SEVP, parallel to the Flinders Highway. The Northern Gas Pipeline Project runs from Tenant Creek (Northern Territory) ending at Mt Isa, approximately 150 km west of SEVP. Considering the linear nature of both projects and the relatively small impact areas that are in proximity to SEVP, cumulative impacts are not considered to be an important risk to environmental values of the SEVP.

4.1.10 Summary

The primary ecological impact of the SEVP will be the clearing of remnant vegetation. The impacts of clearing will persist for 10-50 years, until the rehabilitated mined vegetation has fully developed. Given the dominant vegetation type to be cleared is grassland, the ability for rapid recovery of cover is very high.

The ecological impacts of edge effects, habitat fragmentation, dust, altered fire regime, artificial light, noise and vibration, waste, disturbance to terrestrial wildlife, turbidity and cumulative impacts will be negligible. How these impacts will specifically affect each significant matter is assessed in the following section.

5 Impact Mitigation Recommendations

5.1 Avoidance

The avoidance and minimisation of impacts to national and state significant environmental values were a major consideration during the planning of the SEVP. The mine footprint has been positioned to limit disturbance, as much as practicable. As a result of these avoidance measures, the majority of protected matters known from the area will not be significantly impacted by the SEVP.

5.2 Mitigation of General Impacts

A list of recommended mitigation strategies to reduce impacts to ecological values is presented in Table 8.

Table 8: Mitigation Measures Proposed for General Impacts of the SEVP

	Management Measure	Timing
Clearing of Vegetation		
1	SEVP employees and contractors should be made aware of environmental obligations and compliance requirements through the site induction program.	Induction
2	Staged clearing should remove habitats in stages, which will allow movement of fauna away from disturbed areas.	Ongoing
3	Ongoing rehabilitation throughout the life of the mine, to reduce environmental impacts.	Ongoing
4	Topsoil removed from one site in preparation for mining should be immediately deposited and spread in already-mined sites. By limiting the stockpiling of soil, natural seed banks will be retained.	Ongoing
Habitat Fragmentation		
1	Habitat fragmentation should be avoided by retaining vegetation corridors along drainage lines within the site.	Ongoing
Direct Mortality		
1	Fauna spotter-catchers should inspect sites prior to vegetation clearing.	Ongoing
2	Injured fauna should be taken to the nearest wildlife carer or veterinarian.	Ongoing
3	All fauna injuries and mortality must be communicated to DEHP within 24 hours.	Ongoing
Species of National / State Significance		
1	SEVP employees and contractors should be taught to identify species of significance and alert fauna spotter / catchers.	Ongoing
Dust		
1	Dust should be suppressed using water trucks / wetting to keep dust related impacts to a minimum.	As required
Altered Fire Regimes		
1	Reduced fire regimes will require on-site staff to be vigilant of the potential for fire. Fire awareness training should be included during the site induction process	Induction / ongoing
Waste		
1	Wastes should be disposed of appropriately and collected by a licensed waste contractor and taken to a licensed waste facility. Waste tracking certificates should be kept and maintained as part of this process.	Ongoing

	Management Measure	Timing
Weeds and Pest Animals		
1	Vehicle wash-downs should be required for all new vehicles entering the site to ensure seeds aren't spread onto the SEVP	Ongoing
2	Disposal and storage of putrescible wastes must be undertaken appropriately to ensure feral animals aren't attracted to the site	Ongoing

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Appendix A – Flora Species – March and July 2017 Survey

Family	Species
Acanthaceae	*Nelsonia campestris*
Acanthaceae	*Rostellularia adscendens*
Aizoaceae	*Trianthema triquetra*
Aizoaceae	*Zaleya galericulata*
Amaranthaceae	*Aerva javanica*
Amaranthaceae	*Alternanthera nodiflora*
Amaranthaceae	*Amaranthus mitchellii*
Amaranthaceae	*Gomphrena breviflora*
Amaranthaceae	*Gomphrena celosioides*
Amaranthaceae	*Ptilotus spicatus*
Apocynaceae	*Calotropis gigantea*
Asteraceae	*Streptoglossa adscendens*
Boraginaceae	*Trichodesma zeylanicum*
Byttneriaceae	*Waltheria indica*
Caesalpiniaceae	*Chamaecrista longipes*
Caesalpiniaceae	*Parkinsonia aculeata*
Caesalpiniaceae	*Senna planitiicola*
Celastraceae	*Denhamia oleaster*
Chenopodiaceae	*Atriplex spongosa*
Chenopodiaceae	*Chenopodium auricomum*
Chenopodiaceae	*Enchylaena tomentosa*
Chenopodiaceae	*Maireana villosa*
Chenopodiaceae	*Salsola australis*
Chenopodiaceae	*Sclerolaena bicornis*
Cleomaceae	*Cleome viscosa*
Convolvulaceae	*Evolvulus alsinoides*
Convolvulaceae	*Ipomoea diamantinensis*
Convolvulaceae	*Ipomoea lonchophylla*
Convolvulaceae	*Operculina aequisepala*
Convolvulaceae	*Polymeria longifolia*
Convolvulaceae	*Polymeria pusilla*
Cucurbitaceae	*Cucumis melo*
Cyperaceae	*Cyperus difformis*
Cyperaceae	*Cyperus gilesii*
Cyperaceae	*Cyperus victoriensis*
Cyperaceae	*Eleocharis spiralis*
Fabaceae	*Aeschynomene indica*
Fabaceae	*Alysicarpus muelleri*
Fabaceae	*Crotalaria dissitiflora subsp. dissitiflora*
Fabaceae	*Crotalaria medicaginea var. neglecta*
Fabaceae	*Desmodium muelleri*
Fabaceae	*Glycine falcata*
Fabaceae	*Indigofera linifolia*
Fabaceae	*Indigofera linnaei*
Fabaceae	*Rhynchosia minima*
Fabaceae	*Sesbania brachycarpa*
Fabaceae	*Vigna lanceolata*
Malvaceae	*Abelmoschus ficulneus*
Malvaceae	*Abutilon hannii*

Malvaceae	*Malvastrum americanum var. stellatum*
Malvaceae	*Sida fibulifera*
Malvaceae	*Sida laevis*
Malvaceae	*Sida spinosa*
Malvaceae	*Sida trichopoda*
Marsileaceae	*Marsilea hirsuta*
Mimosaceae	*Neptunia gracilis*
Mimosaceae	*Vachellia nilotica*
Myrtaceae	*Eucalyptus coolabah*
Nyctaginaceae	*Boerhavia spp.*
Phyllanthaceae	*Phyllanthus maderaspatensis*
Poaceae	*Astrebla lappacea*
Poaceae	*Astrebla pectinata*
Poaceae	*Astrebla squarrosa*
Poaceae	*Cenchrus ciliaris*
Poaceae	*Chloris pectinata*
Poaceae	*Dactyloctenium radulans*
Poaceae	*Enneapogon avenaceus*
Poaceae	*Eriachne mucronata*
Poaceae	*Eulalia aurea*
Poaceae	*Iseilema fragile*
Poaceae	*Iseilema membranaceum*
Poaceae	*Iseilema vaginiflorum*
Poaceae	*Panicum decompositum var. decompositum*
Portulacaceae	*Portulaca oleracea*
Rhamnaceae	*Ventilago viminalis*
Sapindaceae	*Atalaya hemiglauca*
Sparrmanniaceae	*Corchorus trilocularis*
Zygophyllaceae	*Tribulus terrestris*
Gentianaceae	*Centaurium spicatum*
Molluginaceae	*Glinus lotoides*

Appendix B – Fauna Species – March and July 2017 Survey

Scientific Name	Common Name	EPBC Act	NC Act	trap 1	trap 2	trap 3	trap 4	trap 5	trap 6	trap 7	trap 8	trap 9	trap 10	target 1	target 2	target 3	target 4	target 5	incidental
Macropus giganteus	eastern grey kangaroo	-	LC						x					x	x				
Macropus rufus	red kangaroo	-	LC				x		x	x	x		x		x	x	x		
Capra hircus	goat	-	I																x
Dromaius novaehollandiae	emu	-	LC																x
Coturnix ypsilophora	brown quail	-	LC					x											
Anas gracilis	grey teal	-	LC											x	x				
Anas superciliosa	Pacific black duck	-	LC											x					
Aythya australis	hardhead	-	LC											x					
Malacorhynchus membranaceus	pink-eared duck	-	LC											x					
Stictonetta naevosa	freckled duck	-	LC											x					
Tachybaptus novaehollandiae	Australasian grebe	-	LC											x					
Geopelia cuneata	diamond dove	-	LC			x										x			
Ocyphaps lophotes	crested pigeon	-	LC	x		x				x	x		x	x	x	x	x		
Phaps histrionica	flock bronzewing	-	LC														x		
Podargus strigoides	tawny frogmouth	-	LC											x					
Eurostopodus argus	spotted nightjar	-	LC											x					
Anhinga novaehollandiae	Australasian darter	-	LC											x					
Phalacrocorax sulcirostris	little black cormorant	-	LC											x					
Pelecanus conspicillatus	Australian pelican	-	LC											x	x				
Ardea alba modesta	eastern great egret	-	LC											x					
Ardea pacifica	white-necked heron	-	LC														x		
Egretta novaehollandiae	white-faced heron	-	LC														x		
Plegadis falcinellus	glossy ibis	M	SLC												x				
Threskiornis spinicollis	straw-necked ibis	-	LC											x			x		
Aquila audax	wedge-tailed eagle	-	LC											x					x
Accipiter fasciatus	brown goshawk	-	LC											x					
Circus assimilis	spotted harrier	-	LC											x	x				
Haliastur sphenurus	whistling kite	-	LC						x	x			x	x					
Milvus migrans	black kite	-	LC	x	x	x		x	x					x		x			
Falco berigora	brown falcon	-	LC	x				x	x	x				x			x		
Falco cenchroides	nankeen kestrel	-	LC	x		x		x	x	x	x	x		x	x				
Falco subniger	black falcon	-	LC		x			x						x					
Fulica atra	Eurasian coot	-	LC											x					
Tribonyx ventralis	black-tailed native-hen	-	LC											x			x		
Ardeotis australis	Australian bustard	-	LC		x		x	x	x					x			x		
Himantopus himantopus	black-winged stilt	-	LC											x	x				
Elseyornis melanops	black-fronted dotterel	-	LC											x	x		x		
Erythrogonys cinctus	red-kneed dotterel	-	LC											x					
Calidris acuminata	sharp-tailed sandpiper	M	SLC											x					
Turnix velox	little button-quail	-	LC	x															
Stiltia isabella	Australian pratincole	-	LC																x
Cacatua galerita	sulphur-crested cockatoo	-	LC						x					x					
Cacatua sanguinea	little corella	-	LC				x		x			x	x		x				
Eolophus roseicapillus	galah	-	LC						x	x	x	x	x	x	x	x	x		
Nymphicus hollandicus	cockatiel	-	LC	x	x	x	x	x	x	x	x	x	x	x	x	x			
Melopsittacus undulatus	budgerigar	-	LC						x	x	x			x			x		
Todiramphus pyrrhopygius	red-backed kingfisher	-	LC				x			x							x		
Merops ornatus	rainbow bee-eater	-	LC											x					
Malurus lamberti	variegated fairy-wren	-	LC											x		x			
Malurus leucopterus	white-winged fairy-wren	-	LC		x														
Conopophila rufogularis	rufous-throated honeyeater	-	LC											x			x		

Epthianura aurifrons	orange chat	-	LC														x		
Epthianura tricolor	crimson chat	-	LC																x
Coracina novaehollandiae	black-faced cuckoo-shrike	-	LC																x
Lalage tricolor	white-winged triller	-	LC			x													
Artamus cinereus	black-faced woodswallow	-	LC	x			x												x
Artamus personatus	masked woodswallow	-	LC		x		x	x	x							x	x	x	x
Artamus superciliosus	white-browed woodswallow	-	LC		x			x										x	
Cracticus nigrogularis	pied butcherbird	-	LC			x	x	x									x		
Cracticus tibicen	Australian magpie	-	LC		x	x		x	x	x				x	x	x			
Rhipidura albiscapa	grey fantail	-	LC				x												
Rhipidura leucophrys	willie wagtail	-	LC	x	x	x	x							x	x		x		
Corvus orru	Torresian crow	-	LC	x		x	x		x	x							x		
Grallina cyanoleuca	magpie-lark	-	LC	x											x	x	x		
Myiagra inquieta	restless flycatcher	-	LC											x	x	x	x		
Struthidea cinerea	apostlebird	-	LC	x						x				x			x		
Mirafra javanica	Horsfield's bushlark	-	LC							x									x
Cincloramphus cruralis	brown songlark	-	LC		x					x	x								
Taeniopygia guttata	zebra finch	-	LC	x		x				x	x				x				
Anthus novaeseelandiae	Australasian pipit	-	LC						x	x	x					x			x
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	-	LC						x										
Petroica goodenovii	Red-capped Robin	-	LC											x					
Platalea regia	Royal Spoonbill	-	LC											x					
Lichenostomus penicillatus	White-plumed honeyeater	-	LC											x					
Vanellus tricolor	Banded lapwing	-	LC							x									
Chrysococcyx basalis	Horsfelds Bronze cuckoo	-	LC											x					
Chlamydera maculata	Spotted bowerbird	-	LC														x		
Leggadina lakedownensis	Northern Short-tailed Mouse	-	LC							x									
Demansia rimicola	soil-crack whipsnake	-	LC				x		x										
Heteronotia binoei	Bynoe's gecko	-	LC	x			x												
Amphibolurus gilberti	Gilbert's dragon	-	LC		x		x												
Pogona henrylawsoni	downs bearded dragon	-	LC	x		x													
Tympanocryptis tetraporophora	Eyrean earless dragon	-	LC			x													
Varanus gouldii	sand monitor	-	LC																x
Ctenotus inornatus	bar-shouldered ctenotus	-	LC	x	x														
Pseudonaja guttata	speckled brown snake	-	LC		x	x													
Suta suta	myall snake	-	LC																x
Limnodynastes tasmaniensis	spotted grassfrog	-	LC														x		
Cyclorana novaehollandiae	eastern snapping frog	-	LC																x
Litoria caerulea	common green treefrog	-	LC											x					
Litoria latopalmata	broad palmed rocketfrog	-	LC														x		

Appendix C – Anabat Analysis Reports (March and July 2017)

Brett Taylor

48 Broughton Rd

Kedron. 4031

Ph: 0439564918

Re: Microbat echolocation call analysis – Julia Creek Project

This report compiles the results of ten nights of microbat call recording analysis from four Anabat SD2 recorders used in the Julia Creek region (north Queensland) in late March 2017. A total of 110 bat calls were analysed out of a total of over 50,000 Anabat files provided. Calls were identified using available microbat call keys (Milne 2002; Pennay et al. 2004) and a personal call library from species recorded in Queensland.

Call quality was generally poor across sites and recording dates. It is understood recorders were set at a high sensitivity to allow recording of the potential presence of Ghost Bat (*Macroderma gigas*), a species listed as Vulnerable under the State's NC act and the Commonwealth's EPBC Act. Call records are described in Table 1 and have been identified here only by codes provided on the supplied SD cards as no other information was provided at the time. The majority of anabat files recorded were from a single recorder (over 45,000 calls), identified here as BERN 22-2-11. It is uncertain whether this machine may have malfunctioned as it appears the machine continuously recorded files over one and a half nights (27 and 28 March) before the SD card capacity was reached. No microbat echolocation calls were recorded on this card, or on the card identified as 04539 (28 and 29 March) over a total of four nights. The paucity of calls may well be a reflection of the local habitat resources on the Mitchell Grass Downs with few habitat trees available for microbat roosting.

Four bats could be confidently identified to species (Table 1). Examples of the calls interpreted for the species identification analysis are provided in the final section of this report. The most commonly recorded species was Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Another bat could only be identified to the level of genus, *Nyctophilus*. Calls from bats in this genus are very similar and currently cannot be distinguished from each other through call analysis. However, the only species likely to occur in the area is *N. Geoffroyii.*

There were two calls in the range of approximately 40 kHz. Two species of *Scotorepens* (*greyii* or *sanborni*) as well as *Chalinolobus nigrogriseus* call at this frequency in a similar call shape and all have some potential to occur in the area. *C. nigrogriseus* also often calls in a distinctive call shape (see Milne 2002), however no calls of this style were recorded. The most likely species present is *Scotorepens greyii.*

A single very short and poor quality call has some potential to be that of a *Taphozous* species, however there is little certainty able to be applied to this identification.

Table 1 Anabat call records for Julia Creek survey - March 2017

		Anabat - 03041			Anabat – BERN 09		
Scientific name	Common name	27 Mar	28 Mar	29 Mar	27 Mar	28 Mar	29 Mar
Chaerophon jobensis	Northern Freetail Bat					2	No calls
Chalinolobus gouldii	Gould's Wattled Bat				1	3	
Mormopterus lumsdenae	Lumsden's Freetail Bat		3	6	4		
Nyctophilus species	Long-eared Bat species	1		1	3	1	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	2		27	9	19	
Scotorepens greyii/sanborni	Little/Northern Broad-nosed Bat					2	
	Unidentified	3	1	5	15	2	
	Total	**6**	**4**	**39**	**32**	**29**	**0**

Yellow-bellied Sheathtail Bat was the most commonly recorded species. This is a large distinctive species that roosts in tree hollows. Yellow-bellied Sheathtail Bat is found across most of the continent (not the south-west) and occupies most habitats except rainforest. The species is known to migrate to southern Australia during the northern summer.

Gould's Wattled Bat is found across much of Australia except for Cape York Peninsula. It is generally a common species, although not in the survey area, and can be found in all habitats. This is generally a tree hollow roosting species.

Lumsden's Freetail Bat (formerly Beccari's) is found across northern Australia including much of Queensland. They are found in a wide range of habitats. In arid areas they are commonly caught along watercourses lined with Red Gums. They roost in tree hollows for the most part but are known to roost in caves in Papua New Guinea and are often found in dwellings.

A number of unidentified calls could not be confidently attributed to bat species due to the poor quality and/or short duration of the calls. All of these were in the lower call frequency range (between 16 – 222 khz), therefore being one of three species identified above: Northern Freetail Bat, Lumsden's Freetail Bat or Yellow-bellied Sheathtail Bat.

No cave dwelling species were recorded except for a single potential record of a *Taphozous* species, although as stated above, there is a low confidence in this identification and the potential for this call to be other causes (such as insect noise) is likely. No calls resembling the known calls of Ghost Bat were identified although the species may be difficult to detect due to the low intensity of its calls. However, the Julia Creek area is not a known location for the species and, given no other cave dwelling microbat species were reliably detected it would seem unlikely the species will occur in the area.

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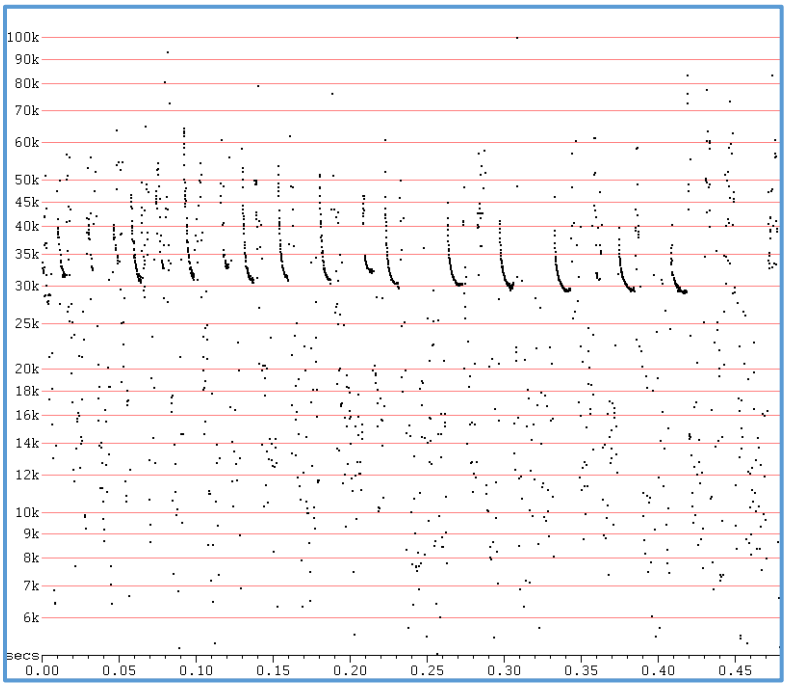
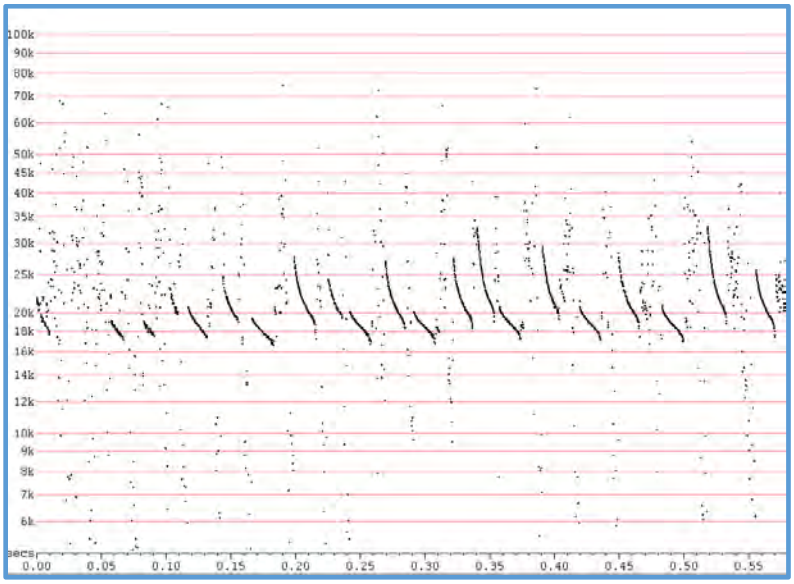
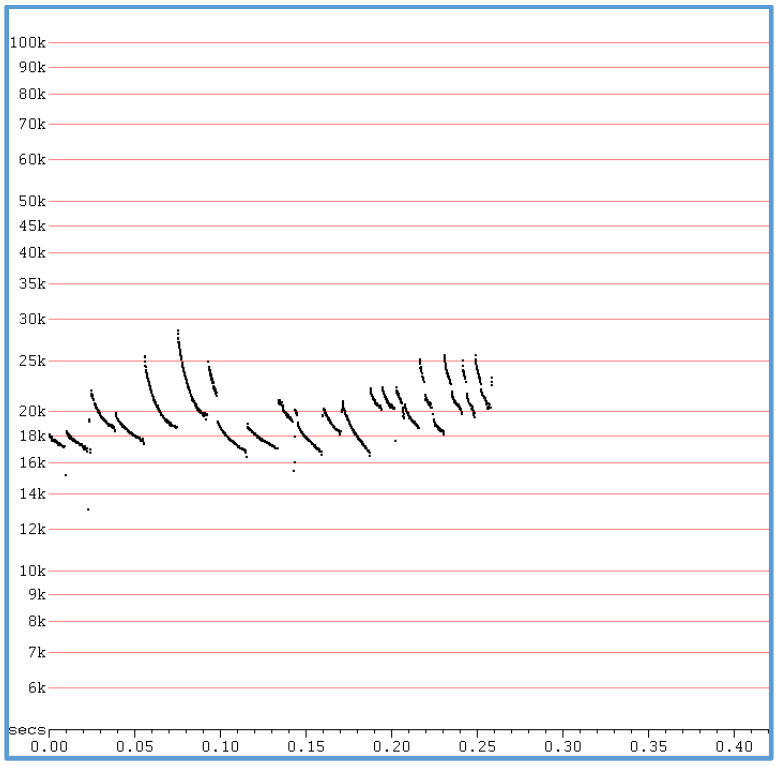
Echolocation Call Examples



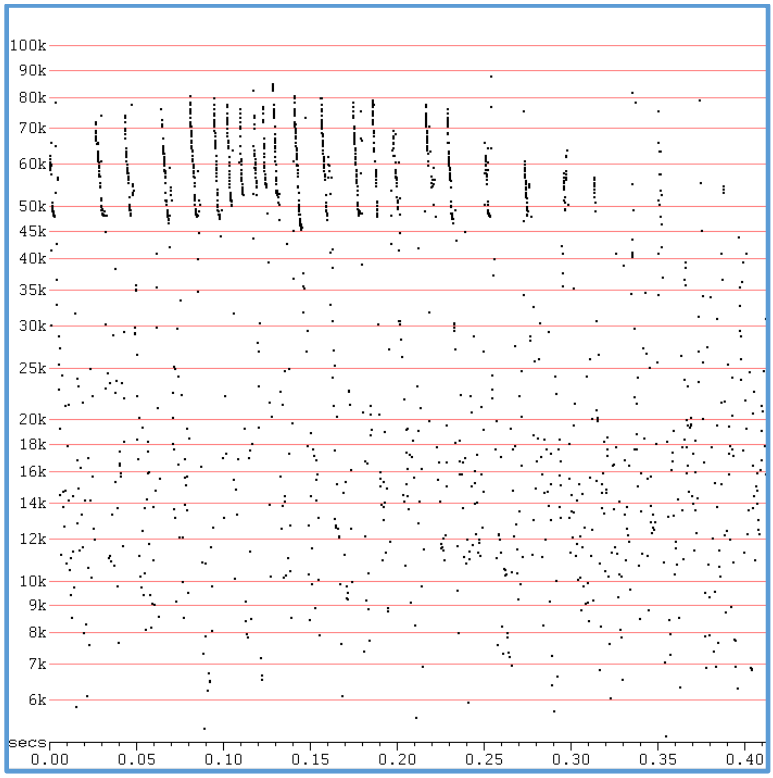
***Chalinolobus gouldii* – 27 Mar (BERN 09)**



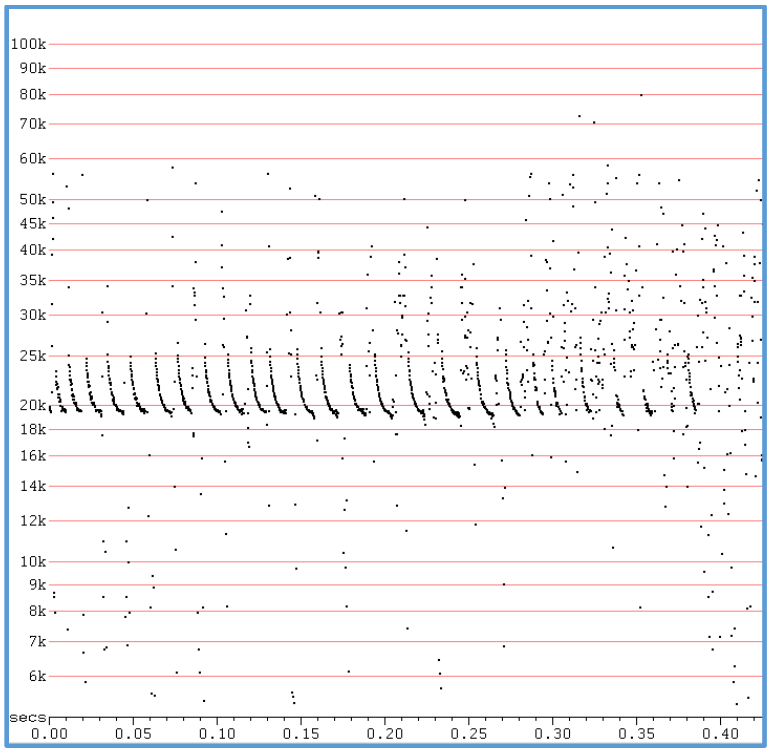
***Chaerophon jobensis* - 28 Mar (BERN 09)**



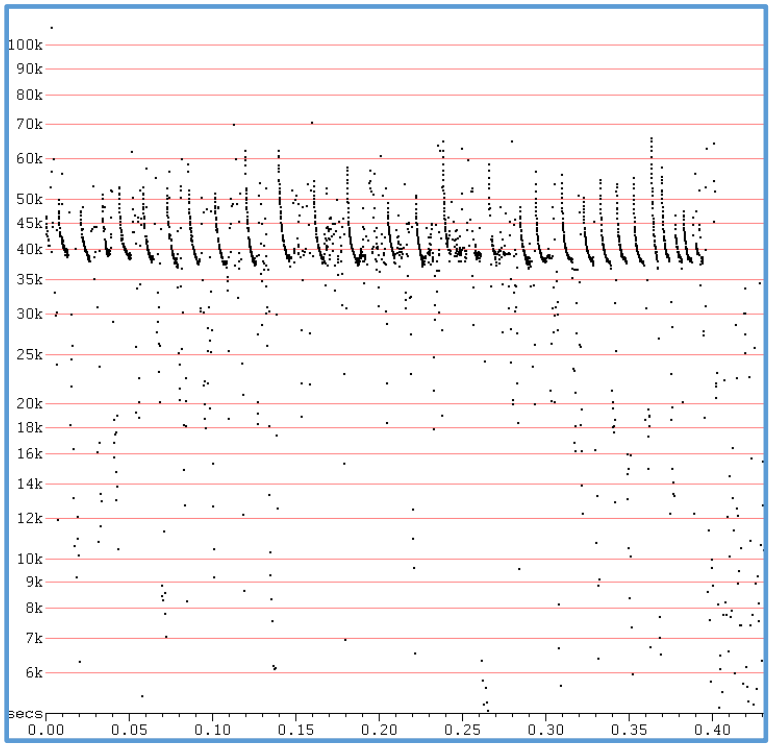
***Mormopterus lumsdenae* - 29 Mar (03041)**



***Nyctophilus sp.* - 27 Mar (BERN 09)**



***Saccolaimus flaviventris* - 28 Mar (BERN 09)**



***Scotorepens greyii* (likely) - 28 Mar (BERN 09)**

Microbat Call Identification Report

Prepared for ("Client"):	Epic Environmental
Survey location/project name:	St Elmo, Julia Creek
Survey dates:	24-29 July 2017
Client project reference:	
Job no.:	EPI-1702
Report date:	8 August 2017

Methods

Data received

A single raw data file (data.dat) and associated detector log file was received for analysis. Log entries indicate the Anabat SD2 detector (Titley Scientific, Brisbane) was deployed between 24th and 28th July 2017.

Data post-processing

CFCread (Corben 2017) was used to convert the raw data files to Anabat bat call sequence files in zero-crossing analysis format (ZC files). This process yielded just 23 ZC files for analysis.

Call identification

All ZC sequence files were viewed using *AnalookW* (Corben 2015), with species identification achieved manually by comparing the *AnalookW* sonograms with those of reference calls collected from northern Queensland and/or with reference to published call descriptions (e.g. Reinhold *et al.* 2001; Milne 2002).

Species' identification was also guided by considering probability of occurrence based on general distribution information (Churchill 2008; van Dyck *et al.* 2013) and/or on-line database records from the Atlas of Living Australia (http://www.ala.org.au).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Reardon *et al.* (2015).

Results & Discussion

Detector failure

A review of the log files downloaded from the detector shows that the detector was deployed in "forced record mode", commencing at 18:41 hr on 24th July and ceasing to operate due to flat batteries at 23:40 hr on the following night (25th July). The detector was switched on several times on subsequent days, but failed again shortly after start-up due to flat batteries.

Log file entries for the 24th and 25th July also show microphone voltage being less than expected (138-139 V rather than 150V). The cause of this fault is unknown, but it may have affected the ability of the detector to sense and record bat calls.

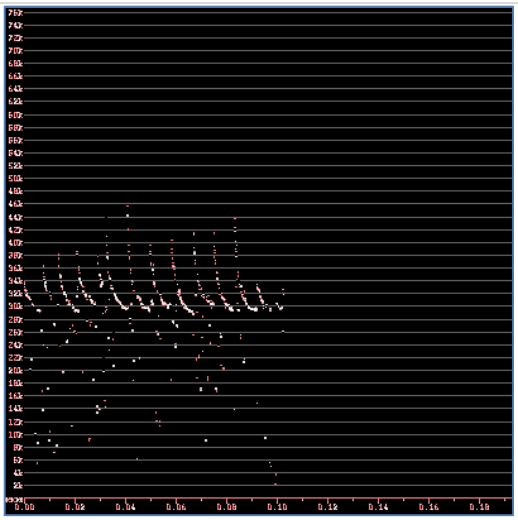
Species recorded

Only two species were recorded:

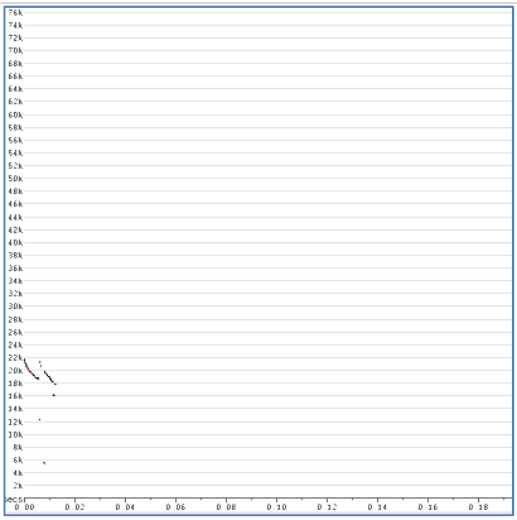
- *Chalinolobus gouldii* – 15 calls on 24th July and 5 calls on 25thJuly; and
- *Saccolaimus flaviventris* or *Chaerephon jobensis* – 1 call on 24th July.

The call allocated to *S. flaviventris/C. jobensis* has only two pulses, so cannot be positively identified.

Figure 1 Representative call sequences from the Julia Creek, July 2017 survey data.



Chalinolobus gouldii



S. flaviventris / C. jobensis

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Appendix D – EPBC Act Protected Matters Search

Australian Government
Department of the Environment and Energy

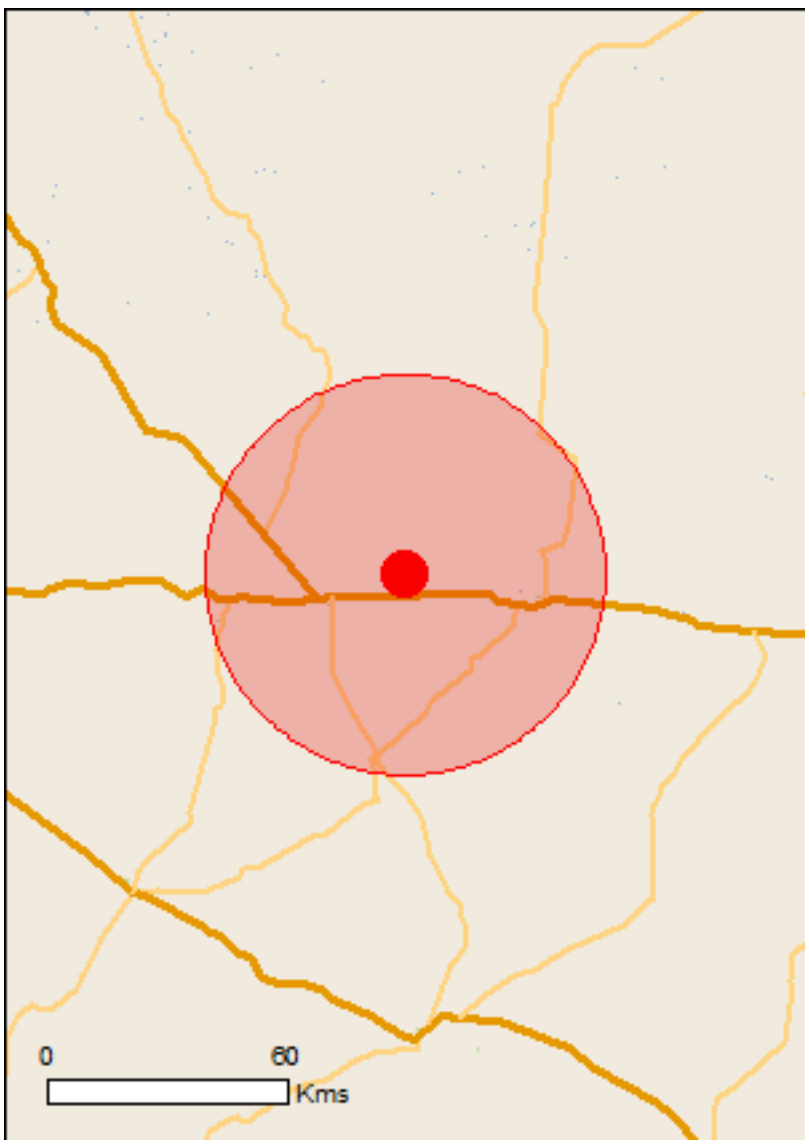
EPBC Act Protected Matters Report

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.

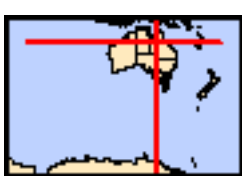
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 10/03/17 15:05:25



Coordinates
Buffer: 50.0Km



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:	1
Listed Threatened Species:	12
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. 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:	14
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:	13
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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.

Name	Status	Type of Presence
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community likely to occur within area

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
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Sminthopsis douglasi Julia Creek Dunnart [305]	Vulnerable	Species or species habitat known to occur within area
Reptiles		

Name	Status	Type of Presence
Acanthophis hawkei		
Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area
Sharks		
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to 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 Marine Species		
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		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
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
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		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 known to occur

Name	Threatened	Type of Presence 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
[Cuculus saturatus](#) Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat may occur within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to 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
Reptiles		
[Crocodylus johnstoni](#) Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		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
Birds		
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
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
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		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
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		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

-20.608857 141.904399

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 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 E – Regional Ecosystem Mapping

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. **Recorder:** A Daniel **Day/Date:** Tues 28th March 17

Purpose St Almo EPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0591350 7727553 **Datum:** GDA'94

W393

Vegetation structure

367
636

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	1.0	0.5 – 5	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 – 0.5	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – codominant; *a* – associated; *s* – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Malvastrum americanum
G	a	Rhynchosia minima
G		Indigofera linifolia

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: brown self-mulching clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c/4.9.26

Proposed RE code: 4.9.1

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - **Site form** **Regional ecosystem code**

Location

Site No. 2 **Recorder:** A Daniel **Day/Date:** Tue 28/03/17

Purpose St Alms FPM?

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS coordinates: Zone 54 0588834 7725773 **Datum:** GDA'94

W394

638

639

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	4.5	0.5 - 6	S
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.05	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; *d* – dominant; *c* – codominant; *a* – associated; *s* – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Chloris sericea
G	a	Neptunia gracilis
G	a	Heliotropium americanum
G	a	Boerhavia dominii
G	a	Sesbania ?vaga
G	a	[illegible] minima
G	a	Senna planitiicola

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 3 **Recorder:** A Daniel **Day/Date:** Tue 28/03/17

Purpose St Amand EPA

Locality: (inc. distance/direction to nearest town) Julia Creek

GPS coordinates: Zone 54 0589912 7722040 **Datum:** GDA'94

1395

Vegetation structure

Median height of the EDL is to be measured 640 641

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	4	0.5-5	S
T1			
T2			
T3			
S1			
S2			
G	0.2	0-0.4	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Sclerolaena birchii
G	a	Senna planitricola
G	a	Dichanthium sericeum
G	a	Sida fibulifera
G	a	Salsola kali
G	a	Aristida contorta
G	a	Panicum queenslandicum

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 4 **Recorder:** A Daniel **Day/Date:** Tue 25/08/17

Purpose Stratmo FPM

Locality: (inc. distance/direction to nearest town) Duke Creek

GPS coordinates: Zone 54 0594128 7713153 **Datum:** GDA 94

396
642
643

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	2	0.5 - 4	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	c	Astrebla lappacea
G	c	Iseilema [illegible]
G	c	Sporobolus caroli
G	c	Panicum decompositum
G	c	Chloris sp
G	a	Tricuspidata sp.
G	a	Chrysopogon sericeus
G	a	Senna planticola
G	a	Cleome viscosa

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - **Site form** **Regional ecosystem code**

Location

Site No. 5 **Recorder:** A. Daniel **Day/Date:** Tues 28/03/17

Purpose 8th Alumo

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0394495 7713669 **Datum:** GDA'94

W397
646
647

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E			
T1			
T2			
T3			
S1			
S2			
G	0.1	0 - 0.3	VS

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – codominant; *a* – associated; *s* – suppressed.

Str.	Rel. dom.	Scientific Name
G	d	648 Enneapogon avenaceus

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Pale non-cracking hardpan clay with sandstone gravel surface

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.2

Proposed RE code: 4.9.2

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 6 Recorder: A Daniel Day/Date: Tues 28/03/17

Purpose 87 Alma EPRI

Locality: (inc. distance/direction to nearest town) Jarha Crk

GPS coordinates: Zone 54 0593925 7714696 Datum GDA'94

W398

Vegetation structure

Median height of the EDL is to be measured 651 652

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	8	6 - 9	VS
T1			
T2			
T3			
S1	4	1 - 6	MD
S2	0.7	0.3 - 1	S
G	0.60	0 - 1	MD

Structural formation: (including height) Open Woodland

Ecologically dominant layer: E/G ?

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Eucalyptus coolabah
S1	d	Acacia farnesiana
S2	d	Acacia farnesiana
G	a	Senna planitiicola
G	d	Panicum decompositum
G	a	Salsola sp.
G	a	Waltheria indica
G	a	Cleome viscosa
	a	Iseilema

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 3

RE code changes

Existing RE code: 4.3.15 / 4.3.4c

Proposed RE code: 4.3.4c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 7 **Recorder:** A. Daniel **Day/Date:** Tue 28/08/19

Purpose St Mungo ERM

Locality: (inc. distance/direction to nearest town) Julia Creek

GPS coordinates: Zone 54 0393967 7714871 **Datum:** GDA 94

WJ399

653

654

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 4	VS
T1			
T2			
T3			
S1			
S2			
G	001	0 - 0.2	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
d	d	Salsola sp.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: deep cracking clay.

Field observation and notes:

Landzone: 3

RE code changes

Existing RE code: 4.3.19

Proposed RE code: 4.3.19

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 8 **Recorder:** A. Daniel **Day/Date:** Tues 28/03/17

Purpose Staging EPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0596996 7723752 **Datum:** GDA'94

11400
658
657

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 5	S
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: g

Plant species

Record relative (numerical) dominance for each stratum; *d* – dominant; *c* – codominant; *a* – associated; *s* – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
g	d	Boerhavia dominii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: light brown self mulching clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c / 4.9.2b

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 9 **Recorder:** A Danika **Day/Date:** Tues 28/03/17

Purpose St Almo EPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0595699 7722704 **Datum:** GDA94

WA01

658
659

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	1.5	0.5 – 3	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 – 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Panicum decompositum

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: light brown self-mulching clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 11 **Recorder:** A Daniel **Day/Date:** Tues 28/03/17

Purpose 81st Area CPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 650302 7724013 **Datum:** GDA 94

402
661
660

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 4	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: light grey brown self-mulching clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c / 4.9.2b

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 11 **Recorder:** A. Daniel **Day/Date:** 29/08/17

Purpose St Alma ERM

Locality: (inc. distance/direction to nearest town) Fuller Crk

GPS coordinates: Zone 54 0539619 7723221 **Datum:** ~~GDA~~ 94

W403 662 663

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E			
T1			
T2			
T3			
S1			
S2			
G	0-1	0-0.2	S

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
G	d	Triodia longiceps

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Brown Soft weathering overlying clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c / 4.9.2b

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - **Site form** **Regional ecosystem code**

Location

Site No. 12 **Recorder:** E Daniel **Day/Date:** Wed 29/08/17

Purpose [illegible]

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS coordinates: Zone 54 | 0594136 | 7715391 | **Datum:** GDA94

404
664
665

Vegetation structure
Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	6	4 - 7	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species
Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Alectryon oleifolius
E	a	Denhamia oleofolius
G	a	Chloris...
G	c	Enneapogon avenaceus
G	c	Salsola sp.
G	a	Iseilema indica
G	a	Senna planitiicola

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Pale hardpan with gravel surface

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - **Site form** **Regional ecosystem code**

Location

Site No. 13 Recorder: A Daniel Day/Date: Wed 29/03/17

Purpose St Almo ERM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 059037 7715123 Datum: GDA'94

404
666
669

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	4	3-5	15
T1			
T2			
T3			
S1			
S2			
G	0.1	0 - 0.2	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Salsola sp

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Pale hard pan

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.26

Proposed RE code: 4.9.26

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 14 Recorder: A. Dwind Day/Date: Wed 29/03/17

Purpose St Helens EPM

Locality: (inc. distance/direction to nearest town) Julia Ck.

GPS coordinates: Zone 54 0593973 7717930 Datum: GDA94

W405

Vegetation structure

Median height of the EDL is to be measured 670 668 669

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	1	0.5 – 2	VS
T1			
T2			
T3			
S1			
S2			
G	0.1	0 – 0.2	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	c	Salsola sp.
G	c	Astrebla lappacea

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: disturbed with flakes of sandstone

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.26

Proposed RE code: non-remnant Cleared

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 15 Recorder: A Dannock Day/Date: Wed 29/03/17

Purpose St Almo EPM

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS coordinates: Zone 54 0593676 7719293 Datum: GDA 94

WAO6
671
672

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	1	0.5 – 2	VS
T1			
T2			
T3			
S1			
S2			
G	0.1	0 - 0.3	MD

Structural formation: (including height)

Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Salsola sp.

note: V. little Astrebla.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: limestone present on surface

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c ~~4.12.2b~~

Proposed RE code: 4.9.2b

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - **Site form** **Regional ecosystem code**

Location

Site No. 16 Recorder: A Daniel Day/Date: WED 29/03/17

Purpose St Alma EPM

Locality: (inc. distance/direction to nearest town) Julia Crk.

GPS coordinates: Zone 54 0594157 7720160 Datum: GDA'94

407
673
674

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	2.5	1 - 4	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	6 - 0.4	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Salsola sp.
G	s	Astrebla lappacea

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: brown self-mulching cracking clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 17 **Recorder:** A Daniel **Day/Date:** Wed 29/03/16

Purpose St Alma EPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0595656 7715952 **Datum** GDA'94

408
675
676

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 5	VS
T1			
T2			
T3			
S1			
S2			
G		- 0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Walthenia indica
G	a	Indigofera linifolia
G	a	Salsola sp.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Dale brown cracking clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 18 **Recorder:** A. Daniel **Day/Date:** Wed 29/03/17

Purpose St Amo EPM

Locality: (inc. distance/direction to nearest town) Julia Ck

GPS coordinates: Zone 54 0597117 7715996 **Datum:** GDA 94

409
677
678

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 5	VS
T1			
T2			
T3			
S1			
S2			
G	0.3	0 - 0.4	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	c	Astrebla lappacea
G	c	Astrebla squarrosa
G	c	Salsola sp.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 19 **Recorder:** A. Dam **Day/Date:** Wed 29th 03/17

Purpose St Alwo EPM

Locality: (inc. distance/direction to nearest town) Tulu Crk

GPS coordinates: Zone 54 0539698 7715988 **Datum:** GDA94

410
679

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 4	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0 - 0.4	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Acacia farnesiana
G	c	Astrebla pappaea
G	c	Salsola sp.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: light brown cracking clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 20 Recorder: A. Daniel Day/Date: Thurs 30/03/17

Purpose St Albans EPM

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS coordinates: Zone 54 0591349 7723175 Datum GDA'94

411 9:28

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	2	1 – 4	VS
T1			
T2			
T3			
S1			
S2			
G	0.2	0-0.3	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; *d* – dominant; *c* – codominant; *a* – associated; *s* – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Atalaya hemiglauca
E	a	Acacia farnesiana
G	d	Astrebla lappacea
G	a	Enteropogon
G	a	Panicum decompositum

forbs rare

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Pale brown cracking clay

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.2b

Proposed RE code: 4.9.2b

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form **Regional ecosystem code**

Location

Site No. 21 **Recorder:** A Daniel **Day/Date:** Thurs 30/03/17

Purpose St Alma EPM

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS coordinates: Zone 54 0592030 7723775 **Datum:** GDA94

412

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	5	3 - 6	VS
T1	1.5	0.5 - 3	S
T2			
T3			
S1			
S2			
G	0.1	0 - 0.2	MD

Structural formation: (including height) Grassland

Ecologically dominant layer: G

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
E	d	Alectryon oleifolius
T1	d	Acacia farnesiana
G	d	Astrebla sp (Small)

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Pale cracking clay, rock fragments present

Field observation and notes:

Landzone: 9

RE code changes

Existing RE code: 4.9.26

Proposed RE code: 4.9.25

END

Request for Assessment of Regional Ecosystem Map - DRAFT

SHEET F - Site form Regional ecosystem code

Location

Site No. 22 Recorder: A. Daniel Day/Date: Thurs 30/03/17

Purpose St Alma EPM

Locality: (inc. distance/direction to nearest town) Julia Ck.

GPS coordinates: Zone 54 0594980 7725777 Datum: GDA 94

413 9:47

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median Height	Height interval	Est. cover density (D,M,S,V)
E	3	1 - 4	MD
T1			
T2			
T3			
S1			
S2			
G	0.1	0 - 0.2	S

Structural formation: (including height) Tall Woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***a*** – associated; ***s*** – suppressed.

Str.	Rel. dom.	Scientific Name
T1	d	Acacia farnesiana
G	c	Iseilema sp.
G	c	Astrebla sp.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes:

Landzone: 3?

RE code changes

Existing RE code: 4.9.1c

Proposed RE code: 4.9.1c

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 1 **Recorder:** A Daniel **Day/Date:** THURS 27/07/17

Purpose St Elmo

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS: 54 6596361 7720135 GDA 94

W526 1682 1681

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	6	4 - 8	S
T2		-	
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height) low woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	d	Acacia nilotica
G	a	Salsola kali
G	d	Astrebla spp

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils:

Field observation and notes: Brown self-mulching clay

Landzone: 3?

RE code changes

Existing RE code:

Proposed RE code:

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 2 **Recorder:** A. Daniel **Day/Date:** Thurs 27/07/17

Purpose

Locality: (inc. distance/direction to nearest town) Julia Crk

GPS: 54 0594896 7726713 GDA 94

1683
1684

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	8	4 - 10	S
T2		-	
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height) Woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	d	Acacia nilotica
G	d	Bare ground

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Brown self-mulching clay

Field observation and notes:

Landzone: 3

RE code changes

Existing RE code:

Proposed RE code: non-remnant

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 3 **Recorder:** A. Daniel **Day/Date:** Thurs 27/07/17

Purpose & Flora. Julia etc

Locality: (inc. distance/direction to nearest town)

GPS: 54 | 0593039 | 7719671 | D 194

1685
1686

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	6	4 - 8	S
T2	3	1 - 4	S
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height) Woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	d	Eucalyptus coolabah
T2	d	Acacia nilotica
E	d	Salsola sp.

Geology, landform, soils

1687 1688

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: ~~Soils~~ Sandy clay

Field observation and notes:

Landzone: 3

RE code changes

Existing RE code:

Proposed RE code:

END

Rem

Non-rem East