

# Appendix 4

## Biodiversity Assessment Report - Updated

prepared by

EnviroKey Pty Ltd

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# **Part 9a Biodiversity Assessment Report - Updated**

**State Significant Development No. 5765**

***Prepared by:***

**EnviroKey Pty Ltd**

**June 2021**

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# Biodiversity Assessment Report - Updated

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## COMMONLY USED ACRONYMS

ACEC	Animal Care and Ethics Committee
AIP	air photograph
Applicant	Bowdens Silver Pty Ltd
BAR	Biodiversity Assessment Report
BAR footprint	The disturbance footprint used for the BAR. The area of direct impact
BBAM	BioBanking Assessment Methodology
BBCC	BioBanking Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BGW	Box-Gum Woodland
BOS	Biodiversity Offset Strategy
BVT	Biometric Vegetation Type
CEEC	Critically endangered ecological community
CMA	Catchment Management Authority
CW	Central West
DEC	Department of Environment and Conservation
DEEC	Department of Environment, Conservation and Climate Change
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	EcoLogical Australia
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FBA	Framework for Biodiversity Assessment
GPS	Global positioning system
IBRA	Interim Biogeographical Regions of Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance
Niche	Niche Environmental and Heritage
NSW	New South Wales
OEH	NSW Office of Environment & Heritage
Project	Bowdens Silver Project
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TEC	Threatened ecological community
TSC Act	NSW Threatened Species Conservation Act 1995
TSF	Tailings storage facility
VIS	Vegetation Information System
WRE	waste rock emplacement

## **COMMONLY USED TERMS**

locality	The area within 10km of the Study Area (see Maps 6, 7 and 8)
migratory species	a species specified in the schedules of the EPBC Act
mine life	Approximately 16.5 years comprising the site establishment and construction stage (approximately 18 months - including 12 months of mining pre-strip) and mining / processing for approximately 15 years (to the end of concentrate production).
Project life	Approximately 23 years comprising the site establishment and construction stage, mining and processing operations (to the end of concentrate production) and includes the period for final rehabilitation.
Proposed development	the footprint of the proposed development
Region	means a biogeographical region that has been recognised and documented in accordance with the Interim Biogeographical Regions of Australia (IBRA) (Thackway and Creswell, 1995). The Study Area is located within two Bioregions; the Sydney Basin Bioregion and NSW South Western Slopes Bioregion.
Study Area	The land assessed by this study, which corresponds with the land owned by Bowdens Silver Pty Ltd, in which a land access agreement was in place at the time of the field survey and land in which a land access agreement was not in place, but assessed by air photo interpretation.
threatened biota	means those threatened species, endangered populations or endangered ecological communities considered known or likely to occur in the Study Area
threatened species	a species specified in the schedules of the BC Act or the EPBC Act



## **EXECUTIVE SUMMARY**

EnviroKey Pty. Ltd (EnviroKey) was engaged by R.W Corkery & Co Pty. Ltd (RWC) on behalf of Bowdens Silver Pty Limited (the “Applicant”, Bowdens Silver) to prepare a Terrestrial Biodiversity Assessment Report (BAR) for the proposed Bowdens Silver Project (the “Project”) located approximately 26 kilometres east of Mudgee, New South Wales. The Project was declared a State Significant Development (SSD) by the NSW Government. Assessment and approval is being sought under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

This BAR was prepared in accordance with the NSW Framework for Biodiversity Assessment and the NSW Biodiversity Offset Policy for Major Projects. Since Commonwealth matters are assessed under the bilateral agreement with NSW, this report also provides an assessment on the relevant Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) listed biota.

The terrestrial biodiversity values of the Study Area have been comprehensively surveyed over the past 6 years. Comprehensive field surveys identified a total of 11 Biometric Vegetation Types (BVT) occurring within the Study Area. A summary of the extent of each BVT within both the Study Area and BAR footprints is provided in **Table ES1**.

The field surveys also identified a total of 370 flora species, of which 267 are native flora species and 103 are exotic flora, and a total of 168 fauna species including:

- 123 species of bird;
- 21 species of mammal;
- 18 species of reptile; and
- six species of frog.

Of the 11 BVT recorded, three meet the definition of a threatened ecological community (TEC), namely Box-Gum Woodland (BGW), as listed by the NSW Biodiversity Conservation Act 2016 (BC Act) and, under specific identification criteria, as a critically endangered ecological community under the EPBC Act. Of the individual flora and fauna species, a total of 14 fauna and two flora species are listed under the BC Act and/or EPBC Act and two migratory species were also recorded during the field surveys. Additionally, a number of existing previous records for threatened species are located within close proximity of the proposed Mine Site and Pipeline.

Of the recorded threatened species, two classify as species credit species, have been recorded within the BAR (disturbance) footprints. These being Ausfeld’s Wattle (*Acacia ausfeldii*) and Koala (*Phascolarctos cinereus*). Two other species credit species are predicted to occur within the BAR footprints. These being Squirrel Glider (*Petaurus norfolcensis*) based on the presence of good quality Box-gum Woodland and Regent Honeyeater (*Anthochaera phrygia*) based on the location of the Project in relation to the Mudgee-Wollar key area and Capertee Valley key area as defined by the National Recovery Plan for Regent Honeyeater and the recently assigned Capertee Valley Important Bird Area.

**Table ES1**  
**Summary of BVT / PCT Areas within the Study Area and BAR Footprint**

Page 1 of 2

<b>Biometric Vegetation Type</b>	<b>Total hectares in Study Area (includes BAR footprints)</b>	<b>BAR Footprint – Mine Site^ (hectares)</b>	<b>BAR Footprint – Pipeline (hectares)</b>	<b>Percentage Impacted in Study Area (%)</b>
CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Medium)	336.30	88.33	4.53	27.5
CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Poor)	201.71	64.02	2.36	32.9
CW112 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	273.15	21.80	0	8
CW216 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	9.18	0	1.24	13.51
CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the central western slopes (Moderate/Good_Medium)	69.42	21.68	0	31
CW242 Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes (Moderate/Good_High)	71.86	1.04	0	1.5
CW249 Derived grassland of the NSW South Western Slopes (Moderate/Good_Poor)	21.87	0	5.18	23.7
CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes (Moderate/Good_High)	102.57	56.65	0	55.2
CW270 Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion (Moderate/Good_High)	3.2	0.77	0	24
CW272 Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills (Moderate/Good_Medium)	2.59	0	0.65	25.1
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_High)	420.69	81.69	0.21	19.2

**Table ES1 (Cont'd)**  
**Summary of BVT / PCT Areas within the Study Area and BAR Footprint**

Page 2 of 2

<b>Biometric Vegetation Type</b>	<b>Total hectares in Study Area (includes BAR footprints)</b>	<b>BAR Footprint – Mine Site^ (hectares)</b>	<b>BAR Footprint – Pipeline (hectares)</b>	<b>Percentage Impacted in Study Area (%)</b>
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	39.19	11.81	0.20	30.6
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	96.32	18.92	0	19.5
CW299 Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region (Moderate/Good_Medium)	2.87	0	0.76	26.5
^ Includes relocated Maloneys Road and Transmission Line				

The likely direct and indirect impacts on biodiversity have been assessed within this BAR. Throughout the planning phase, impact avoidance to biodiversity values has influenced Project design and appropriate mitigation measures have been identified and described to minimise likely direct and indirect impacts.

The total disturbance footprint of the Project would be approximately 495.67 hectares of which approximately 381.84 hectares is native vegetation with the remaining 113.83 hectares being existing cleared land dominated by non-native species. Of the native vegetation to be disturbed approximately 182.27 hectares classifies as the BC Act listed BGW, of which 147.82 hectares also meets the classification of the EPBC Act listed BGW. In total approximately 88.18 hectares (48%) of the BGW comprises only derived grassland and not trees and shrubs which have already been cleared by past agricultural activities.

The results of the BioBanking Credit Calculator confirm that the following credits are required to offset the residual impacts of the Project (Mine Site and Pipeline combined).

- 23 290 ecosystem credits
- 3 669 species credits for Koala
- 9 240 species credits for Ausfeld's Wattle
- 4 010 species credits for Squirrel Glider
- 22 213 species credits for Regent Honeyeater
- 1 152 species credits for Silky Swainson-pea
- 104 species credits for Small Purple-pea

The Project would impact habitats for locally occurring threatened biota. The Project could have a significant impact on Box-Gum Woodland as listed by the EPBC Act and Regent Honeyeater. However, both appropriate mitigation measures and a biodiversity offset strategy would be applied should the Project proceed. Further, a range of avoidance measures have been implemented during the planning phase to minimise the level of impact where possible. Where impacts are not able to be avoided, a range of detailed mitigation measures are proposed and these would be implemented. The development and implementation of a biodiversity offset strategy would meet the requirements of the NSW offset policy for major projects to offset any potential residual impacts of the Project.

Some revegetation is proposed in addition to the biodiversity offset strategy using native species consistent with the existing plant communities. While not formally accounted for with the biodiversity offset or assessment of impact, in the long-term, the areas rehabilitated to native vegetation would further reduce impacts to biodiversity.

# 1. INTRODUCTION

## 1.1 PROJECT BACKGROUND

EnviroKey was engaged by RWC on behalf of the Applicant to prepare a BAR for the Project located approximately 26 kilometres east of Mudgee, New South Wales (see **Map 1**). The Project was declared an SSD by the NSW Department of Planning and (SSD 5765). Assessment and approval is being sought from the NSW Minister for Planning and Environment for a Development Consent under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

With the repeal of *NSW Threatened Species Conservation Act 1995* (TSC Act) in August 2017, which was replaced by the *NSW Biodiversity Conservation Act 2016* (BC Act) (25 August 2017), RWC sought advice from the (then) Department of Planning and Environment (DPE) as to the Biodiversity Assessment pathway for the Project. This was sought given that substantial environmental assessment (and more specifically substantial biodiversity assessment) in connection with the preparation of the Environmental Impact Statement (EIS) had been completed under the TSC Act before the commencement of the BC Act. DPE advised that, for this Project, the biodiversity assessment could be continued under the former legislation as the Project is considered a “pending or interim planning application” under clause 27 (1)(d) of Part 7 of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (the BC Regulation). As such, the DPE requires an assessment of all biodiversity values as a BAR prepared under the *Framework for Biodiversity Assessment* (FBA) (OEH, 2014d, OEH, 2014e).

## 1.2 THE PROJECT

The Bowdens Silver Project comprises seven principal components, namely:

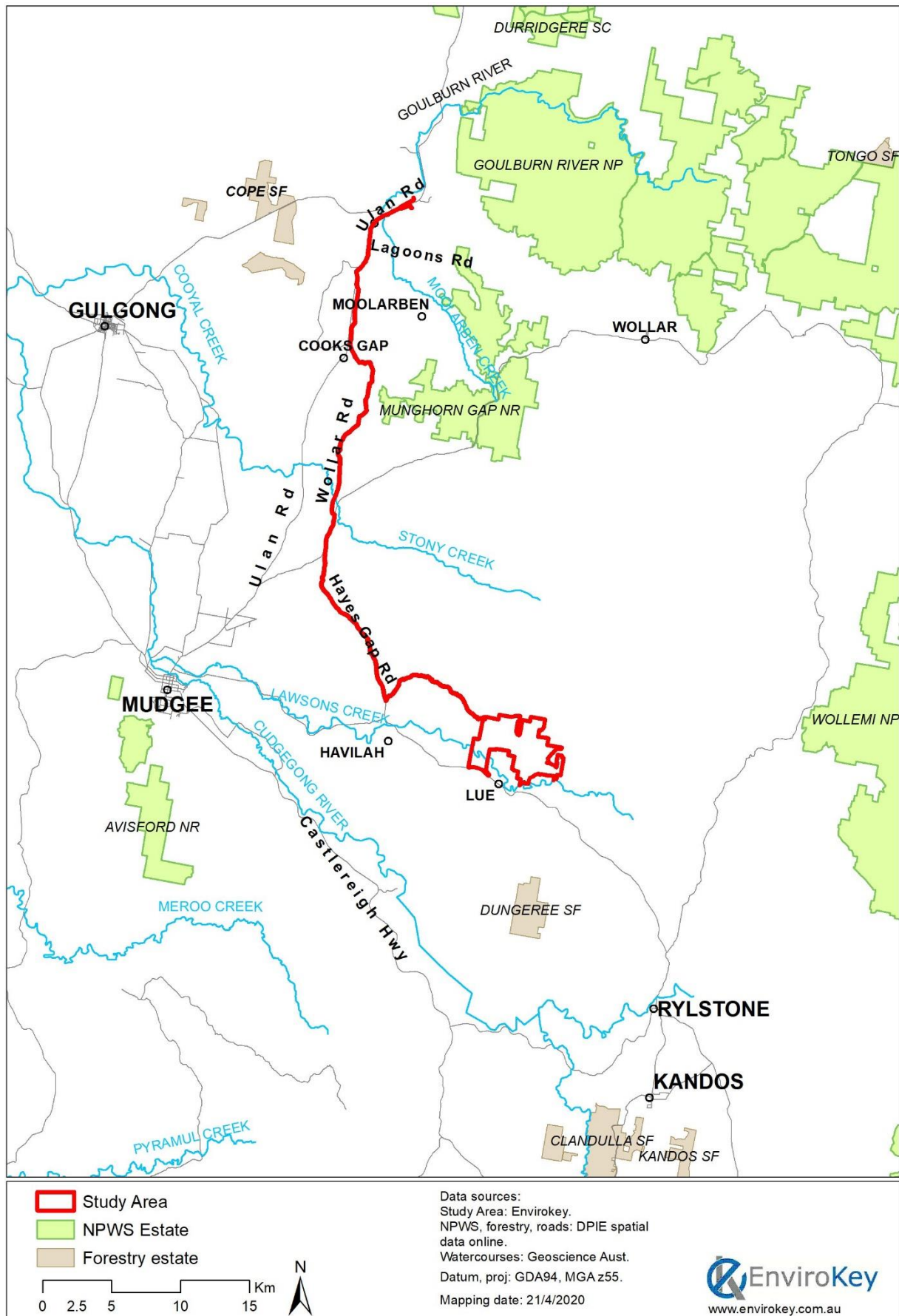
- a main open cut pit and two satellite open cut pits collectively covering up to approximately 52 hectares
- a processing plant and related infrastructure covering approximately 22 hectares
- a waste rock emplacement (WRE) covering approximately 77 hectares
- a low grade ore stockpile covering approximately 14 hectares (9 hectares above the WRE)<sup>1</sup>
- an oxide ore stockpile covering 8 hectares
- a tailings storage facility (TSF) covering approximately 117 hectares
- a southern barrier to provide visual and acoustic protection to properties south of the Mine Site covering approximately 32 hectares.

The above components would be supported by a range of on-site and off-site infrastructure. The on-site infrastructure comprises haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities. The off-site infrastructure comprises a relocated section of Maloneys Road (including a new railway bridge crossing and new crossing of Lawsons Creek) and a water supply pipeline for the delivery of water from two mines in the Ulan area.

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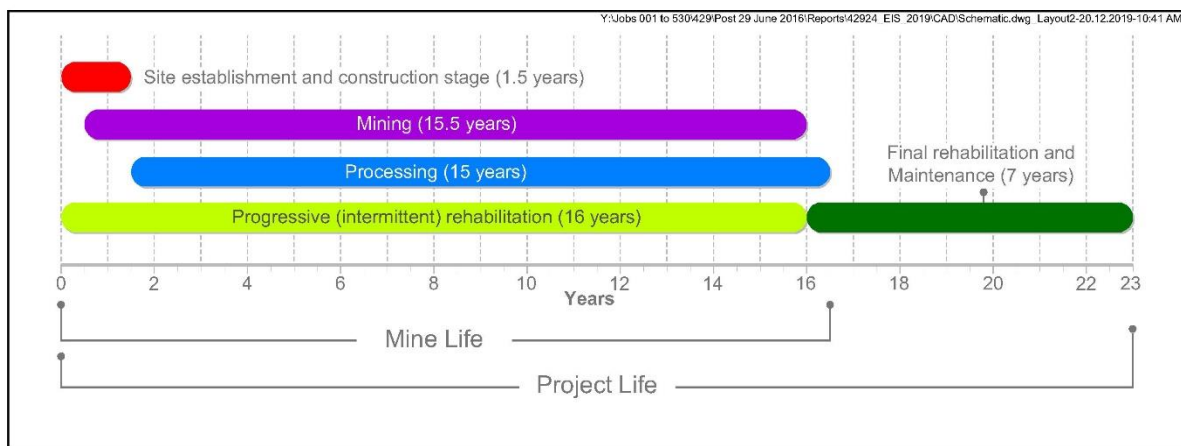
<sup>1</sup> The low grade ore stockpile would be constructed adjacent to but largely upon the northern sections of the WRE.

**Map 1 Regional Location of the Study Area**



The Project would incorporate conventional open cut pits where overburden/waste rock is removed from above and around the silver-zinc-lead ore and either used for on-site construction activities or placed in the out-of-pit WRE or the southern barrier. The mined ore would be transported by haul trucks to the on-site processing plant where it would be crushed, milled and processed to liberate the silver, zinc and lead minerals. These minerals would be collected by conventional froth flotation to produce two concentrates that would be dewatered and transported off site by truck. The residual materials from processing (tailings) would be pumped in the form of a slurry to the TSF located to the west of the main open cut pit.

The Project would require a site establishment and construction period of approximately 18 months during which the processing plant and all related infrastructure and the initial embankment of the TSF would be constructed. Once operational, Bowdens Silver anticipates the mine would produce concentrates for approximately 15 years. In total, it is proposed the mine life would be approximately 16.5 years, i.e. from the commencement of the site establishment and construction stage to the completion of concentrate production. It is envisaged rehabilitation activities would be completed over a period of approximately 7 years, i.e. from Year 16 to Year 23. The duration of each of the main components throughout the mine life and Project life are displayed in the following schematic.



### 1.3 REFERRAL TO THE COMMONWEALTH

On 20 December 2018, the Project was referred under the Commonwealth EPBC Act (EPBC 2018/8372). On 5 April 2019, a delegate of the Commonwealth Minister for the Environment declared the action to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on the following controlling provisions under Part 3 of the EPBC Act:

- sections 18 and 18A of the EPBC Act (listed threatened species and communities).

The action is to be assessed under the bilateral agreement with NSW. Accordingly, this document provides an assessment of those components of the Project which comprise the action, on the relevant threatened species and communities listed under the EPBC Act.

## 1.4 CONTEXT OF BIODIVERSITY ASSESSMENT REPORT

The NSW Government has developed a Biodiversity Offsets Policy for Major Projects, including SSD. As part of an application for a Major Project under the EP&A Act, a proponent must prepare an EIS that addresses the Secretary's Environmental Assessment Requirements (SEARs) provided by the DPE.

The then DPE formally advised that, given substantial environmental assessment (and more specifically substantial biodiversity assessment) in connection with the preparation of the EIS occurred before the commencement of the BC Act, the biodiversity assessment could be continued under the former legislation as the Project is considered a "pending or interim planning application" under clause 27(1)(d) of Part 7 of the BC Regulation. As such, the DPE require an assessment of all biodiversity values as a BAR prepared under the FBA).

The SEARs require the FBA be applied to assess impacts on biodiversity. The FBA outlines the assessment methodology to quantify and describe the biodiversity values of the development site, and the biodiversity offsets required for any unavoidable impacts in accordance with the NSW Biodiversity Offsets Policy for Major Projects. The SEARs relevant to the BAR and cross references to where these are addressed in this BAR are tabulated within **Annexure 10**.

The FBA negates the need to conduct Assessments of Significance under the TSC Act. However, the FBA requires proponents to identify and assess the impacts on all EPBC Act listed threatened species and ecological communities that may be on the development site.

## 1.5 STUDY AREA

The Study Area is located within the Mid-Western Regional Council Local Government Area (LGA), and the Capertee, Upper Slopes, Kerrabee and Wollemi sub-regions of the former Central West Catchment Management Authority and former Hunter/Central Rivers, and the Central Tablelands Local Land Services region. The Study Area has been developed to consider land tenure at the time of the field surveys. The location of the Study Area is identified on **Map 2** and it is approximately 2 141.2 hectares in area, incorporating both the Mine Site, section of relocated Maloneys Road, and water supply pipeline corridor.

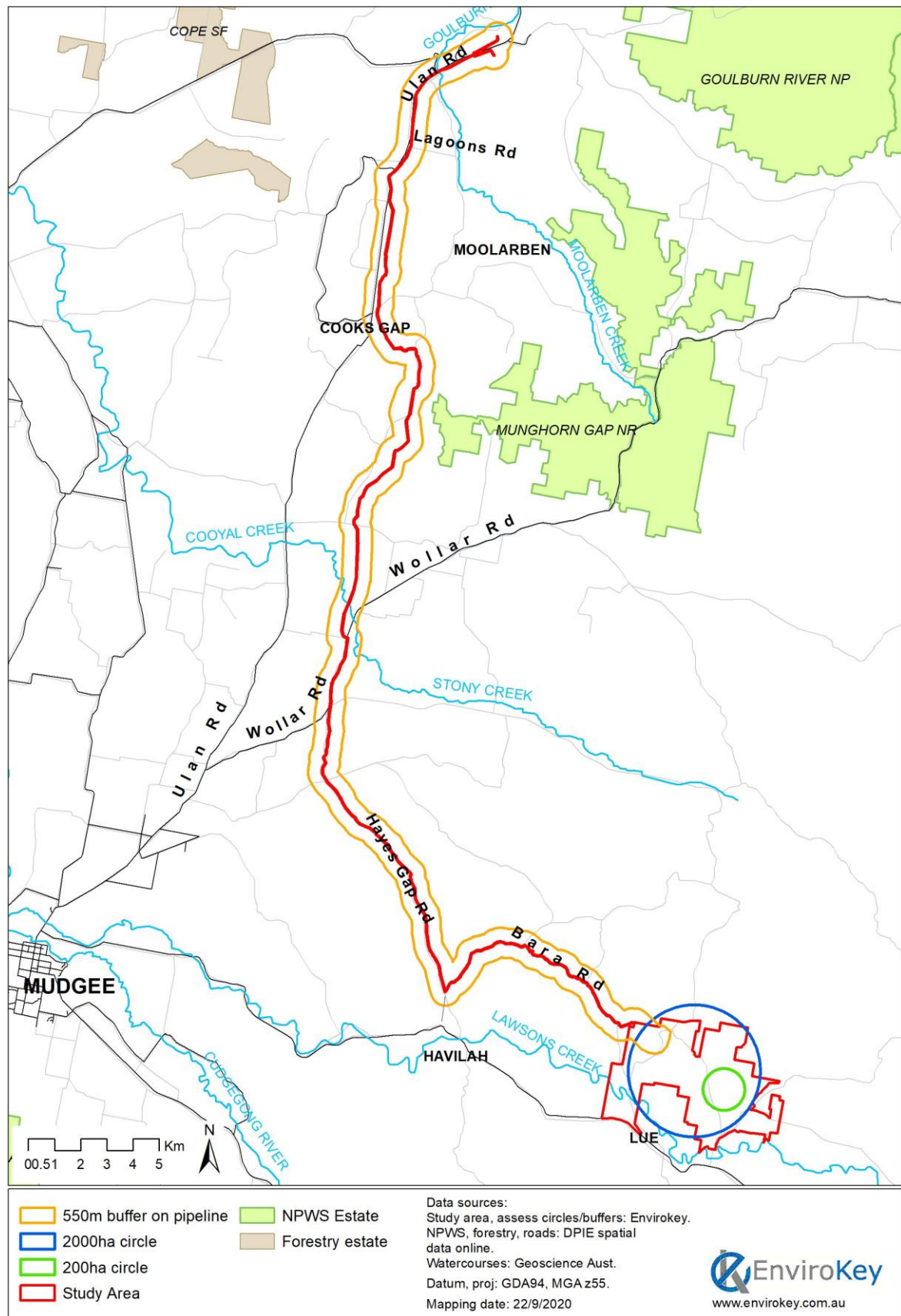
## 1.6 GENERAL DESCRIPTION OF THE DEVELOPMENT SITE

The BAR Development Site Footprint ("BAR footprint") (**Map 3**) is referred to throughout this report and is defined as the maximum construction and operational disturbance footprint for the purposes of this BAR and the BOS. In accordance with the BBAM, the BAR footprint was split into two developments and therefore, two projects in the Biobanking Credit Calculator (BBCC). The pipeline was assigned as a Linear-based development (0143/2020/5083MP), while the Mine Site and associated infrastructure areas, including the relocated Maloneys Road and relocated transmission line was assigned to a Site based development (0143/2020/5088MP).

It should also be noted that the BAR footprint is indicative and may vary slightly following further detailed mine planning and particularly the detailed design of supporting infrastructure. While it is likely that some changes to the BAR footprint would be expected over the Project life, any such changes are expected to be minor and therefore would have no material impact on biodiversity values.

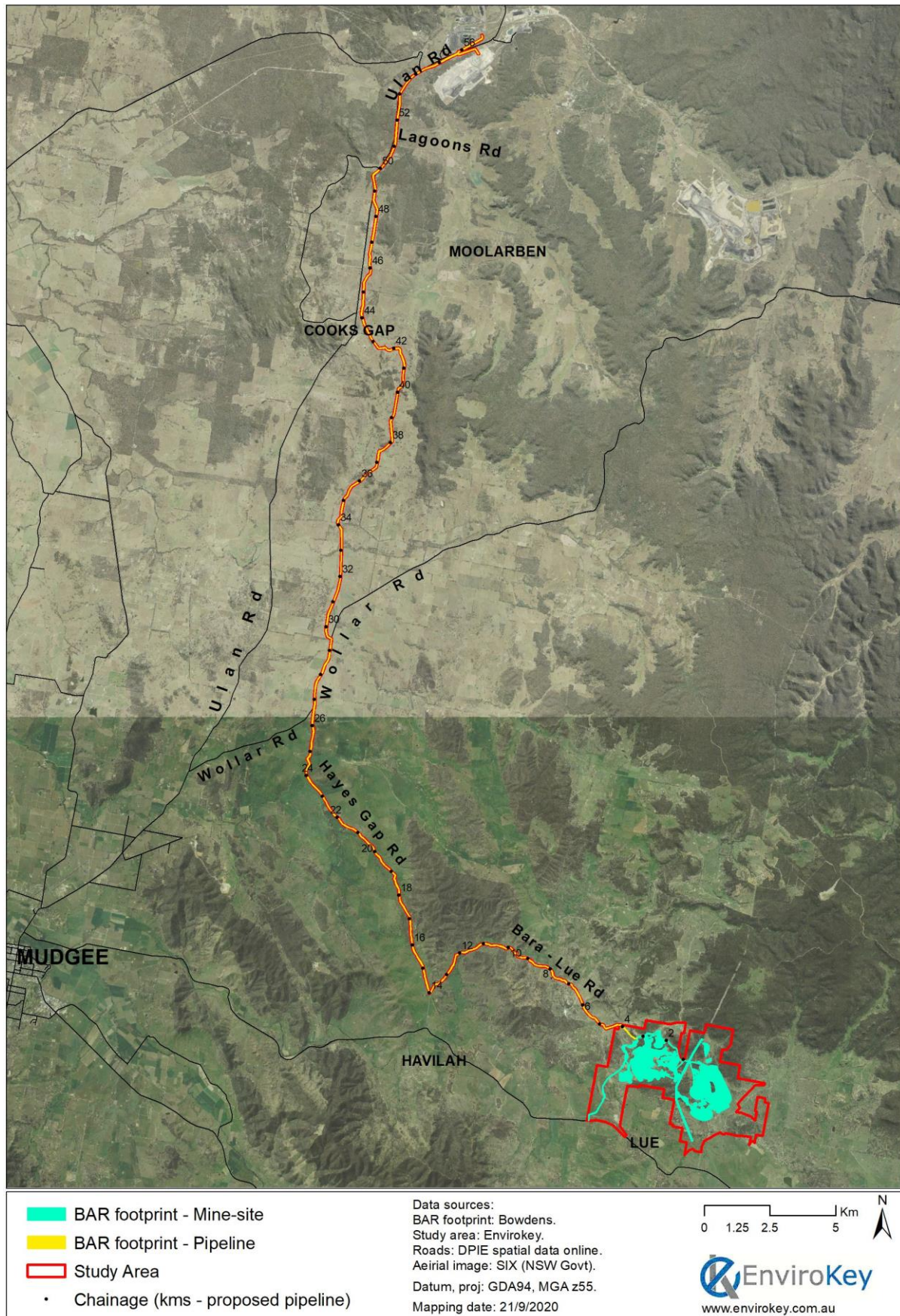


**Map 2 Location of the Study Area**





**Map 3 BAR Footprint**



## **1.7 ASSESSMENT REQUIREMENTS**

This BAR was prepared in accordance with the SEARs for the EIS. In general, the objective of this assessment is to:

- Provide an overview of the terrestrial flora and vertebrate fauna of the BAR Footprint and Study Area;
- provide an assessment of the likely adverse impacts of the Project on terrestrial flora and fauna including listed threatened species and ecological communities under the NSW BC Act and EPBC Act;
- describe measures that would be implemented to avoid and mitigate impacts on terrestrial flora and fauna; and
- identify that a BOS is being prepared that would maintain or improve biodiversity values of the region in the medium to long-term.

## 2. METHODOLOGY

### 2.1 BACKGROUND INFORMATION

#### 2.1.1 Previous Studies

Previous studies have been completed across portions of the Study Area. These were:

- Ecological Australia (ELA) (2014). Biobanking plots/transects datasheets and vegetation mapping of the proposed Bowdens Silver Mine (ELA, 2014);
- Geoff Cunningham Natural Resource Consultants (2014). Flora Study of the Proposed Bowdens Silver Mine and Associated Relocation of Maloneys Road, via Lue, NSW (GCNRC, 2014);
- Biodiversity Monitoring Services (2012) Fauna Survey of Potential Development Area (BMS, 2012); and
- Biodiversity Monitoring Services (2013) Further Fauna Assessments (BMS, 2013).

All previous studies have collected substantial data throughout the Study Area and have been considered in the preparation of this BAR. Data from ELA has been incorporated into this BAR and BioBanking calculations given that it was found to be the most recent, collected in a format suitable for inclusion into the BAR, and the most representative after on-ground validation by EnviroKey.

#### 2.1.2 Guidelines and Policies used in the Assessment

The following guidelines and policies were considered in the preparation of this BAR.

- NSW offset policy for major projects (State Significant Development and State Significant Infrastructure) (NSW Office of Environment and Heritage (OEH) (OEH, 2014d).
- BioBanking Assessment Methodology (OEH, 2014b).
- NSW Framework for Biodiversity Assessment (OEH, 2014e).
- Department of Environment, Conservation and Climate Change (DECC) Threatened Species Assessment Guidelines (DECC, 2007).
- Department of Environment and Conservation (DEC) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft) (DEC, 2004).
- Assessors guide to the Biobanking Credit Calculator (OEH, 2012a).

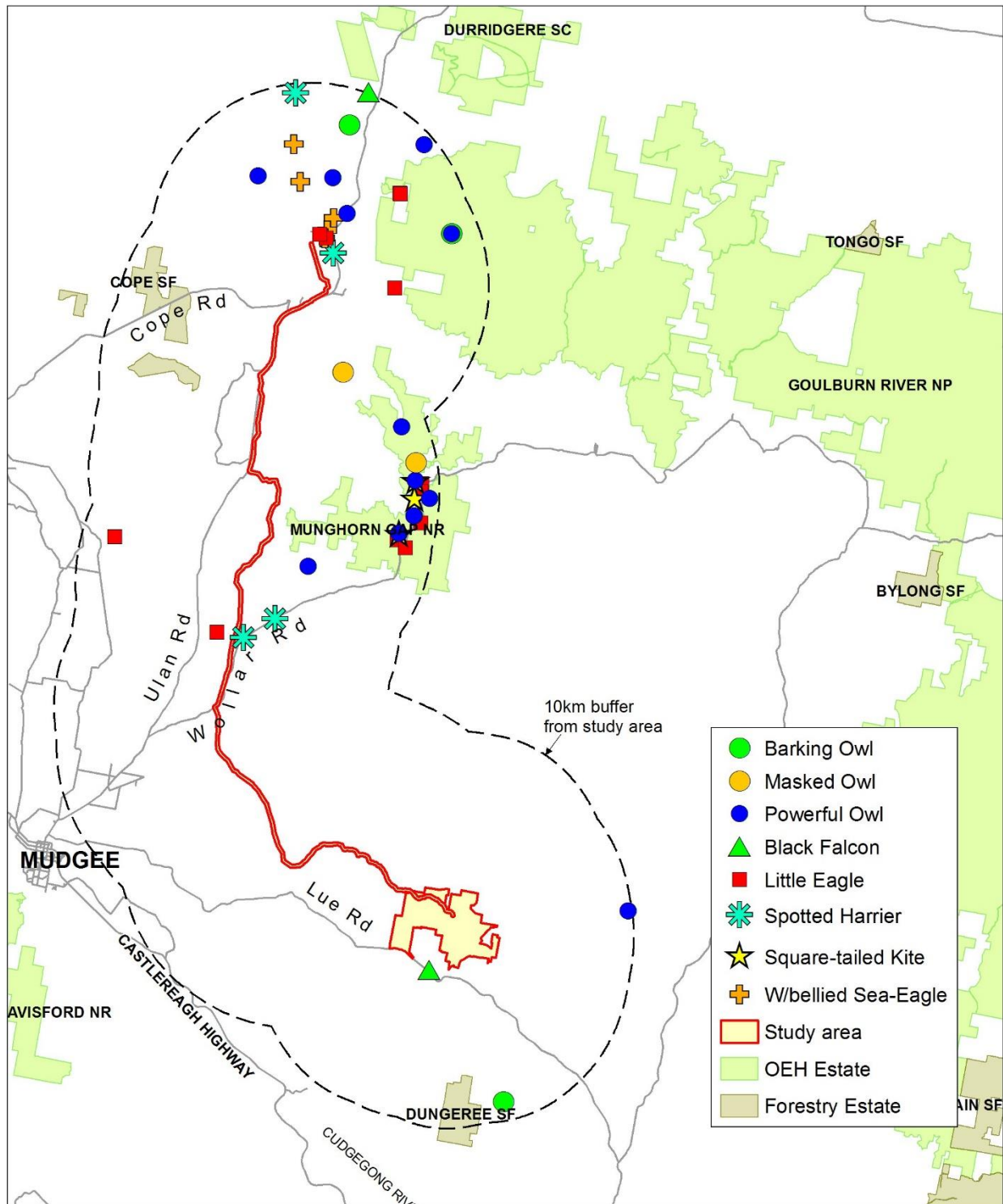
#### 2.1.3 Database Searches

EnviroKey carried out the following database searches for the locality.

- OEH BioNET Atlas of NSW Wildlife (**Map 4 to 8**) (OEH, 2020a).
- EPBC Act Protected Matters Search Tool (**Annexure 2**) (DoEE, 2020).
- OEH Threatened Species Predictor Tool for the Capertee and Wollemi Sub-regions within the Sydney Basin Bioregion, and the Upper Slopes Sub-region within the NSW South Western Slopes Bioregion (OEH, 2020c)



**Map 4 Previous Threatened Owl and Raptor Records in the Locality**



Data sources:  
 Threatened & Migratory biota data: OEH Bionet - data licence CON09007.  
 Study area: Bowdens Silver.  
 Roads: Geoscience Australia (1:250K maps).  
 OEH, Forestry estates: OEH Spatial Data Download.  
 Datum, Projection: GDA 1994, MGA Zone 55

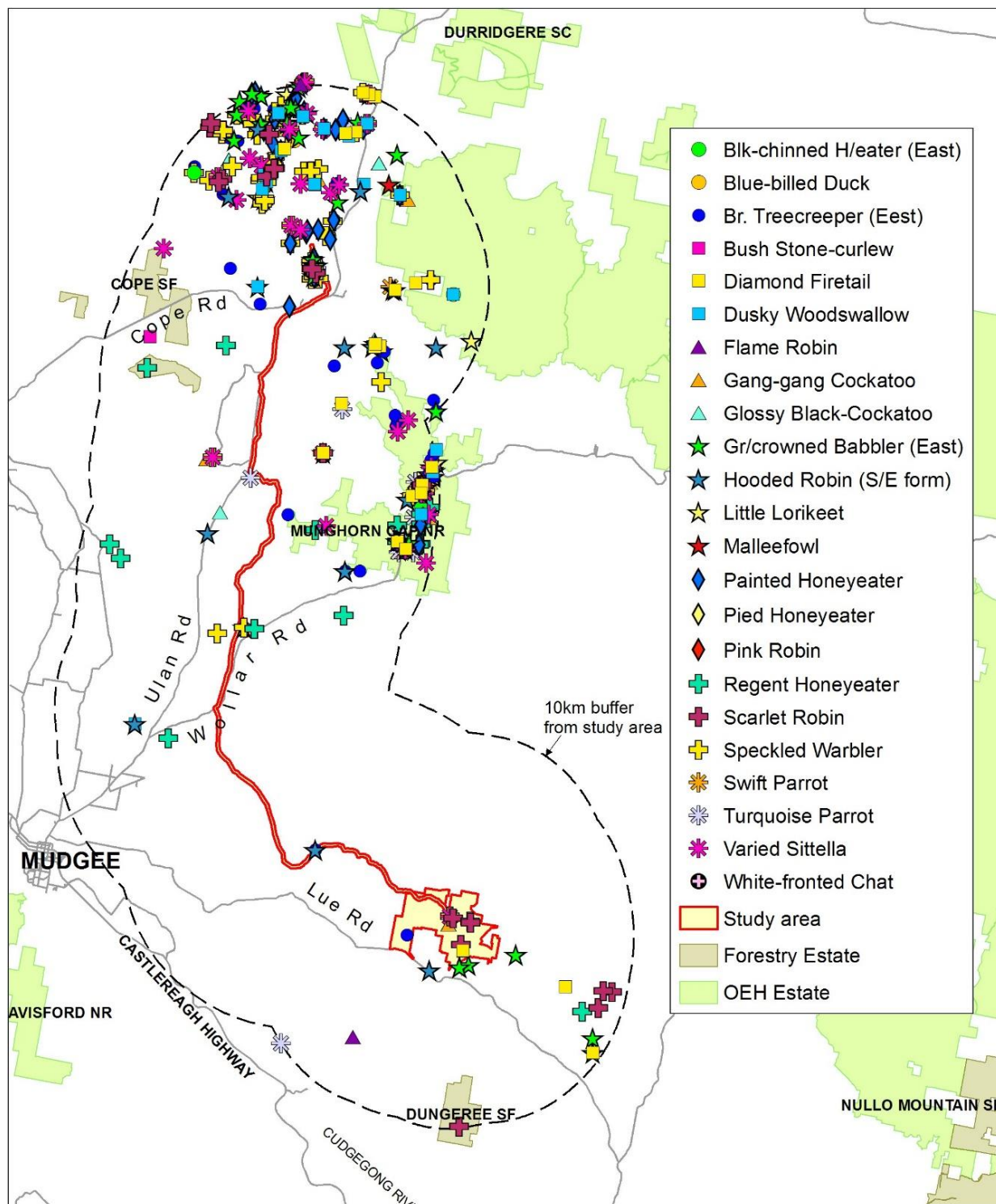
Mapping date: 29 March 2019

0 2.5 5 10 Km



PO Box 7231 Tathra NSW 2550  
[www.envirokey.com.au](http://www.envirokey.com.au)

Map 5 Previous Other Threatened Bird Records in the Locality



Data sources:  
 Threatened & Migratory biota data: OEHL Bionet - data  
 licence CON09007.  
 Study area: Bowdens Silver.  
 Roads: Geoscience Australia (1:250K maps).  
 OEHL, Forestry estates: OEHL Spatial Data Download.  
 Datum, Projection: GDA 1994, MGA Zone 55

Mapping date: 29 March 2019

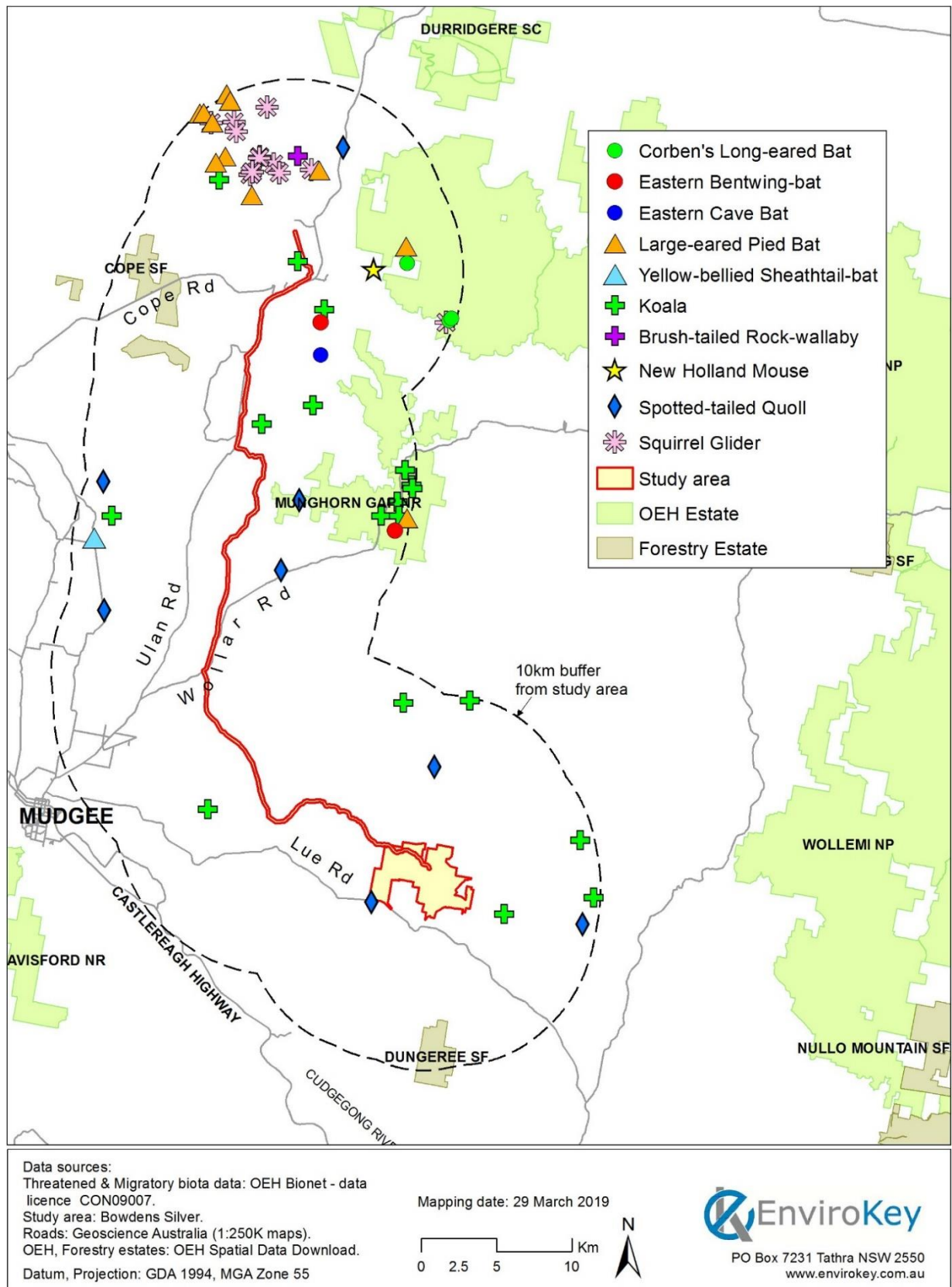
0 2.5 5 10 Km



**EnviroKey**

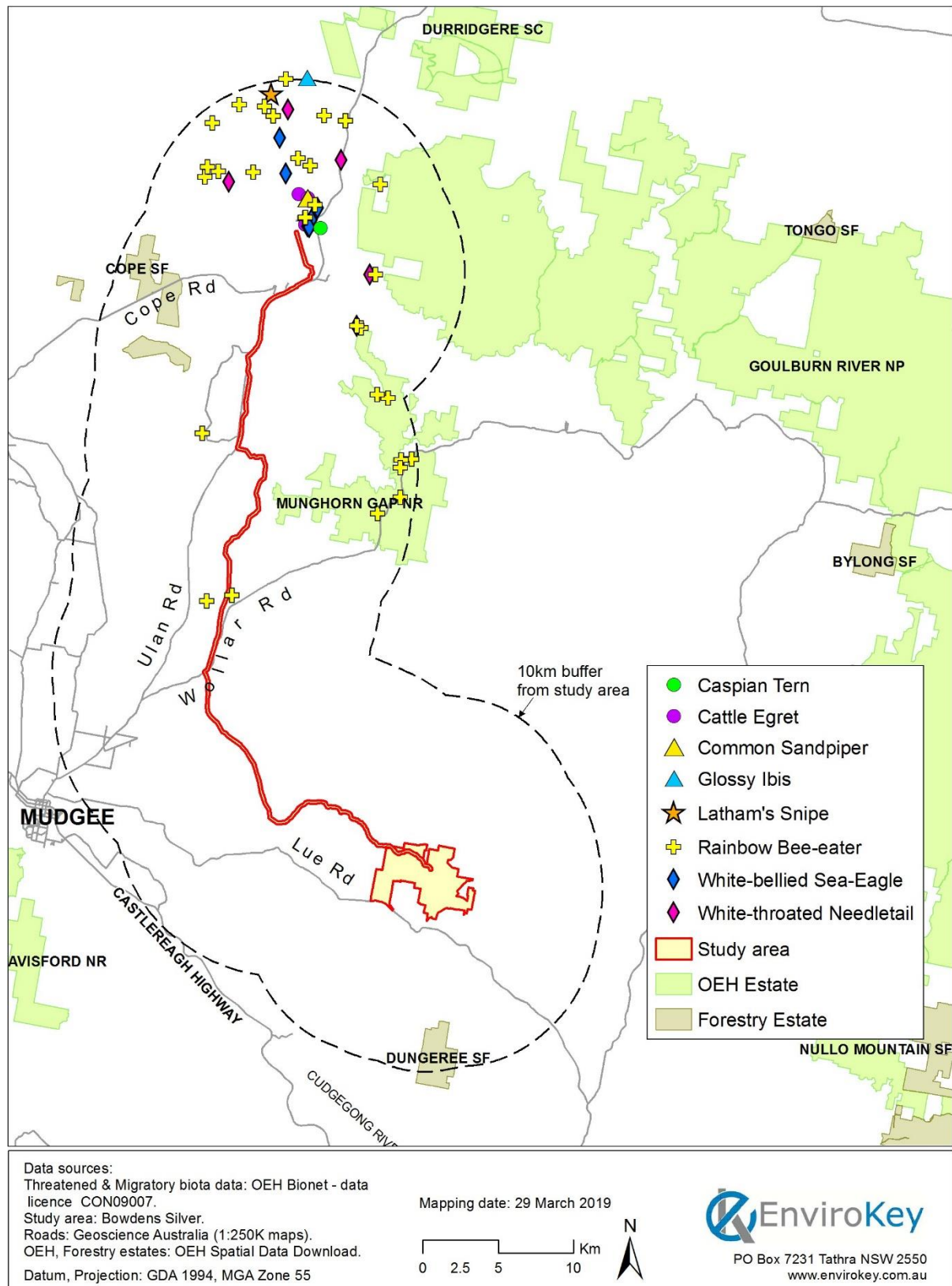
PO Box 7231 Tathra NSW 2550  
[www.envirokey.com.au](http://www.envirokey.com.au)

**Map 6 Previous Other Threatened Fauna Records in the Locality**



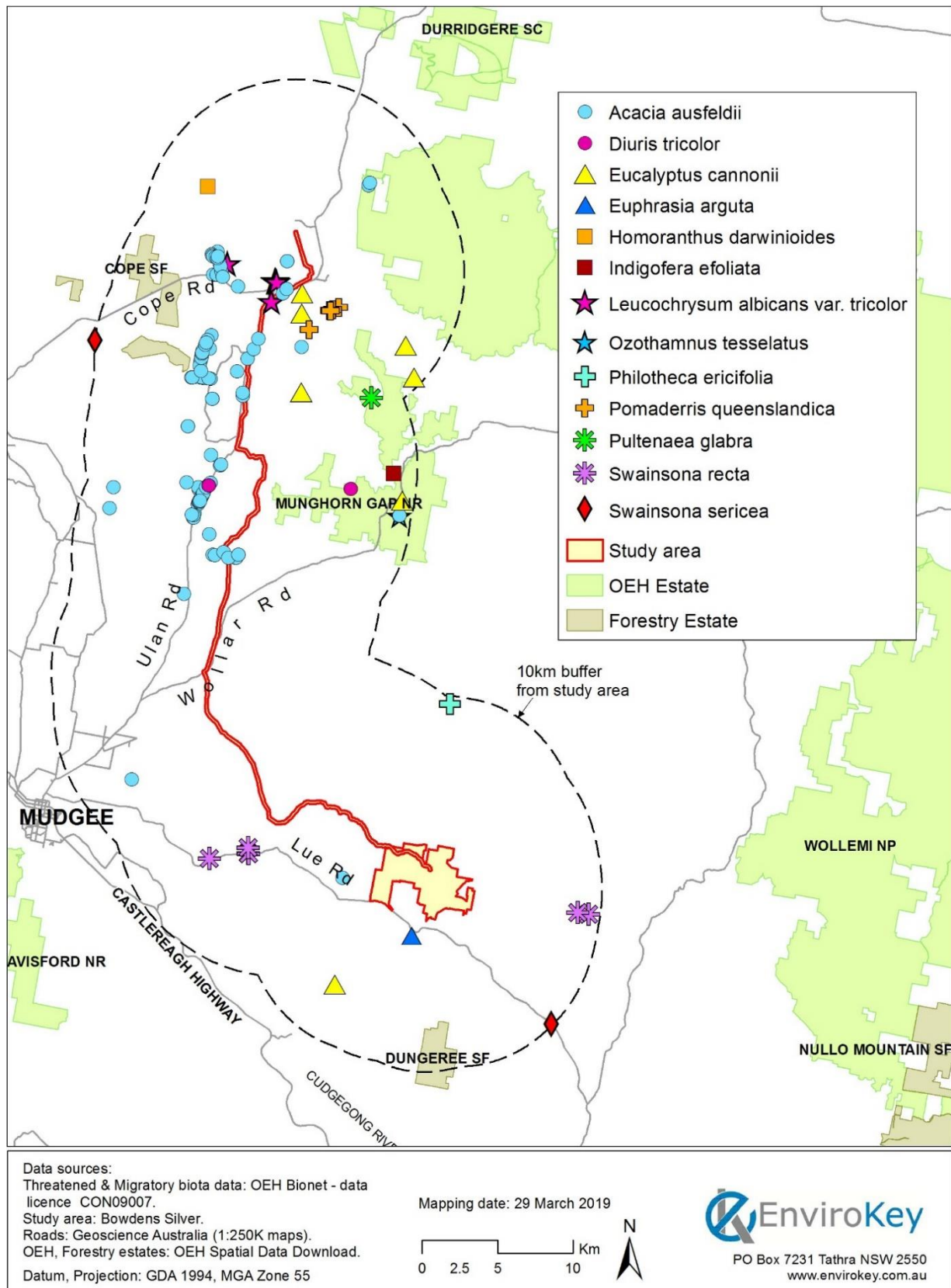


Map 7 Previous Migratory Fauna Records in the Locality





**Map 8 Previous Threatened Flora Records in the Locality**



- *Mid-Western Regional Local Environmental Plan 2012.*
- Bureau of Meteorology Groundwater Dependent Ecosystem Atlas (GDE Atlas).

EnviroKey also reviewed the most recent vegetation datasets for the locality. This being the State Vegetation Type Map: Central Tablelands Region VIS\_4778 version 1.0. The vegetation mapping was considered when reviewing and validating the vegetation communities of the Study Area (**Map 9 to 11**).

## **2.2 LANDSCAPE FEATURES**

### **2.2.1 Identifying Landscape Features**

Landscape features within the Study Area including the inner and outer assessment circles as required and defined by BBAM, were determined through reviewing of aerial photography, relevant GIS and ground-truthing during field surveys. Landscape features that were relevant to the Study Area and surrounds included:

- IBRA bioregions and subregions;
- Mitchell landscapes;
- rivers and streams;
- wetlands;
- native vegetation extent; and
- State and Regional Biodiversity Links.

### **2.2.2 Determining Landscape Value**

Determining the 'Landscape Value' of the Study Area was calculated by assessment of the following landscape attributes.

- Percentage of native vegetation cover.
- Connectivity value.
- Patch size.

This was applied by using all native vegetation visible on aerial images for the purpose of calculating the landscape score value.

### **2.2.3 Percentage of Native Vegetation Cover**

In accordance with the FBA, the percentage of native vegetation cover was determined by the current percent native vegetation cover and the future native vegetation cover (i.e. following disturbance by the Project) within the inner and outer assessment circles. This was carried out using digital aerial photography interpretation using ArcMap GIS software. Imagery from Google Earth and as captured by Bowdens Silver, were used to digitise native woody vegetation within the assessment circles. Further refinement of these areas was carried out following field surveys where required.

The inner and outer assessment circles must be at a 1: 10 ratio and one of the combinations from Table 8 of Appendix 4 of the FBA. For the Linear-based development (the pipeline) a 550-metre buffer circle was applied to the pipeline. For the Site-based development (the Mine Site and associated infrastructure), an inner and outer assessment circle was applied and centred on the portion of the BAR footprint that represents that area of native vegetation most impacted by the Project (see **Map 2**).

#### **2.2.4 Connectivity Value**

To determine connectivity value, the Project was assessed for the presence of native vegetation connecting links as well as local, regional or State links as required by the FBA.

Connecting links are present when an area of native vegetation in the Study Area is adjoined to other areas of native vegetation and is:

- in a moderate to good condition;
- has a patch size of greater than one hectare;
- is separated by a distance of less than 100 metres; and
- is not separated by a large waterbody or other large gap, i.e. dual carriageway, etc.

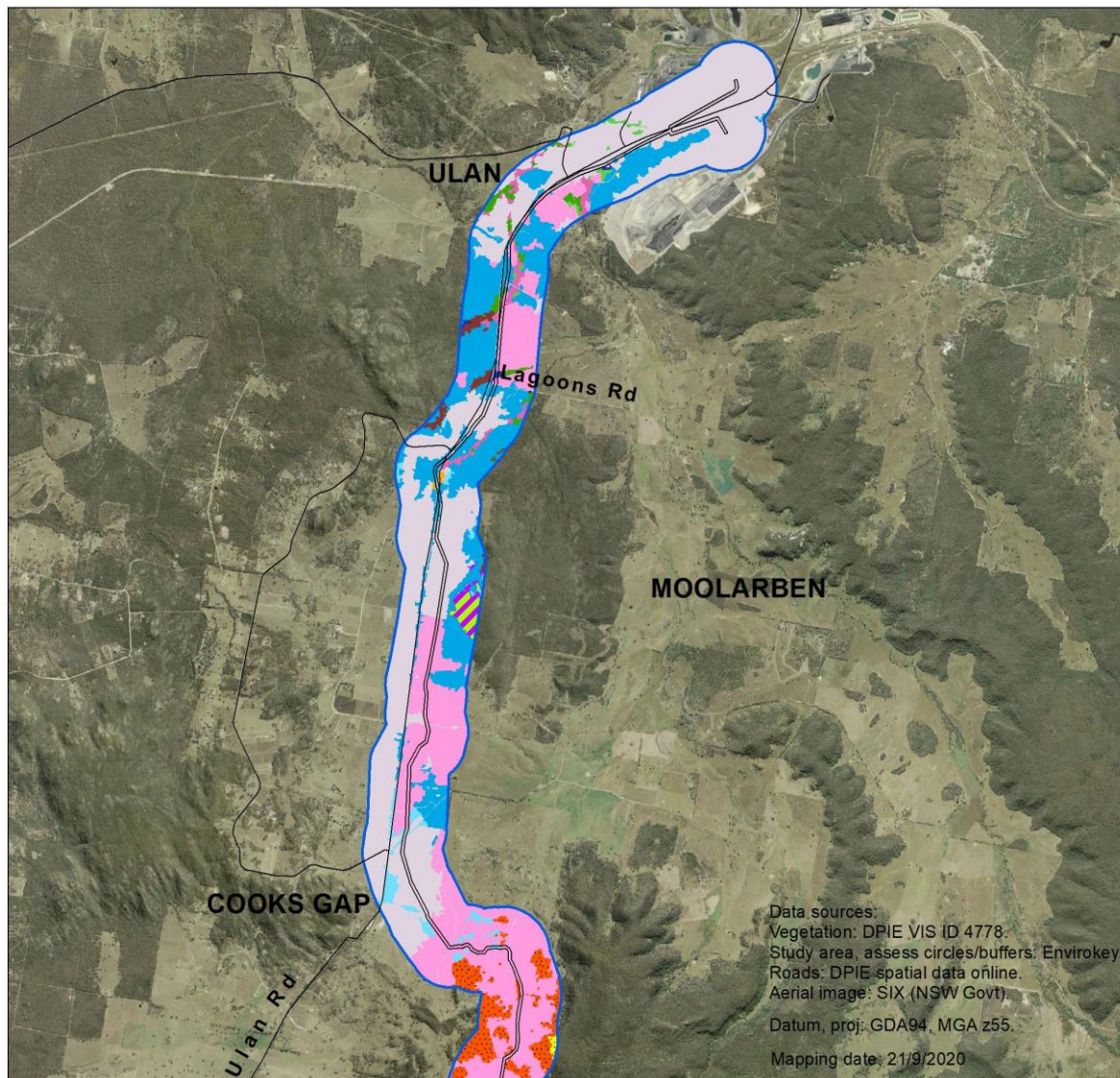
State and regional biodiversity links are defined as links which have been identified as important on a State or regional scale by OEH.

#### **2.2.5 Patch Size**

A patch is an area of native vegetation that occurs in the Study Area and is in moderate to good condition. Patches may extend onto adjoining land that is not part of the Study Area. Assessment of patches was made in accordance with Table 15 of the FBA (OEH, 2014c).



Map 9 Existing Vegetation Mapping within the Locality



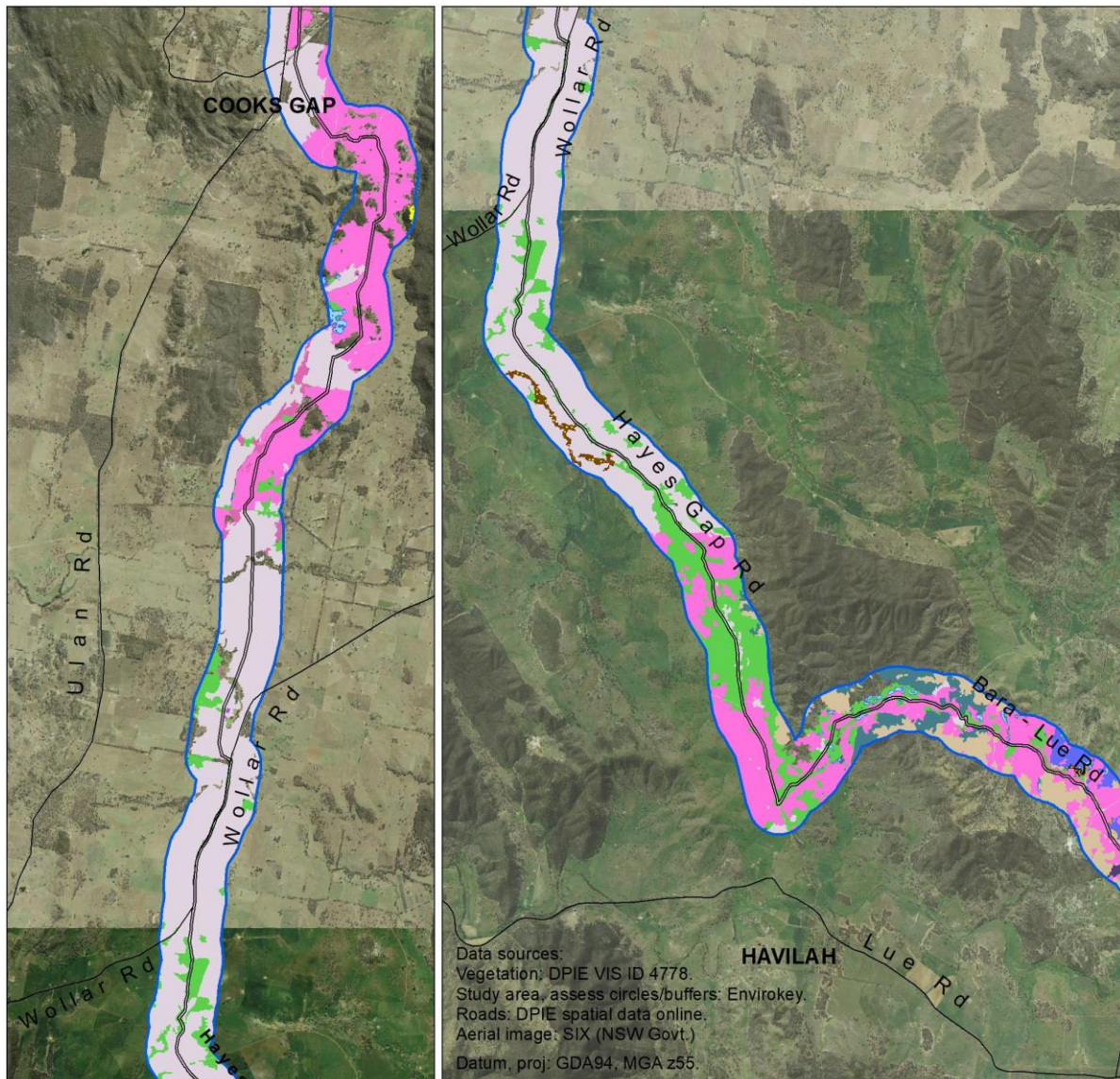
- Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands Bioregion
- Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- Derived grassland of the NSW South Western Slopes
- Growee Ranges Grey Gum-Scribbly Gum Forest
- Long-leaved Box - Red Box grass-shrub open forest on hillslopes in the Mudgee Region; NSW central western slopes
- Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin
- Non Native
- Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands; South Eastern Highlands Bioregion
- Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW SWS
- Rough-barked Apple - Blakelys Red Gum - Narrow-leaved Stringybark +/- Grey Gum sandstone riparian grass fern open forest
- Scribbly Gum - Narrow-leaved Ironbark - Bossiaea rhombifolia heathy open forest on sandstone ranges of the Sydney Basin
- Western Hunter Dwyers Red Gum-Cypress Woodland
- Western Hunter Flats Rough-barked Apple Forest
- Western Hunter Foothills Box Woodland
- White Box - Black Cypress Pine shrubby woodland of the Western Slopes
- Yellow Box - Blakelys Red Gum grassy woodland on the tablelands; South Eastern Highlands Bioregion
- Study Area
- 550m buffer off pipeline

0 0.5 1 2 Km





**Map 10 Existing Vegetation Mapping within the Locality**

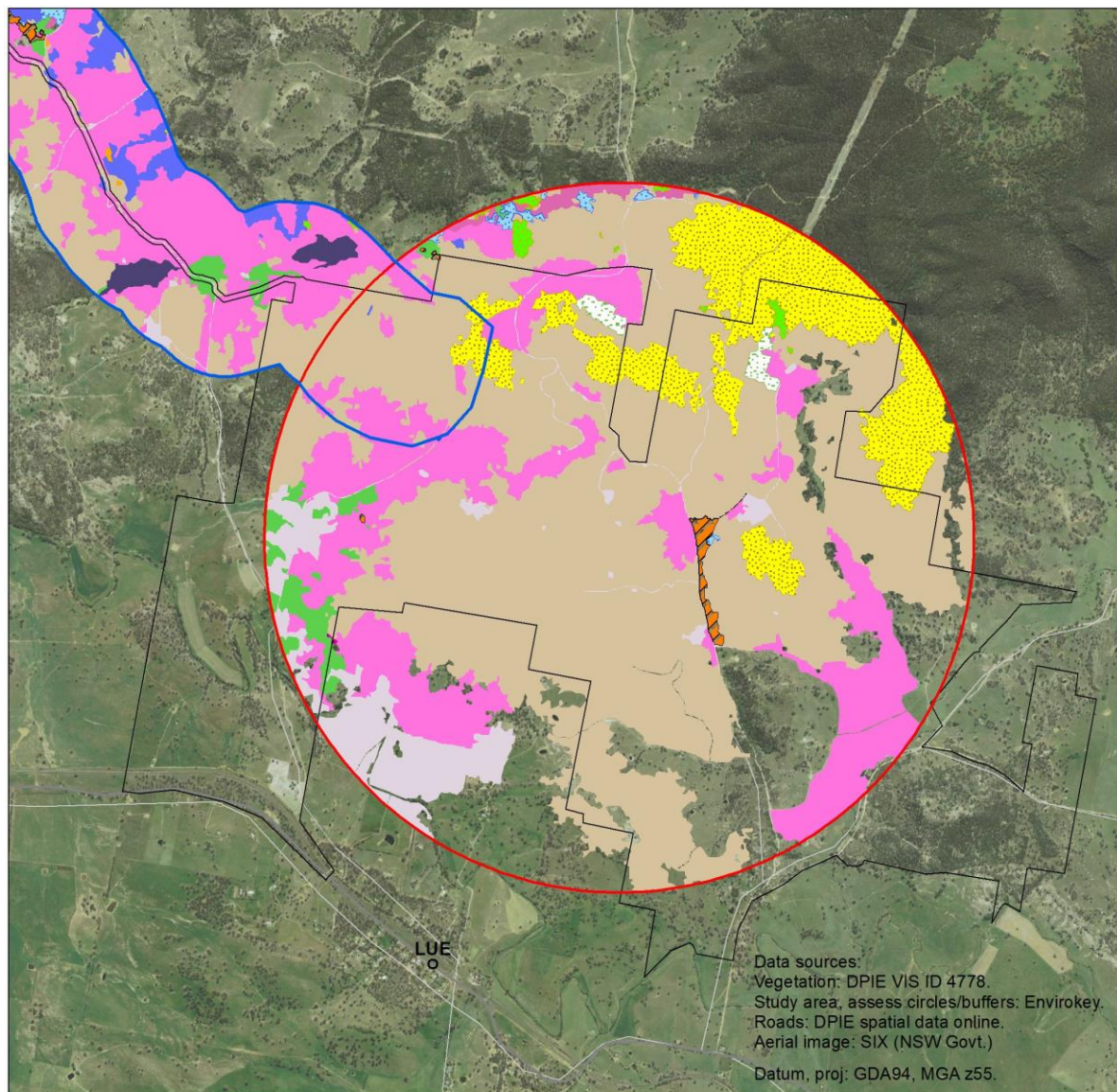


- Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands Bioregion
- Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- Capertee Foothills Box-Stringybark Forest
- Central Tableland Ribbon Gum-Apple Gully Forest
- Derived grassland of the NSW South Western Slopes
- Derived grassland of the South Eastern Highlands Bioregion and South East Corner Bioregion
- Growee Ranges Grey Gum-Scribbly Gum Forest
- Long-leaved Box - Red Box grass-shrub open forest on hillslopes in the Mudgee Region; NSW central western slopes
- Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin
- Non Native
- Red Box - Tumbledown Gum - Red Stringybark - Long-leaved Box dry woodland; upper NSW South Western Slopes Bioregion
- Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW SWS Bioregion
- River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion
- Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion
- Typha rushland
- Western Hunter Flats Rough-barked Apple Forest
- Yellow Box - Blakelys Red Gum grassy woodland on the tablelands; South Eastern Highlands Bioregion
- Study Area
- 550m buffer off pipeline

0 0.5 1 2 Km  
Mapping date: 21/9/2020



Map 11 Existing Vegetation Mapping within the Locality



- Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands Bioregion
- Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- Capertee Foothills Box-Stringybark Forest
- Central Tableland Ribbon Gum-Apple Gully Forest
- Derived grassland of the NSW South Western Slopes
- Derived grassland of the South Eastern Highlands Bioregion and South East Corner Bioregion
- Growee Ranges Grey Gum-Scribbly Gum Forest
- Long-leaved Box - Red Box grass-shrub open forest on hillslopes in the Mudgee Region; NSW central western slopes
- Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin
- Non Native
- Red Box - Tumbledown Gum - Red Stringybark - Long-leaved Box dry woodland; upper NSW South Western Slopes Bioregion
- Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW SWS Bioregion
- River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion
- Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion
- Typha rushland
- Western Hunter Flats Rough-barked Apple Forest
- Yellow Box - Blakelys Red Gum grassy woodland on the tablelands; South Eastern Highlands Bioregion
- 2000ha circle
- 550m buffer off pipeline
- Study Area

0 0.25 0.5 1 Km

Mapping date: 21/9/2020

## **2.3 FIELD SURVEYS**

### **2.3.1 Introduction**

EnviroKey employed a series of field survey methods to carry out the field assessments of the terrestrial biodiversity values of the Study Area over the following five field survey periods.

- 4 to 9 December 2016 (6 days)
- 30 January to 3 February 2017 (5 days)
- 13 to 16 November 2017 (4 days)
- 29 January to 3 February 2019 (6 days)
- 3 to 7 April 2019 (5 days)

The surveys considered the relevant survey guidelines for general impact assessment and for specific threatened species. If information was not available on whether or not threatened species occur within the Study Area, then a precautionary approach was adopted, and species presence was assumed. This approach is consistent with the FBA and relevant impact assessment guidelines.

The following subsections provide further detail on the survey methods used and rationale behind their selection.

### **2.3.2 Vegetation Communities**

Verification of vegetation communities and the presence of TECs, was completed from a combination of floristic surveys in accordance with the Biobanking Assessment Methodology (BBAM) as detailed in the FBA (OEH, 2014b, OEH, 2014c) and the BioNet Vegetation Classification (OEH, 2020b).

Biometric Vegetation Types (BVT) were assigned to vegetation mapping units previously identified by ELA, and those published BVT for the Central West CMA region. This was done by comparing the dominant canopy species recorded, the general description of location, soil type and other attributes as described in the OEH online VIS classification database v2.1 (OEH, 2020b). Vegetation polygons assigned to the 'moderate-good' condition category were also assigned to a sub-condition class of poor, moderate or good to form vegetation zones. Information to complete these tasks was compiled from the Biometric plot/transect surveys completed across the Study Area.

EnviroKey also reviewed the most recent vegetation mapping for the locality. This being the State Vegetation Type Map: Central Tablelands Region VIS\_4778 version 1.0. This vegetation mapping was considered when reviewing and validating the vegetation communities of the Study Area (**Map 9 to 11**).

### 2.3.3 Biometric Plot/Transect Surveys

The design of an appropriate survey requires careful consideration of survey methods and effort. The field survey was originally designed using the existing regional vegetation mapping, and then based on ground-truthing of accessible portions of the Study Area, combined with air photograph interpretation (API). The number of biometric plot/transect surveys was then determined in accordance with the BioBanking and FBA methodology (OEH, 2014a, OEH, 2014c).

A total of 170 Biometric plot/transect surveys were undertaken in accordance with the Biobanking Methodology and the FBA (81 by ELA and 89 by EnviroKey). A large number was completed across the Study Area as the location and extent of the BAR footprint was not finalised until late April 2019. A subset of these plot/transects that were located within the BAR footprint were then applied to the BioBanking Credit Calculator (BBCC) to meet the number of plot/transects required. **Table 1** and **Table 2** provides an overview of the adequacy of the Biometric plot/transect survey in regard to the Biobanking Methodology and the two BAR footprints (site-based and linear-based) that was applied to the BBCC.

**Table 1**  
**Adequacy of Vegetation Survey for the Bowdens Silver Project –**  
**Site based assessment (Mine Site)**

<b>Veg. zone</b>	<b>Area within BAR footprint (ha)</b>	<b>BVT and Condition Class</b>	<b>No. of plots/transects sampled &amp; entered into BBCC (&amp; min. required)</b>
1	88.33	CW111_Moderate/Good_Medium	7 (5)
2	64.02	CW111_Moderate/Good_Poor	8 (5)
3	21.80	CW112_Moderate/Good_Poor	6 (4)
4	21.68	CW217_Moderate/Good_Medium	5 (4)
5	1.04	CW242_Moderate/Good_High	1 (1)
6	56.65	CW263_Moderate/Good_High	6 (5)
7	0.77	CW270_Moderate/Good_High	3 (1)
8	81.69	CW291_Moderate/Good_High	6 (5)
9	11.81	CW291_Moderate/Good_Medium	5 (3)
10	18.92	CW291_Moderate/Good_Poor	3 (3)

**Table 2**  
**Adequacy of Vegetation Survey for the Bowdens Silver Project –**  
**Linear based assessment (Pipeline)**

<b>Veg. zone</b>	<b>Area within BAR footprint (ha)</b>	<b>BVT and Condition Class</b>	<b>No. of plots/transects sampled &amp; entered into BBCC (&amp; min. required)</b>
1	4.53	CW111_Moderate/Good_Medium	3 (3)
2	2.36	CW111_Moderate/Good_Poor	2 (2)
3	0.20	CW291_Moderate/Good_Medium	1 (1)
4	1.24	CW216_Moderate/Good_Medium	2 (1)
5	0.65	CW272_Moderate/Good_Medium	1 (1)
6	0.76	CW299_Moderate/Good_Medium	1 (1)
7	5.18	CW249_Moderate/Good_DerivedGrassland	3 (3)



These plots/transect plots include a 20 metre by 20 metre full floristic plot, a 20 metre by 50 metre plot identifying the number of hollow-bearing trees and length of fallen timber and a 50 metre transect which was used to collect data on canopy cover, midstorey cover and ground cover of native and exotic flora species.

The location of all Biometric plot/transects is provided on **Map 19** to **26** and the BBAM field raw data sheets for plot/transects used in the BBCC calculations are included in **Annexure 3**.

### **2.3.4 Threatened Ecological Community Identification**

Any native vegetation community identified within the Study Area was compared to listings of TECs under the BC Act and EPBC Act. The OEH BioNet Vegetation Information System also confirms TEC listings for each BVT (OEH, 2020b).

### **2.3.5 Random Meander and Threatened Flora Surveys**

Whenever travelling between Biometric plot/transect surveys, and any of the fauna surveys, vegetation community surveys and threatened flora searches were completed.

In addition, a 15-minute search targeting threatened flora by random meander at each of the EnviroKey Biometric plot/transects was also carried out. This generally resolved in a search area of about 1 hectare. While the random meander surveys have not been mapped (as they coincided with the BBAM plot/transects), they have been occurring across the Study Area since 2016. These were carried out over the following survey periods.

- 4 to 9 December 2016 (6 days)
- 30 January to 3 February 2017 (5 days)
- 13 to 16 November 2017 (4 days)
- 29 January to 3 February 2019 (6 days)
- 3 to 7 April 2019 (5 days)

These surveys have resulted in additional species not recorded during formal surveys being detected and entered into the species lists for the Study Area.

As detailed in section 2.3.6, additional targeted surveys for threatened flora were also carried out between 24 and 30 November 2020 (7 days) by AREA Environmental.

### **2.3.6 Targeted Swainsona surveys**

AREA Environmental carried out a targeted Swainsona survey in 2020 after individuals identified by Bowdens Silver personnel appeared to be the threatened species *Swainsona recta*. *Swainsona sericea* had already been detected within the study area during previous surveys.

The field survey was carried out between 24 and 30 November 2020. No rainfall or adverse weather conditions effected the field survey results. The field survey targeted all PCT identified on the BioNET Atlas database as having an association with *Swainsona recta* as well as any areas predicted to support the species by the recently developed modelling prepared by AREA Environmental.

The scope of the field surveys was to ground truth records of *Swainsona recta* as identified by Bowdens Silver environmental staff and to survey other areas of the proposed Mine Site that may support this or similar species. Only one PCT with a known association with *Swainsona recta* as identified on the BioNet database collection is identified in the development footprint. This is *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*. This PCT was surveyed in full by two suitably qualified and experienced staff on foot following requisite survey guidelines.

AREA Ecologists also surveyed additional areas within the Mine Site and identified *Swainsona sericea* in the development footprint in the following two PCTs.

- *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion and*
- *PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion*

These PCTs were also assessed using pedestrian transects.

Other targeted searches undertaken during these surveys included searches for the following species.

- *Euphrasia arguta*
- *Prasophyllum sp. Wybong*
- *Prasophyllum petilum Tarengo Leek Orchid*

The report by AREA Environmental is provided in full within **Annexure 9**.

### 2.3.7 Fauna Surveys

An extensive set of fauna surveys and habitat assessments were also completed. These included Diurnal bird surveys, Herpetofauna surveys, Camera trap surveys, Call playback surveys, Spotlighting surveys, Echolocation call recording surveys, Koala transects, scat and sign searches and Riparian surveys. A description of each survey method is provided below and the locations of fauna surveys provided on **Map 12** and **Map 13**.

Field surveys were conducted under the authority of a Scientific Licence issued by OEH under the BC Act and an Animal Research Authority approved by, and in accordance with, the Animal Care and Ethics Committee (ACEC) of the Director-General of Trade and Investment.

#### Diurnal Bird Surveys

Surveys to determine the presence and usage of the Study Area by diurnal birds were conducted. A total of 137 diurnal bird surveys were completed guided by a standardised technique (Watson, 2003). Surveys were conducted in either the early morning or late afternoon to coincide with peak bird activity. Observers actively searched for diurnal birds and identified species by sight and by vocalisation during each 20-minute bird survey. Opportunistic data was also collected during the field surveys whenever traversing the Study Area.

These were as follows:

- |                                 |            |
|---------------------------------|------------|
| • 4 to 9 December 2016          | 33 surveys |
| • 30 January to 3 February 2017 | 19 surveys |
| • 13 to 16 November 2017        | 26 surveys |
| • 29 January to 3 February 2019 | 25 surveys |
| • 3 to 7 April 2019             | 34 surveys |

### **Camera Trap Surveys**

Motion-activated infrared cameras are well known for their efficiency in detecting fauna species without the need to set traditional traps (Claridge et al., 2004). RECONYX PC900 HyperFire Professional High Output motion-activated infrared cameras were activated at five locations during the December 2016 survey and five locations during the February 2017 survey. Cameras were set on high sensitivity with five images captured per motion detected. Cameras were pointed to a bait station containing a chicken wing (a known attractant for Quolls) and sardines from a can (a known attractant for Rosenberg's Goanna (Sass et al., 2014)).

Cameras were activated between 4 and 9 December 2017 (5 nights/6 days) resulting in a survey effort of 25 camera nights/30 camera days, between 31 January and 3 February 2017 (3 nights/4 days) resulting in a survey effort of 15 camera nights/20 camera days. Four cameras were used in the field survey between 3 and 7 April 2019 (3 nights/4 days) resulting in a survey effort of 12 camera nights/16 camera days. The total survey effort completed using this method is 52 camera nights/66 camera days.

### **Herpetofauna Surveys**

Herpetofauna (frog and reptile) searches were conducted at 85 sites across the Study Area. Each site was systematically searched by an experienced ecologist for a period of 30 minutes for active and inactive animals. Fallen timber, loose bark, tree and ground hollows, and loose soil were extensively searched (Blomberg and Shine, 1996).

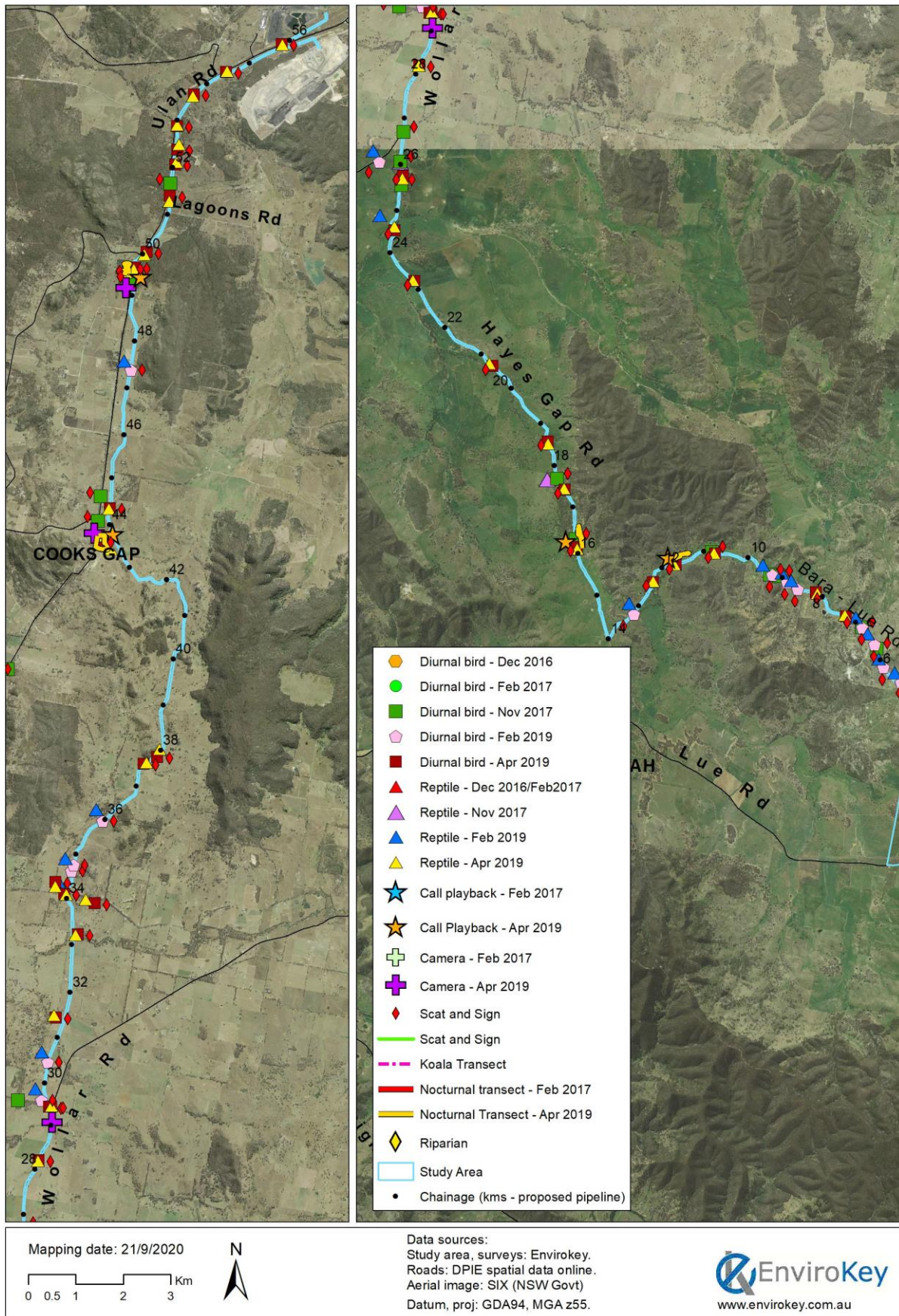
During each survey period, the following herpetofauna surveys were completed:

- |                                 |            |
|---------------------------------|------------|
| • 30 January to 3 February 2017 | 23 surveys |
| • 13 to 16 November 2017        | 2 surveys  |
| • 29 January to 3 February 2019 | 26 surveys |
| • 3 to 7 April 2019             | 34 surveys |

### **Call Playback Surveys**

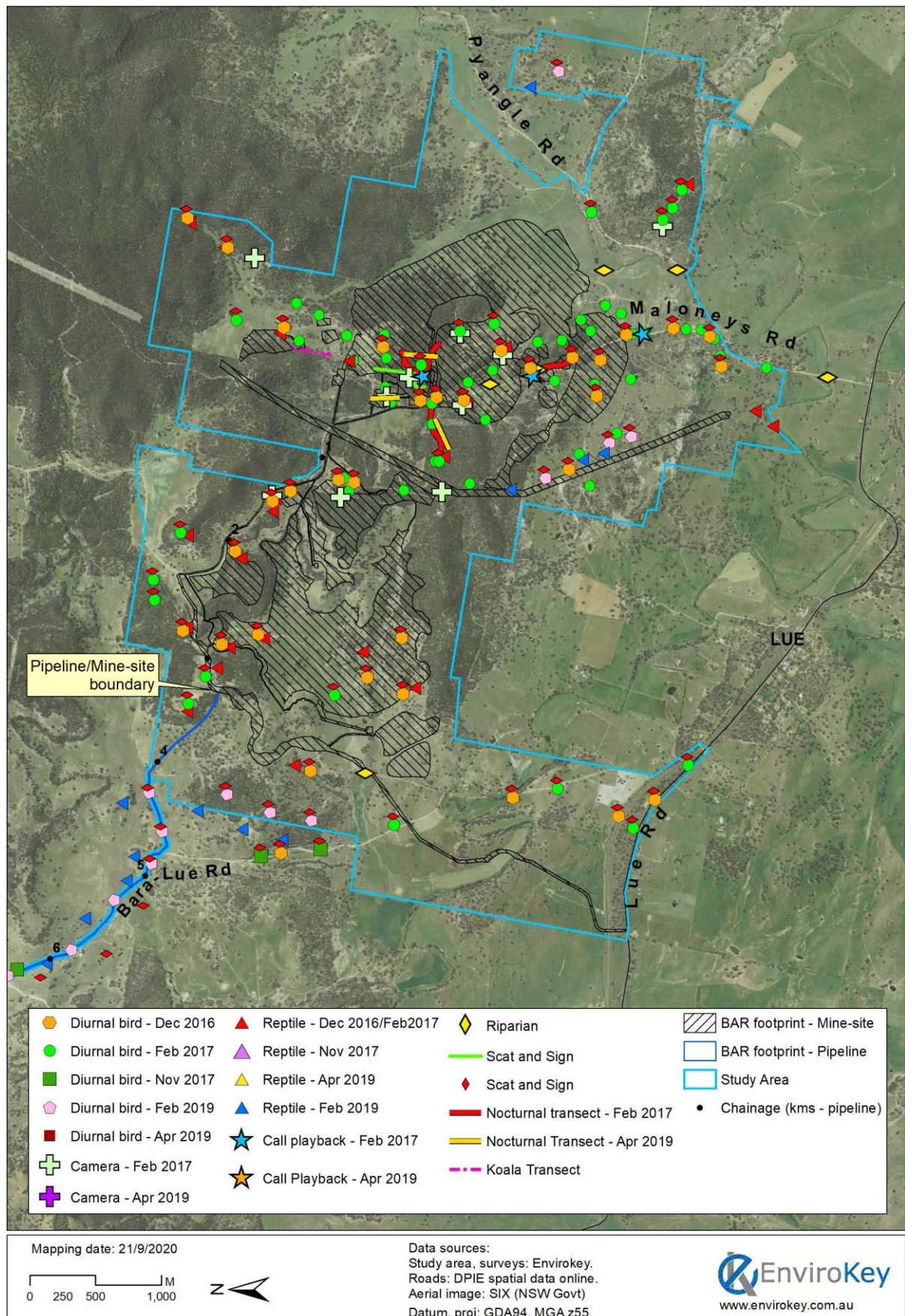
Call playback was conducted to target nocturnal fauna. The target species for this assessment were the Masked Owl, Barking Owl, Bush Stone Curlew and Koala. Call playback was undertaken at three sites across the Study Area during both the December 2016 and February 2017 field surveys. In the December 2016 survey, the three sites were surveyed each night for the three nights. In February 2017, all three sites were surveyed on one occasion. Call playback was also carried out in April 2019 at four locations.

Map 12 Fauna Survey Locations within the Study Area





**Map 13 Fauna Survey Locations within the Study Area**



At each location, the Call playback survey commenced with an initial listening period of 10 minutes. The call of a target species was then transmitted intermittently over a period of five minutes, following by a five minute listening period. This was then repeated for each target species. Spotlighting was undertaken at the conclusion of the Call playback, with a minimum of 20 minutes at each site.

### **Koala Transects and Scat & Sign Searches**

In the February 2017 field survey, two Koala transects were carried out. The purpose of these transects was to follow up on the detection of a single Koala by Bowdens Silver Staff during the December 2016 field survey by EnviroKey.

Each transect was systematically searched for active and inactive Koalas, their signs (i.e. scratches on trees) and their scats. Each transect was slowly walking with specific scat searches every 50 metres. Each transect was carried out in about 2-person hours.

Additional search effort for Koala was also completed during Scat and Sign Searches. A total of 137 Scat and Sign searches for a period of 10 minutes each were also carried out at the conclusion of every Diurnal bird survey. These were completed as follows:

- |                                 |                           |
|---------------------------------|---------------------------|
| • 4 to 9 December 2016          | 33 scat and sign searches |
| • 30 January to 3 February 2017 | 19 scat and sign searches |
| • 13 to 16 November 2017        | 26 scat and sign searches |
| • 29 January to 3 February 2019 | 25 scat and sign searches |
| • 3 to 7 April 2019             | 34 scat and sign searches |

The extensive nature of the Koala scat searches provides an excellent understanding of the potential habitat occupancy through the BAR footprints. The results of this work confirm that these potential habitats showed no sign of current, or previous occupancy (in terms of the life of a scat). Given this, only the BVT/PCT in the highest condition that was found to provide habitat occupancy, and was therefore assigned as a species polygon for Koala.

### **Spotlighting and Echolocation Call Recording Survey**

Spotlighting was undertaken using a hand-held 50W spotlight by two persons for a period of one person-hour for each survey. A total of three sites were surveyed during the December 2016 and February 2017 field surveys. In addition, vehicular spotlighting was also conducted while travelling across the Study Area during nocturnal surveys.

While spotlighting, microchiropteran bats were targeted by using a 'Titley' Anabat SD1 Echolocation Call Recording Unit coupled to a Personal Digital Assistant for active monitoring. Survey time along each transect was about 30 minutes. Additionally, a single stationary anabat unit was activated at a single site for 4 nights during the December 2016 field survey. Mobile monitoring was also conducted while travelling across the Study Area during nocturnal hours with the use of an Anabat Car Mount with High Mount Microphone.

The use of Echolocation Call Recording Units is consistent with State and Commonwealth guidelines for surveying microchiropteran bats.

All data collected from the Anabat SD1 were then analysed into bat and non-bat origin files. These files were then analysed using the software package AnalookW guided by '*Bat Calls of New South Wales: Region based guide to echolocation calls of microchiropteran bats*' (Pennay et al., 2004) and the EnviroKey reference call collection. Members of the *Nyctophilus* genus could not be identified to species level due to a lack of differentiation between species and are identified to genus level only. Anabat analysis was conducted by Principal Ecologist Steve Sass, who has analysed more than 100 000 files from across western and central NSW.

A call was defined as a sequence of three or more consecutive pulses of similar frequency. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating as follows.

D = Definite: Species identification not in doubt.

PR = Probable: Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call types.

PO = Possible: Call characteristics are comparable with the species, but there exists a reasonable probability of confusion with one or more similar bat species or the quality or length of call prohibits a confident identification.

Those calls unable to be identified due to poor call quality resulting in a lack of diagnostic features were assigned 'Unidentifiable'.

### Scat and Sign Search

Two dedicated track and scat transect searches were completed across the Study Area, as well as an additional 137 Scat and Sign searches for a period of 10 minutes each were carried out at the conclusion of every Diurnal bird survey. Any track and scat of interest observed during the field survey while undertaking other survey methods, was inspected. In the case of scats, identification was made using '*Tracks, Scats and Other Traces: A field guide to Australian Mammals*' (Triggs, 2008). Where identification was in doubt, a sample was collected and sent to the author of that guide and scat specialist Barbara Triggs for further analysis.

### Riparian Survey

Six sites were selected *apriori* for the February 2017 field survey on the basis of EnviroKey's existing knowledge of the Study Area and the relative representativeness of riparian habitats present. Each site was visually assessed for the presence of native and exotic flora, and fauna habitats, with a particular emphasis on the interface between land and water (in accordance with the definition of riparian vegetation).

## 2.3.8 Fauna Survey Effort

Fauna survey effort was focused on the basis of vegetation communities and potential habitat for threatened flora and fauna within the Study Area. A summary of the field survey effort for each survey method is provided (

Table 4). Fauna survey effort was guided by the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (working draft) (DEC, 2004) taking into consideration the size of the Study Area and the vegetation communities and fauna habitats present. The diverse range of survey methods used in this study and the survey effort conducted confirms that overall, this assessment is consistent with OEH guidelines.

Weather conditions during the field survey were considered conducive to detecting all fauna species including threatened fauna. Data from Bowdens Silver weather station (MET01) is presented (**Table 3**).

**Table 3**  
**Weather conditions during the field surveys from the Bowdens Silver Weather Station**  
**(MET01: GDA Zone 55 770080E 6385069N)**

Date	Min Temp (degrees C)	Max Temp (degrees C)	Rainfall (mm)
04/12/16	11.9	33.6	-
05/12/16	17.8	34.0	-
06/12/16	17.1	27.8	1.8
07/12/16	13.5	27.4	1.8
08/12/16	11.4	32.1	-
09/12/16	6.0	21.5	-
30/01/17	17.4	35.9	-
31/01/17	18.8	37.9	-
01/02/17	20.7	37.5	12.8
02/02/17	20.2	28.5	0.2
03/02/17	19.6	29.9	-
13/11/17	5.9	24.3	19
14/11/17	10.0	24.2	0.2
15/11/17	7.9	26.7	-
16/11/17	11.0	18.6	3.8
29/01/19	18.6	33.6	0.2
30/01/19	21.1	28.6	-
31/01/19	19.2	31.7	-
01/02/19	17.4	22.8	-
02/02/19	17.9	26.6	-
03/02/19	14.7	31.8	-
03/04/19	7.72	23.7	-
04/04/19	8.13	22.7	-
05/04/19	10.2	20.6	-
06/04/19	9.85	25.0	-
07/04/19	8.67	27.2	-



**Table 4**  
**Summary of Fauna Survey Type, Effort and Target Fauna Conducted for this Assessment**

<b>Survey Type</b>	<b>Total Survey Effort</b>
Diurnal Birds	137 locations for 20 minutes each. Total survey effort was 2,740 minutes
Camera Trap Surveys	December 2016: Five sites over 5 nights/6 days resulting in 25 camera nights / 30 camera days.  February 2017: Five sites over 3 nights/4 days resulting in 15 camera nights / 20 camera days.  April 2019: Four sites over 3 nights/4 days resulting in 12 camera nights and 16 camera days.  Total survey effort: 52 camera nights/66 camera days.
Herpetofauna Survey	85 sites in total for 30 minutes each. Total survey effort 2 550 person minutes
Call Playback	December 2016: Three sites in total. Three sites were surveyed each night for 3 nights (9 surveys).  February 2017: Three sites in total. Three sites surveyed on one occasion.  April 2019: Four sites each surveyed on one occasion.  Total survey effort: 16 hours.
Koala Transects and Scat and Sign Searches	February 2017: Two transects each taking 2 person hours. Total survey effort, 4 person hours.  December 2016: 33 scat and sign searches Jan/Feb 2017: 19 scat and sign searches November 2017: 26 scat and sign searches Jan/Feb 2019: 25 scat and sign searches April 2019: 34 scat and sign searches
Spotlighting & Echolocation Call Recording	At Call Playback Sites: During each of the 16 survey occasions, 20 minutes of spotlighting was completed at the conclusion of call playback. Total survey effort was 320 minutes.  December 2016 & February 2017: At three sites, 1 person hour of spotlighting and echolocation call recording. 2 person hours per survey period, giving a total of 6 person hours of spotlighting and echolocation call recording.  December 2016: A single Anabat detector was placed beside a dam over 4 nights.  April 2019: 2 person hours of spotlighting/echolocation call recording was carried out at four locations giving a total of 8 person hours.  Total echolocation call recording survey effort: 22 recording hours plus 4 nights of recording  Total spotlighting survey effort: 20 person hours.
Scat and Sign Search	137 searches totalling 10 minutes each. Total survey effort: 1 370 minutes
Riparian Surveys	6 sites over 30 minutes each. Total survey effort: 180 minutes

### **2.3.9 Field Survey Personnel**

This BAR was led by Mr. Steve Sass (Principal Ecologist, B.App.Sci (Env.Sci) (Hons), Grad.Cert.CaptVertMngt (CSU)) of EnviroKey. Mr Sass is an accredited Biobanking Assessor (accreditation no. 0143). Field surveys were conducted by suitably qualified and experienced personnel. Previous studies are included within the BAR and these were also prepared by suitably qualified and experienced personnel. Details of all personnel and their role in the preparation of the BAR are provided (see **Annexure 1**).

### **2.3.10 Nomenclature**

Nomenclature used within this report follows Morcombe (2004) for birds, Menkhorst & Knight (2010) for mammals (except bats) and for bats, Churchill (2008). For frogs, the latest field guide is used (Tyler and Knight, 2009) and for reptiles, the field guide to the reptiles of NSW (Swan et al., 2004) with modifications due to recent taxonomic revisions where required (Sass, 2011b, Sass, 2011a). For flora, plants were identified using keys and nomenclature in the online version of Flora of NSW (PlantNET, 2019). Where known, changes to nomenclature and classification have been incorporated into the results.

Where no common name is provided with these texts, a generally accepted name is used.

### **2.3.11 Limitations**

A common limitation of many biodiversity studies is the short period of time in which they are conducted. When combined with a lack of seasonal sampling this can lead to either low detection rates or false absences being reported. This is also particularly relevant to highly mobile species that may not have been in the Study Area at the time of the field surveys. However, the field survey for this BAR was extensive and comprehensive and the results are indicative of the likely flora and flora species that utilise the habitats of the Study Area. Conversely, some species that may use the Study Area from time to time may not have been recorded, but these were outside of the field surveys.

Plot locations were recorded with hand-held GPS units, which can have location errors of up to 30 metres in some conditions. While it is noted that vegetation floristic plots provide an indicative flora species list, these are not exhaustive of the species present in the entire Study Area. The floristic surveys and biometric plots were largely conducted within the optimal survey period for most flora.

For some portions of the proposed water pipeline, land access agreements were not in place at the time of the field surveys. In this instance, a combination of air photo interpretation, 'over the fence' survey and the use of existing data, was used qualitatively to 'best-guess' the BVT and presence of TEC in those portions.

### 3. LANDSCAPE FEATURES

#### 3.1 IBRA BIOREGIONS AND SUBREGIONS

The Study Area is located within two Bioregions; the Sydney Basin Bioregion which extends north to the Hunter Valley, west to Mudgee and south to Batemans Bay, and the NSW South West Slopes Bioregion which extends south to near Albury (Thackway and Creswell, 1995, NPWS, 2003a). The Sydney Basin bioregion extends over the Mine Site and part of the water supply pipeline corridor, while the NSW South Western Slopes Bioregion, Upper Slopes Subregion is present at the very south of the Maloneys Road re-alignment, and for about two-thirds of the water supply pipeline corridor.

The Wollemi Subregion of the Sydney Basin Bioregion occurs in the north of the Mine Site, and the northern portion of the water supply pipeline corridor, while the Capertee Subregion extends across the majority of the Mine Site.

A third bioregion, the Brigalow Belt South Bioregion, is located about 100 metres west of the northern extent of the water supply pipeline corridor.

#### 3.2 MITCHELL LANDSCAPES

Seven Mitchell Landscapes occur within the Study Area (Mitchell, 2002). These being Talbragar-Upper Macquarie Terrace Sand, Upper Goulburn Valleys and Escarpment, Cope Hills Granite, Capertee Plateau, Gulgong Ranges, Cudgegong Channels and Floodplains and Wollemi Ranges (**Map 14**). An additional Mitchell Landscape; Sydney Basin Diatremes, occurs within the outer assessment circle but is outside the Study Area and BAR footprint.

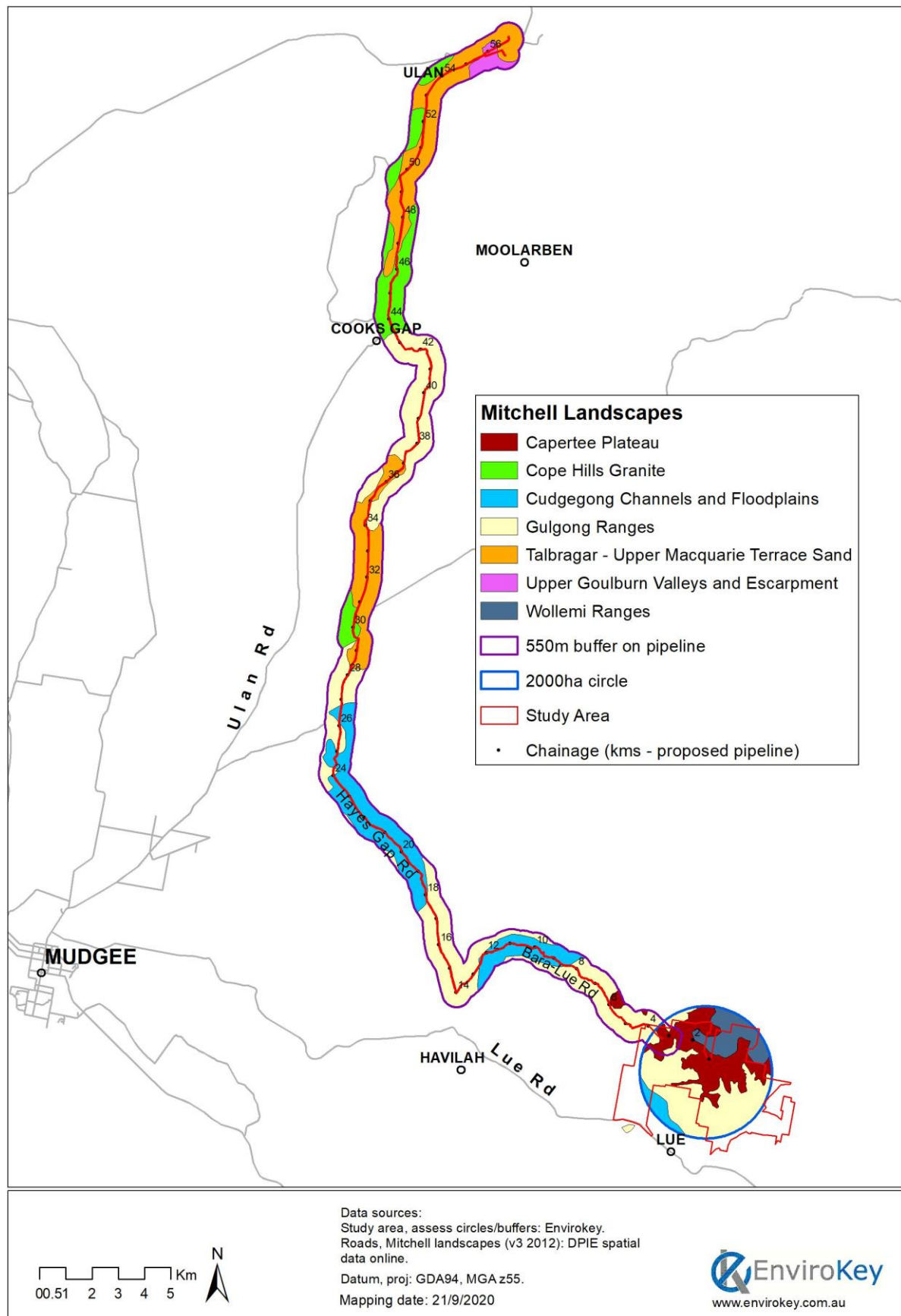
With seven Mitchell Landscapes occurring within the Study Area, the landscapes and soils are generally complex and likely to be overlapping. The following descriptions have been sourced from the detailed work of Mitchell (2002).

In the Capertee Plateau landscape, wide valleys, low rolling hills below sandstone cliffs on Permian conglomerates, sandstones, and shales with coal occur at the base of the Sydney Basin and on exposure of underlying Devonian shale, siltstone or quartzite. General elevation is between 800 and 1 000 metres AHD with local relief generally between 100 and 120 metres. Shallow stony texture-contrast soil profiles occur, usually with gritty well drained A-horizons, over tough yellow or grey poorly drained clays. Boulder debris with a clay matrix occurs below cliffs with organic sand in swamps.

The Gulgong Ranges landscape is characterised by strike ridges with steep slopes and long debris aprons on complexly folded steep dipping Silurian lithic sandstone, quartzite and phyllite, Devonian sandstone, siltstone, shale, rhyolite and dacite. Elevation is generally between 550 and 980 metres AHD with local relief around 350 metres.

The Wollemi Ranges landscape is characterised by strongly undulating ranges and dissected plateaus on horizontal Triassic quartz and lithic sandstones, conglomerate and some shale. Generally, elevation is between 300 and 800 metres AHD with a local relief of 200 metres. Extensive rock outcrops can occur with thin sandy soils in joint crevices and on benches.

**Map 14 Mitchell Landscapes in the locality**



Steeper slopes below plateau remnants occur with iron cemented gravels, gradational yellow earth and yellow texture-contrast profiles.

The Cudgegong Channels and Floodplains landscape occurs as channels, floodplains and terraces on Quaternary alluvium, with a general elevation of between 450 and 600 metres AHD. Local relief is relatively minor and generally around 30 metres. Undifferentiated loam and sandy loam occurs on the floodplains, dark gradational loams on low terraces and red-yellow texture-contrast profiles on high terrace remnants against steep hill slopes.

The Cope Hills Granite is characterised by undulating and rolling hills on Carboniferous granite, with a general elevation between 500 and 740 metres AHD with a local relief of 150 metres. Gritty gradational red earth and red texture-soils occur in this landscape.

The Upper Goulburn Valleys and Escarpment occurs as steep hills and sandstone escarpments with cliffs, rock outcrops and long debris slopes on Permian and Triassic quartz sandstone, lithic sandstone, conglomerate and shale. It generally occurs at an elevation of 250 to 700 metres AHD and has a local relief of 250 metres. Soils in this landscape are rubbery textured and harsh texture-contrast soils.

The Talbragar – Upper Macquarie Terrace Sands and Gravels occurs at a general elevation of between 350 and 500 metres AHD, with a minor local relief of 30 to 40 metres. This landscape is found on sandy Quaternary alluvial sediments on the floodplain and terraces of the Talbragar River. Soil profile is red-brown and red-yellow earthy sands with some yellow texture-contrast soils on the valley margins.

### 3.3 RIVERS AND STREAMS

The Mine Site has a number of streams classified as Order 1 to Order 4 or greater (**Map 16**). Hawkins and Lawsons Creeks (4<sup>th</sup> order or greater) appear to be intermittent, with aquatic habitat consisting of a series of disconnected pools following extended periods of low rainfall. Many of the tributaries flowing through the Mine Site were not flowing despite recent rainfall and are probably highly ephemeral (Cardno, 2020) and are considered 3<sup>rd</sup>, 2<sup>nd</sup> or 1<sup>st</sup> order streams. Within the BAR footprint (Mine Site), these streams would be removed so no riparian buffer is applied. In general, riparian vegetation has been either previously removed, or significantly altered by past agricultural activity, based on EnviroKey's assessment of these landscape features.

The riparian zone (or riparian area) is the interface between land and water. Riparian vegetation is the term used to describe the plants growing on the water's edge, the banks of rivers and creeks and along the edges of wetlands (DPI, 2017). With the association of water, riparian vegetation often has affinities with the requirement for water dependence, such as flooding River Red Gums, or vegetation that prefers to grow in consistently wet soils. Riparian vegetation throughout the proposed Mine Site and directly adjacent is largely dominated by introduced grasses with little or no native vegetation present. At some locations, Rough-barked Apple and various Eucalypts occur. However, these species are not confined to riparian areas, and throughout the Study Area, can be seen growing in various landscape positions, often well away from a permanent or ephemeral watercourse. In some of the watercourse, native aquatic flora is present. These comprises mostly 'weedy' species such as Native Reed and Cumbungi.

Photographic examples of riparian areas and riparian vegetation are shown in **Plate 1**.





**Plate 1 Examples of riparian areas and riparian vegetation throughout the Study Area**

Along the proposed water supply pipeline corridor, two major creeks occur- Stony Creek which then flows into Cooyal Creek and Moolarben Creek which are also likely to 4<sup>th</sup> Order or greater (**Map 15**). Stony Creek flows east to west while Moolarben Creek flows from south to north and eventually into the Goulburn River at Ulan. In general, riparian vegetation has been either previously removed, or significantly altered by past agricultural activity and erosion, based on our assessment of these landscape features. The pipeline traverses' 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> order streams on up to 26 occasions, although no detailed analysis has been performed. No buffer distances are applied to any waterway given that the BAR footprint for the pipeline traverses each feature. It is likely that any impacts would be from directional drilling by underboring each waterway.

### **3.4 CAVES, OVERHANGS, CREVICES, CLIFFS AND ESCARPMENTS**

The BAR footprints are largely devoid of caves, overhangs, crevices, cliffs or escarpments. The Aboriginal and Historical Cultural Heritage Assessment prepared by Landskape Natural and Cultural Heritage Management (2020) identifies a rock shelter (identified as BL44). The rock shelter is within a tor, or rock outcrop, and is described as having a floor area of about 3m x 4m (p62). While this specific rock shelter has not been visited as part of this BAR, the general location has been traversed, and EnviroKey recorded a number of threatened bird species in this location. The general area was not deemed as having any significant value for biodiversity at the time of the inspection and the boulders were large with little, if any cracking.

The report also identifies two 'shallow pits' thought to be the beginnings of abandoned attempts to dig mine shafts. Both diggings have been inspected by EnviroKey ecologists who found that they do not provide any mine shaft habitat that could be suitable for roosting microchiropteran bats given their shallow nature (less than 1 metre) and being full of water.

To the north of the BAR footprint (Mine Site) a number of potential cliff lines could contain small caves, crevices and overhangs suitable for microchiropteran bats. The general location of these features is provided in **Map 17**.

### **3.5 WETLANDS**

There are no important or local wetlands relevant to the Study Area. There are no SEPP 14 wetlands in the Study Area, and no SEPP 14 wetlands would be affected by the Project.

### **3.6 POTENTIAL GROUNDWATER DEPENDENT ECOSYSTEMS**

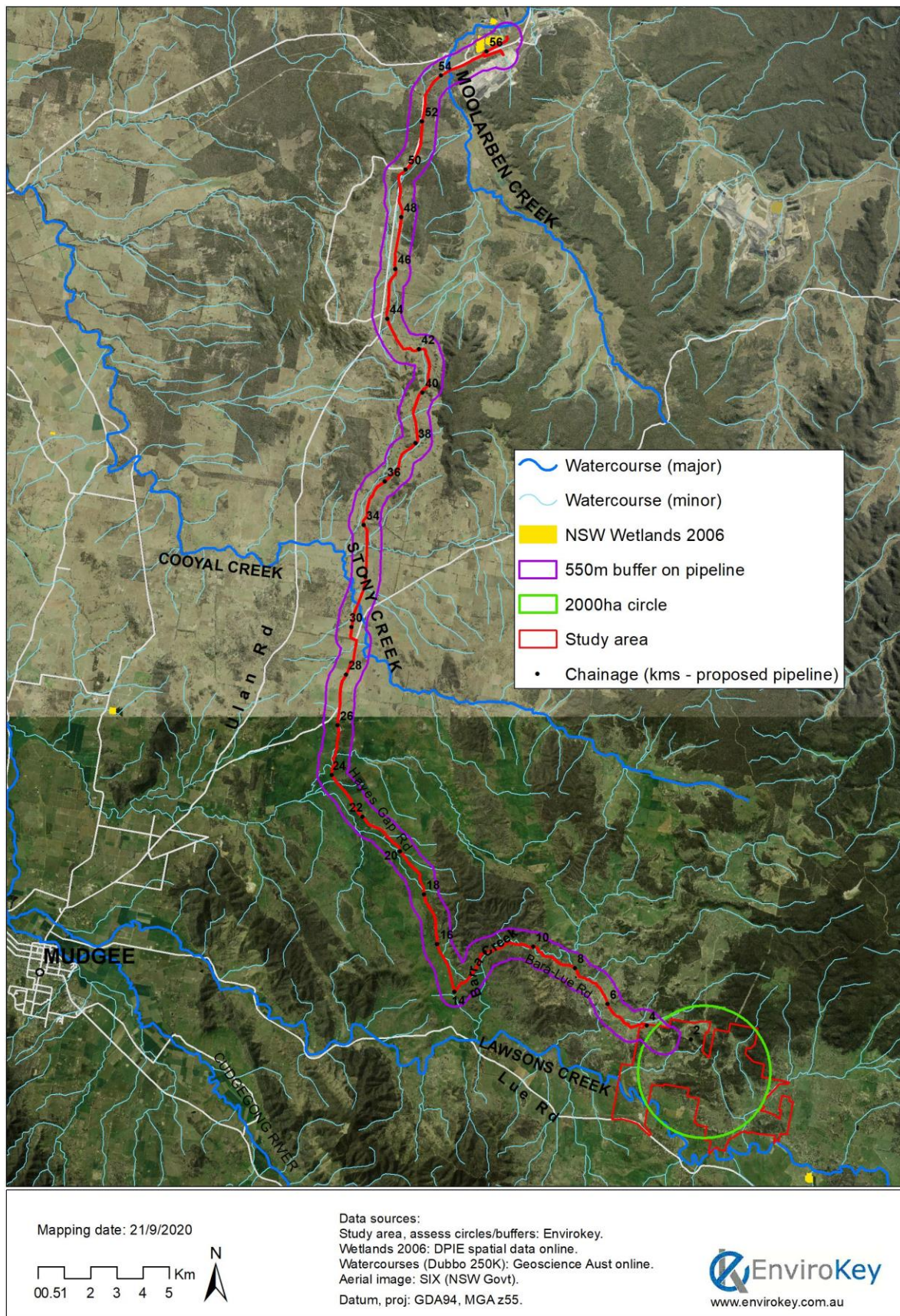
A review of the Atlas of Groundwater Dependent Ecosystems (GDE) revealed that aquatic, terrestrial and subterranean GDE occur within the Study Area. As this BAR focuses on terrestrial ecosystems, focus has been placed upon the terrestrial GDE.

The Atlas of GDE maps both low potential and high potential GDE within the Study Area (see **Map 18**). No known GDEs have been mapped within the Study Area. The information presented correlates low potential GDE as those vegetation communities on mid and upper slopes, with the Atlas characterising Red Stringybark and Inland Scribbly Gum as a vegetation community with low potential GDE. Areas containing species such as Blakely's Red Gum and Yellow Box are identified as potential vegetation communities with a high potential GDE.

In general, vegetation communities that are most likely to interact with GDE are those forming part of the riparian zone. Native vegetation is all but absent in the riparian areas (see Section 3.3), and it is likely that the vegetation remaining are not obligate phreatophytes.

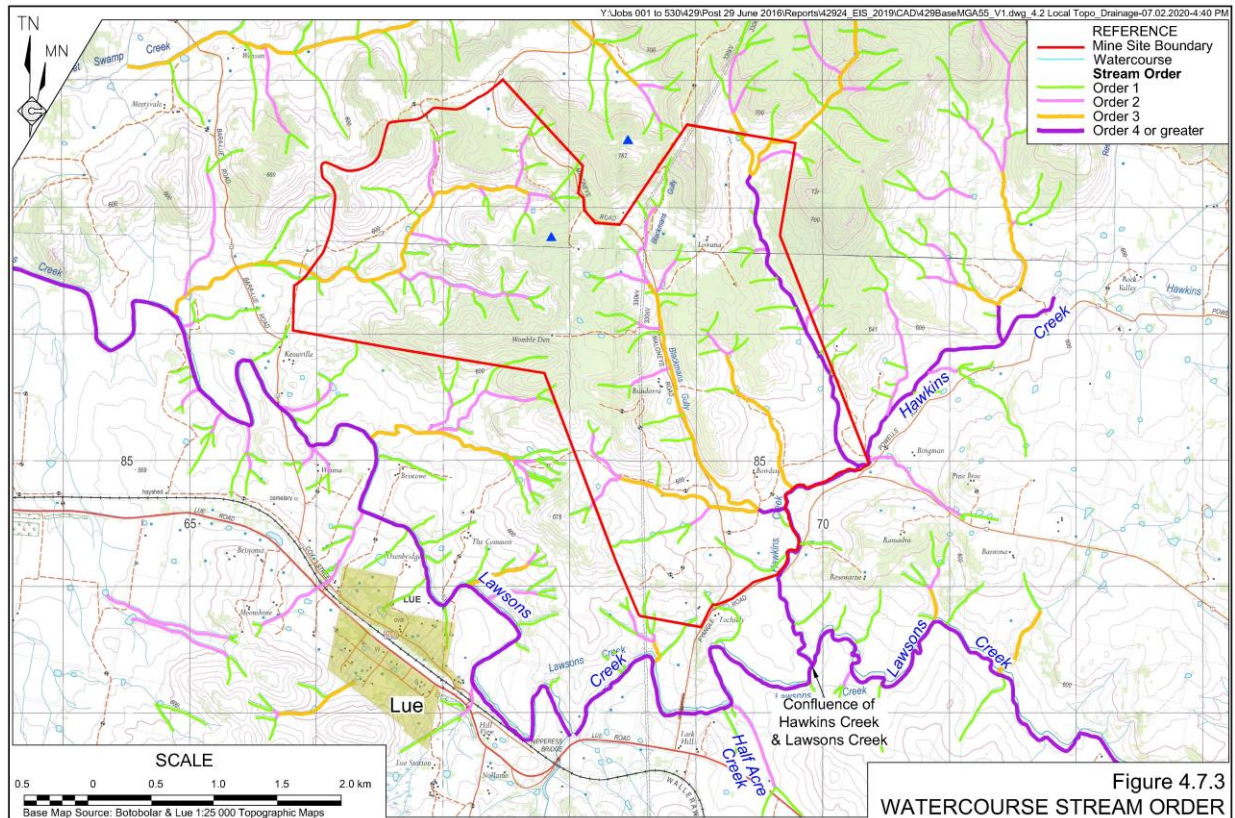


**Map 15 Watercourses and Wetlands in the locality**

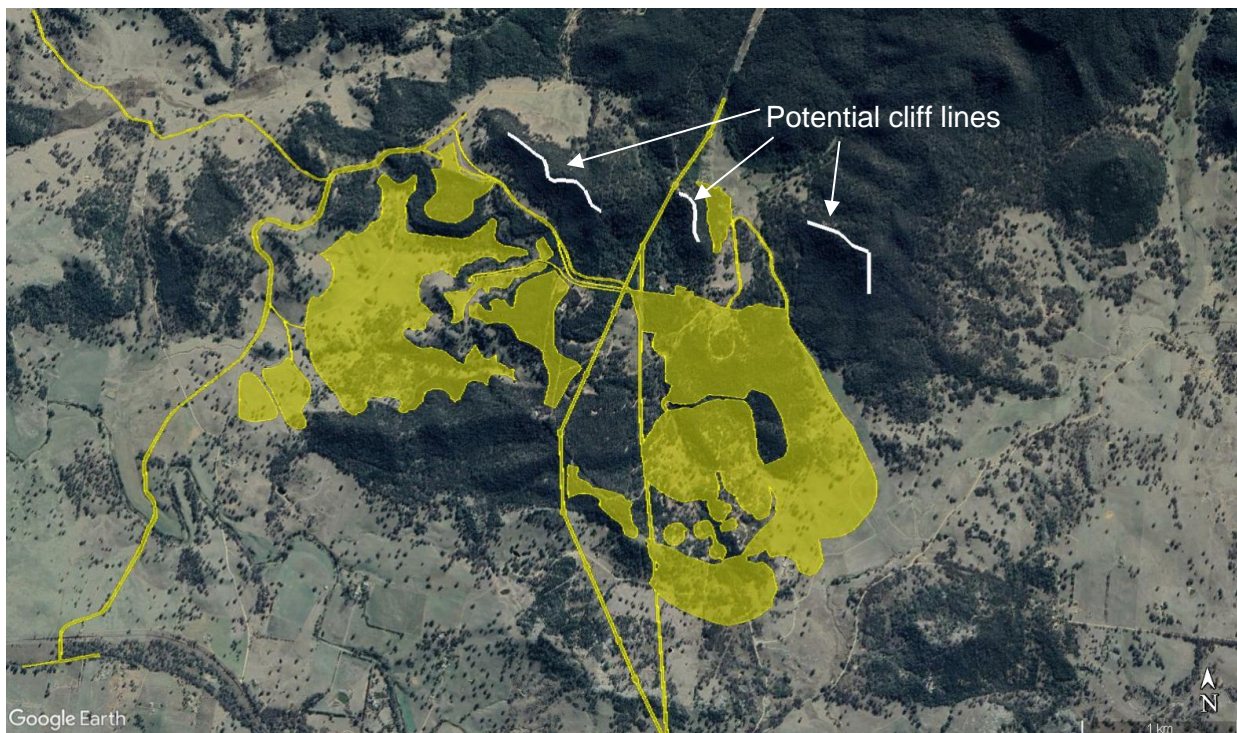




**Map 16 Stream ordering within and adjacent to the Mine Site**

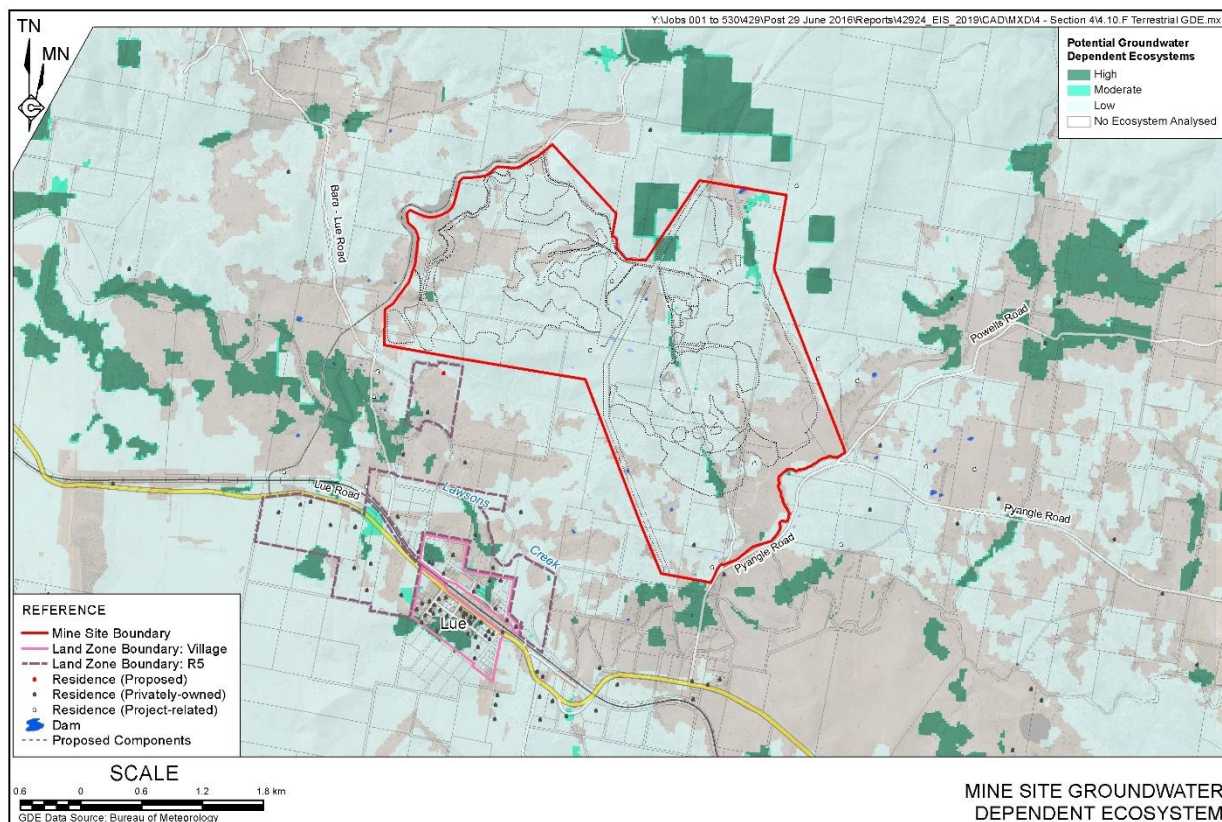


**Map 17 Potential cliff lines near the BAR footprint (Mine Site)**





## Map 18 Potential Groundwater Dependent Ecosystems



### 3.7 CONNECTIVITY VALUES

No formal State or regional biodiversity link is present within the Study Area, therefore none would be affected should the Project proceed.

Local wildlife corridors do exist at a smaller scale. The *Mid-Western Regional Local Environmental Plan 2012* identifies that portions of the Study Area are of 'Moderate Biodiversity Sensitivity' and 'High Biodiversity Sensitivity' with large portions in the north of the Study Area of no biodiversity sensitivity.

Connectivity value scores entered into the BBCC are detailed in **Table 5**.

**Table 5**  
**Connectivity Value Scores**

Attribute	Before Development	After Development
<b>Mine Site – Site-based assessment</b>		
Connectivity width class	>100m-500m	0-5m
Connectivity overstorey condition	PFC* > 25% of lower BM	No native overstorey
Connectivity midstorey condition	PFC* midstorey/ground cover >50% of lower BM	No midstorey/ground cover
<b>Pipeline – Linear-based assessment</b>		
Connectivity width class	No link	-
Area/Perimeter ratio	46	44
*Projected Foliage Cover		

### 3.8 LANDSCAPE VALUE SCORE

The Project has both Site-based impacts and linear impacts and while it was decided to assess the landscape value score as a Site-based development in the BBAM Credit Calculator (BBCC) as the majority of the impacts are at the Mine Site, rather than the linear water pipeline, BCD requested that the project be assessed using two projects in the BBCC. For the pipeline, a 550 metre 'buffer' was created and assessed using the approach detailed by the Lineal Module of the FBA (see Section 2.2.3) while for the site-based assessment, two landscape circles were created, a 200ha assessment circle and a 2 000ha circle.

**Table 6** provides the native vegetation cover before and after the proposed disturbance for Mine Site (site-based assessment), and the native vegetation percent class entered into the BBCC as defined by the FBA, while

**Table 7** relates to the pipeline (linear-based assessment).

The landscape value score for the Study Area is 30.0 as calculated by the BBCC for the Mine Site, while the landscape value score for the Study Area for the Pipeline was 4.5.

**Table 6**  
**Native Vegetation Cover in Assessment Circles for the Mine Site (site-based assessment)**

Assessment Circle	Before Development			After Development		
	Area of Native vegetation (ha)	Native vegetation cover (%)	Native vegetation percent class	Area of Native vegetation (ha)	Native vegetation cover (%)	Native vegetation percent class
Outer	1,642	82	80-90	1,317	64	60-70
Inner	188.1	94	90-100	45.7	23	20-30

**Table 7**  
**Native Vegetation Cover in Assessment buffer for the pipeline (linear-based assessment)**

Assessment	Before Development			After Development		
	Area of Native vegetation (ha)	Native vegetation cover (%)	Native vegetation percent class	Area of Native vegetation (ha)	Native vegetation cover (%)	Native vegetation percent class
550m buffer	1 952.86	32.92	30-35	1 937.73	32.66	30-35

## 4. NATIVE VEGETATION

### 4.1 VEGETATION ZONES

Comprehensive field surveys revealed 11 BVT within 14 vegetation zones occur within the Study Area. Each vegetation zone is described within this chapter based on their respective vegetation condition (Moderate/Good\_high, Moderate/Good\_medium, Moderate/Good\_poor). The extent and distribution of each BVT and vegetation zone are detailed on **Map 19** to **Map 29**. This section provides a description of each, a floristic summary and photographic example. A summary of the extent of each BVT within both the Study Area and BAR footprint is provided in **Table 8**.

**Table 8**

**Summary of BVT / PCT Areas within the Study Area and BAR Footprint (Mine Site and Pipeline)**

BVT	PCT	Condition	Study Area (ha)	BAR Footprint – Mine^ Site (ha)	BAR Footprint – Pipeline (ha)
<b>CW 111*</b> Rough-barked Apple – Red Gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281	Moderate / Good_medium	336.30	88.33	4.53
		Moderate / Good_poor	201.71	64.02	2.36
<b>CW 112*</b> Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	277	Moderate / Good_poor	273.15	21.80	0
<b>CW 216*</b> White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	266	Moderate / Good_medium	9.18	0	1.24
<b>CW217</b> White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the central western slopes of NSW	273	Moderate / Good_medium	69.42	21.68	0
<b>CW 242</b> Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes	325	Moderate / Good_high	71.86	1.04	0
<b>CW 249</b> Derived grassland of the NSW South Western Slopes	796	Moderate / Good_poor	21.87	0	5.18
<b>CW 263</b> Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	324	Moderate / Good_high	102.57	56.65	0
<b>CW 270</b> Mugga Ironbark – Red Box – White Box – Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion	358	Moderate / Good_high	3.2	0.77	0
<b>CW 272</b> Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills	468	Moderate / Good_medium	2.59	0	0.65
<b>CW 291</b> Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion	323	Moderate / Good_high	420.69	81.69	0.21
		Moderate / Good_medium	39.19	11.81	0.20
		Moderate / Good_poor	96.32	18.92	0
<b>CW 299</b> Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region	401	Moderate / Good_medium	2.87	0	0.76
<b>Total</b>			<b>1 650.91</b>	<b>366.71</b>	<b>15.13</b>
* Meet the definition of BGW, a Threatened Ecological Community.					
^ Includes relocated Maloneys Road and Transmission Line					

#### 4.1.1 CW 217 White Box Shrubby Open Forest on Fine Grained Sediments on Steep Slopes in the Mudgee Region of the Central Western Slopes of NSW (Moderate/Good\_medium)

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW217. A summary of the floristic diversity is provided in **Table 9**. A photographic example is provided in **Plate 2**.

**PCT:** 273

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 60% (Central West)

**Condition:** Moderate/Good\_Medium. Occurs on upper slopes and ridges. Overstorey cover is >25% of the lower benchmark for the community, as the canopy has generally been thinned, occasionally remaining intact or comprising regrowth. The shrub layer is often thinned, with the understorey generally dominated by native grasses and other groundcovers. However, exotic pasture species and typical farm weeds are common throughout, especially around stock camps. A Tree-of-Heaven infestation occurs in the vicinity of coordinates 767700 E, 6386350 N (MGA zone 55).

**Extent in the Study Area:** 69.42ha

**Extent in the BAR Footprint (Mine Site):** 21.68ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** EK4, EK5, EK11, ELA17, ELA55.

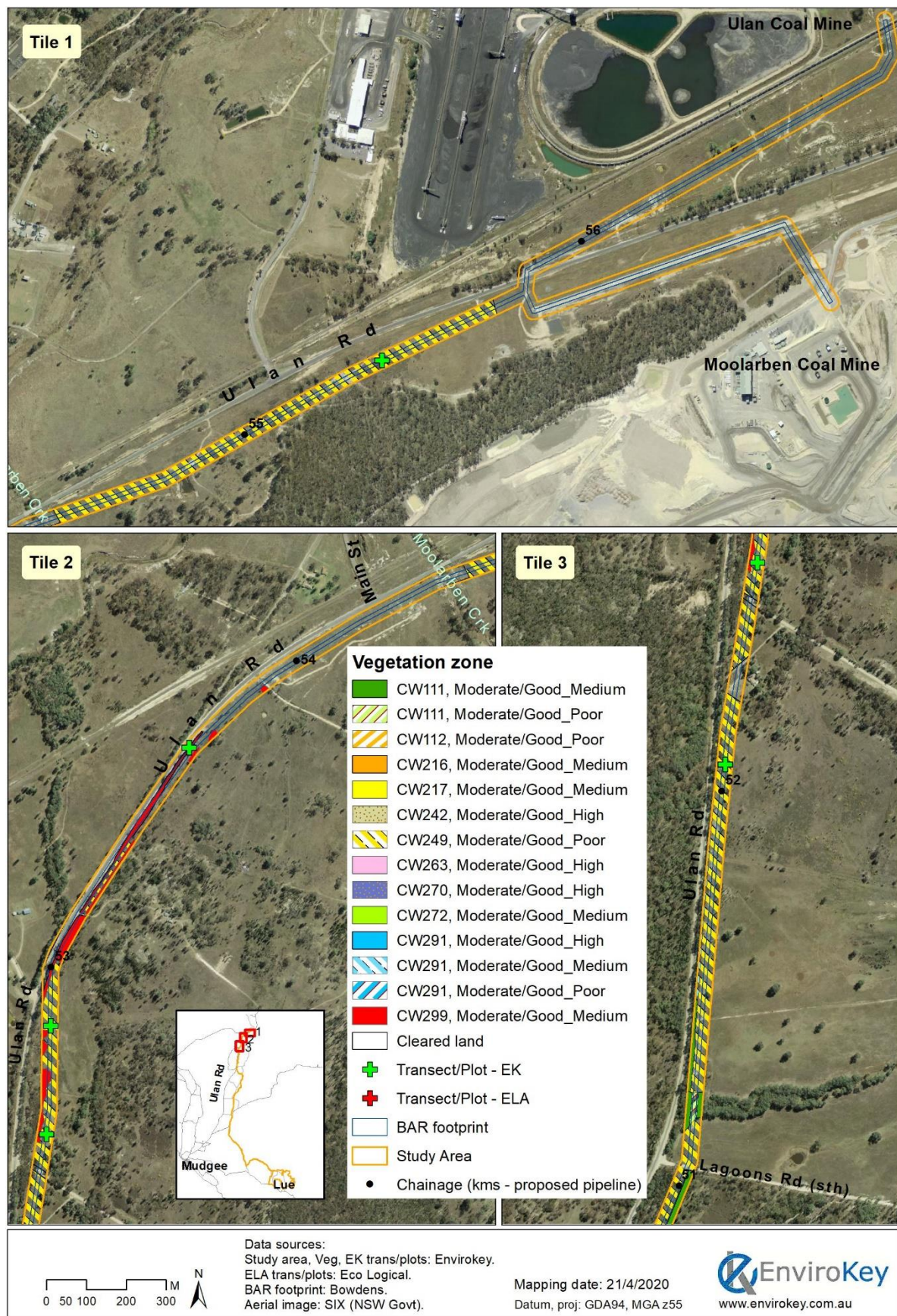
Table 9

Summary of the Floristic Diversity within CW 217 White Box Shrubby Open Forest on Fine Grained Sediments on Steep Slopes in the Mudgee Region of the Central Western Slopes of NSW (Moderate/Good\_medium)

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	18 13 – 23	22.5 8 – 37	White Box, Red Stringybark ( <i>E. macrorhyncha</i> ), Black Cypress Pine ( <i>Callitris endlicheri</i> ), Rough-barked Apple ( <i>Angophora floribunda</i> ), Inland Scribbly Gum ( <i>E. rossii</i> ).
Shrubs/small trees	4.1 1.2 – 7	6.5 2 – 11	<i>Cassinia</i> spp., Hickory Wattle ( <i>Acacia implexa</i> ), Tablelands Wattle ( <i>A. caesiella</i> ), Native Blackthorn ( <i>Bursaria spinosa</i> ), Tree Violet ( <i>Melicactus dentatus</i> ), Sticky Daisy-bush ( <i>Olearia elliptica</i> ), Black Cypress Pine.
Groundcovers	0.5 0.1 to 0.7	74 46 – 90	Natives: Weeping Grass ( <i>Microlaena stipoides</i> ), Ringed Wallaby Grass ( <i>Rytidosperma caespitosum</i> ), Common Wheatgrass ( <i>Elymus scaber</i> ), Tufted Hedgehog Grass ( <i>Echinopogon caespitosus</i> ), Shorthair Plumegrass ( <i>Dichelachne micrantha</i> ), Speargrass ( <i>Austrostipa</i> sp.), Hoary Guinea Flower ( <i>Hibbertia obtusifolia</i> ), Stinging Nettle ( <i>Urtica incisa</i> ), Trailing Speedwell ( <i>Veronica plebeia</i> ), Kidney Weed ( <i>Dichondra repens</i> ), Stinking Pennywort ( <i>Hydrocotyle laxiflora</i> ), Bidgee-widgee, Native Geranium, Rock Fern. Exotics: Spear Thistle ( <i>Cirsium vulgare</i> ), Catsear ( <i>Hypochaeris radicata</i> ), Narrow-leaved Clover ( <i>Trifolium angustifolium</i> ), Rat's Tail Fescue ( <i>Vulpia myuros</i> ), St John's Wort ( <i>Hypericum perforatum</i> ), Silvery Hairgrass ( <i>Aira caryophyllaea</i> ).
Vines/climbers	-	<1%	Slender Tick-trefoil, Twining glycine

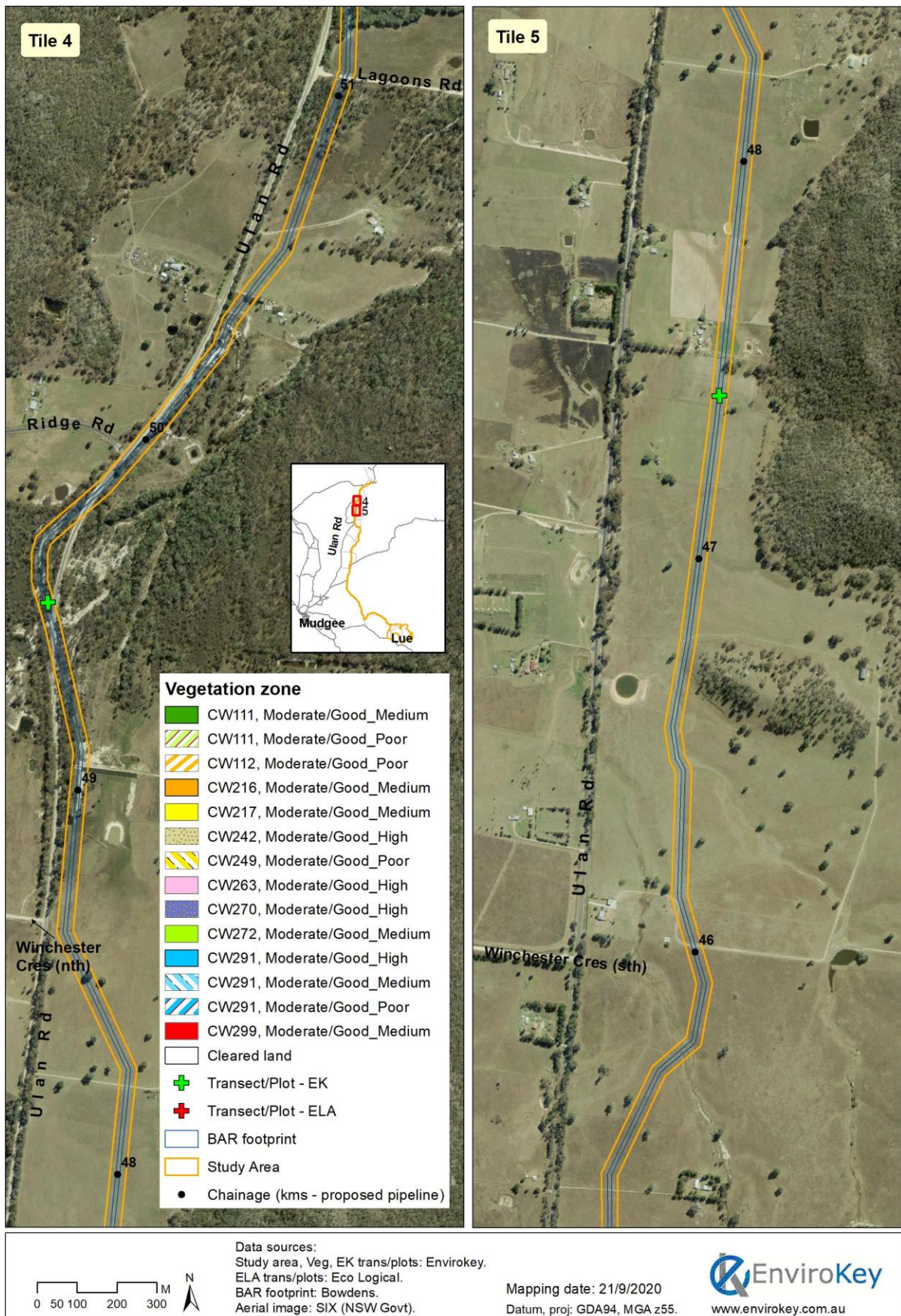


Map 19 Biometric Vegetation Types within the Study Area – Reference Areas 1 to 3



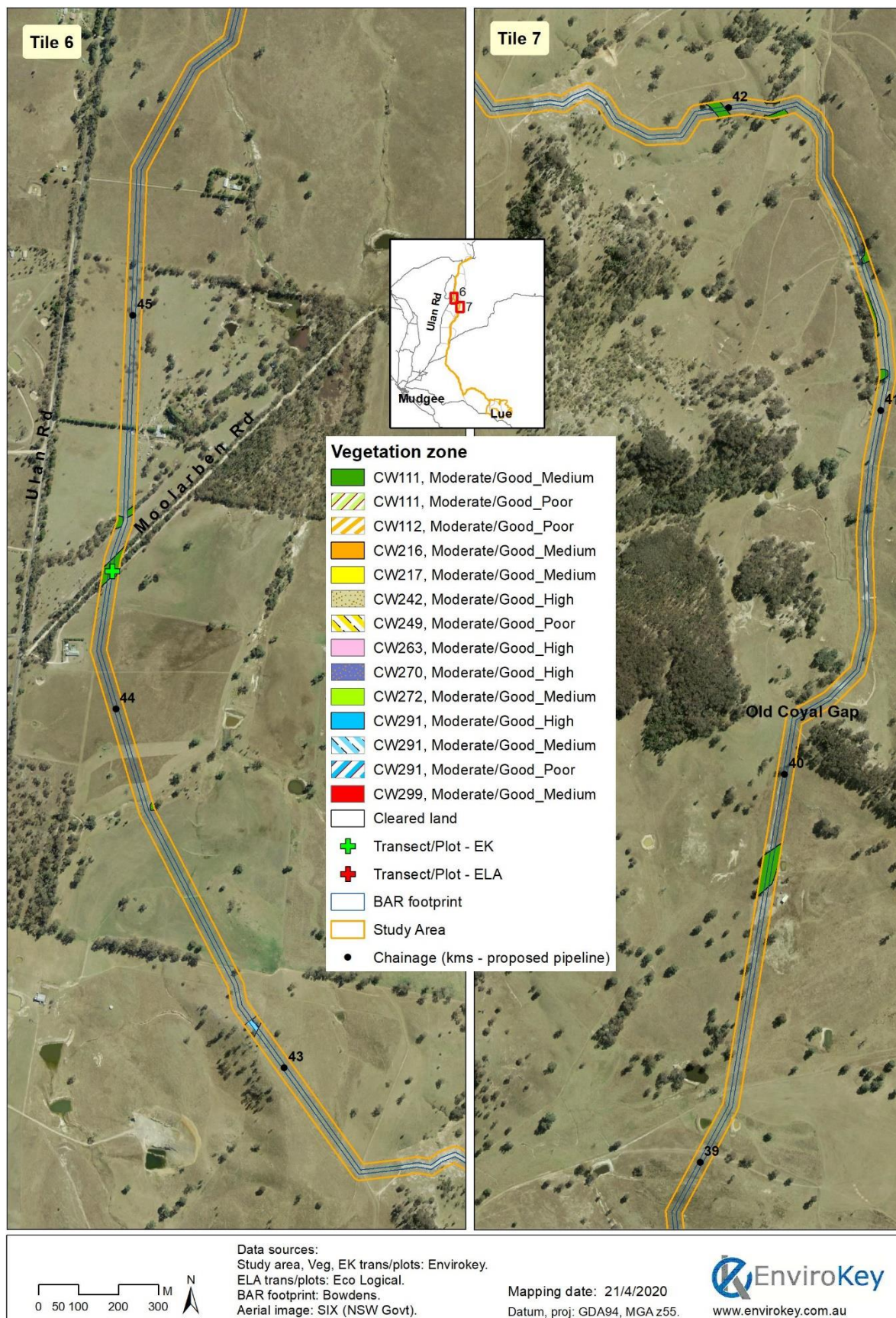


**Map 20 Biometric Vegetation Types within the Study Area – Reference Areas 4 and 5**



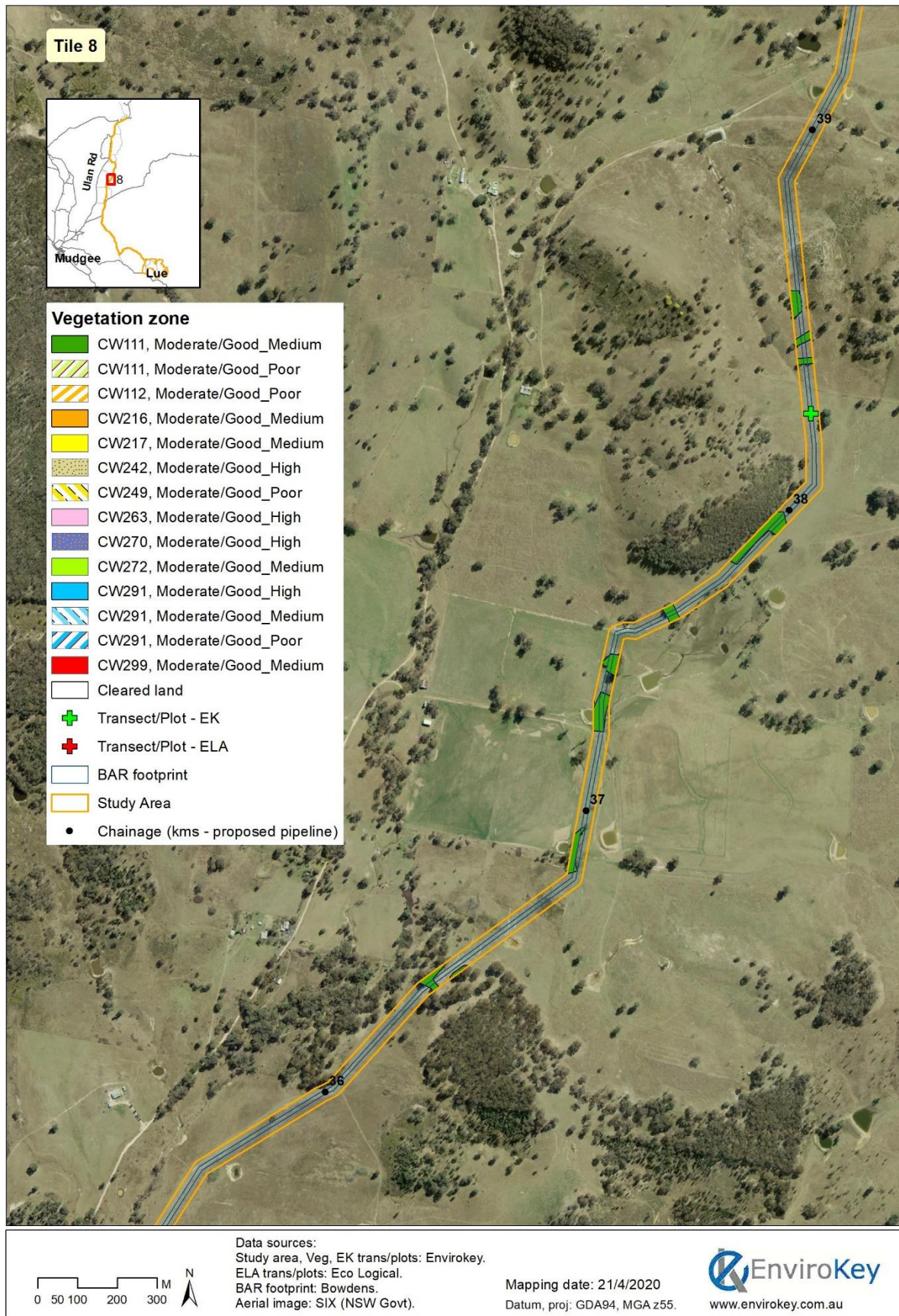


**Map 21 Biometric Vegetation Types within the Study Area – Reference Areas 6 and 7**



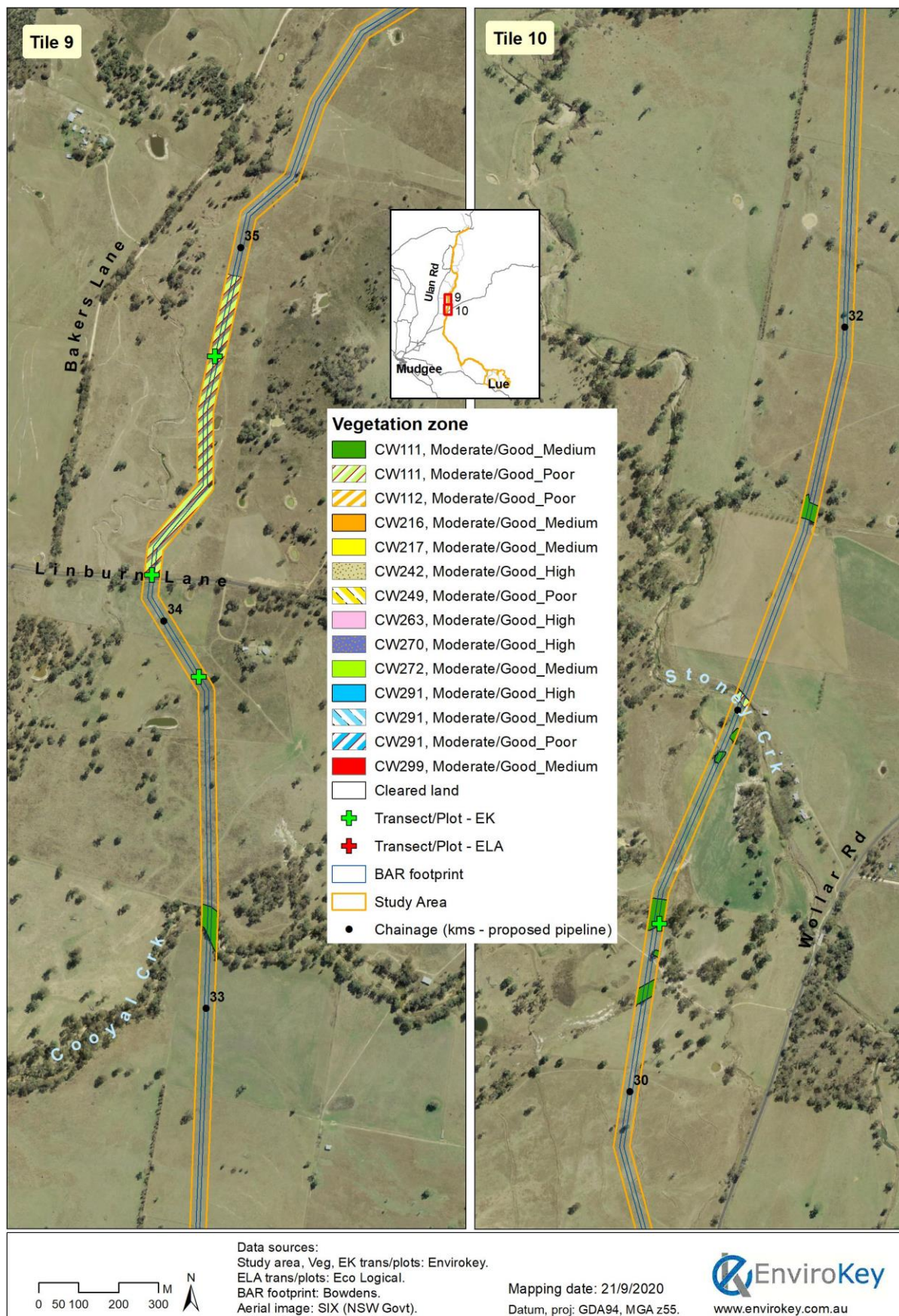


**Map 22 Biometric Vegetation Types within the Study Area – Reference Area 8**



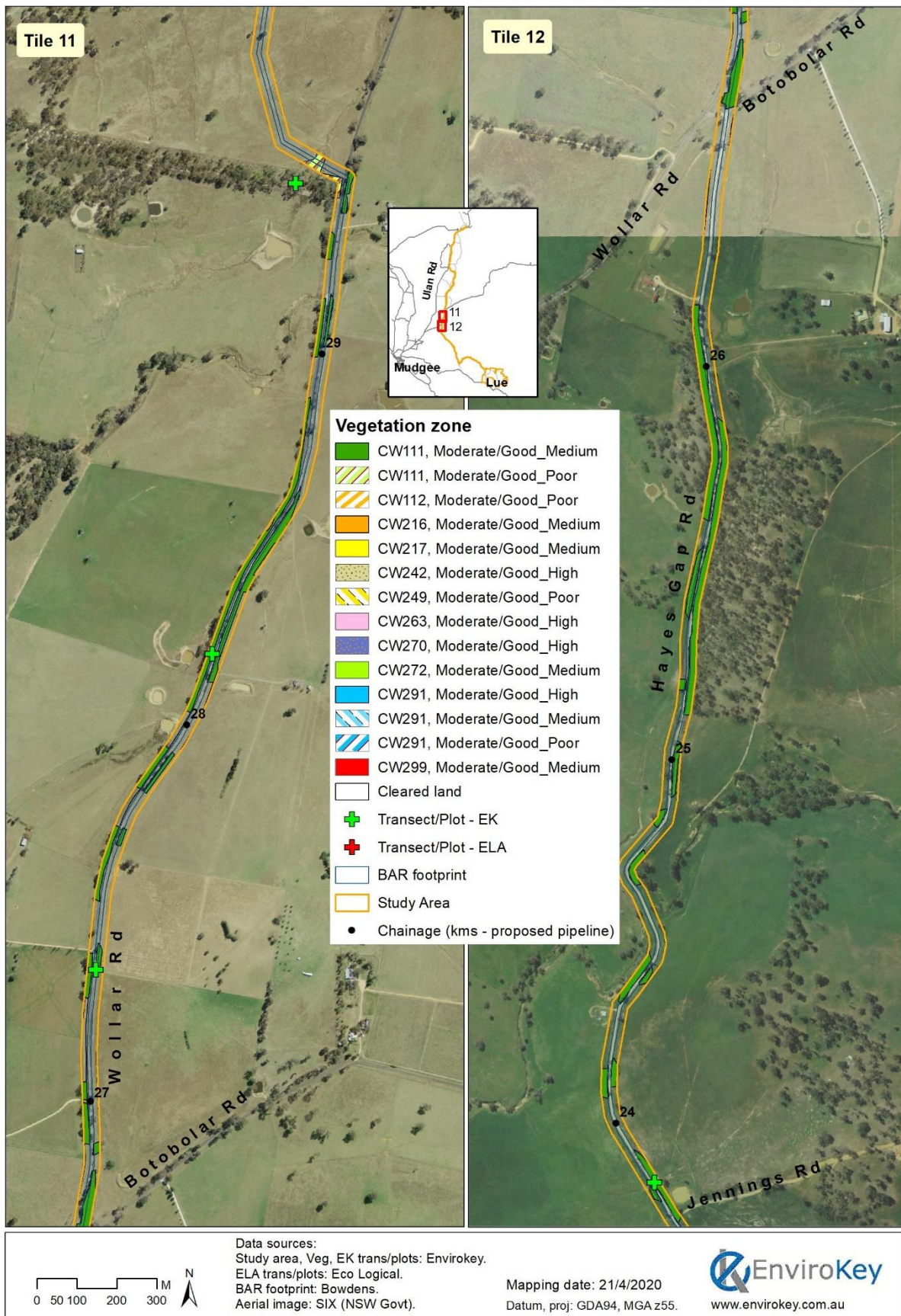


Map 23 Biometric Vegetation Types within the Study Area – Reference Areas 9 and 10



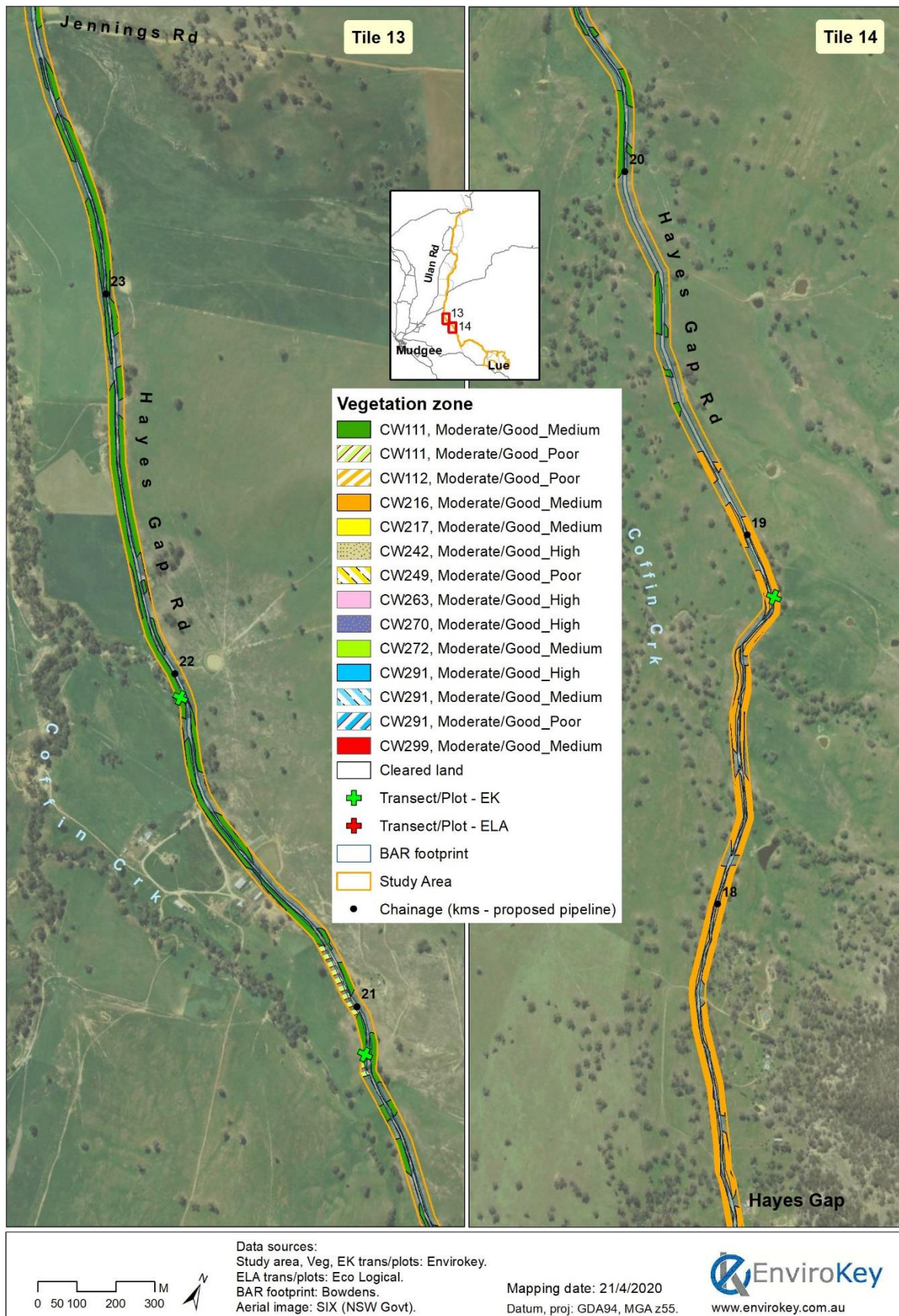


**Map 24 Biometric Vegetation Types within the Study Area – Reference Areas 11 and 12**



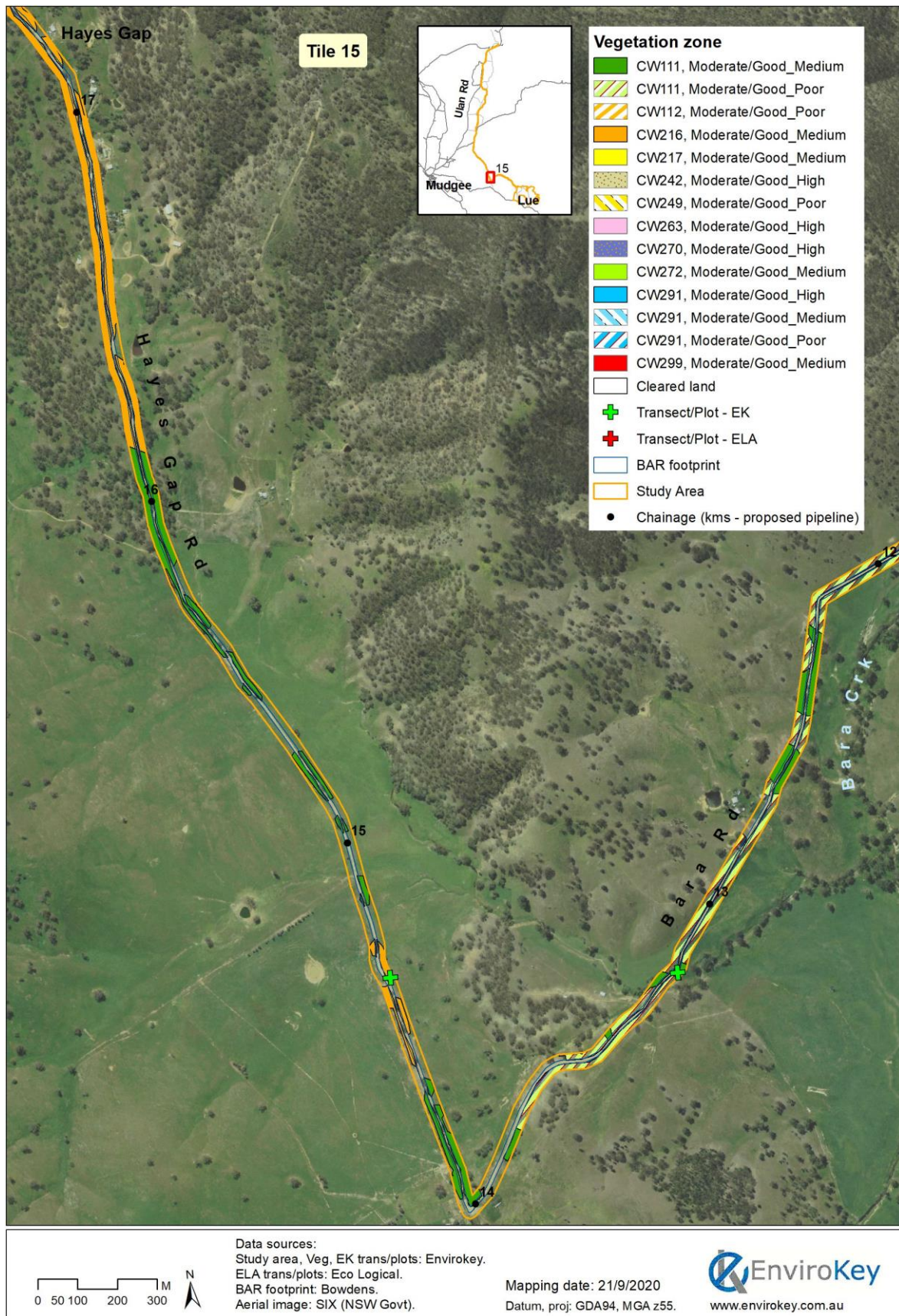


Map 25 Biometric Vegetation Types within the Study Area – Reference Areas 13 and 14



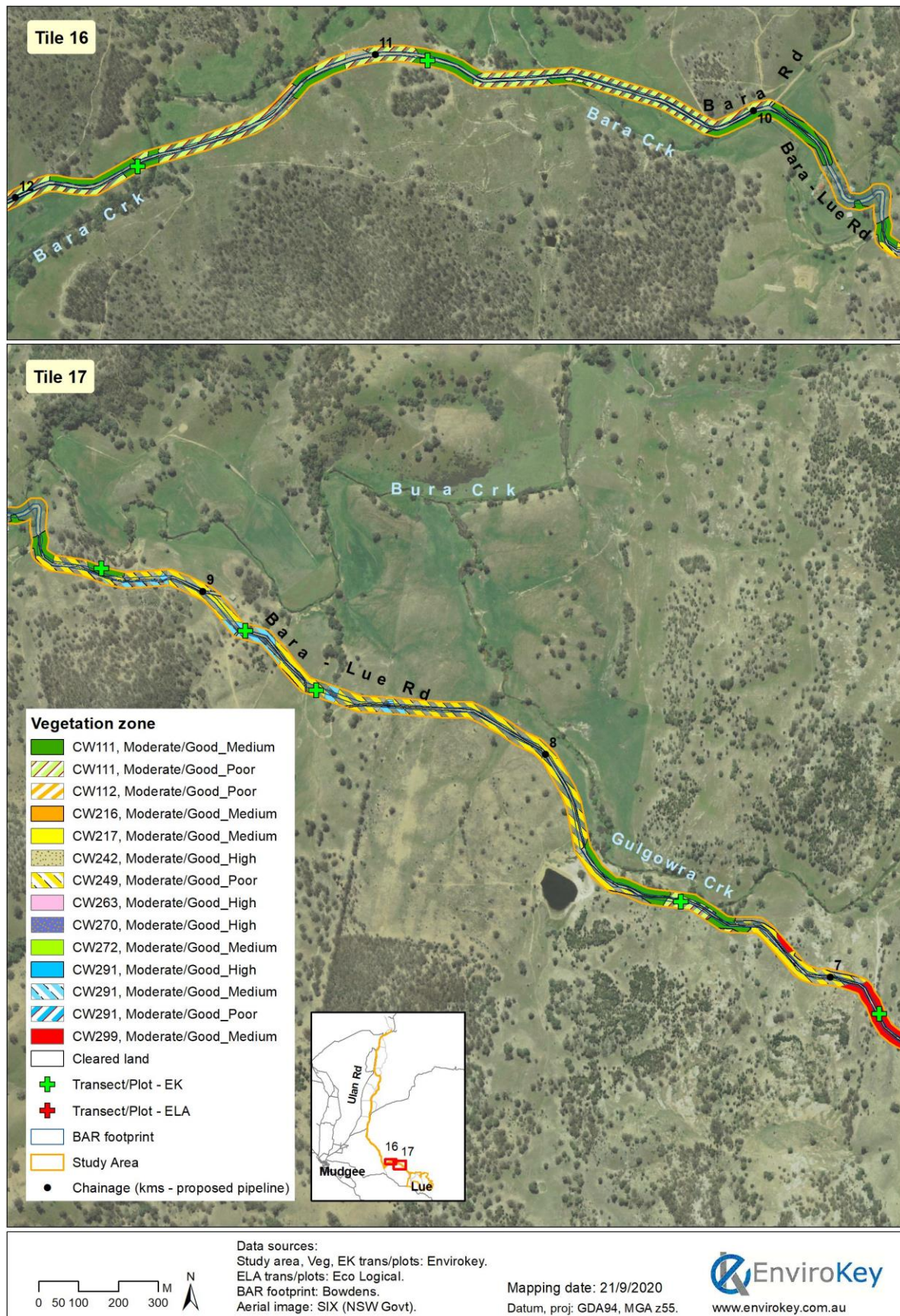


**Map 26 Biometric Vegetation Types within the Study Area – Reference Area 15**



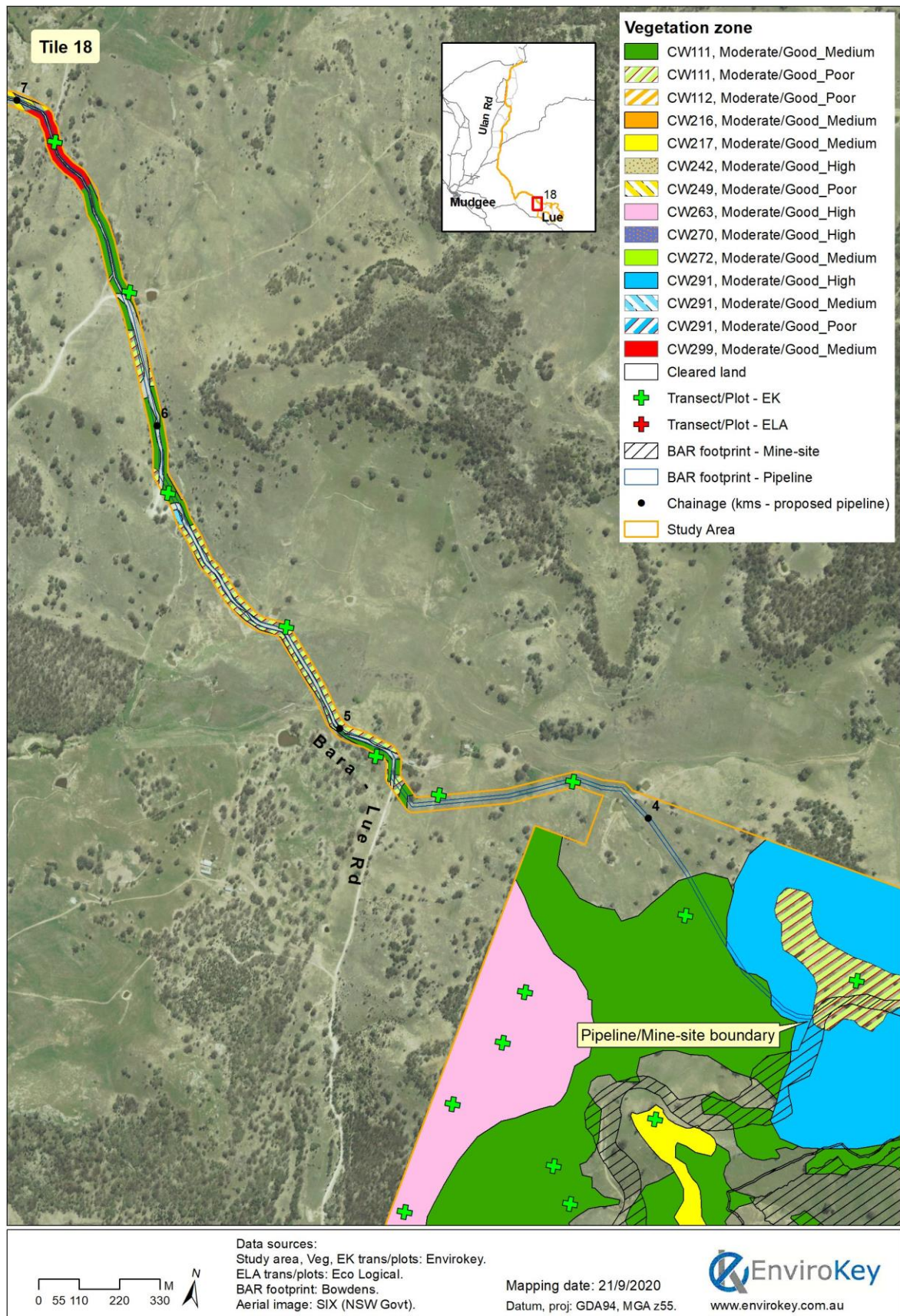


Map 27 Biometric Vegetation Types within the Study Area – Reference Areas 16 and 17



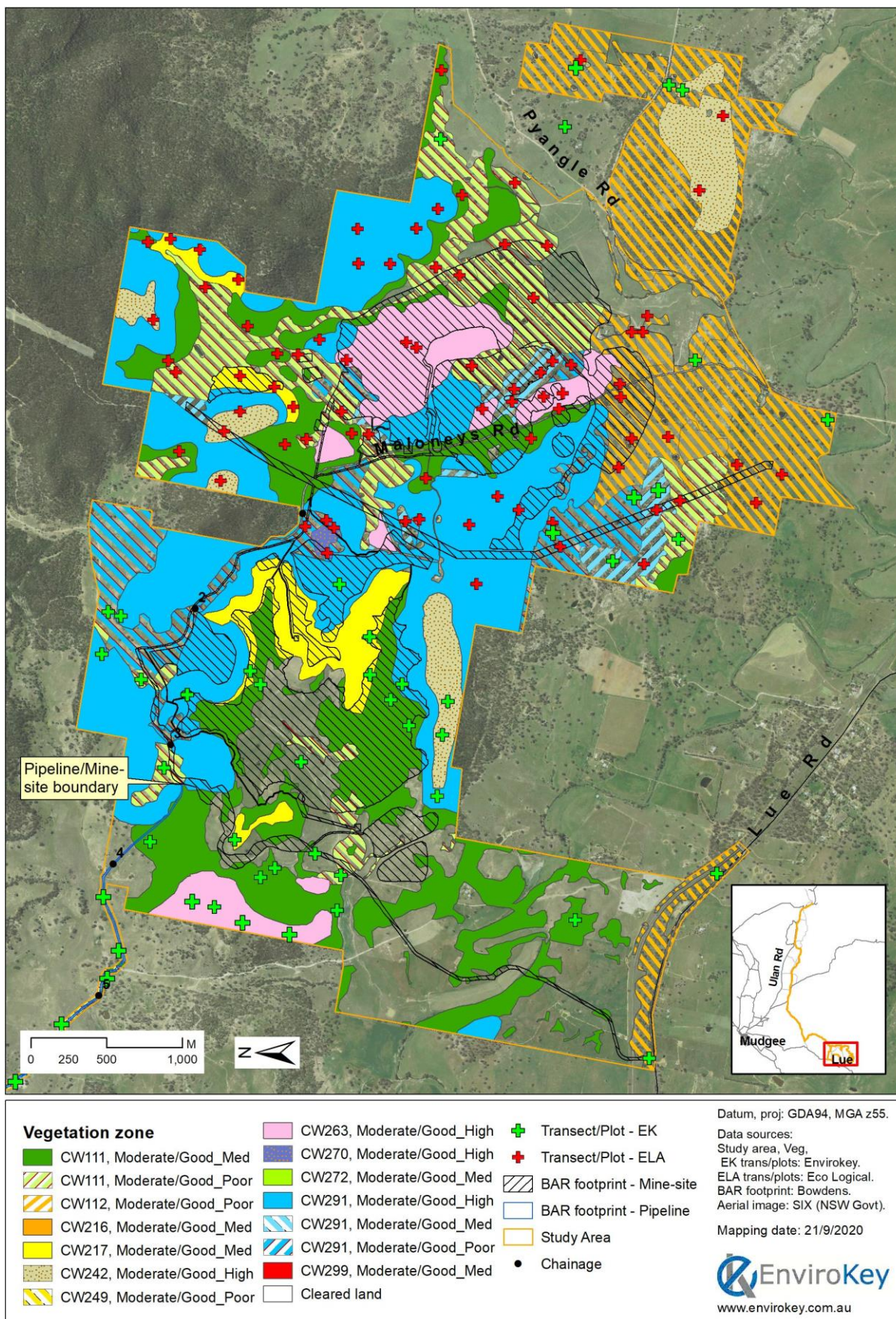


**Map 28 Biometric Vegetation Types within the Study Area – Reference Area 18**





Map 29 Biometric Vegetation Types within the Study Area – Reference Area – Mine Site







**Plate 2** A Photographic Example of CW 217 White Box Shrubby Open Forest on Fine Grained Sediments on Steep Slopes in the Mudgee Region of the Central Western Slopes of NSW (Moderate/Good\_medium)

#### **4.1.2 CW 112 Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

**Vegetation formation:** Grassy Woodlands

**Vegetation class:** Western Slopes Grassy Woodlands

**BVT:** CW 112. A summary of the floristic diversity is provided in **Table 10**. A photographic example is provided in **Plate 3**.

**PCT:** 277

**Conservation status:** Box-Gum Woodland (BC, EPBC)

**Estimate of percent cleared:** 95% (Central West)

**Condition:** Moderate/Good\_poor. Comprises grazing land (and the railway easement on Lue Road) with scattered remnant and regrowth paddock trees. Overall, overstorey cover is only slightly >25% of the lower benchmark for the community. The understorey rarely contains native shrubs or regenerating eucalypts. Mature trees are uncommon, with most comprising regrowth. The groundcover layer is often dominated by exotic pasture grasses and other weeds typically found in grazing land, a number of the more hardy native grasses persist in low/moderate density.

**Extent in the Study Area:** 273.15ha

**Extent in the BAR Footprint (Mine Site):** 21.80ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** EK15, ELA21, ELA42, ELA58, ELA68, ELA69.



Table 10

**Summary of the Floristic Diversity within CW 112 Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	14 8 – 20	5 0 – 10	Yellow Box, Blakely's Red Gum ( <i>E. blakelyi</i> ), Rough-barked Apple, rarely Apple Box ( <i>E. bridgesiana</i> ),
Shrubs/small trees	4.5 2 – 7	2 0 – 20	Black Cypress Pine, Hickory Wattle.
Groundcovers	0.5 0.1 to 0.7	76 44 – 100	Natives: Wattle Mat-rush ( <i>Lomandra filiformis</i> ), Red Grass, Tussock ( <i>Poa labillardierei</i> ), Common Wheatgrass, Kangaroo Grass ( <i>Themeda triandra</i> ), Weeping Grass, Shorthair Plumegrass, Corrugated Sida ( <i>Sida corrugata</i> ), Yellow Burr-daisy ( <i>Calotis lappulacea</i> ), Swamp Dock ( <i>Rumex brownii</i> ), Clustered Everlasting ( <i>Chrysocephalum semipapposum</i> ), Purple Burr-Daisy ( <i>C. cuneifolia</i> ), Small St John's Wort ( <i>Hypericum gramineum</i> ). Exotics: Rat's-tail Fescue, Narrow-leaved Clover, Lamb's Tongues ( <i>P. lanceolata</i> ), Oats ( <i>Avena sp.</i> ), White Horehound ( <i>Marrubium vulgare</i> ), Skeleton Weed ( <i>Chondrilla juncea</i> ).
Vines/climbers	-	<1%	Slender Tick-trefoil



**Plate 3 A Photographic Example of CW 112 Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

**4.1.3 CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_medium)**

**Vegetation formation:** Grassy Woodlands

**Vegetation class:** Western Slopes Grassy Woodlands

**BVT:** CW 111. A summary of the floristic diversity is provided in . A photographic example is provided in **Plate 4**.

**PCT:** 281

**Conservation status:** Box-Gum Woodland (BC, EPBC)

**Estimate of percent cleared:** 67% (Central West)

**Condition:** Moderate/Good\_Medium. This community typically occurs on more fertile soils of valley floors and footslopes. This vegetation zone (Moderate/Good \_medium) comprises the more densely timbered remnants on grazing land and in roadside verges. On the poorer soils at the northern extremity of the pipeline, it only occurs along creek lines, becoming increasingly common in a southerly direction. Larger trees mostly occur along roadsides, with paddock remnants often comprising regrowth. The understorey rarely contains native shrubs and occasionally contains regenerating eucalypts. The groundcover layer is often dominated by exotic pasture grasses and other weeds typically found in grazing land, but occasional patches exist where native groundcover density and species richness can be considered relatively high.

**Extent in the Study Area:** 336.30ha

**Extent in the BAR Footprint (Mine):** 88.33ha

**Extent in the BAR Footprint (Pipeline):** 4.53ha

**Plots completed in vegetation zone (BAR footprint):** EK6, EK8, EK12, EK44, EK45, EK50, EK51, EK52, EK53, EK54, EK55, EK59, ELA11, ELA24, ELA28, ELA66.



**Plate 4 A Photographic Example of CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_medium)**

Table 11

**Summary of the Floristic Diversity within CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_medium)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical species
Trees	17.5 8 – 27	20 11 – 32	Yellow Box, Rough-barked Apple, Blakely's Red Gum, White Box, Kurrajong ( <i>Brachychiton populneus</i> ), occasionally <i>E. macrocarpa</i> (Western Grey Box) in mid/northern section of pipeline.
Shrubs/small trees	3 1 – 5	7 0 – 10	Tree Violet ( <i>M. dentatus</i> ), Black Cypress Pine, Hickory Wattle, Stiff-leaf Wattle ( <i>A. obtusifolia</i> ), Native Blackthorn, Tablelands Wattle, Drooping Sheoak ( <i>Allocasuarina verticillata</i> ), Spurwing Wattle ( <i>A. triptera</i> ), Fern-leaved Wattle ( <i>A. filicifolia</i> ), Australian Indigo ( <i>Indigofera australis</i> ), Dolly Bush ( <i>Cassinia aculeata</i> ).
Groundcovers	0.5 0.1 to 0.7	71 48 – 90	Natives: Weeping Grass, Wallaby Grass ( <i>Rytidosperma</i> sp.), Speargrass, Shorthair Plumegrass, Blown Grass ( <i>Lachnagrostis filiformis</i> ), A Wiregrass ( <i>Aristida</i> sp.), Hoary Guinea Flower, Star Cudweed ( <i>E. sphaericus</i> ), Yellow Burr-daisy ( <i>C. lappulacea</i> ), Bidgee-widgee, Kidney Weed, <i>Oxalis perennans</i> , Bluebell ( <i>Wahlenbergia</i> sp.). Exotics: Catsear, Rat's-tail Fescue, Proliferous Pink, Skeleton Weed, Spear Thistle, Blackberry ( <i>Rubus anglocandicans</i> ).
Vines/climbers	-	<1%	Twining glycine, Old Man's Beard ( <i>Clematis aristata</i> ).

#### 4.1.4 CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_poor)

**Vegetation formation:** Grassy Woodlands

**Vegetation class:** Western Slopes Grassy Woodlands

**BVT:** CW 111. A summary of the floristic diversity is provided in **Table 12**. A photographic example is provided in **Plate 5**.

**PCT:** 281

**Conservation status:** Box-Gum Woodland (BC, EPBC) (mostly the derived grassland variant)

**Estimate of percent cleared:** 67% (Central West)

**Condition:** Moderate/Good\_poor. Occurring in grazing paddocks and roadside verges, this vegetation zone consists of either derived grassland (i.e. >50% native groundcover with no or few trees) or very open grassy woodland with an exotic-dominated groundcover layer.



The understorey rarely contains native shrubs or regenerating eucalypts, while the groundcover layer is often dominated by exotic pasture grasses and other weeds typically found in grazing land.

**Extent in the Study Area:** 201.71ha

**Extent in the BAR Footprint (Mine):** 64.02ha

**Extent in the BAR Footprint (Pipeline):** 2.36ha

**Plots completed in vegetation zone (BAR footprint):** EK57, ELA19, ELA20, ELA30, ELA32, ELA33, ELA37, ELA38, ELA57, ELA105.

**Table 12**

**Summary of the Floristic Diversity within CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_poor)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	13 6 – 20	3 0 – 8	Yellow Box, Blakely's Red Gum, Rough-barked Apple, occasionally Western Grey Box (mid/northern section of pipeline).
Shrubs/small trees	2.75 1.5 – 4	2 0 – 10	Tablelands Wattle, Fern-leaved Wattle, Black Cypress Pine, Prickly Moses ( <i>A. ulicifolia</i> ).
Groundcovers	0.5 0.1 to 0.7	91 82 – 100	Natives: Red Grass, Wallaby Grass ( <i>Rytidosperma</i> sp.), Shorthair Plumegrass, Barbed Wire Grass ( <i>Cymbopogon refractus</i> ), A Wiregrass ( <i>Aristida</i> sp.), Rock Fern, Stinking Pennywort, Ivy Goodenia ( <i>Goodenia. Hederacea</i> ), Bracken ( <i>Pteridium esculentum</i> ), Tall Sedge ( <i>Carex appressa</i> ), Small Poranthera ( <i>Poranthera microphylla</i> ). Exotics: Hairgrass, Narrow-leaved Clover, St. Johns Wort, Rat's-tail Fescue, Shivery Grass ( <i>Briza minor</i> ), , Phalaris, Ryegrass, Catsear.
Vines/climbers	-	-	-



**Plate 5 A Photographic Example of CW 111 Rough-barked Apple – Red Gum – Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good\_poor)**

#### 4.1.5 CW 216 White Box Grassy Woodland in the Upper Slopes sub-region of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)

**Vegetation formation:** Grassy Woodlands

**Vegetation class:** Western Slopes Grassy Woodlands

**BVT:** CW 216. A summary of the floristic diversity is provided in **Table 13**. A photographic example is provided in **Plate 6**.

**PCT:** 266

**Conservation status:** Box-Gum Woodland (BC, EPBC)

**Estimate of percent cleared:** 94% (Central West)

**Condition:** Moderate/Good\_Medium. Within the Study Area, occurs on hills along Hayes Gap Road. It merges with CW111 on footslopes/creeks. Larger trees are relatively common along the roadsides. The understorey rarely contains native shrubs and occasionally contains regenerating eucalypts. The groundcover layer is often dominated by exotic pasture grasses and other agricultural weeds, but occasional patches exist where native groundcover density and species richness can be considered relatively high. Disturbance from road maintenance activities was often noted during surveys, as were signs of firewood removal.

**Extent in the Study Area:** 9.18ha

**Extent in the BAR Footprint (Mine Site):** 0ha

**Extent in the BAR Footprint (Pipeline):** 1.24ha

**Plots completed in vegetation zone (BAR footprint):** EK56, EK58.

**Table 13**

**Summary of the Floristic Diversity within CW 216 White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	18 15 – 22	35 30 – 46	White Box
Shrubs/small trees	-	-	
Groundcovers	0.5 0.1 to 0.7	55 40 – 60	Natives: Red Grass ( <i>Bothriochloa macra</i> ), Weeping Grass, Wallaby Grass ( <i>Rytidosperma sp.</i> ), Speargrass, Bidgee-widgee, Kidney Weed, <i>Oxalis perennans</i> , Bluebell ( <i>Wahlenbergia sp.</i> ).  Exotics: Phalaris ( <i>Phalaris aquatica</i> ), Catsear, Rat's-tail Fescue, Skeleton Weed, Spear Thistle,
Vines/climbers	-	<1%	Twining glycine.



**Plate 6** A Photographic Example of CW 216 White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)

**4.1.6 CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_high)**

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 291. A summary of the floristic diversity is provided in **Table 14**. A photographic example is provided in **Plate 7**.

**PCT:** 323

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 30% (Central West)

**Condition:** Moderate/Good\_high. Common on upper slopes and ridges in the vicinity of the proposed mine. Overstorey cover is within the benchmarks for the community. This vegetation zone comprises the least disturbed patches of CW291. The canopy generally contains a high proportion of older remnant trees, though dense stands of (older) Black Cypress Pine regrowth are sometimes present. The midstratum contains a relatively large range of shrubs, while the groundcover layer is usually sparse.

**Extent in the Study Area:** 420.69 ha

**Extent in the BAR Footprint (Mine Site):** 81.69 ha

**Extent in the BAR Footprint (Pipeline):** 0.21 ha

**Plots completed in vegetation zone (BAR footprint):** EK7, EK20, EK21, EK28, EK29, EK35, ELA10, ELA74, ELA75.



Table 14

**Summary of the Floristic Diversity within CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_high)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	16 7 – 25	28 13 – 38	Black Cypress Pine, Inland Scribbly Gum, Narrow-leaved Stringybark ( <i>E. sparsifolia</i> ), Rough-barked Apple, Red Stringybark, Mugga Ironbark ( <i>E. sideroxylon</i> ), White Box.
Shrubs/small trees	4 1 – 7	15 0 – 30	Tablelands Wattle, Sticky Daisy-bush, Narrow-leaved Geebung ( <i>Persoonia linearis</i> ), Sticky Hop-Bush ( <i>Dodonaea viscosa</i> subsp. <i>Angustifolia</i> ), Dolly Bush ( <i>C. aculeata</i> ), <i>Cassinia quinquefaria</i> , Hickory Wattle, Native Blackthorn, Stiff-leaf Wattle.
Groundcovers	0.5 0.1 to 0.7	27 5 – 48	Natives: Speargrass, Wallaby Grass, Weeping Grass, Shorthair Plumegrass, Tufted Hedgehog Grass, Purple Wiregrass ( <i>A. pilosa</i> ), Daphne Heath ( <i>Brachyloma daphnoides</i> ), Hoary Guinea Flower, Rock Fern ( <i>C. sieberi</i> ), Ivy Goodenia, <i>Oxalis perennans</i> , Kidney Weed, Small Poranthera ( <i>P. microphylla</i> ), Yellow Burr-daisy . Exotics: Ragwort, Common Centaury ( <i>Centaureum erythraea</i> ), Catsear, Saffron Thistle ( <i>C. lanatus</i> ), Wireweed ( <i>Polygonum aviculare</i> ), Curled Dock ( <i>R. crispus</i> ).
Vines/climbers	-	<1%	Slender Tick-trefoil, Twining glycine.



**Plate 7 A Photographic Example of CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_high)**

#### 4.1.7 CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 291. A summary of the floristic diversity is provided in **Table 15**. A photographic example is provided in **Plate 8**.

**PCT:** 323

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 30% (Central West)

**Condition:** Moderate-good\_Medium. This vegetation zone comprises disturbed CW 291 (distribution as previous), where dense, even-aged stands of Black Cypress Pine are common. Overstorey cover is >25% of the lower benchmark for the community, however the eucalypt canopy is very sparse. Dense, even-aged stands of Black Cypress Pine are common. The groundcover layer is very sparse, with low native species richness. Exotic species are uncommon.

**Extent in the Study Area:** 39.19ha

**Extent in the BAR Footprint (Mine Site):** 11.81ha

**Extent in the BAR Footprint (Pipeline):** 0.20ha

**Plots completed in vegetation zone (BAR footprint):** EK31, ELA25, ELA36, ELA39, ELA63, ELA72, ELA104.

Table 15

Summary of the Floristic Diversity within CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	13 10 – 15	13 5 – 20	Black Cypress Pine, Inland Scribbly Gum, Rough-barked Apple, Red Stringybark.
Shrubs/small trees	3 3 – 6	6 0 – 25	Black Cypress Pine saplings, Tablelands Wattle, Sticky Daisy-bush, Narrow-leaved Geebung, Sticky Hop-bush, Dolly Bush, <i>Cassinia quinquefaria</i> , Hickory Wattle, Native Blackthorn, Stiff-leaf Wattle.
Groundcovers	0.5 0.1 to 0.7	4 3 – 6	Natives: Speargrass, Wallaby Grass, Weeping Grass, Shorthair Plumegrass, Tufted Hedgehog Grass ( <i>E. caespitosus</i> var. <i>caespitosus</i> ), Purple Wiregrass ( <i>A. ramosa</i> ), Daphne Heath, Hoary Guinea Flower, Fern ( <i>C. sieberi</i> ), Ivy Goodenia, <i>Oxalis perennans</i> , Kidney Weed, Small Poranthera ( <i>P. microphylla</i> ), Yellow Burr-daisy .  Exotics: Ragwort, Common Centaury ( <i>Centaureum erythraea</i> ), Catsear, Saffron Thistle ( <i>C. lanatus</i> ), Wireweed ( <i>Polygonum aviculare</i> ), Curled Dock ( <i>R. crispus</i> ).
Vines/climbers	-	-	



**Plate 8**     **A Photographic Example of CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_medium)**

**4.1.8            CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 291. A summary of the floristic diversity is provided in **Table 16**. A photographic example is provided in **Plate 9**.

**PCT:** 323

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 30% (Central West)

**Condition:** Moderate/Good\_poor. Comprises cleared CW 291, often in the early stages of regeneration, i.e. scattered overstorey and midstratum regrowth. Overstorey species cover is generally >25% of the lower benchmark for the community (albeit mainly comprising juvenile trees). The groundcover layer is relatively dense and grassy. Some exotic pasture grasses and other weeds are present, however native grasses are generally dominant.

**Extent in the Study Area:** 96.32ha

**Extent in the BAR Footprint (Mine Site):** 18.92ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** ELA102, ELA40, ELA61, ELA64.



**Table 16**  
**Summary of the Floristic Diversity within CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	-	-	Scattered Scribbly Gum and Black Cypress Pine
Shrubs/small trees	4.5 3 – 6	26 0 – 30	Stiff-leaf Wattle, Tablelands Wattle, Black Cypress Pine.
Groundcovers	0.5 0.1 to 0.7	46 5 – 48	Natives: Tufted Hedgehog Grass ( <i>E. caespitosus</i> var. <i>caespitosus</i> ), Paddock Lovegrass ( <i>E. leptostachya</i> ), Common Wheatgrass, Wallaby Grass, Swamp Dock, Rock Fern, Burr-Daisy ( <i>C. cuneifolia</i> ), Yellow Burr-daisy, Bluebell ( <i>Wahlenbergia</i> sp.). Exotics: Rat's-tail Fescue, Catsear.
Vines/climbers	-	-	-



**Plate 9**     **A Photographic Example of CW 291 Red Stringybark – Inland Scribbly Gum Open Forest on Steep Hills in the Mudgee – Northern Section of the NSW South Western Slopes Bioregion (Moderate/Good\_poor)**

#### 4.1.9 CW 263 Inland Scribbly Gum Grassy Open Forest on Hills in the Mudgee Region, NSW Central Western Slopes (Moderate/Good\_high)

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 263. A summary of the floristic diversity is provided in **Table 17**. A photographic example is provided in **Plate 10**.

**PCT:** 324

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 12% (Central West)

**Condition:** Moderate/Good\_high. Occurs on ridgetops in the vicinity of the proposed mine, is absent along the pipeline route. Canopy cover is within the benchmarks for the community (often at the higher end where dense regrowth occurs). The canopy is generally dominated by eucalypts, with a grassy understorey. However, disturbance is also common, as evidenced by dense, even-aged stands of Black Cypress Pine. Grass-cover is very sparse in these areas.

**Extent in the Study Area:** 102.57ha

**Extent in the BAR Footprint (Mine):** 56.65ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** ELA7, ELA8, ELA9, ELA26, ELA34, ELA35.

**Table 17**

**Summary of the Floristic Diversity within CW 263 Inland Scribbly Gum Grassy Open Forest on Hills in the Mudgee Region, NSW Central Western Slopes (Moderate/Good\_high)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	14 10 – 18	32 12 – 45	Inland Scribbly Gum, Rough-barked Apple, Black Cypress Pine, Narrow-leaved Stringybark ( <i>E. sparsifolia</i> ).
Shrubs/small trees	4.5 3 – 6	15 0 – 30	Black Cypress Pine. <i>Cassinia</i> sp.
Groundcovers	0.5 0.1 to 0.7	18 5 – 48	Natives: Shorthair Plumegrass, Paddock Lovegrass ( <i>E. leptostachya</i> ), Dolly Bush, Native Carrot ( <i>Daucus</i> sp.), Rock Fern, Kidney Weed, Showy Isotome ( <i>Isotoma axillaris</i> ), Yellow Burr-daisy. Exotics: Rat's-tail Fescue, Ragwort, Common Prickly Pear ( <i>Opuntia stricta</i> var. <i>stricta</i> ), Proliferous Pink.
Vines/climbers	-	<1%	Twining glycine.



**Plate 10** Photographic Examples of CW 263 Inland Scribbly Gum Grassy Open Forest on Hills in the Mudgee Region, NSW Central Western Slopes (Moderate/Good\_medium) (left: Eucalypt Dominated Patch. Right: Dense Cypress Pine Regrowth in background)

#### **4.1.10 CW 242 Blue-leaved Stringybark Open Forest of the Mudgee Region NSW Central Western Slopes (Moderate/Good\_high)**

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 242. A summary of the floristic diversity is provided in **Table 18**. A photographic example is provided in **Plate 11**.

**PCT:** 325

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 17% (Central West)

**Condition:** Moderate/Good\_high. Occurs on low fertility slopes and ridges in the vicinity of the proposed mine, is absent along the pipeline route. Comprises a relatively dense overstorey, where cover is within the benchmarks for the community. Shrubs are uncommon. The groundcover layer is generally grassy, except where dense stands of Black Cypress Pine occur.

**Extent in the Study Area:** 71.86ha

**Extent in the BAR Footprint (Mine Site):** 1.04ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** ELA53

**Table 18**  
**Summary of the floristic diversity within CW 242 Blue-leaved Stringybark open forest of the Mudgee region, NSW central western slopes (Moderate/Good\_high)**

Page 1 of 2

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	13.5 7 – 20	25 10 – 40	Blue-leaved Stringybark ( <i>E. agglomerata</i> ), Inland Scribbly Gum, Black Cypress Pine, Red Stringybark, White Box, occasionally Blakely's Red Gum.
Shrubs/small trees	1.75 1 – 2.5	8.5 4 – 13	<i>Cassinia</i> sp., Narrow-leaved Geebung ( <i>P. linearis</i> ), Sticky Daisy-bush.



Table 18 (Cont'd)

Summary of the floristic diversity within CW 242 Blue-leaved Stringybark open forest of the Mudgee region, NSW central western slopes (Moderate/Good\_high)

Page 2 of 2

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Groundcovers	0.5 0.1 to 0.7	14.5 13 – 16	Natives: Wallaby Grass, Speargrass, Silvertop Wallaby Grass ( <i>R. pallidum</i> ), Common Wheatgrass, Shorthair Plumegrass, Daphne Heath, Hoary Guinea Flower, Prickly Shaggy Pea ( <i>Podolobium ilicifolium</i> ), Ivy Goodenia, Pomax ( <i>Pomax umbellata</i> ), Stinkweed ( <i>Opercularia diphylla</i> ), Rock Fern, Small St John's Wort, Trailing Speedwell. Exotics: Hairgrass, Proliferous Pink, Ragwort.
Vines/climbers	-	-	-



Plate 11 A Photographic Example of CW 242 Blue-leaved Stringybark Open Forest of the Mudgee Region, NSW Central Western Slopes (Moderate/Good\_high)

#### 4.1.11 CW 270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine Tall Woodland on Rises and Hills in the Northern NSW South Western Slopes Bioregion (Moderate/Good\_high)

**Vegetation formation:** Shrubby sub-formation

**Vegetation class:** Western Slopes Dry Sclerophyll Forests\

**BVT:** CW 270. A summary of the floristic diversity is provided in **Table 19**. A photographic example is provided in **Plate 12**.

**PCT:** 358

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 93% (Central West)

**Condition:** Moderate/Good\_high. Common on upper slopes and ridges in the vicinity of the proposed mine, absent along the entire pipeline route. Overstorey cover is within the benchmarks for the community. This vegetation zone comprises the least disturbed patches of CW 291. The canopy generally contains a high proportion of older remnant trees, though dense stands of (older) Black Cypress Pine regrowth are sometimes present. The midstratum contains a relatively large range of shrubs, while the groundcover layer is usually sparse.

**Extent in the Study Area:** 3.2ha

**Extent in the BAR Footprint (Mine Site):** 0.77ha

**Extent in the BAR Footprint (Pipeline):** 0ha

**Plots completed in vegetation zone (BAR footprint):** ELA59, ELA60, ELA62.

**Table 19**

**Summary of the Floristic Diversity within CW 270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine Tall Woodland on Rises and Hills in the Northern NSW South Western Slopes Bioregion (Moderate/Good\_high)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	16 7 – 25	28 13 – 38	Mugga Ironbark, Red Box ( <i>E. polyanthemos</i> ), Black Cypress Pine, Red Stringybark, White Box, Inland Scribbly Gum.
Shrubs/small trees	4 1 – 7	15 0 – 30	Sticky Daisy-bush, Tableland Wattle, Narrow-leaved Geebung, Babingtonia sp.
Groundcovers	0.5 0.1 to 0.7	27 5 – 48	Natives: Speargrass, Kangaroo Grass, Weeping Grass, Purple Wiregrass ( <i>A. ramosa</i> ), Clustered Everlasting, Rock Fern, Ivy Goodenia. Exotics: Silvery Hairgrass ( <i>Aira caryophyllea</i> ), Clover ( <i>Medicago</i> spp.), Catsear, <i>Anagallis arvensis</i> .
Vines/climbers	-	<1%	Slender Tick-trefoil, Twining glycine.



**Plate 12** A Photographic Example of CW 270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine Tall Woodland on Rises and Hills in the Northern NSW South Western Slopes Bioregion (Moderate/Good\_high)

#### **4.1.12 CW 249 Derived Grassland of the NSW South Western Slopes (Moderate/Good\_poor)**

**Vegetation formation:** Grasslands

**Vegetation class:** Western Slopes Grasslands

**BVT:** CW 249. A summary of the floristic diversity is provided in **Table 20**. A photographic example is provided in **Plate 13**.

**PCT:** 796

**Conservation status:** Not a TEC (i.e. not derived from Box Gum Woodland)

**Estimate of percent cleared:** N/A (Central West)

**Condition:** Moderate/Good\_poor. Within the Study Area, comprises all derived (native) grasslands not derived from a threatened ecological community. Occurs at the northern and southern extremities of the proposed pipeline route, on sandy/stony soils, where woody cover has been cleared for electricity transmission easements or road construction. This vegetation generally has only a low weed cover.

**Extent in the Study Area:** 21.87ha

**Extent in the BAR Footprint (Mine Site):** 0ha

**Extent in the BAR Footprint (Pipeline):** 5.18ha

**Plots completed in vegetation zone (BAR footprint):** EK40, EK41, EK46, EK47.



**Table 20**  
**Summary of the Floristic Diversity within CW 249 Derived Grassland of the NSW South Western Slopes (Moderate/Good\_poor)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	13 6 – 20	1 0 – 3	(Occasional seedlings/saplings of Blakely's Red Gum, Rough-barked Apple, Cypress Pine).
Shrubs/small trees	1.5 1.0 – 2.5	5 0 – 25	Sifton Bush ( <i>Cassinia arcuata</i> ), Western Silver Wattle ( <i>Acacia decora</i> ), Dwarf Cherry ( <i>Exocarpos strictus</i> ).
Groundcovers	0.5 0.05 – 0.9	25 10 – 70	Natives: Red Grass, Wallaby Grass ( <i>Rytidosperma</i> sp.), Barbed Wire Grass, A Wiregrass ( <i>Aristida</i> sp.), Rock Fern, Ivy Goodenia, <i>Carex appressa</i> . Exotics: Parramatta Grass ( <i>Sporobolus africanus</i> ), Rhodes Grass ( <i>Chloris gayana</i> ), Great Mullein ( <i>Verbascum thapsus</i> subsp. <i>thapsus</i> ), St. Johns Wort, Catsear. Pigeon Grass ( <i>Setaria</i> sp.), <i>Paspalum</i> sp.
Vines/climbers	-	-	-



**Plate 13**      **Photographic Examples of CW 249 Derived Grassland of the NSW South Western Slopes (Moderate/Good\_poor)**

#### 4.1.13 CW 299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine Woodland on Sandy Flats, mainly in the Pilliga Scrub Region (Moderate/Good\_medium)

**Vegetation formation:** (Shrubby sub-formation)

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 299. A summary of the floristic diversity is provided in **Table 21**. A photographic example is provided in **Plate 14**.

**PCT:** 401

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 33% (Central West)

**Condition:** Moderate/Good\_medium. Occurs towards the northern extremity of the proposed pipeline route, on sandy/stony soils, along Ulan Road. Weeds and other disturbance mainly occur on/near the road-shoulder. Despite overstorey species composition having some similarity to Box Gum Woodland, overall species composition and structure (shrubby dry sclerophyll forest, rather than a grassy woodland) aligns well with typical hill/poor soil communities in the locality.

**Extent in the Study Area:** 2.87ha

**Extent in the BAR Footprint (Mine Site):** 0ha

**Extent in the BAR Footprint (Pipeline):** 0.76ha

**Plots completed in vegetation zone (BAR footprint):** EK48

**Table 21**

**Summary of the Floristic Diversity within CW 299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine Woodland on Sandy Flats, mainly in the Pilliga Scrub Region (Moderate/Good\_medium)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	18 15 – 22	27 27 – 27	Blakely's Red Gum, Rough-barked Apple, Black Cypress Pine.
Shrubs/small trees	1.5 1.0 – 2.5	5 0 – 25	Sifton Bush, Western Silver Wattle, Dwarf Cherry.
Groundcovers	0.5 0.05 – 0.9	25 10 – 70	Natives: Wallaby Grass ( <i>Rytidosperma</i> sp.), Barbed Wire Grass, A Wiregrass ( <i>Aristida</i> sp.), Rock Fern.  Exotics: Rhodes Grass, St. Johns Wort, Cobblers Pegs ( <i>Bidens pilosa</i> ), Catsear. Pigeon Grass ( <i>Setaria</i> sp.), <i>Paspalum</i> sp.



**Plate 14** A Photographic Example of CW 299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine woodland on Sandy Flats, mainly in the Pilliga Scrub Region (Moderate/Good\_medium)

**4.1.14 CW 272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum Shrubby Open Forest on Sandstone Low Hills (Moderate/Good\_medium)**

**Vegetation formation:** (Shrubby sub-formation)

**Vegetation class:** Western Slopes Dry Sclerophyll Forests

**BVT:** CW 272. A summary of the floristic diversity is provided in **Table 22**. A photographic example is provided in **Plate 15**.

**PCT:** 468

**Conservation status:** Not a TEC

**Estimate of percent cleared:** 33% (Central West)

**Condition:** Moderate/Good\_Medium. Occurs towards the northern extremity of the proposed pipeline route along Ulan Road (south of Toole Road), mostly associated with a minor waterway. Weeds are uncommon, but part of this vegetation comprises a disused road/track, in a disturbed condition. The threatened species, Ausfeld's wattle (*Acacia ausfeldii*), was found to be common in the disturbed area.

**Extent in the Study Area:** 2.59ha

**Extent in the BAR Footprint (Mine Site):** 0ha

**Extent in the BAR Footprint (Pipeline):** 0.65ha

**Plots completed in vegetation zone (BAR footprint):** EK49



Table 22

**Summary of the Floristic Diversity within CW 272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum Shrubby Open Forest on Sandstone Low Hills (Moderate/Good\_medium)**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical species
Trees	12 3 – 20	30 30 – 30	Blakely's Red Gum, Western Grey Box, Rough-barked Apple, Black Cypress Pine, Narrow-leaved Ironbark ( <i>E. crebra</i> ).
Shrubs/small trees	1.2 1.0 – 1.8	15 15 – 15	Sifton Bush, Ausfeld's wattle ( <i>Acacia ausfeldii</i> ), Broome Bitter Pea ( <i>Daviesia genistifolia</i> ), Sticky Hop-Bush.
Groundcovers	0.2 0.1 – 0.4	27 27 – 27	Natives: A Wiregrass ( <i>Aristida</i> sp.), Spear Grass, Wallaby Grass ( <i>Rytidosperma</i> sp.), Barbed Wire Grass, Tufted Hedgehog Grass. Exotics: Prairie Grass ( <i>Bromus catharticus</i> ), Catsear, Plantain ( <i>Plantago lanceolata</i> ).
Vines/climbers	-	-	-



**Plate 15** A Photographic Example of CW 272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum Shrubby Open Forest on Sandstone Low Hills (Moderate/Good\_medium)

## 4.2 OTHER VEGETATION

### 4.2.1 Cleared Land

**PCT:** Cleared Land is not assigned a BVT. A summary of the floristic diversity is provided in **Table 23**. Photographic examples are provided in **Plate 16**.

**Conservation status:** Not a TEC

**Condition:** Comprises cleared grazing land. Some of the more hardy native grasses persist, however, exotic pasture species and other farm weeds dominate in all but occasional patches (this is especially so during periods of annual weed proliferation).

**Extent in the Study Area:** 486.73ha

**Extent in the BAR Footprint (Mine Site):** 74.29ha

**Extent in the BAR Footprint (Pipeline):** 39.54ha

**Table 23**  
**Summary of the Floristic Diversity within Cleared Land**

Structure	Av. Height & range (m)	Av. Cover & range (%)	Typical Species
Trees	-	-	-
Shrubs/small trees	-	-	-
Groundcovers	0.5 0.1 to 0.7	(Natives) 40 25 – 55  (Exotics) 60 45 – 75	Natives: Red Grass, Wallaby Grass ( <i>Rytidosperma</i> spp.), Tufted Hedgehog Grass ( <i>E. caespitosus</i> var. <i>caespitosus</i> ), Weeping Grass, Common Wheatgrass, <i>Juncus usitatus</i> , Bidgee-widgee, Star Cudweed ( <i>E. sphaericus</i> ), Swamp Dock.  Exotics: <i>Bromus</i> spp., Catsear, Shivery Grass, Saffron Thistle ( <i>C. lanatus</i> ), Rat's-tail Fescue, Paspalum ( <i>Paspalum dilatatum</i> ), St. Johns Wort, Hairgrass, Ragwort ( <i>Senecio jacobaea</i> ), Narrow-leaved Clover, A Medic ( <i>Medicago</i> sp.), Maltese Cockspur ( <i>Centaurea melitensis</i> ), Skeleton Weed, Goose Grass ( <i>Eleusine tristachya</i> ), <i>Phalaris</i> sp.



**Plate 16**      **Photographic Examples of Cleared Land within the Study Area**

### 4.3 THREATENED ECOLOGICAL COMMUNITIES

Of the 11 BVT within the Study Area, three of these meet the definition of a threatened ecological community (TEC).

Rough-Barked Apple – Red Gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW S/W Slopes & Brigalow Belt South Bioregions (CW 111), Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW S/W Slopes Bioregion (CW 112) and White Box grassy woodland in the upper slopes sub-region (CW 216) are consistent with the BC Act listing for *White Box*, *Yellow Box*, *Blakely's Red Gum Woodland*, which is listed as an endangered ecological community. This is also confirmed by the OEH BioNET Vegetation Classification System (OEH, 2020b).

Under certain identification criteria, these BVT also meet the definition of this TEC under the EPBC Act, collectively referred to as Box-Gum Woodland (BGW). Listed as a critically endangered ecological community (CEEC) *White Box-Yellow Box-Blakey's Red Gum Grassy Woodland and Derived Native Grassland*, some patches of vegetation meet the EPBC Act criteria on the following basis:

- The most common overstorey species is, or was previously, White Box and/or Yellow Box and/or Blakey's Red Gum
- Native species exceed 50% of the groundcover vegetation
- Patches (as defined by the EPBC Act identification guidelines) are greater than 2 hectares in area
- Natural regeneration of the dominant overstorey eucalypt species is occurring

Under both the BC Act and EPBC Act, native grassland which has been formed by the clearing of overstorey vegetation, also meets the definition of BGW TEC.

The location and legal classification of BGW throughout the Study Area is presented in **Map 30** to **Map 40**.

#### **4.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE – VEGETATION COMMUNITIES**

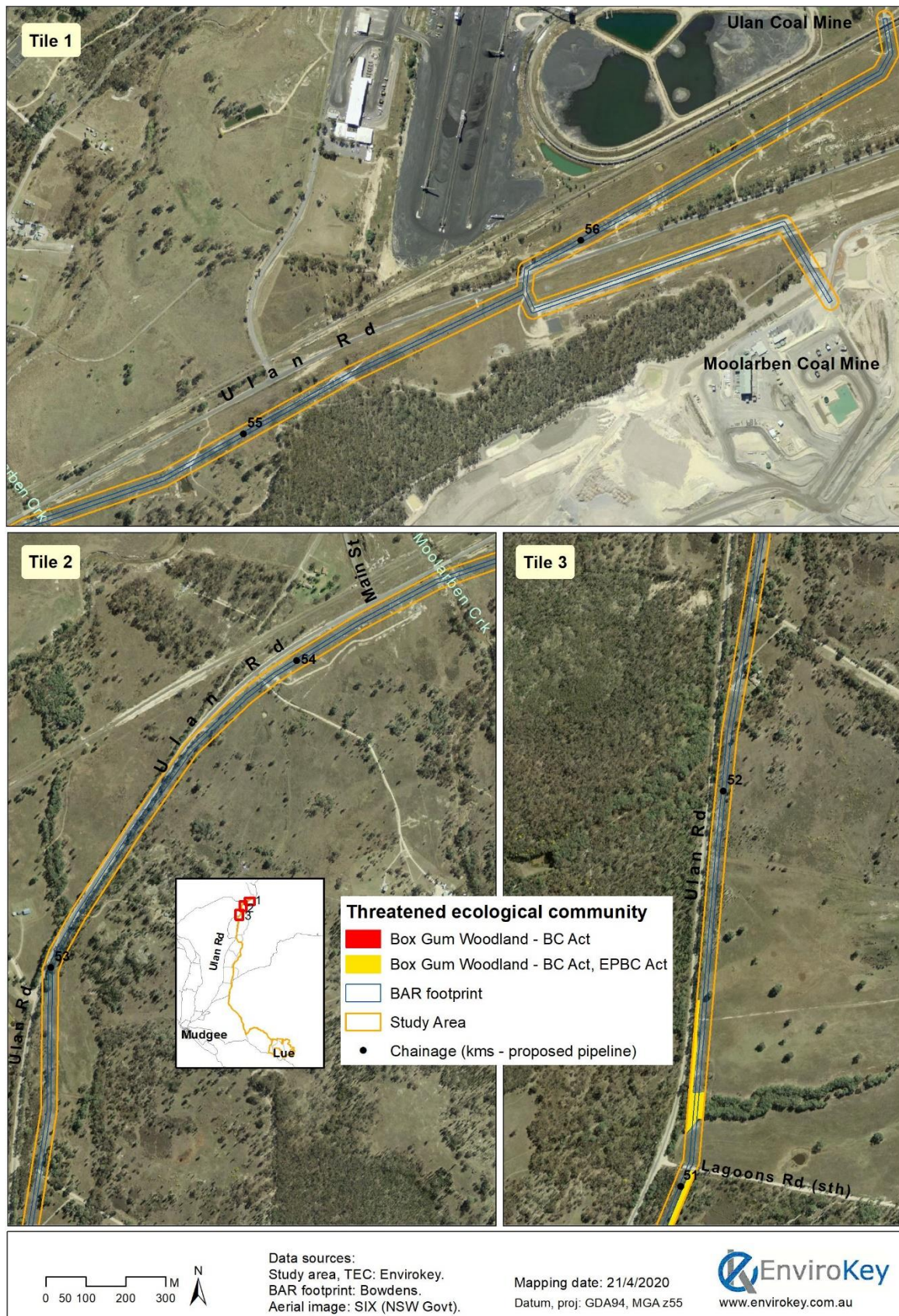
Box-Gum Woodland (BGW) was the only EPBC listed Matter of National Environmental Significance (MNES) – vegetation community identified during the comprehensive field surveys. This was identified on the basis that patches met the identification criteria outlined within Appendix 2 of the National Recovery Plan for the EPBC Act CEEC listing (DECCW, 2011).

Patches were assigned to the CEEC when they met the following criteria in accordance with the identification flowchart (Appendix 2 of the National Recovery Plan for BGW):

- The most common overstorey species is, or was previously, White Box and/or Yellow Box and/or Blakey's Red Gum
- Native species exceed 50% cover of the groundcover vegetation
- Patches (as defined by the EPBC Act identification guidelines) are greater than 2 hectares in area
- Natural regeneration of the dominant overstorey eucalypt species is occurring.

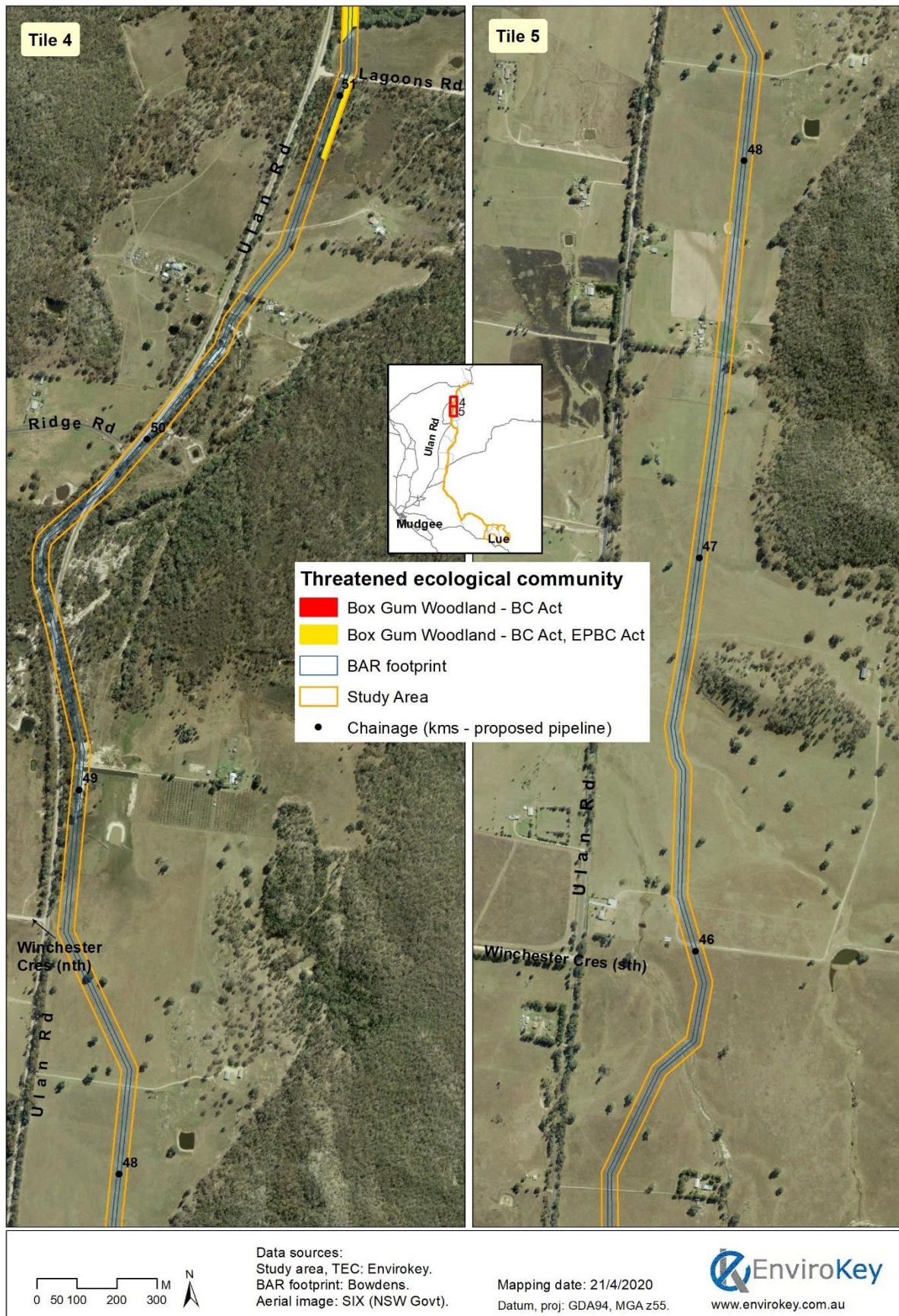


**Map 30 Box-gum Woodland within the Study Area – Reference Areas 1 to 3**



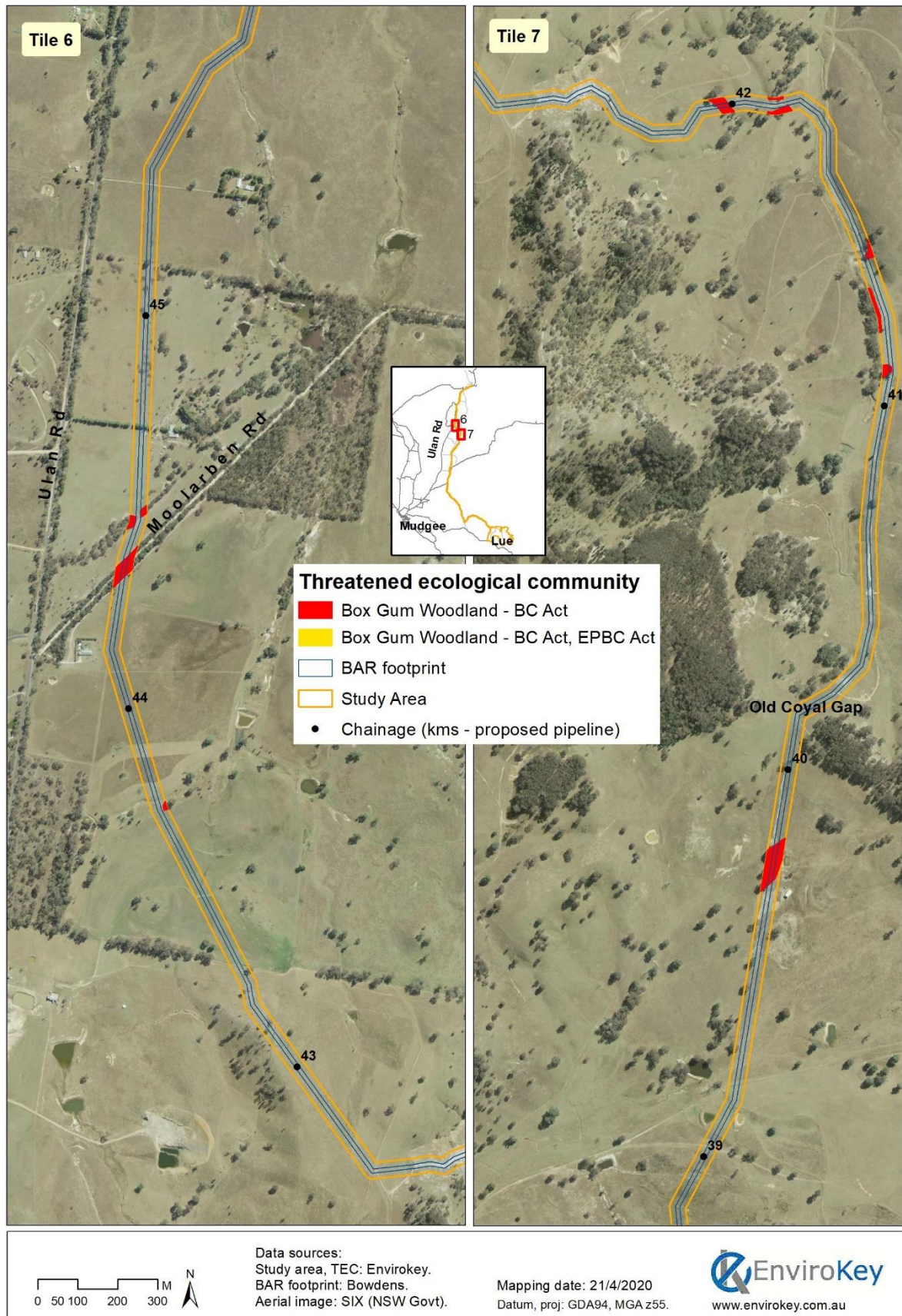


**Map 31 Box-gum Woodland within the Study Area – Reference Areas 4 and 5**



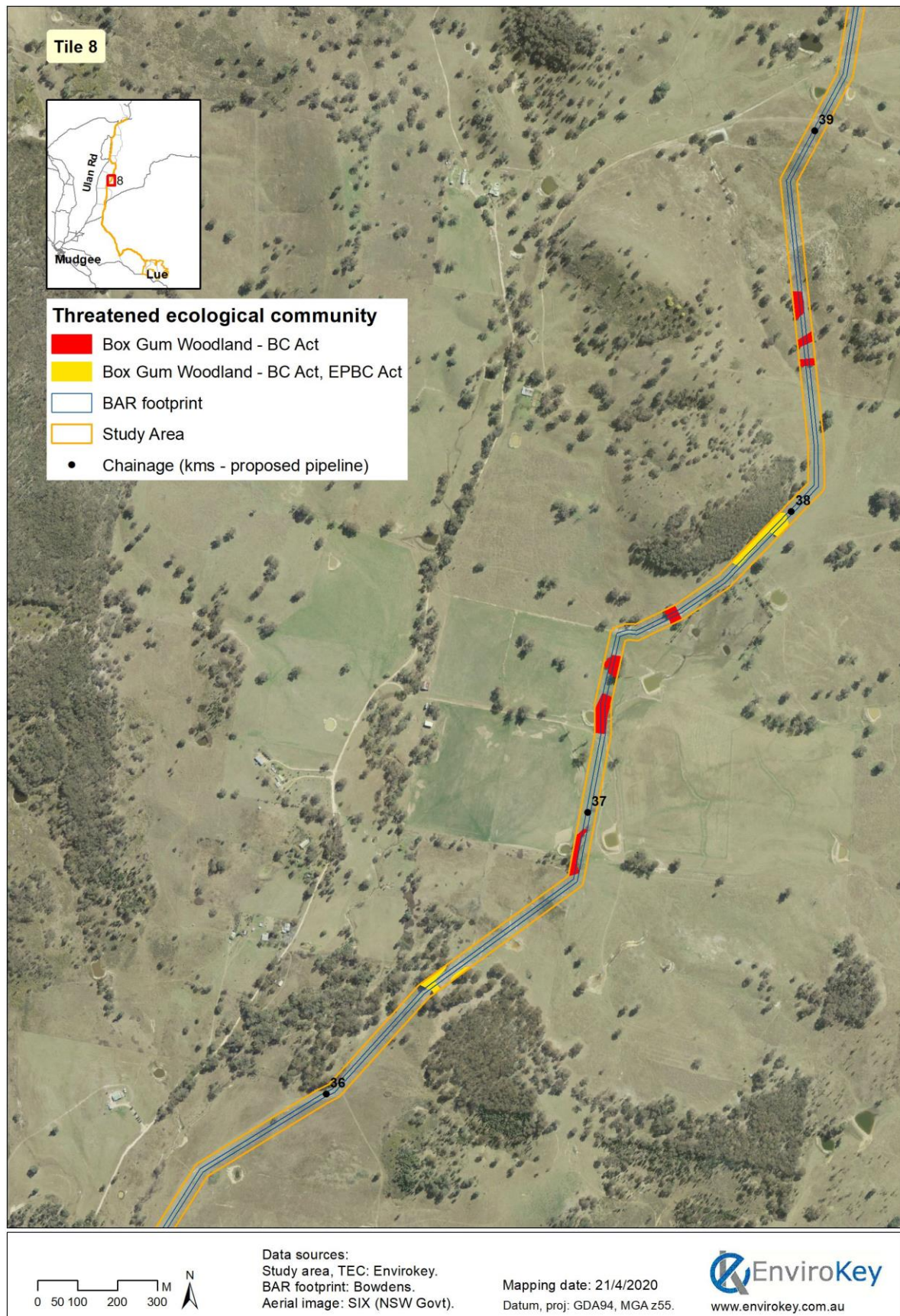


**Map 32 Box-gum Woodland within the Study Area – Reference Areas 6 and 7**



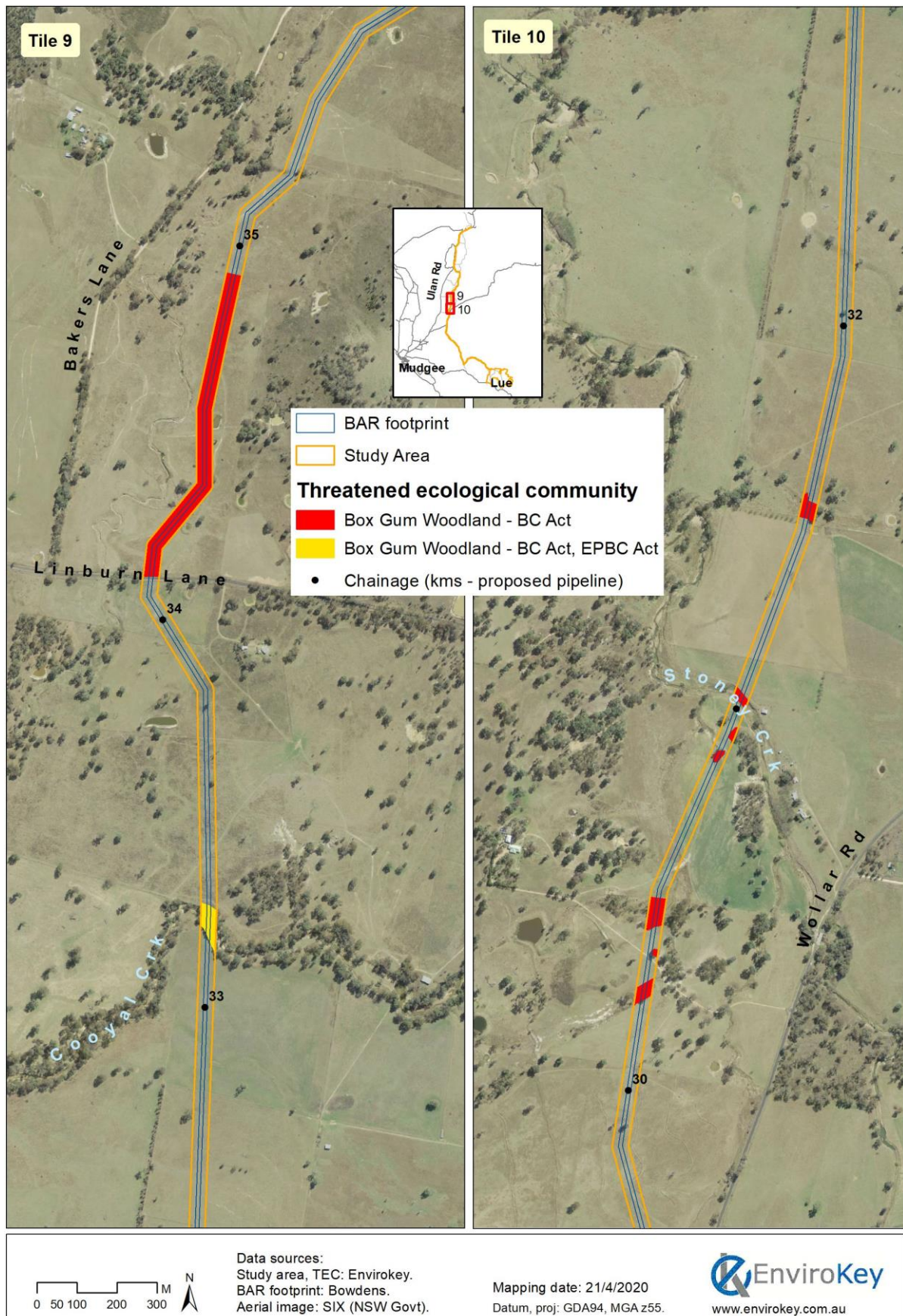


**Map 33 Box-gum Woodland within the Study Area – Reference Area 8**



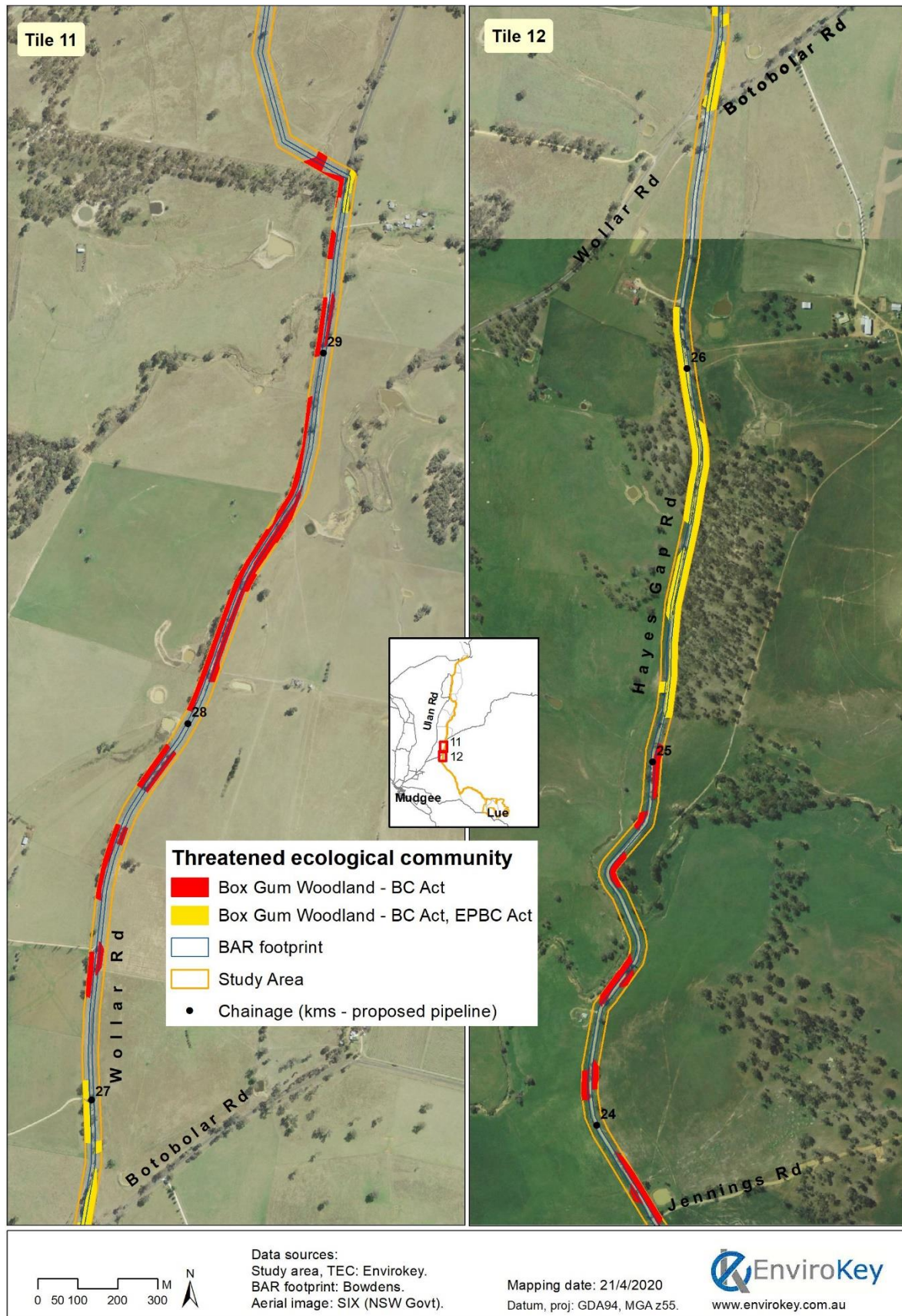


**Map 34 Box-gum Woodland within the Study Area – Reference Areas 9 and 10**



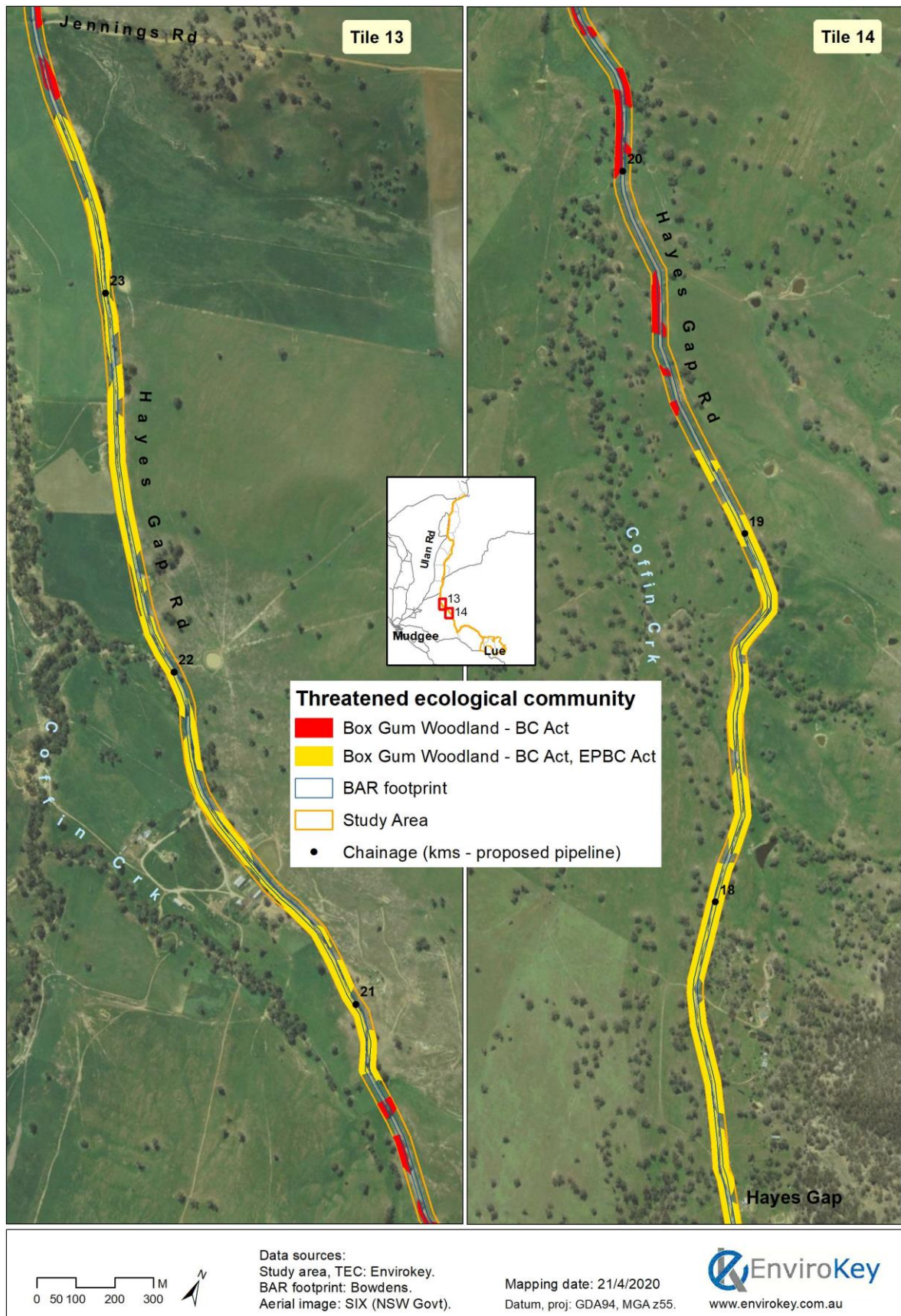


**Map 35 Box-gum Woodland within the Study Area – Reference Areas 11 and 12**



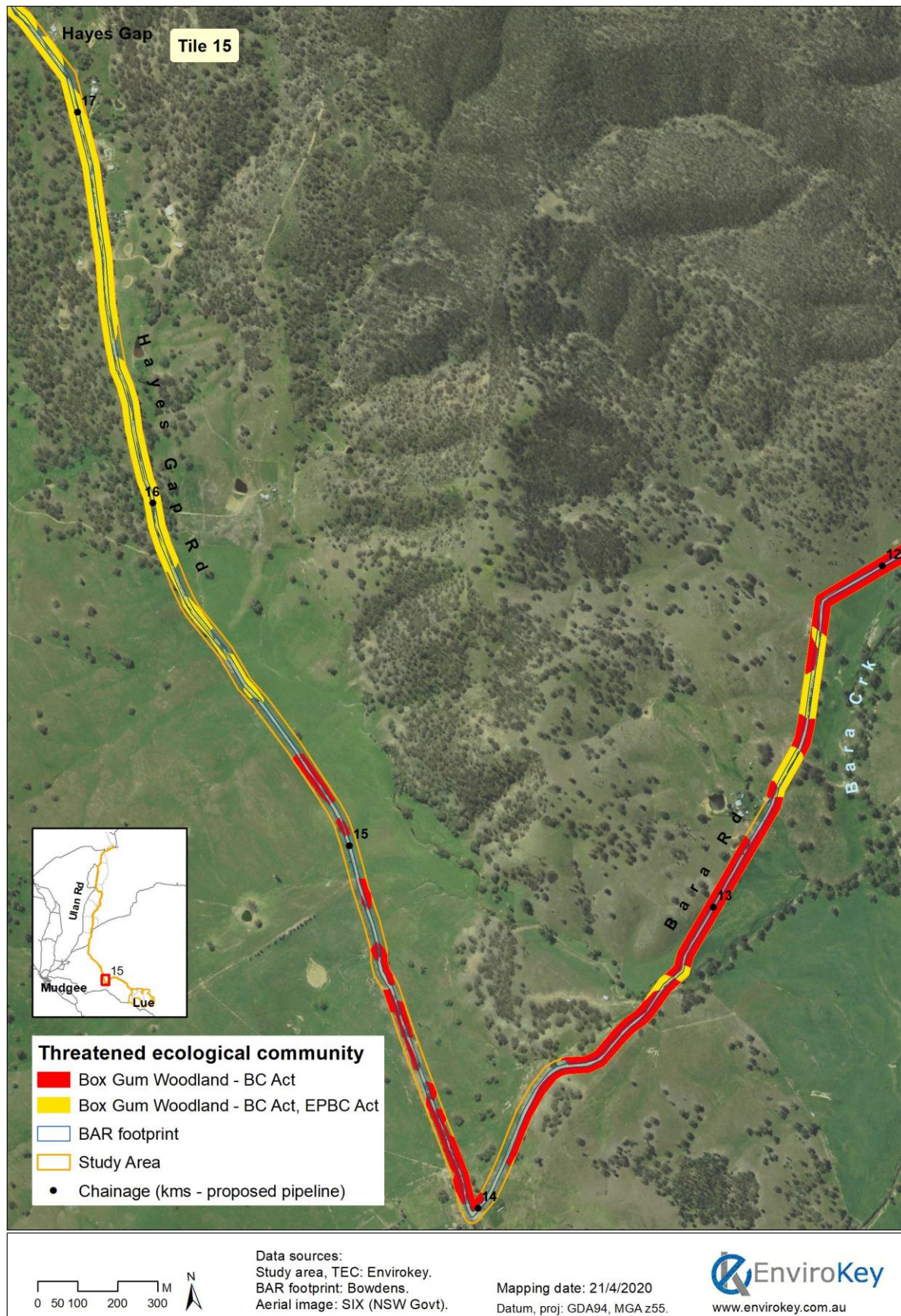


**Map 36 Box-gum Woodland within the Study Area – Reference Areas 13 and 14**



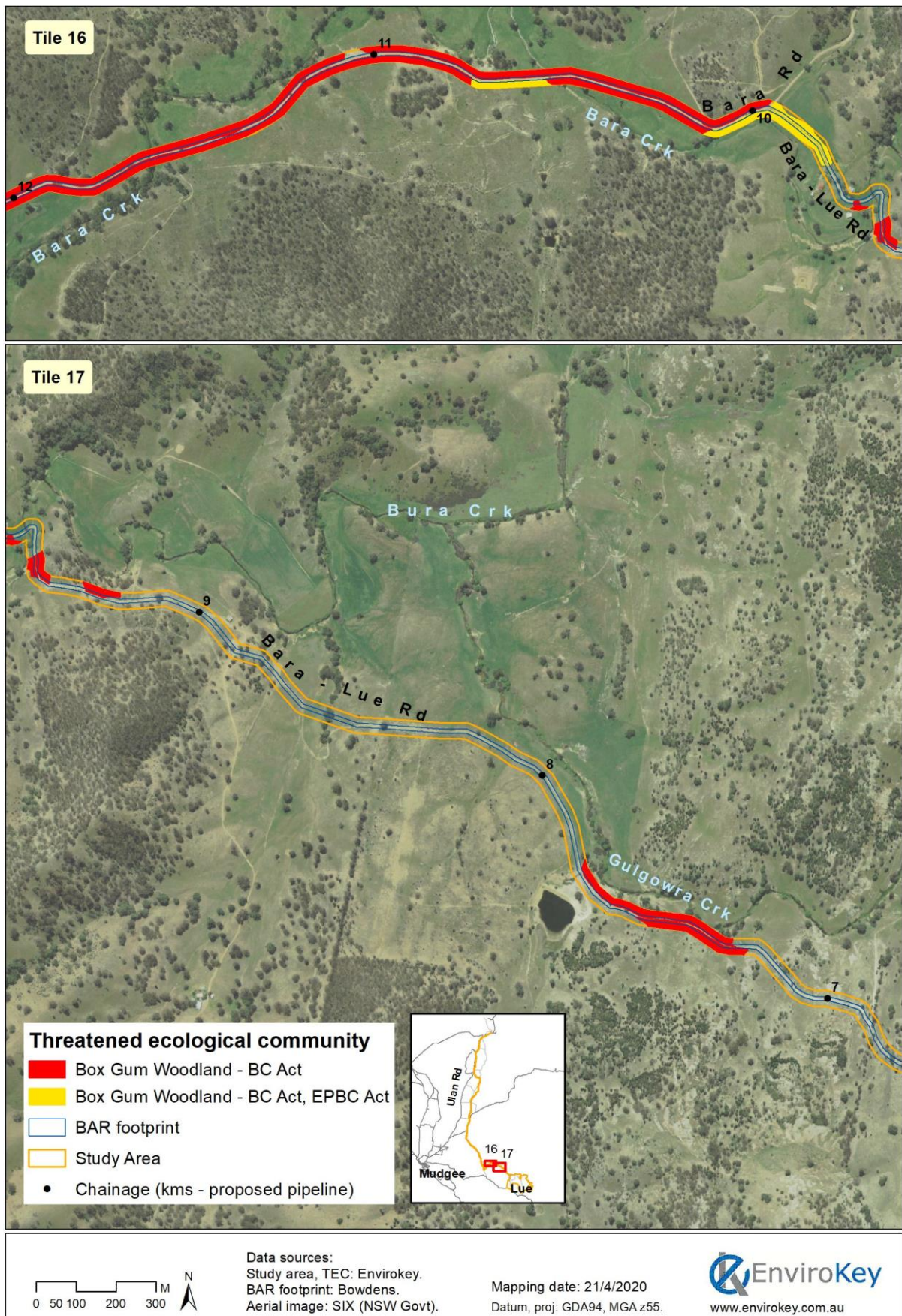


**Map 37 Box-gum Woodland within the Study Area – Reference Area 15**



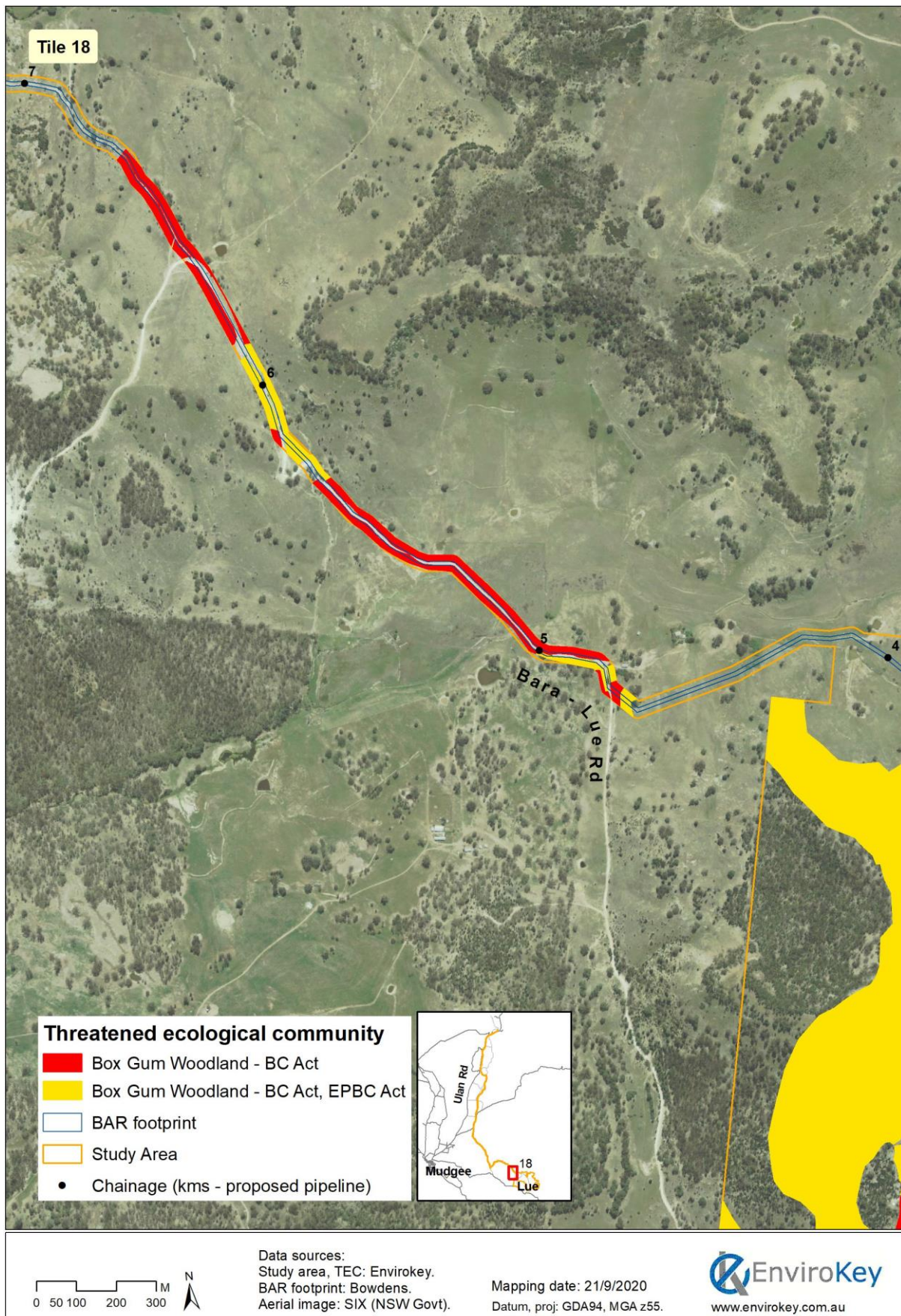


**Map 38 Box-gum Woodland within the Study Area – Reference Areas 16 and 17**



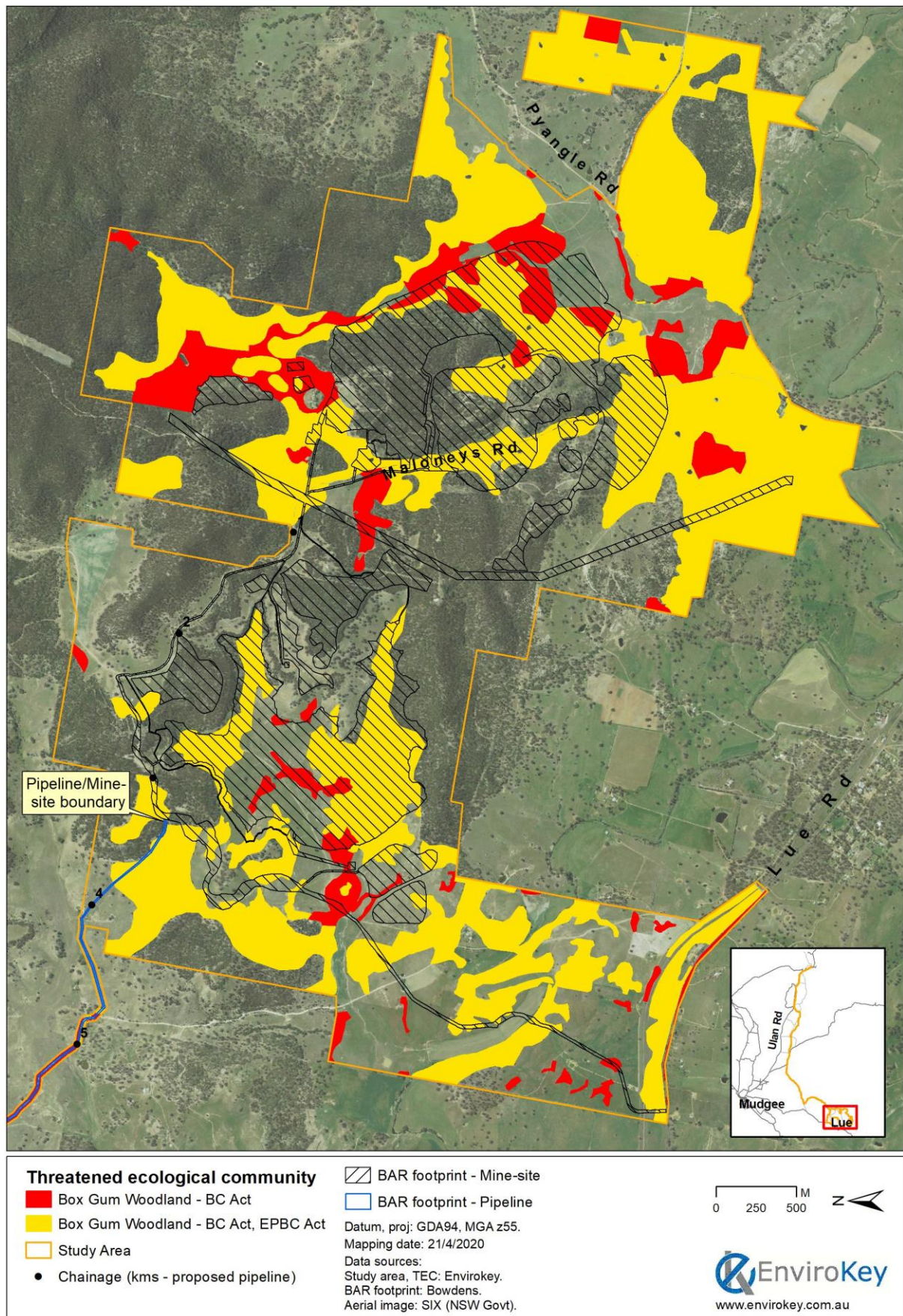


**Map 39 Box-gum Woodland within the Study Area – Reference Area 18**





**Map 40 Box-gum Woodland within the Study Area – Reference Area – Mine Site**



**Table 24** details the total extent of EPBC Act Box-Gum Woodland CEEC within the Study Area. The extent of this CEEC is detailed on **Maps 30 to 40**.

**Table 24**  
**Box-Gum Woodland Extent that Meets the EPBC Act identification Criteria and BC Act listed BGW within the Study Area and Impact Areas**

<b>Condition</b>	<b>Study Area (ha)</b>	<b>BAR Footprint – Mine Site (ha)</b>	<b>BAR Footprint – Pipeline (ha)</b>	<b>BAR Footprint – Total (ha)</b>
BC Act listed BGW only	146.6	30.09	4.35	34.45
BC Act and EPBC Act listed BGW	673.74	144.06	3.77	147.82
<b>Total</b>	<b>820.34</b>	<b>174.15</b>	<b>8.12</b>	<b>182.27</b>



## 5. THREATENED SPECIES

Threatened species relevant to the Project are detailed in this section. This section makes reference to two classifications of threatened species: ecosystem credit species (that is species that can be predicted to occur based on vegetation community and/or habitat assessment) and species credit species (those species that cannot be predicted, and that require specific surveys). The BBCC pre-determines ecosystem credit species and species credit species.

### 5.1 HABITAT FEATURES FOR PARTICULAR SPECIES CREDIT SPECIES

The BBCC, both Mine Site (Site-based assessment) and Pipeline (Linear-based Assessment), identified specific habitat features for particular species credit species and requires an assessment of whether any of those habitat features occur within the Study Area (**Table 25**). If a species habitat is present, then targeted surveys are required.

**Table 25**  
**Assessment of Geographic / Habitat Features for Particular Species Credit Species**

Common Name	Scientific Name	Conservation Status		Habitat Feature	Relevance to BAR footprints
		BC Act	EPBC Act		
Large-eared Pied Bat	<i>Chalinolobus dyweri</i>	V	V	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts and tunnels	Relevant. Land containing escarpment and cliffs adjacent to BAR footprints, some old mine shafts present
Brush-tailed Rock-wallaby	<i>Petrogale penicillate</i>	E	V	Land within 1km of rock outcrops or cliff lines	Relevant. Small portions of the BAR footprints are within 1km of rock outcrops or cliff lines.
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	E	E	Forb-rich grassy woodland	Relevant to only small portions of the BAR footprints
Booroolong Frog	<i>Litoria booroolongensis</i>	E	E	Land within 100m of stream or creek banks	Relevant. Habitat features within the BAR footprints.
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	V	-	Land within 40m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	Relevant. Habitat features within the BAR footprints.
Small Purple-pea	<i>Swainsona recta</i>	E	E	Land containing a forb-rich grassy groundlayer	While a forb-rich grassy groundlayer is not present, individuals located during field survey within BAR footprint.

## 5.2 TARGETED SURVEYS FOR THREATENED SPECIES

The FBA requires that targeted surveys occur for all species credit species, as ecosystem credit species are predicted to occur based on habitat as a surrogate. This is relevant to species listed under the BC Act. EPBC Act species were targeted during the comprehensive field surveys.

The BBCC pre-determines a list of species credit species relevant to the Project (**Table 26**). Based on this analysis, the comprehensive field surveys have adequately surveyed all species credit species with the exception of *Prasophyllum* sp. Wybong.

*Prasophyllum* sp. Wybong is an undescribed species of orchid listed under the EPBC Act. It is currently known from only a handful of locations and is **not listed under the BC Act**. However, targeted surveys by AREA Environmental included this species in favourable seasonable conditions and it was not detected (**Annexure 9**).

**Table 26**  
**Species Credit Species requiring Survey and Relevant Survey Timing**

Common Name	Scientific Name	Survey timing											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Booroolong Frog	<i>Litoria booroolongensis</i>	Y	Y										Y
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Brush-tailed Rock-wallaby	<i>Petrogale penicillate</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Capertee Stringybark	<i>Eucalyptus cannonii</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clandulla Geebung	<i>Persoonia marginata</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eastern Pygmy-possum	<i>Carcartetus nanus</i>	Y	Y	Y	Y					Y	Y	Y	Y
Eucalyptus alligatrix subsp. alligatrix	<i>Eucalyptus alligatrix subsp. alligatrix</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Euphrasia arguta	<i>Euphrasia arguta</i>	Y	Y	Y	Y						Y	Y	Y
Grevillea divaricate	<i>Grevillea divaricate</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grevillea obtusiflora	<i>Grevillea obtusiflora</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Koala	<i>Phascolarctos cinereus</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Y	Y	Y	Y					Y	Y	Y	Y
Pale-headed snake	<i>Hoplocephalus bitorquatus</i>	Y	Y	Y	Y						Y	Y	Y
Prasophyllum sp. Wybong	<i>Prasophyllum sp. Wybong</i>										Y		
Regent Honeyeater	<i>Anthochaera phrygia</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Silky Swainson-pea	<i>Swainsona sericea</i>									Y	Y	Y	Y
Small Purple-pea	<i>Swainsona recta</i>									Y	Y	Y	
Squirrel Glider	<i>Petaurus norfolcensis</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
*Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	No survey timing provided within BBCC											
Veronica blakelyi	<i>Veronica blakelyi</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

y=yes for suitable survey timing

\*There is no survey timing for this species within the BBCC and there are no records of this species in the locality

Note: The highlighted month is the month in which targeted surveys were undertaken for the relevant species

### 5.3 ECOSYSTEM CREDIT SPECIES

The FBA requires that a list of threatened species that can be reliably predicted by habitat surrogates be identified. These species are called ecosystem credit species and they are automatically generated based on the PCT, the IBRA subregion of the development site and biobank site, and the condition and patch size of vegetation.

**Table 27** details the ecosystem credit species requiring offset as a result of the Project for both the Mine Site (Site based assessment) and the Pipeline (Linear-based assessment). These are automatically generated by the BBCC and were not altered for this BAR. The species with the highest threatened species (TS) offset multiplier determines the credit requirements for any BVT that these species are predicted to occur in.

**Table 27**  
**Ecosystem Credit Species requiring Offset as a Result of the Project**

Page 1 of 2

Common Name	Scientific Name	TS offset multiplier Mine Site	TS offset multiplier Pipeline
Black -chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis subsp. gularis</i>	1.3	1.3
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus subsp. victoriae</i>	2.0	2.0
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6	2.6
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	2.1	2.1
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3	1.3
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	2.2	2.2
Flame Robin	<i>Petroica phoenicea</i>	1.3	1.3
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2.0	2.0
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1.8	1.8
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis subsp. temporalis</i>	1.3	1.3
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>	1.7	1.7
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4	1.4
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8	1.8
Little Whip Snake	<i>Suta flagellum</i>	2.3	2.3
Masked Owl	<i>Tyto novaehollandiae</i>	3.0	3.0
Painted Honeyeater	<i>Grantiella picta</i>	1.3	1.3
Powerful Owl	<i>Ninox strenua</i>	3.0	3.0
Scarlet Robin	<i>Petroica boodang</i>	1.3	1.3
Speckled Warbler	<i>Chthonicola sagittata</i>	2.6	2.6
Spotted Harrier	<i>Circus assimilis</i>	1.4	1.4
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	2.6	2.6
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4	1.4
Swift Parrot	<i>Lathamus discolor</i>	1.3	1.3
Turquoise Parrot	<i>Neophema pulchella</i>	1.8	1.8
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3	1.3
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2	2.2



### 5.3.1 Survey Results

While the BBCC automatically predicts the presence of threatened species, the actual field surveys recorded a total of 13 ecosystem credit species within the Study Area. These being:

- Barking Owl, vulnerable BC Act
- Dusky Woodswallow, vulnerable BC Act
- Hooded Robin, vulnerable BC Act
- Diamond Firetail, vulnerable BC Act
- Varied Sittella, vulnerable BC Act
- Scarlet Robin, vulnerable BC Act
- Speckled Warbler, vulnerable BC Act
- Brown Treecreeper, vulnerable BC Act
- Grey-crowned Babbler, vulnerable BC Act
- Eastern Cave Bat (foraging only), vulnerable BC Act
- Greater Broad-nosed Bat, vulnerable BC Act
- Eastern Bentwing Bat (foraging only), vulnerable BC Act
- Large-eared Pied Bat (foraging only), vulnerable BC Act & EPBC Act

The locations of all threatened species recorded during field surveys are provided on **Map 41** and **Map 42**. No other records of ecosystem credit species are known to occur within the Study Area. A discussion on these records is provided below and a full fauna species list from the field surveys is included in **Annexure 5**.

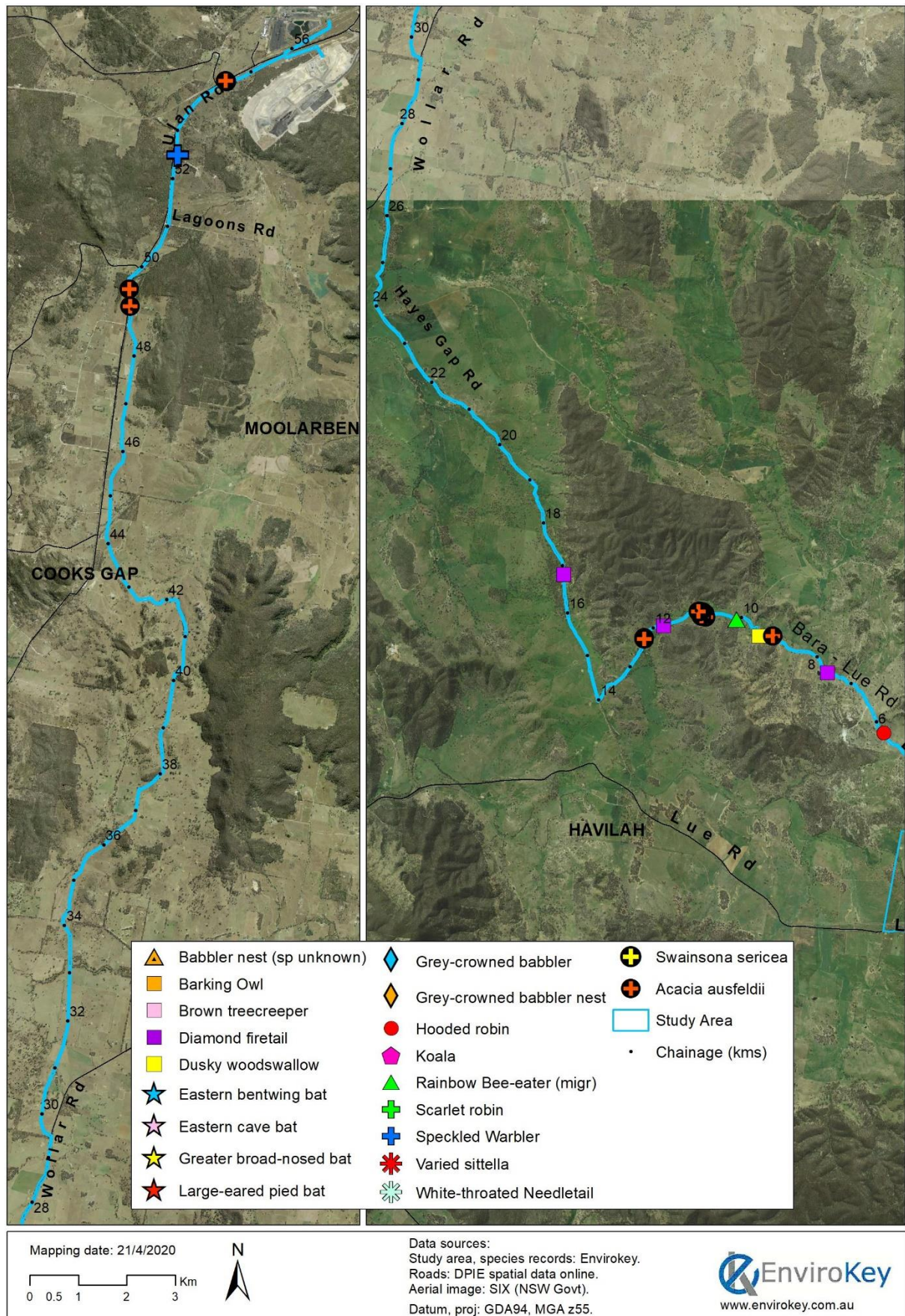
#### Barking Owl

The Barking Owl is widely distributed around Australia but sparsely in NSW (OEH, 2020c, NPWS, 2003b). They can be found in a range of coastal habitats, but in northern Australia and semi-arid areas, riparian areas dominated by red gum and *Melaleuca* species seem preferred. They are also known to be flexible in habitat preferences, and are known to hunt in fragmented woodlands, partially cleared farmland, and closed forest (OEH, 2020c).

The moderately large owl is often seen along timbered watercourses, especially in dense vegetation where they would roost. The species roosts in shaded portions of tree canopies, including tall mid-story trees with dense foliage such as *Acacia* and *Casuarina* species (OEH, 2020c). Nesting occurs during mid-winter and spring within large old hollows, where nests are usually repeatedly used. The species opportunistically hunts for terrestrial, arboreal and aerial prey between dusk and dawn and occasionally in daylight (Kavanagh, 2002). Home ranges are thought to be between 200 and 6 000ha (NPWS, 2003b).

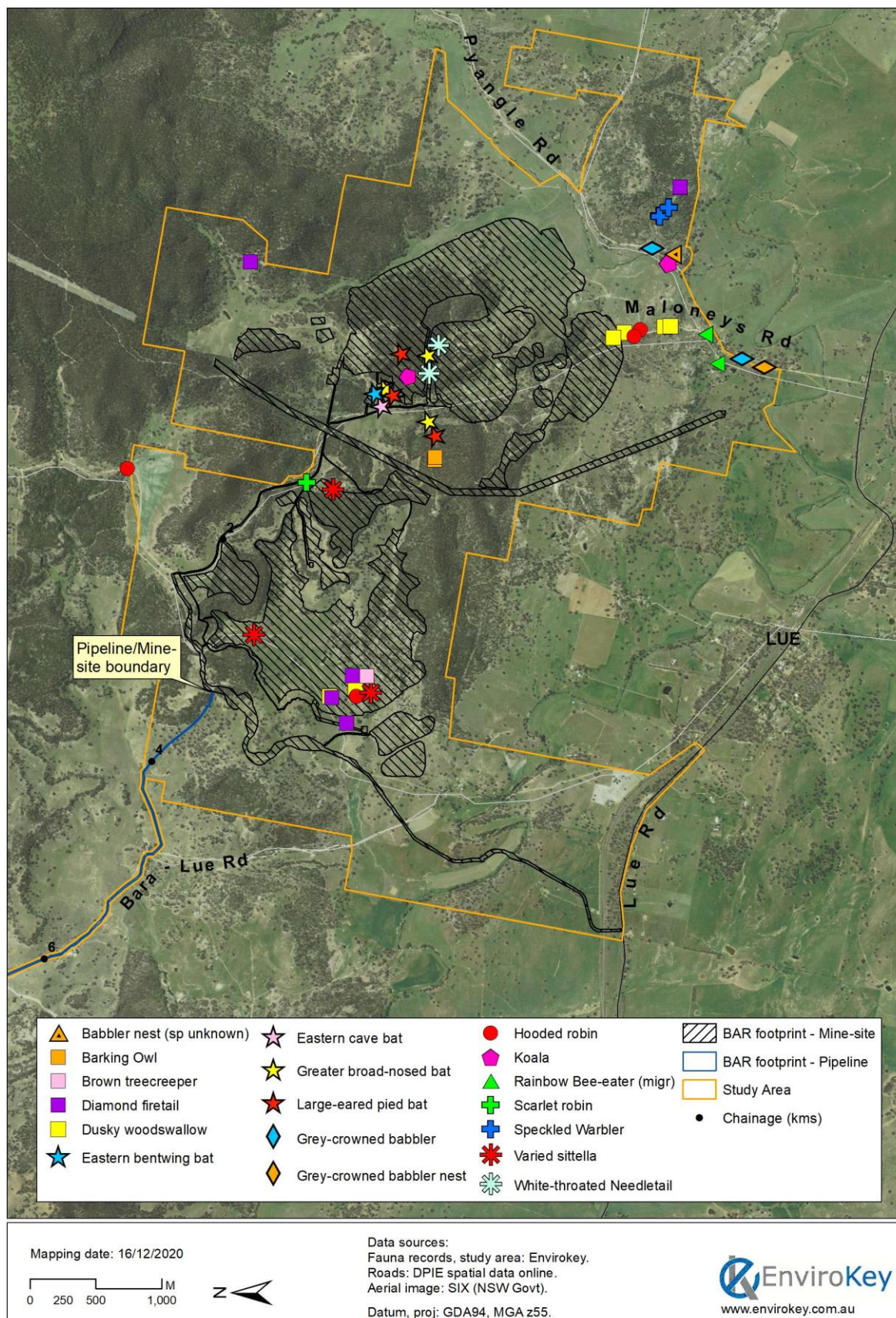
During the comprehensive field surveys, Barking Owl was recorded on two separate nights from the same location within the Mine Site and within the BAR footprint (Mine Site). It is uncertain if this was the same individual, or two individuals. No breeding site has been located within the Study Area, despite extensive searches of hollow-bearing trees. It is probable that the woody vegetation portions of the Study Area provide foraging habitat and potentially breeding habitat for Barking Owl.

**Map 41 Threatened and Migratory Species recorded during the field survey within the Study Area**



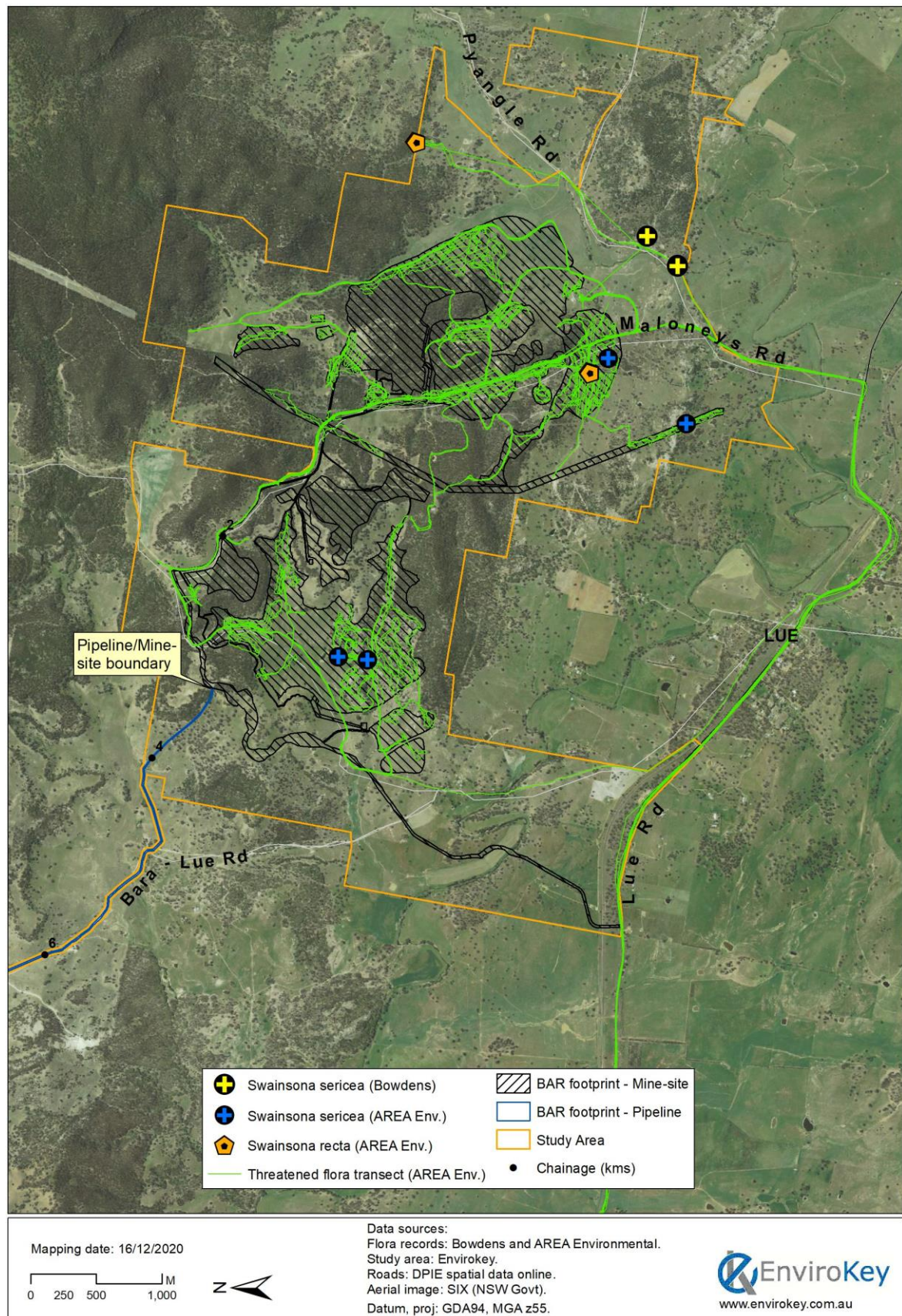


**Map 42 Threatened and Migratory Species recorded during the Field Survey within the Study Area**





**Map 43 Swainsona recta and Swainsona sericea recorded within the Study Area**



Only two other records of Barking Owl exist within the locality; one being Dungeree State Forest south of the Study Area, the other near Durrigere State Conservation Area, north of Ulan (OEH, 2020a) (**Map 5**).

### **Dusky Woodswallow**

Dusky Woodswallow are known to occur in dry, open forest and woodland, including mallee. They are also known in open farmlands, particularly around the edges of woodland and forest patches (OEH, 2020c). They are regarded as widespread in eastern, southern and south-western Australia, and in NSW, it occurs across most of the state (OEH, 2020a).

During the comprehensive field surveys, Dusky Woodswallow was frequently recorded along the southern section of the existing Maloneys Road where open woodland and cleared land occurs. Breeding activity was also recorded in this area. This species was also recorded in the western portion of the Mine Site and along the water supply pipeline corridor on Bara-Lue Road. Based on the frequency of sightings, it is likely that this species occurs across the general locality, despite previous records of Dusky Woodswallow being generally confined to the northern and central portions of the locality around Ulan and Munghorn Gap Nature Reserve (OEH, 2020a) (**Map 5**). The BAR footprint and Study Area is confirmed as both breeding and foraging habitat for Dusky Woodswallow.

### **Hooded Robin**

The Hooded Robin is found across many parts of Australia in woodlands, acacia scrub and mallee (OEH, 2020c, Sass, 2009, Reid, 1999, Watson et al., 2001). First recognised as a declining woodland bird (Reid, 1999), the Hooded Robin is now listed as vulnerable under the BC Act. It is generally considered that the species requires a structurally diverse habitat including microhabitats such as native grasses, shrubs and fallen timber across a breeding territory of around 10 hectares (OEH, 2020c). However, it is believed that the species generally exhibits demanding requirements for both habitat complexity and area (>100ha) (Watson et al., 2001) confirming that the Study Area provides both of these attributes. The Study Area contains habitat for this species, which appears to be mostly confined to lightly wooded country. The five sightings within the Study Area are mostly outside of the BAR footprint. One sighting has also occurred on Bara-Lue Road, near an active quarry.

There are scattered records across the locality including on Lue Road, Ulan Road, Munghorn Gap Nature Reserve and near Ulan (OEH, 2020a) (**Map 5**).

### **Diamond Firetail**

Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South-western Slopes and the North-west Plains and Riverina (OEH, 2020a, Morcombe, 2004). Although they are not commonly found in coastal districts, there are records from near Sydney, the Hunter Valley and the Bega Valley (OEH, 2020a).

The species is found in grassy eucalypt woodlands, including Box-Gum and Snow Gum Woodlands (OEH, 2020c). They also occur in open forest, mallee, Natural Temperate Grassland, and in secondary grasslands. They forage exclusively on the ground, on ripe and partially ripe grass and herb seeds as well as insects.

The species is known to build bottle-shaped nests in trees and bushes and preferentially chooses mistletoe as a nest site (Cooney and Watson, 2005). It has declined in numbers in many areas and has disappeared from parts of its former range with Reid (1999) identifying it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt.

Diamond Firetail appears relatively widespread in the wider locality based on previous records (OEH, 2020a) (**Map 5**). This is also confirmed within the Study Area, with eight sightings in total. All of these records, with the exception of one, were in open woodland. The exception was a single bird in a gully in the north-east corner of the Study Area in the vicinity of the Mine Site.

### **Varied Sittella**

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west (Morcombe, 2004, OEH, 2020c, OEH, 2020a, Noske, 1998). It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

The apparent decline has been attributed to declining habitat cover and quality (Watson et al., 2001). The sedentary nature of this species makes cleared agricultural land a potential barrier to movement. Survival and population viability are sensitive to habitat isolation, reduced patch size and habitat simplification, including reductions in tree species diversity, tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter.

Existing previous records of Varied Sittella occur across the locality and including within the Study Area (likely records from ELA previous surveys) (OEH, 2020a) (**Map 5**). EnviroKey recorded three sightings within the Study Area, and all within the BAR footprint.

Given the relatively sedentary nature of this species, it is most likely that any individuals observed are resident within the Study Area, confirming breeding and foraging habitat is present.

### **Scarlet Robin**

Scarlet Robin is known from dry eucalypt forest and woodlands ranging from south-east Queensland to south east South Australia, Tasmania and south-west Western Australia, and is found in both coastal and inland environments (OEH, 2020c). They are known to occasionally inhabit mallee, wet forest communities or in wetland and tea-tree swamps. During autumn and winter many live in open grassy woodlands and grasslands. In forests and woodlands they prefer an understorey that is open and grassy with few scattered shrubs. Fallen timber and abundant logs are important features of their preferred habitat. They are insectivores and can forage from low perches or off the ground.

Scarlet Robin is considered sensitive to habitat fragmentation and it is threatened by reductions of structural complexity of habitat and native ground covers. (Watson et al., 2001, Barrett et al., 2007). They generally breed from July to January and defend their breeding territory. Nests are made into a cup shape and consist of plant fibres and cobwebs. These nests are usually more than two metres off the ground in the form of a tree (OEH, 2020c).



Existing previous records of Scarlet Robin occur across the locality and including within the Study Area (likely records from ELA previous surveys) (OEH, 2020a) (**Map 5**). EnviroKey recorded Scarlet Robin only on a single occasion, next to the existing Maloneys Road in dense Cypress Pine regrowth within the BAR footprint. These records confirm that foraging habitat and most likely, breeding habitat is present.

### Speckled Warbler

Speckled Warbler has a patchy distribution throughout its range, which is south-eastern Queensland, the eastern half of NSW and most of Victoria (OEH, 2020c, Bell, 1984). They generally occur in eucalypt dominated communities that have a grassy understory. Often these are located on rocky ridges or in gullies in hills. They generally require large remnants of vegetation to persist in fragmented landscapes. Speckled Warbler has been recorded three times in the Study Area; twice in the south-east corner, east of Pyangle Road, and more recently along Ulan Road near Ulan. Previous records within the locality are in the northern and central sections, with the closest to the Mine Site being near Wollar Road (OEH, 2020a) (**Map 5**).

### Brown Treecreeper

The Brown Treecreeper occurs in sub-coastal environments and slopes of the Great Dividing Range through central NSW (Wagga Wagga, Temora, Forbes, Dubbo, Inverell) (Morcombe, 2004). Whilst it has a large range, the species has greatly reduced in density across most of that range (Reid, 1999).

The species is found in eucalypt woodlands dominated by stringybarks or other rough bark eucalypts, usually with an open grassy understory (including Box-gum Woodland) and dry open forest occurs in eucalypt forests and woodland of inland plains and slopes of the Great Dividing Range (Cooper et al., 2002, OEH, 2020c). They are also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands.

Brown Treecreeper has also declined or disappeared from most remaining remnants that are smaller than 300 hectares, at least partly because females disperse from these areas or die preferentially and are not replaced (Cooper et al., 2002, Cooper and Walters, 2002). Once lost from a remnant, recolonisation is unlikely without assistance.

Brown Treecreeper has only been recorded on a single occasion in the Study Area, with a single sighting in the BAR footprint in open woodland in the western portion. An existing record is also mapped with the Study Area from BioNET records (OEH, 2020a) (**Map 5**). Across the locality, Brown Treecreeper has been recorded mostly in the central and northern sections around Munghorn Gap Nature Reserve, Ulan and further north.

### Grey-crowned Babbler

The Grey-crowned Babbler is found on the western slopes of the Great Dividing Range as well as a number of locations in the Hunter Valley where it inhabits woodlands in family groups of up to fifteen individuals (Robinson, 2006, PB, 2005, King, 1980, OEH, 2020c). However, groups as large as twenty birds have been recorded in the Hermidale area (EnviroKey, 2010b). Family groups, known as 'troupes', maintain territories that can range from as little as one but up to fifty hectares depending on the size of the troupe and the quality of habitat resource present (King, 1980). Home ranges are defended all year round, where disputes with neighbouring groups are frequent.

The species is known to occur around mining operations where individuals have been observed foraging and nesting adjacent to administrative buildings on active mining sites (EnviroKey, 2011, EnviroKey, 2012, EnviroKey, 2010a). Nonetheless, loss of habitat is regarded as a key threat to this species. However, Grey-crowned Babbler are known to exist within small home ranges heavily impacted by past clearing events. Surveys in the Hermidale area revealed the presence of a troupe within a one hectare patch of Mulga where an active nest with chicks was recorded (EnviroKey, 2010b). That home range had been isolated by past clearing of more than 50 hectares of woodland several years prior, which had surrounded the remaining patch. At least eight Grey-crowned Babblers were observed bringing food items to an active nest by regularly traversing log piles (the result of clearing) to forage wider than their remaining patch. It is these observations that lead to the suggestion that Grey-crowned Babbler are, to some degree, resilient to the impacts of habitat loss and habitat fragmentation provided connectivity to other habitats remain.

It is thought that two family troupes occur within the Study Area. Both of these are outside the BAR footprint. At least five birds comprise the family troupe along the existing Maloneys Road (in the far south of the Study Area), while at least three birds occur as a family troupe along Pyangle Road. There is some level of connectivity of habitat between these two groups along Pyangle Road, so there may be only a single group, with only some members seen along Pyangle Road at the time of the observation.

Grey-crowned Babblers are known across the locality from multiple records so their presence in the Study Area is not surprising (OEH, 2020a) (Map 5).

### **Eastern Cave Bat**

Eastern Cave Bat is usually found in dry open forest and woodland, near cliffs or rocky outcrops, but it is also known from disused mine shafts (EA, 1999, NPWS, 2001, Churchill, 2008, Law et al., 2005). They often roost in small groups with maternity sites upwards of 200 adults. They are known to cross cleared land as they forage.

The only record within the Study Area comes from previous surveys by ELA pre-December 2016. The source and date of this record is unknown. Given that the species is reliant on specific features for roosting and maternity sites, they are most likely only to forage within the Study Area.

One additional previous record for this species occurs within the locality (OEH, 2020a) (**Map 6**).

### **Greater Broad-nosed Bat**

Greater Broad-nosed Bats use a variety of habitats from woodland to tall forest and rainforest (Churchill, 2008, OEH, 2020c). Habitat essential to the lifecycle of this species includes woody native vegetation (foraging habitat) that contains hollow-bearing trees (roosting and maternity sites).

Greater Broad-nosed Bats were recorded during surveys by ELA (source and date unknown). There are no other records in the locality, and EnviroKey are uncertain as to the level of accuracy of this record particularly if it was through echolocation call recording analysis.

### **Eastern Bentwing Bat**

The Eastern Bentwing-bat are cave dwellers and depend on the presence of caves or mine shafts, tunnels or old buildings (Churchill, 2008, Dwyer, 1962, Baudinette et al., 1994, Dwyer, 1968).

Habitat essential to the lifecycle of this species includes forest (open and dense) and woodland (foraging habitat) that contains caves, disused mine shafts, rock overhangs, and old buildings.

This microbat is also regarded as highly mobile extending their foraging ranges over tens of kilometres (Barclay et al., 2000, Pavey and Burwell, 2004) so roosting habitat could be anywhere in the locality.

The species has been recorded in the Study Area by ELA (source and date unknown) and during the EnviroKey field survey by echolocation call recording. Eastern Bentwing Bat are also known from previous records across the locality (OEH, 2020a) (**Map 6**), so their presence within the Study Area is not surprising but it more likely to be foraging habitat only given the absence of caves.

### **Large-eared Pied Bat**

Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from central QLD to the NSW Southern Highlands (OEH, 2020c, Churchill, 2008, Dywer, 1966). They generally occur in well-timbered habitats containing gullies, and roost in caves as well as crevices in cliffs. This species has been recorded in the Study Area by ELA (source and date unknown) and EnviroKey field survey by echolocation call recording. Large-eared Pied Bat are also known from previous records across the locality around Munghorn Gap Nature Reserve and in the north around Ulan (OEH, 2020a) (**Map 6**). The Study Area contains woodland foraging habitat for this species. However, the Large-eared Pied Bat is only listed as a species-credit species when there is potential breeding habitat for the species likely to be impacted. This species breeds in caves, rock crevices and disused mine shafts, none of which occur within the BAR footprint. Given this, further assessment of the Large-eared Pied Bat has not been undertaken as the foraging component of the species habitat is considered to be part of the ecosystem credit requirements of the Project.

## **5.4 SPECIES CREDIT SPECIES**

### **5.4.1 Geographic and Habitat Features**

Five geographic and habitat features were chosen in the BBCC (both Mine Site as a Site-based assessment, and the Pipeline as a Linear-based assessment) as having broad features that match site habitats in some form within portions of the Study Area (Table 28).



**Table 28**  
**Geographic and Habitat Features in the Study Area**

Habitat Features	Relevant Species-credit Species
Land containing escarpments, cliffs, caves, deep crevices, old mine shafts and tunnels	Large-eared Pied Bat ( <i>Chalinolobus dyweri</i> )
Land within 1km of rock outcrops or cliff lines	Brush-tailed Rock-wallaby ( <i>Petrogale penicillata</i> )
Forb-rich grassy woodland	Tarengo Leek Orchid ( <i>Prasophyllum petilum</i> ) Small Purple-pea ( <i>Swainsona recta</i> ) Silky Swainson-pea ( <i>Swainsona sericea</i> )
Land within 100m of stream or creek banks	Booroolong Frog ( <i>Litoria booroolongensis</i> )
Land within 40m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	Pale-headed Snake ( <i>Hoplocephalus bitorquatus</i> )

## 5.4.2 Predicted Species

The BBCC (Major Project Assessment Type Mine Site and Pipeline) generates the predicted species-credit species (**Table 29**). This section evaluates the potential or actual presence in the Study Area.

**Table 29**  
**Predicted Species-Credit Species**

Page 1 of 4

Common Name	Scientific Name	Legal Status		TS Offset Multiplier	Impacted by the Project	Justification
		BC Act	EPBC Act			
Ausfeld's Wattle	<i>Acacia ausfeldii</i>	V	-	7.7	Yes	Ausfeld's Wattle was recorded within the BAR footprint of the proposed water pipeline.
Booroolong Frog	<i>Litoria booroolongensis</i>	E	E	1.3	No	The Booroolong frog was not recorded within the Study Area despite adequate fauna surveys being carried out within the seasonal requirements of this species. Although some permanent creeks with fringing vegetation do occur, these areas are heavily degraded and modified by past agricultural and clearing activity. This species is not likely to occur within the Study Area and therefore would not be impacted by the Project.
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	-	2.0	No	Brush-tailed Phascogale was not recorded within the Study Area despite adequate fauna surveys being carried out within the seasonal requirements of this species. Although hollow-bearing trees are present, densities required to support this species are not present. There are no records of this species in the locality. This species is not likely to occur within the Study Area and therefore, would not be impacted by the Project.

**Table 29 (Cont'd)**  
**Predicted Species-Credit Species**

Page 2 of 4

Common Name	Scientific Name	Legal Status		TS Offset Multiplier	Impacted by the Project	Justification
		BC Act	EPBC Act			
Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	E	V	2.6	No	The Study Area does not contain any cliff lines, or other suitable habitat, therefore, it is not likely to occur there. Given this, the species would not be impacted by the Project.
Capertee Stringybark	<i>Eucalyptus cannonii</i>	V	-	1.3	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species is known from across the locality. Given the apparent absence from the field surveys, it is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Clandulla Geebung	<i>Persoonia marginata</i>	V	V	1.3	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V	-	2.0	No	Eastern Pygmy-possum was not recorded within the Study Area despite appropriate surveys (targeted spotlighting, motion-activated cameras) and they are not known from previous records in the locality. The degraded understory after decades of agricultural activity strongly suggests that potential habitat is no longer present (even if it once was). This species is not likely to occur in the Study Area and therefore, would not be impacted by the Project.
Eucalyptus alligatrix subsp. alligatrix	<i>Eucalyptus alligatrix</i> subsp. <i>alligatrix</i>	V	V	7.7	No	Despite extensive vegetation survey, this species was not recorded within the Study Area and there are no previous records in the locality. This species is not likely to occur in the Study Area and therefore would not be impacted by the Project.
Euphrasia arguta	<i>Euphrasia arguta</i>	CE	CE	4.0	No	Despite extensive vegetation survey, this species was not recorded within the Study Area. There is a single record south-east of Lue. However, this species is not likely to occur in the Study Area and therefore would not be impacted by the Project.
Grevillea divaricata	<i>Grevillea divaricata</i>	E	-	7.7	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.

**Table 29 (Cont'd)**  
**Predicted Species-Credit Species**

Page 3 of 4

Common Name	Scientific Name	Legal Status		TS Offset Multiplier	Impacted by the Project	Justification
		BC Act	EPBC Act			
Grevillea obtusiflora	<i>Grevillea obtusiflora</i>	E	E	7.7	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Koala	<i>Phascolarctos cinereus</i>	V	V	2.6	Yes	Koala has been recorded twice within the Study Area with one of these within the BAR footprint. The species has also been previously recorded in the locality. Since the EIS was exhibited, Bowdens Silver personnel have recorded four additional sightings of an individual Koala traversing the Study Area.
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	1.3	Yes, but foraging habitat only	This species has been recorded within the Study Area, but roosting or maternity habitat is not present. Further discussion in Section 5.4.3.
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	V	-	3.3	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species and by an experienced Herpetologist. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Prasophyllum sp. Wybong	<i>Prasophyllum</i> sp. Wybong	-	CE	7.7	No	This species has not been recorded within the Study Area. While survey timing was not optimal for this species, the sensitivity of this species to grazing, confirms that it is unlikely to be present within the Study Area given the long grazing history. It is highly unlikely to occur within the Study Area and therefore would not be impacted by the Project.
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	7.7	Yes	No Regent Honeyeater were recorded despite comprehensive surveys and surveys being completed during appropriate sampling months. However, given the rarity of the species (critically endangered), suitable habitat is present, there are previous records in the locality, and the Study Area is located at the northern extent of the Capertee Important Bird Area (IBA) (a known Regent Honeyeater 'hotspot', it is probable that Regent Honeyeater uses the Study Area from time to time but went undetected.
Silky Swainson-pea	<i>Swainsona sericea</i>	V	-	1.8	Yes	Silky Swainson-pea has been recorded within the Study Area and within the BAR footprint in recent surveys by AREA Environmental.



**Table 29 (Cont'd)**  
**Predicted Species-Credit Species**

Page 4 of 4

Common Name	Scientific Name	Legal Status		TS Offset Multiplier	Impacted by the Project	Justification
		BC Act	EPBC Act			
Small Purple-pea	Swainsona recta	E	E	2.6	Yes	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. Additional targeted survey by AREA Environmental located this species within the BAR footprint. The species has also been recorded about 10km east and west of Lue.
Squirrel Glider	Petaurus norfolcensis	V	-	2.2	Yes	While this species was not recorded in the comprehensive field surveys, they are known from previous records across the locality. Box-gum Woodland is known habitat for this species across their range.
Tarengo Leek Orchid	Prasophyllum petilum	E	E	1.3	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. While seasonal requirements for surveys are not defined by the BBCC, the field surveys were carried out in months where the species is known to flower elsewhere. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Veronica blakelyi	Veronica blakelyi	V	-	2.1	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.

### 5.4.3 Survey Results

Five species-credit species were recorded in the Study Area during the comprehensive field surveys and by Bowdens Silver on-site personnel. These were:

- Ausfeld's Wattle (*Acacia ausfeldii*)
- Koala (*Phascolarctos cinereus*)
- Silky Swainson-pea (*Swainsona sericea*)
- Small Purple-pea (*Swainsona recta*)
- Large-eared Pied Bat (*Chalinolobus dyweri*) (foraging habitat)

The locations of all species-credit species recorded during field surveys are provided in **Map 41** and **Map 42**.

Two additional species-credit species were presumed to occur within the Study Area and the BAR footprint (both Mine Site and Pipeline) based on the justification provided in **Table 29**. These were Squirrel Glider and Regent Honeyeater.

Squirrel Glider is a species-credit species that, although not recorded during the comprehensive field surveys, is likely to occur within the BAR footprints given the presence of both foraging and breeding habitat in Box-Gum Woodland. The species polygon for this species includes all woodland habitat within the BAR footprints.

Regent Honeyeater is a species-credit species that, although not recorded during the comprehensive field surveys, is likely to occur within the BAR footprint given the presence of both potential foraging and breeding habitat.

Breeding has been recorded in the Mudgee-Wollar areas which is now considered one of the key areas for this species (DoE, 2016). Birds are known to breed in the Capertee Valley and then at Mudgee-Wollar and vice versa. As the location of the Study Area is in between the Mudgee-Wollar key area and the Capertee Valley breeding area, it is reasonable to expect that the Study Area (and any native vegetation in the Lue district) could contain important habitat for Regent Honeyeater. As a species, Regent Honeyeater is considered a single population with some genetic exchange of individuals between regularly used areas (DoE, 2016). Given the rarity of the species (critically endangered), suitable habitat being present, previous records in the locality, and the landscape position of the Mine Site in the context of breeding, it is reasonable to expect that the Study Area (and any native vegetation in the Lue district) could contain important habitat for Regent Honeyeater.

The species polygon for this species includes all woody vegetation within the BAR footprints.

Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from central QLD to the NSW Southern Highlands (OEH, 2020c, Churchill, 2008, Dywer, 1966). They generally occur in well-timbered habitats containing gullies, and roost in caves as well as crevices in cliffs. This species has been recorded in the Study Area by ELA (source unknown) and EnviroKey field survey by echolocation call recording. Large-eared Pied Bat are also known from previous records across the locality around Munghorn Gap Nature Reserve and in the north around Ulan (OEH, 2020a) (**Map 6**). The Study Area contains woodland foraging habitat for this species. However, the Large-eared Pied Bat is only listed as a species-credit species when there is potential breeding habitat for the species likely to be impacted. This species breeds in caves, rock crevices and disused mine shafts, none of which occur within the BAR footprint. Given this, further assessment of the Large-eared Pied Bat has not been undertaken as the foraging component of the species habitat is considered to be part of the ecosystem credit requirements of the Project.

A discussion on Ausfeld's Wattle, Koala and Silky Swainson-pea/Small Purple-pea follows.

### **Ausfeld's Wattle**

Ausfeld's Wattle occurs in the Mudgee-Ulan-Gulgong area of NSW and previous records held by OEH show that the locality has dozens of known locations (**Map 8**). The comprehensive field surveys detected Ausfeld's Wattle in several locations within the Study Area, with some of these

also within the BAR footprint. An estimated population size of 239 individuals at eight locations was recorded. The population at some sites is likely to extend beyond the boundaries of the Study Area where it occurs. This is particularly relevant at Ryans Creek on Ulan Road but this could not be confirmed due to access permission not being available during the field surveys.

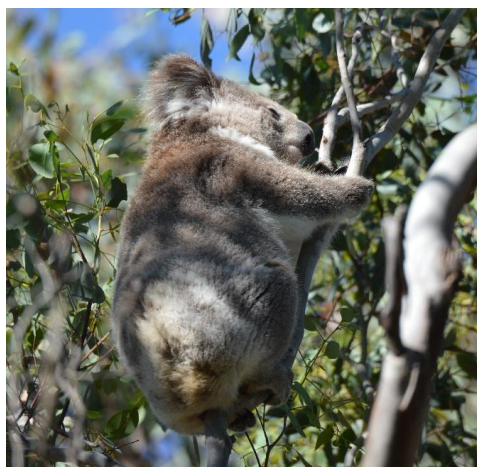
The species polygon created for Ausfelds Wattle includes all individual plants that were recorded during the field surveys with a 5 metre buffer applied to encompass any potential seed bank. However, in instances in the north of the pipeline where the population extends well beyond the boundaries of the study area, no additional buffer is applied. Given that the species was recorded in areas that were the subject of previous disturbance suggesting that this species is a coloniser like other *Acacia* species, a construction buffer is not appropriate, but rather an exclusion zone that would keep machinery, persons or equipment clear of retained vegetation.

## **Koala**

Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (DotE, 2014, DECC, 2008). In NSW, it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It inhabits eucalypt woodlands and forests where it feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area would select preferred browse species. Home range of Koala is known to vary according to habitat quality and can range from two hectares to several hundred hectares.

Two Koala records are known from the Study Area, both of which are either within or directly adjacent to the Mine Site BAR footprint.

The first known Koala record was during an EnviroKey field survey in December 2016, but the individual itself was sighted by Bowdens Silver on-site personnel. This was on 8 December 2016 at around 9.30am. Additional searches were made of the immediate and wider area for both further individuals and for scats, without success.



**Plate 17** A single Koala was sighted within the BAR footprint on 8 December 2016

A single Koala was reportedly sighted on Pyangle Road on 2 November 2017 by a member of the public and subsequently reported on the social media platforms Twitter and Facebook, and also as a Letter to the Editor in the Mudgee Guardian (3 November 2017). Given the photograph confirmed the sighting, this record is accepted for the purpose of the BAR. The locations of both Koala records are detailed on **Map 42**.



Since the EIS was exhibited, Bowdens Silver personnel have recorded four additional sightings. Each sighting was of an individual Koala traversing the Study Area.

As Koala are known to disperse in the months of the two sightings, this may offer a possible explanation to their presence. In a study from south east Queensland, male and female Koala are known to move up to 10.6 kilometres from their natal home ranges and often in a southerly or westerly direction (Disque et al., 2003). A review of existing records shows Koala records both north and east of the Study Area (**Map 6**) further adding to the likely explanation of dispersal. Given the extensive scat searches (137 in total), and the potential observations due to continued occupancy of the Study Area by Bowdens Silver on-site personnel since 2006, it is probable that only the higher quality areas of habitat provide these opportunities for Koala.

The species polygon shown for this species was generated by using the three BVT with a vegetation zone in Moderate/Good\_high condition. These totalled 140.36 hectares and are largely confined to the Mine Site (Site-based assessment). Specifically, it includes the following within the BAR footprint.

- CW 242, Moderate/Good\_high 1.04 hectares (Mine Site only)
- CW 263, Moderate/Good\_high 56.65 hectares (Mine Site only)
- CW 270, Moderate/Good\_high 0.77 hectares (Mine Site only)
- CW 291, Moderate/Good\_high 81.90 hectares (includes 0.21ha from the Pipeline)

Since the field surveys were completed, the 2019/2020 Summer bushfires have had a detrimental impact to Koala populations not only in NSW but across Australia. Undoubtedly, Koala populations in the region are also likely to have some impact from fires in the region. Based on previous records of Koala across the locality, Munghorn Gap Nature Reserve to the north and east of the Project contains a significant number of records. While other records are scattered across the locality acknowledge that a local population in some form occurs across the wider landscape including the Study Area, the key population areas to the north remain unaffected including Munghorn Gap Nature Reserve. Significant areas of Koala habitat were burnt east and south-east of the Study Area but the periphery of this burnt landscape is 13.5 kilometres to the east of the Project (**Map 44**).

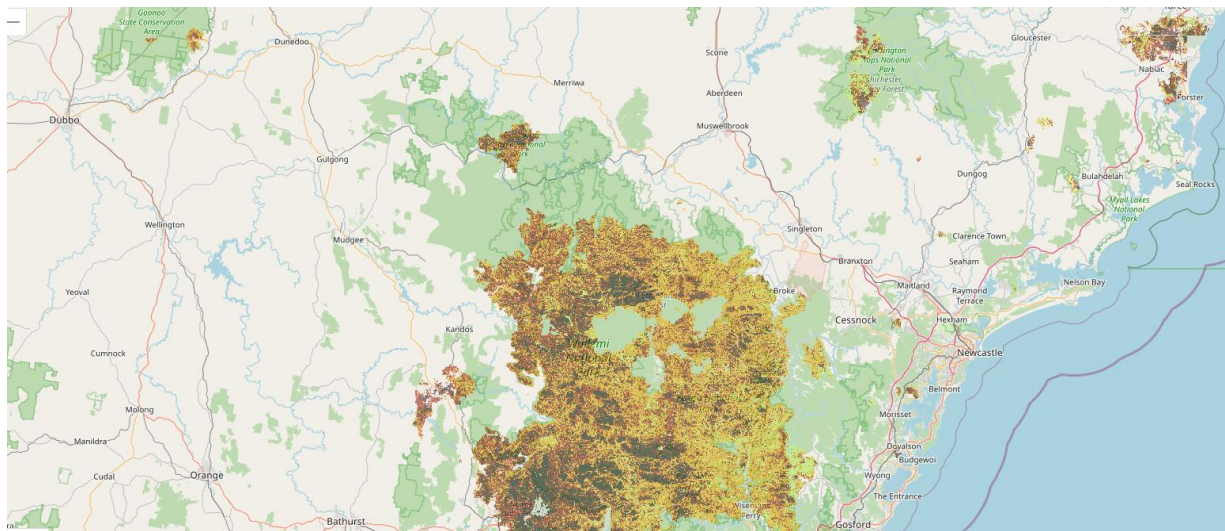
Given the extensive survey effort completed to date within the BAR footprints, and the locations of existing records in the vicinity (**Map 45**), it is unlikely that the BAR footprints are of high importance to Koalas at a regional scale. With consideration of the recent 2019/2020 bushfires and its impacts on the South-east Australia Koala population, Koala habitat remains unburnt in key locations including Munghorn Gap Nature Reserve and further east of that NR. Importantly, biodiversity stewardship sites established at part of the BOS will provide security for Koala in the long-term beyond the life of the Project, which is of significant conservation benefit to Koala.

### **Silky Swainson-Pea**

Silky Swainson-pea (*Swainsona sericea*) is known from over 80 distinct populations known within NSW. Previous records are scattered throughout NSW, from south at the border of NSW and Victoria to the northern portion of the State (OEH, 2020c). There is a large cluster of records located on the eastern border of the ACT and NSW (EnviroKey, 2013).

A variety of habitats are utilised by Silky Swainson-Pea including rocky outcrops, sandhills and riverine plains. It occurs in grassland and eucalypt woodland communities such as Natural Temperate Grassland and Snow Gum (*Eucalyptus pauciflora*) Woodland up on the Monaro. In the Southern Tablelands and South West Slopes areas, Silky Swainson-Pea can also be found in areas of Box-Gum Woodland.

**Map 44**                      **Extent of the 2019/2020 summer fires**



This species is known to flower from September to November and has the ability to produce numerous flowers and seeds under favourable conditions, however vegetative reproduction appears to be the more common method of reproduction. Silky Swainson-Pea regenerates from seed after fire. Some light grazing may also assist by reducing the grass cover and allowing easier germination and establishment. Grazing and weed invasion as a result of agricultural activity are believed to have a large impact on this species.

EnviroKey has not detected this species during the comprehensive field surveys. However, environmental officers with Bowdens Silver have detected Silky Swainson-pea at three locations within the Study Area, all of which are outside both BAR footprints. These are described as follows.

- Dry Dam Gully                      10+ individuals
- DS v-notch gate                      7-10 individuals
- Dusty's Corner gate                      5 individuals

The locations of these three populations are provided on **Map 42**.

Additional surveys by AREA Environmental located Silky Swainson-pea within the BAR footprint during targeted threatened flora surveys in November 2020. Four discrete populations were identified within the BAR footprint. These were:

- One solitary plant in PCT 277
- 10 individuals in PCT 277
- Three individuals in PCT 281

- About 50 individuals in PCT 281

The locations of these four populations are provided on **Map 42**. Given that all four locations are within the BAR footprint, impacts are anticipated from the Project.

### **Small Purple-Pea**

Small Purple-pea (*Swainsona recta*) is known from a number of populations in NSW and ACT comprising more than 9,000 plants. Populations are known from the area including on the Mudgee-Lue Road which is known to have declined from 70 plants in 1987 to 2 plants in 2010 while at population at the Mudgee Lookout has increased in size from 70 plants in 2009 to 270 plants in 2010 (OEH, 2012b).

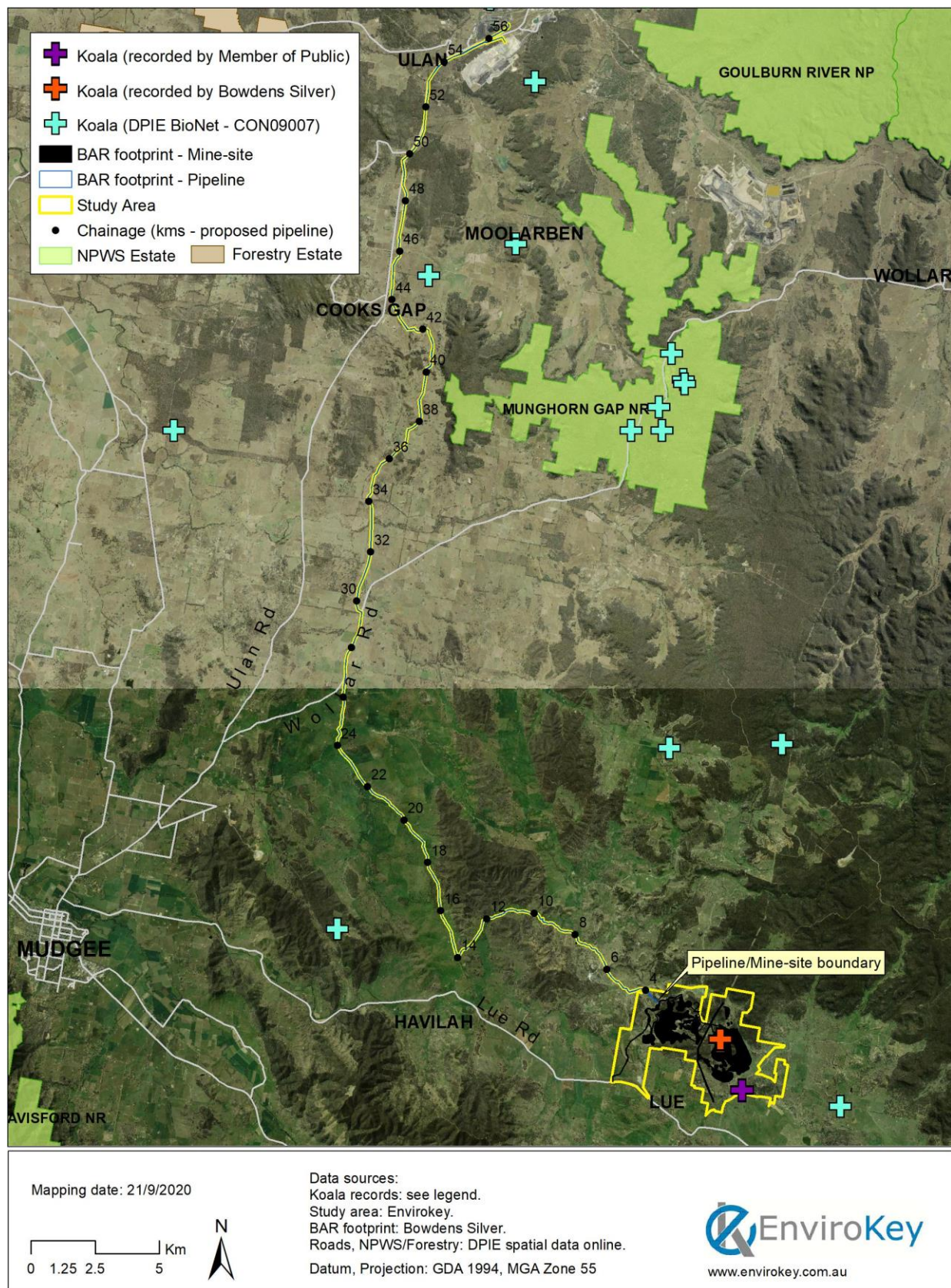
The species occurs in predominately grassy woodland, however, AREA Environmental are currently finalising a predictive habitat model under contract by NSW State government for *Swainsona recta*.

This species is known to flower in October and the field surveys did reveal that flowering had not finished. However, *Swainsona recta* is also identifiable when not in flower, so survey timing did not impact on detectability. Grazing and weed invasion as a result of agricultural activity, as well as reduced fire frequency along with maintenance activities along railway lines and roads are believed to have a large impact on this species.



Map 45

## Koala records in the vicinity of the BAR footprints



#### **5.4.4 Species Habitat Polygons**

Species habitat polygons have been prepared for the six species-credit species known to, or assumed to occur within the BAR footprints. These were:

- Koala
- Ausfeld's Wattle
- Squirrel Glider
- Regent Honeyeater
- Silky Swainson-pea
- Small Purple-pea

The species polygons were prepared:

- Using satellite imagery dated 2019 (Bowdens Silver) and 2018 (Google Earth)
- Including the location of the species (in the case of flora) or areas likely occupied by the species (in the case of fauna)
- Containing the specific habitat features associated with the species.

The species polygons are provided in **Map 46** to **Map 59**.

#### **5.5 THREATENED SPECIES THAT CANNOT WITHSTAND LOSS**

Species are generally flagged as unable to withstand loss if there are two or less populations in the relevant sub-region, or if the species is exceptionally rare or poorly understood.

Ausfeld's Wattle is identified as a 'Red Flag' in the BBCC outputs. The species is known only from the Mudgee-Ulan-Gulgong area and many populations are confined to roadside vegetation remnants and are small in area. Existing records confirm that there are more than 50 known sightings containing 847 individuals (OEH, 2020a). Ausfelds Wattle was only recorded within the BAR footprint – Pipeline. No individuals were recorded within the BAR footprint – Mine Site.

Both Silky Swainson-pea and Small Purple-pea are identified as Red Flags in the BBCC outputs. Silky Swainson-pea is known from within the BAR footprint and outside of the BAR footprint but within Bowdens Silver owned land, while Small Purple-pea was only identified within the BAR footprint. It should be noted that species that cannot withstand further loss are not used in the decision-making threshold for State Significant Developments being assessed in accordance with the FBA, which includes this Project.

#### **5.6 BIODIVERSITY IMPACTS THAT REQUIRE FURTHER CONSIDERATION**

**Annexure 10** identifies biodiversity matters of relevance to this EIS. Where relevant to this BAR, the appropriate section for these is provided. The SEARs identify matters relating to biodiversity impacts requiring further consideration, and additional matters requiring consideration if those biota were recorded during ecology surveys. Section 7.6 of the BAR confirms matters that require further consideration.

## 5.7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE – THREATENED SPECIES

Three threatened species as listed as MNES have been detected within the Study Area. These were:

- Koala (*Phascolarctos cinereus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Small Purple-pea (*Swainsona recta*)

These species are discussed further in Section 5.4 (Species Credit Species) and **Annexure 6** and **Annexure 9**.

### 5.7.1 Predicted MNES Species

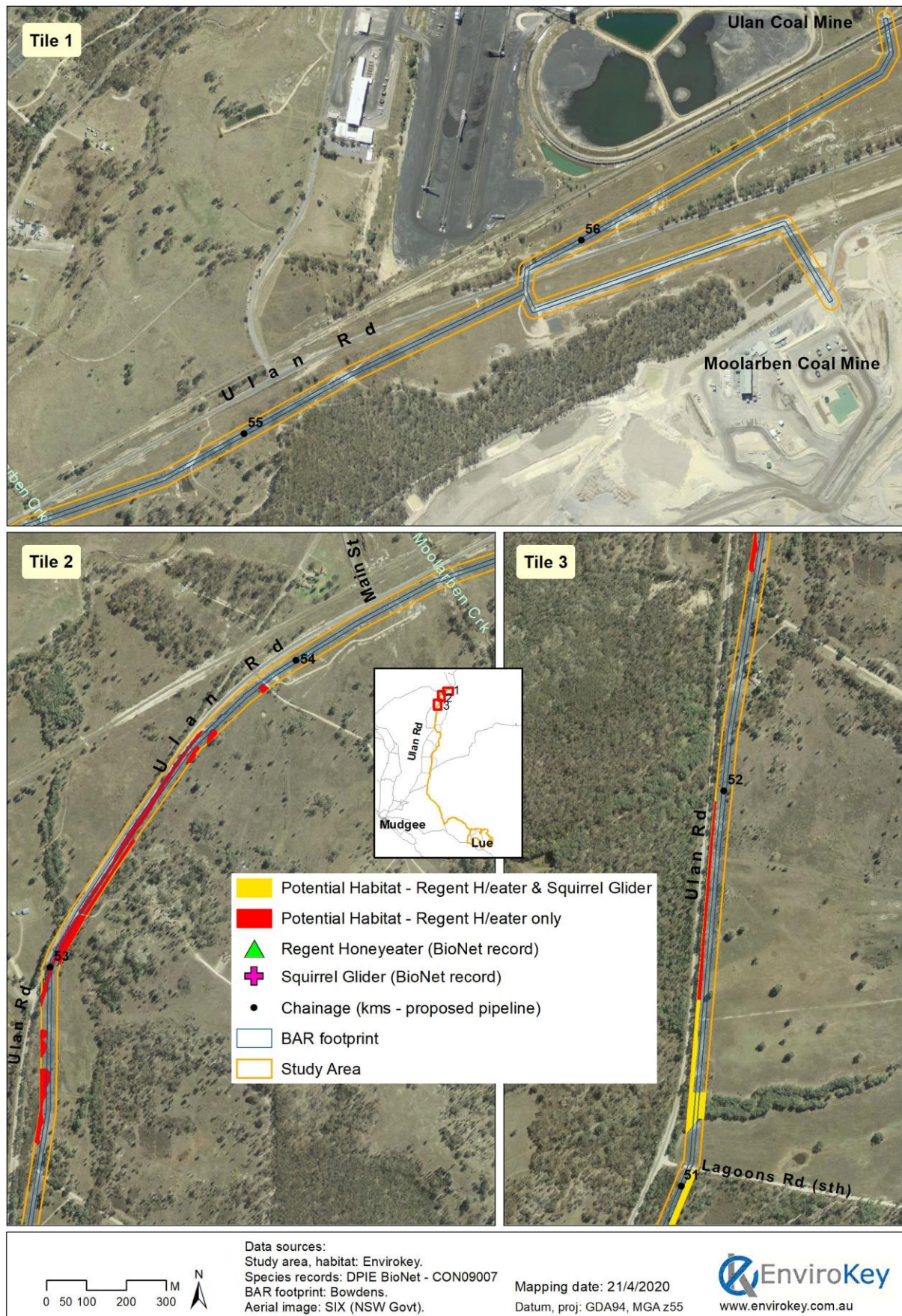
The BBCC (Major Project Assessment Type) automatically generates the predicted ecosystem and species-credit species required for a BAR. This section evaluates the potential or actual presence in the Study Area for biota listed by the EPBC Act that may not have been predicted by the BBCC but are included in a Protected Matters Search Tool report (DoEE, 2020) (**Annexure 2**). The analysis in **Table 30** informs the significance assessments for the significant impact criteria included in **Annexure 6**.

Based on the analysis in **Table 30**, the following biota would be subject to the significant impact criteria assessment in **Annexure 6**.

- Large-eared Pied Bat
- Regent Honeyeater
- Cattle Egret
- Latham's Snipe
- White-throated Needletail
- Swift Parrot
- Rainbow Bee-eater
- Spotted-tailed Quoll
- Koala
- Small Purple-pea
- Box-Gum Woodland

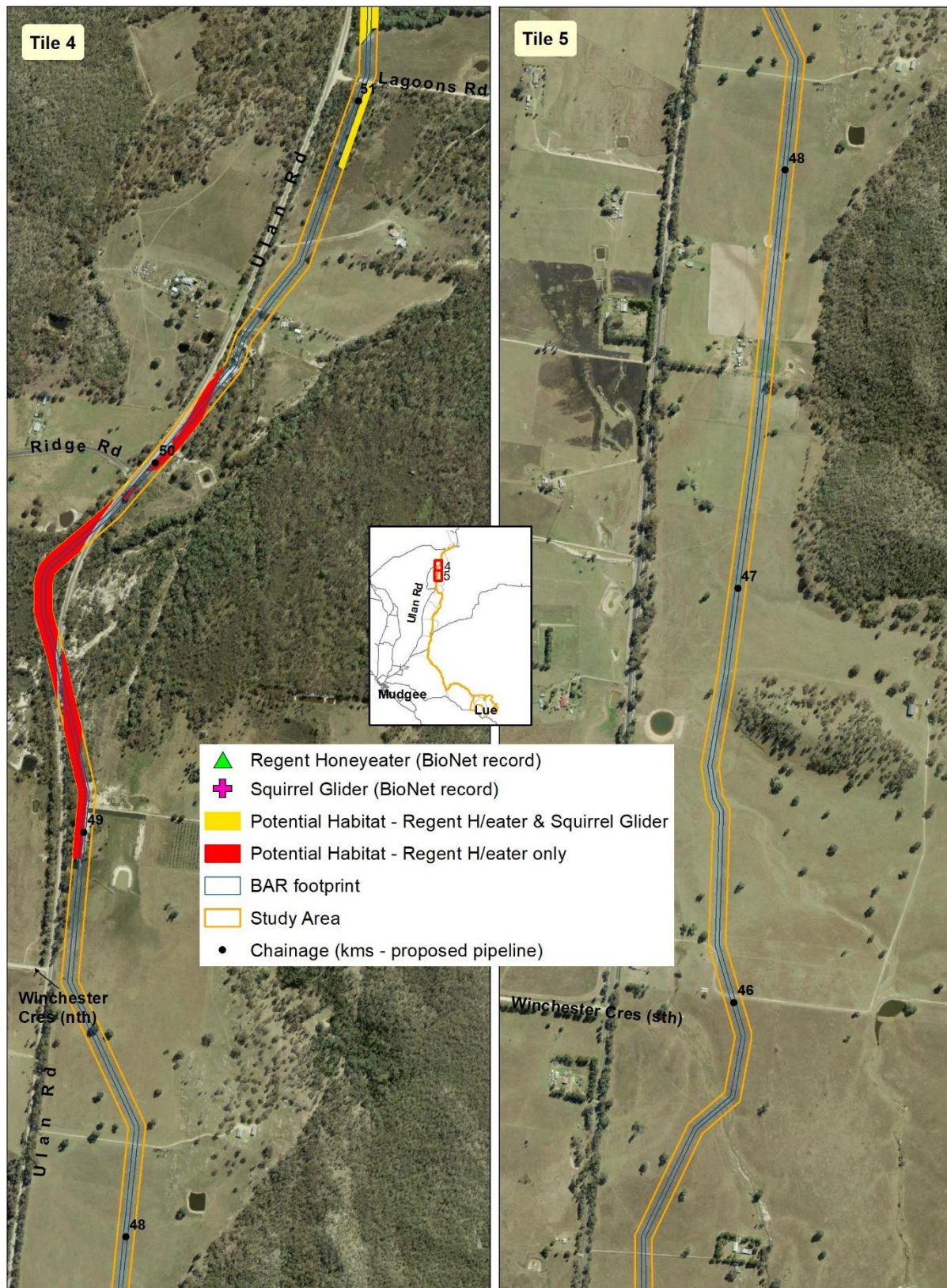


**Map 46 Species polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



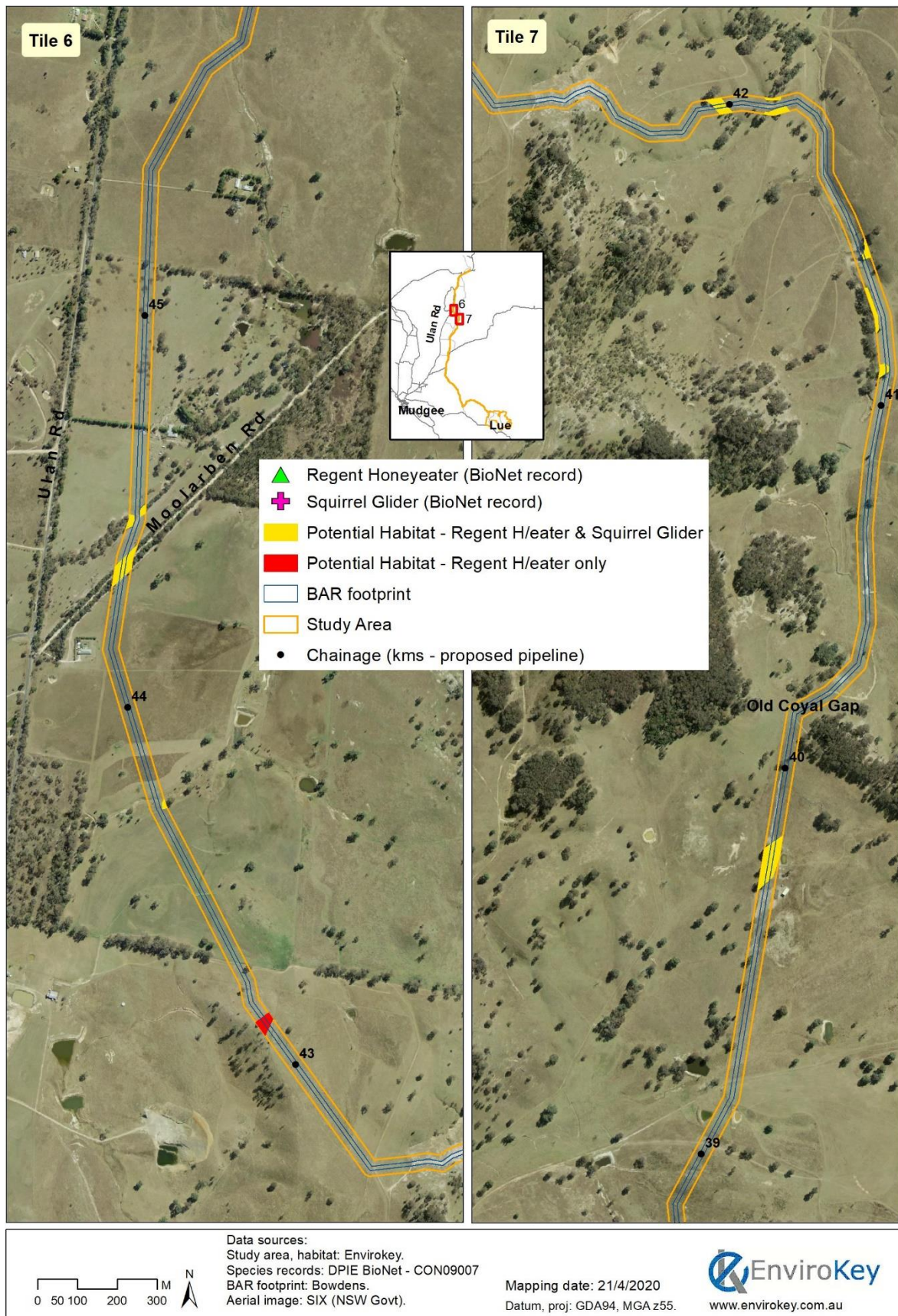


**Map 47 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



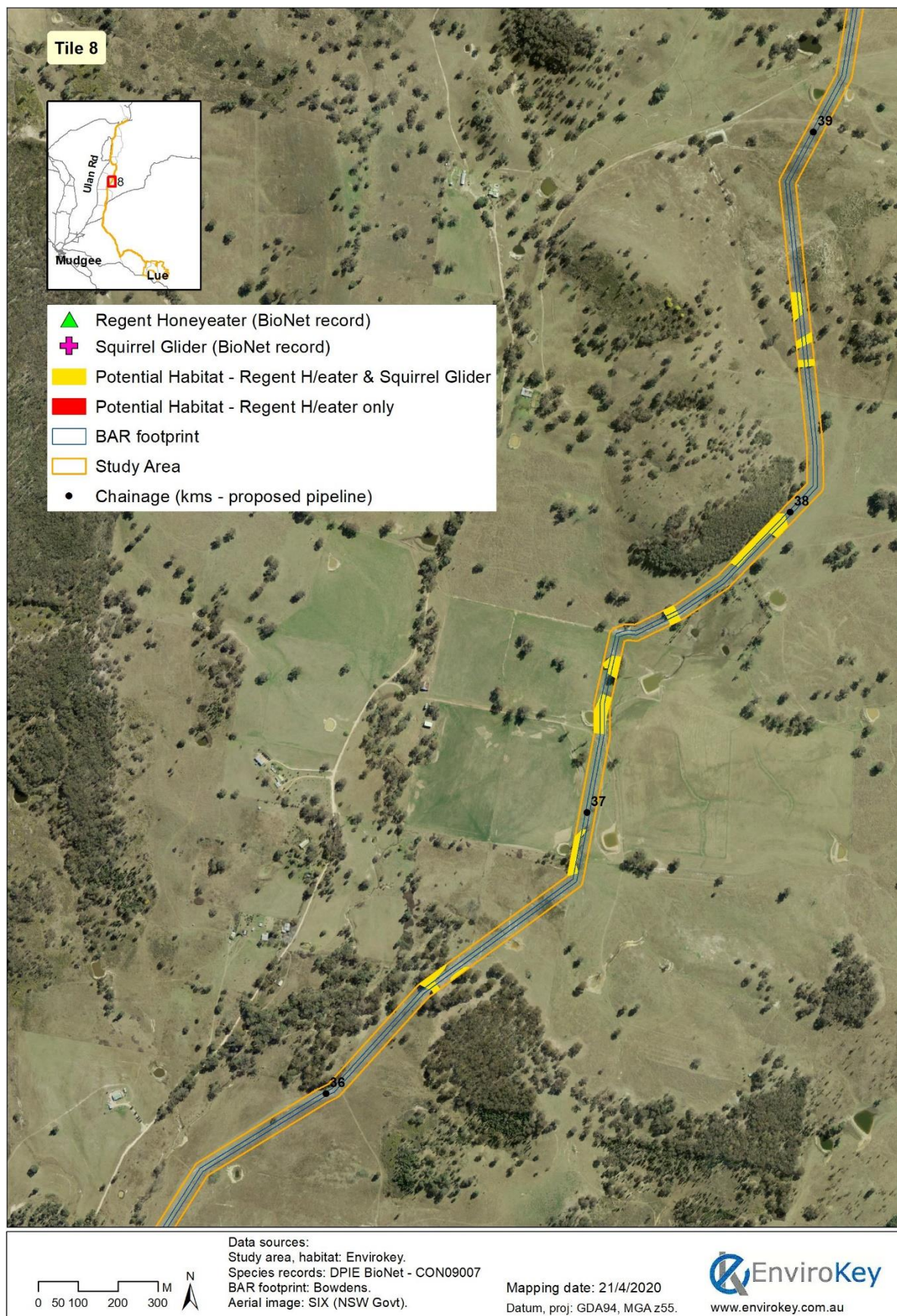


**Map 48 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



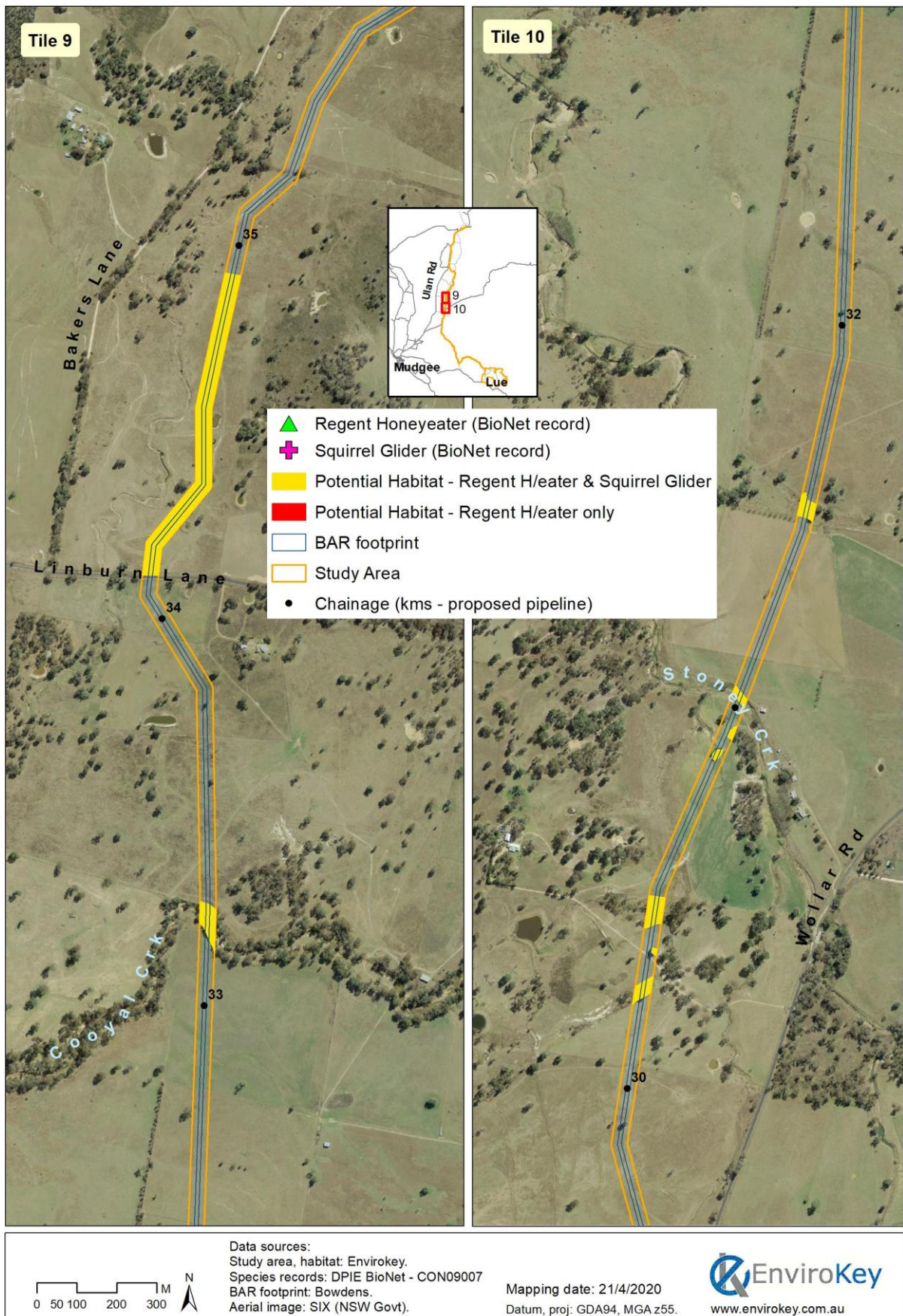


## Map 49 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area



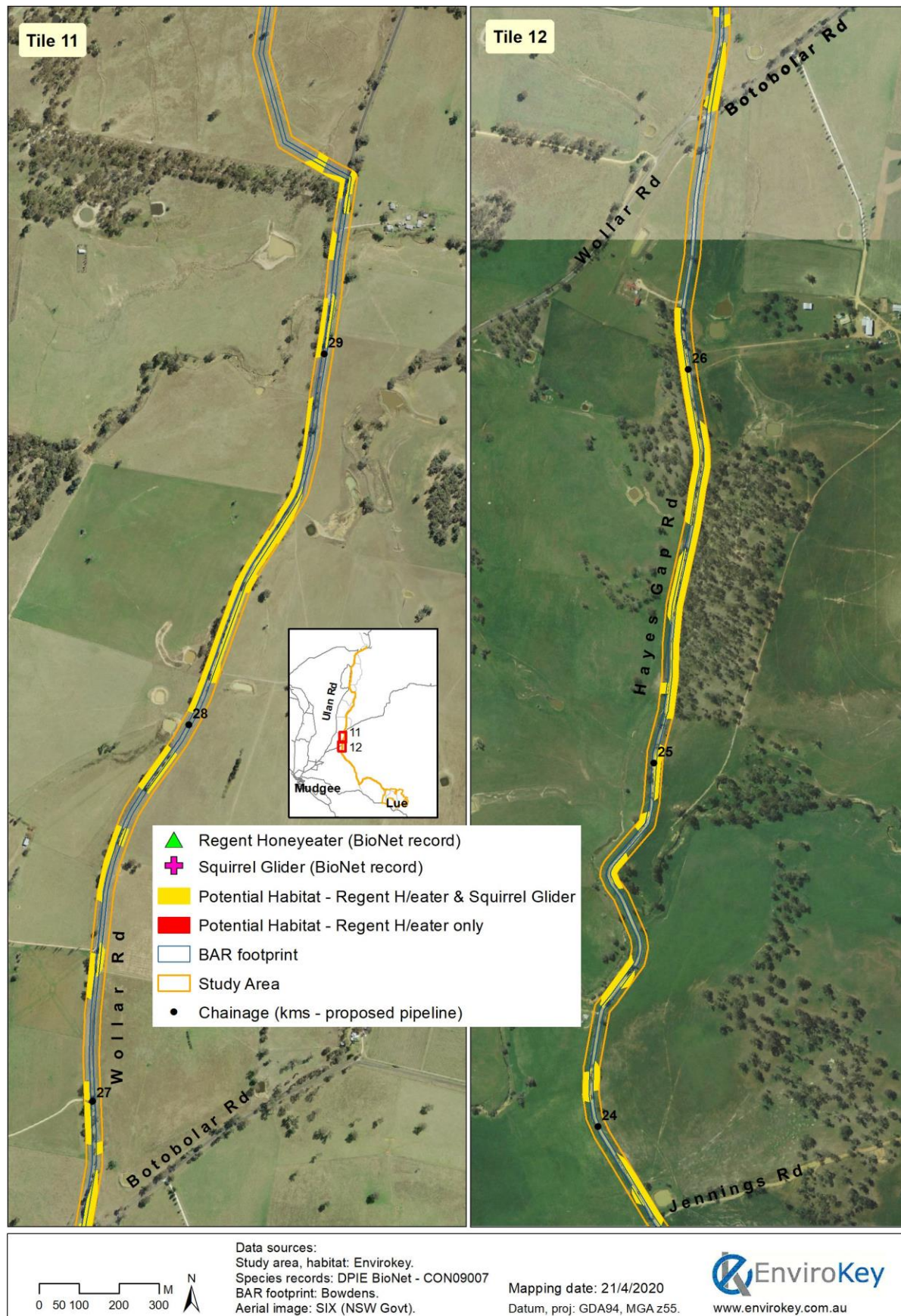


**Map 50 Species polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



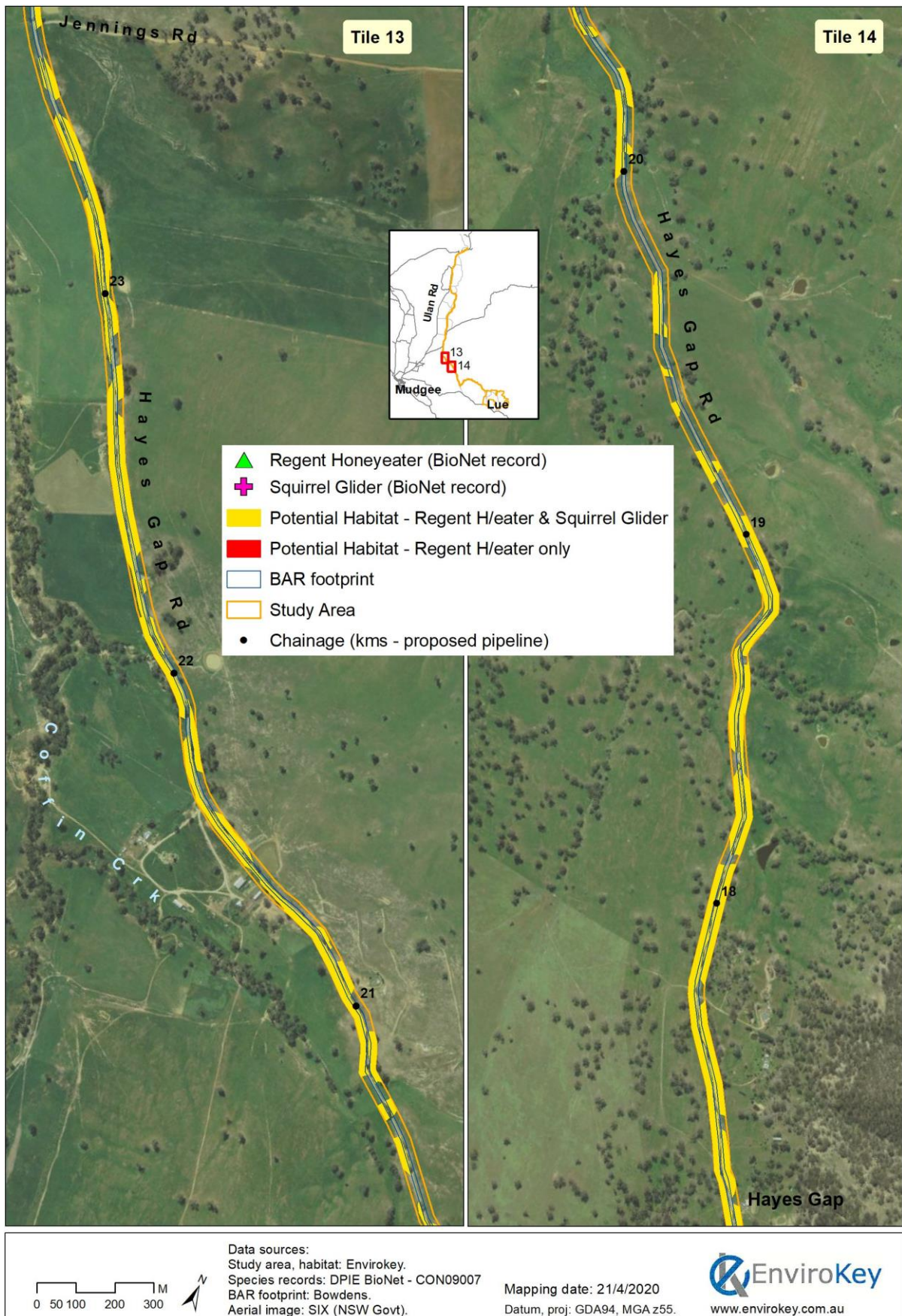


**Map 51 Species polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



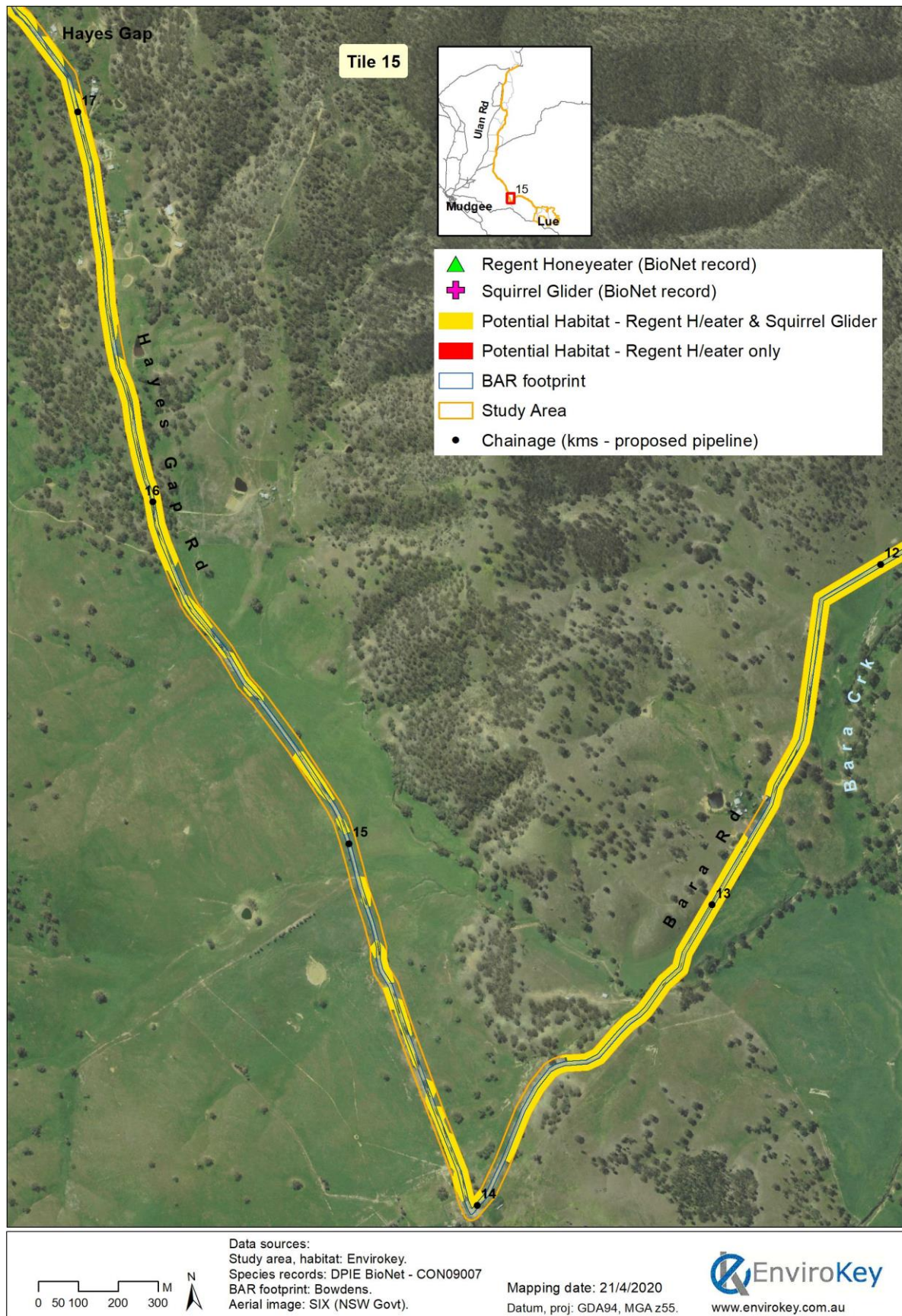


**Map 52 Species polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



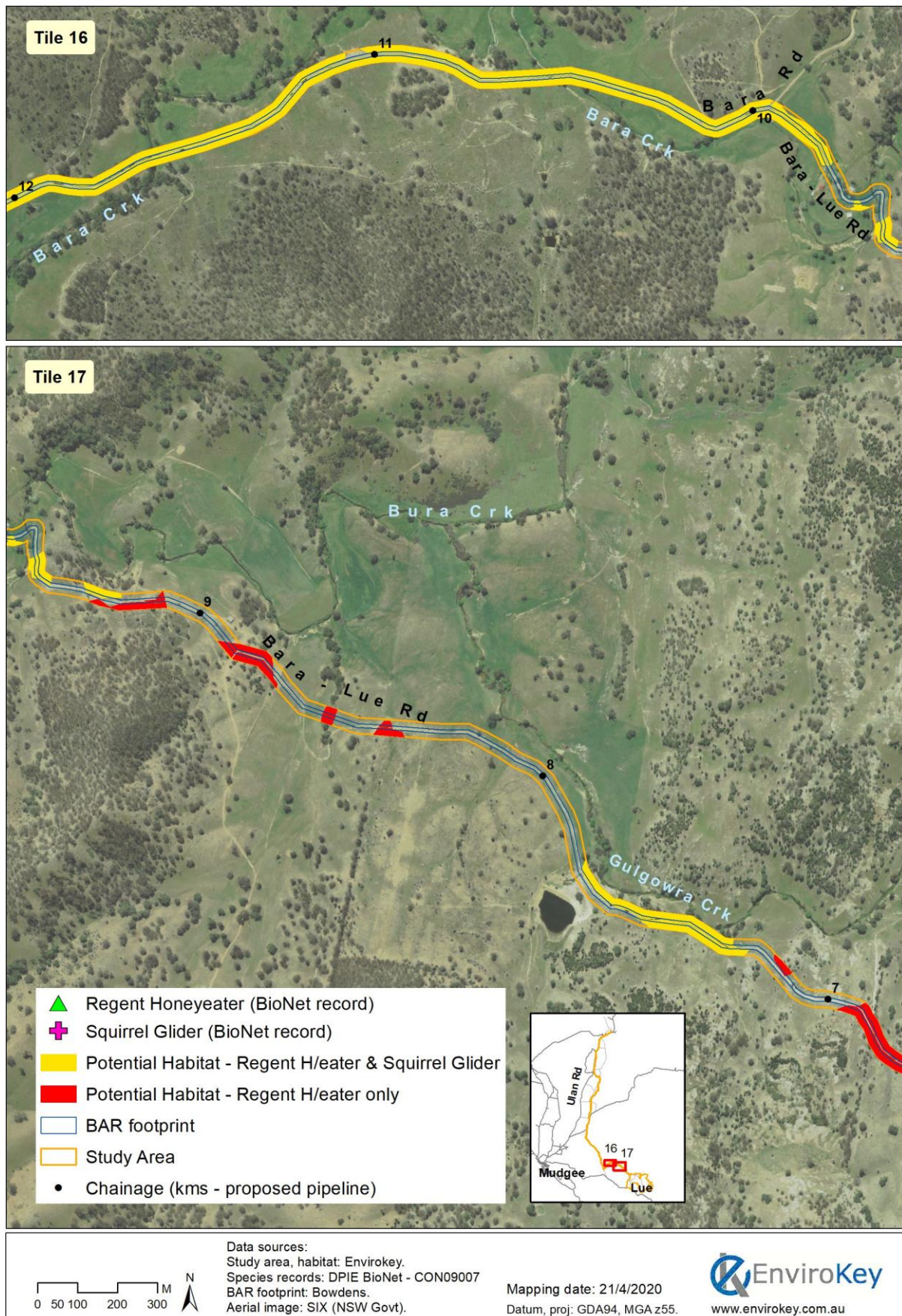


**Map 53 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



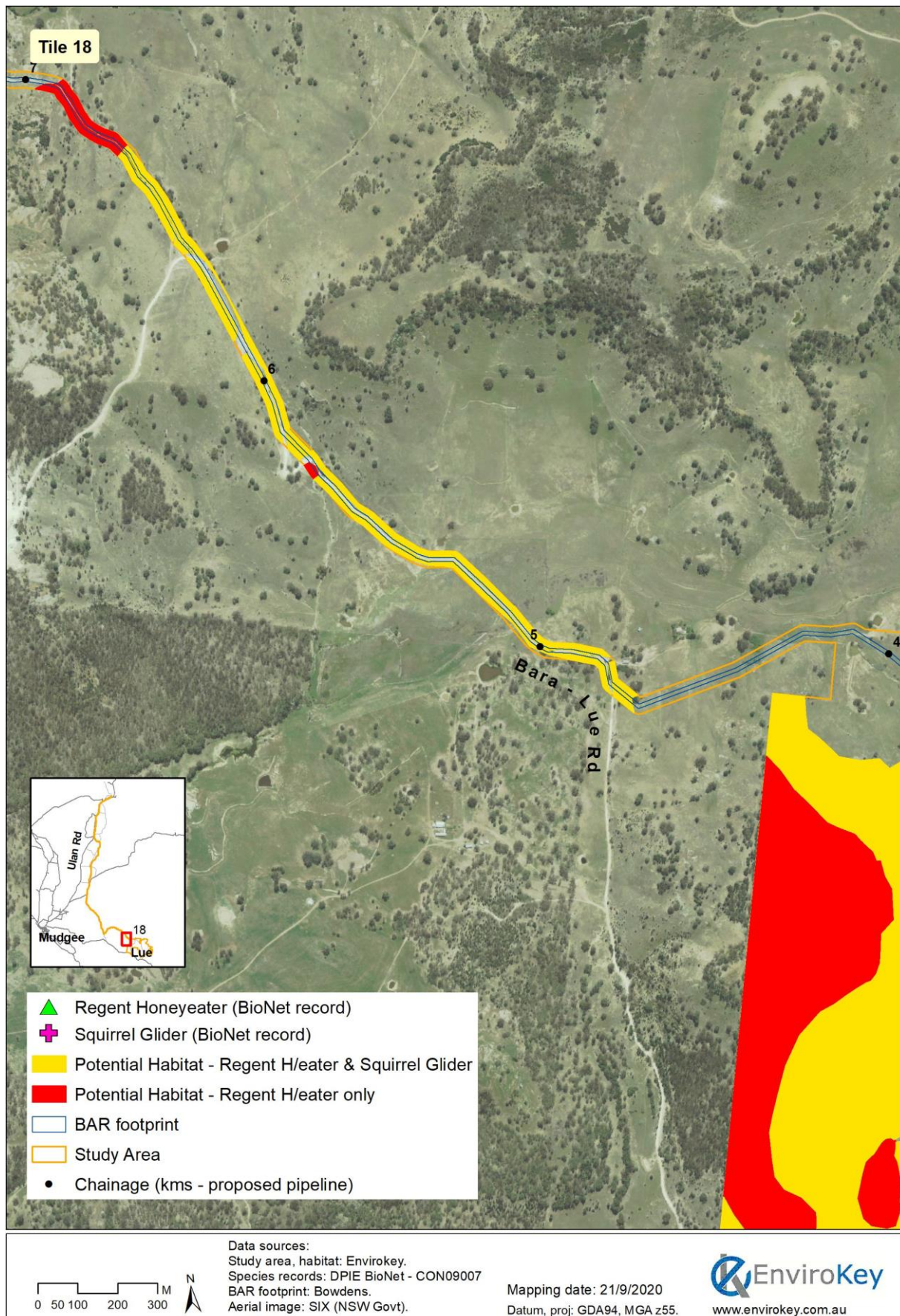


**Map 54 Species polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



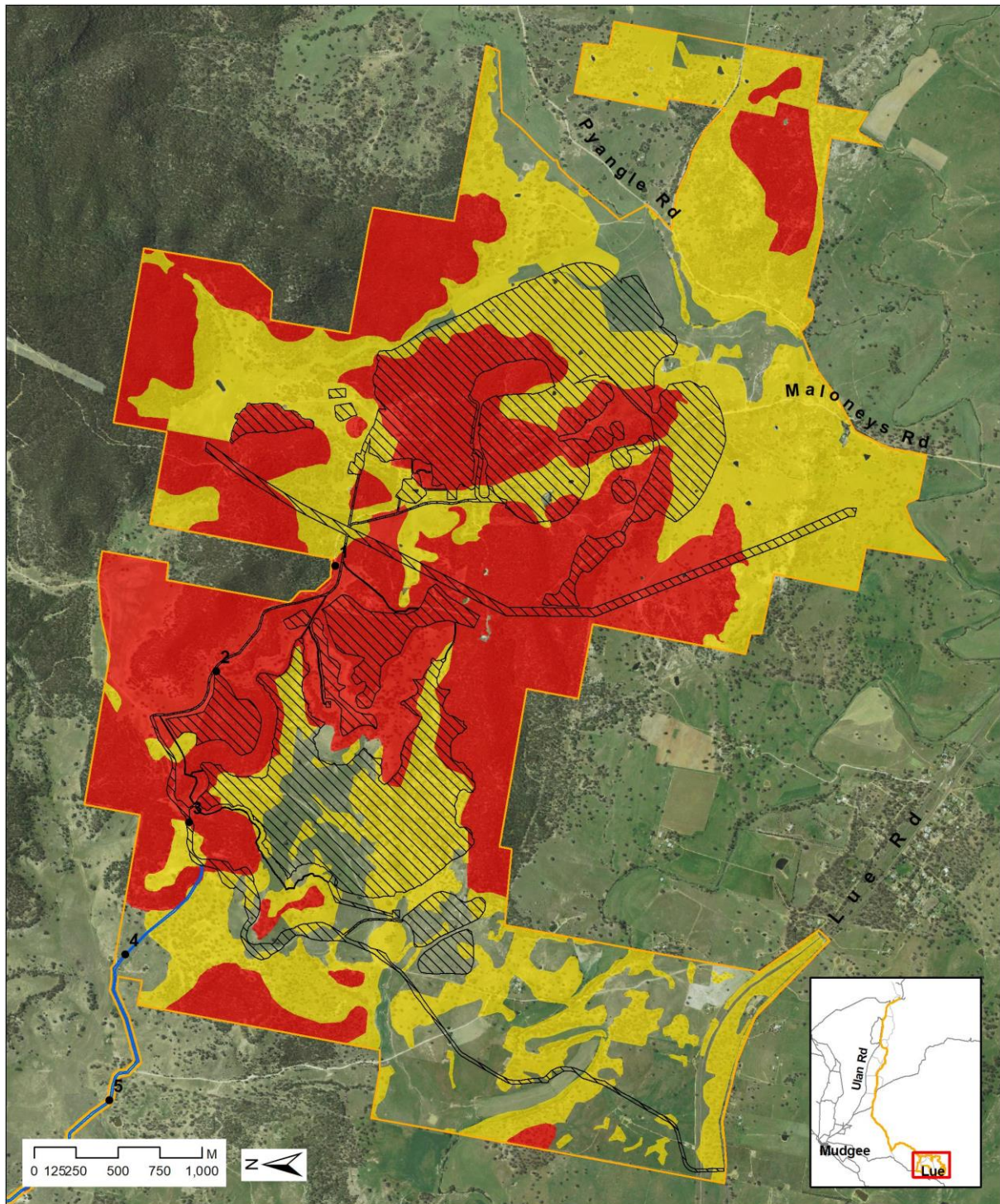


**Map 55 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area**





**Map 56 Species Polygons for Regent Honeyeater and Squirrel Glider in the Study Area**



- ▲ Regent Honeyeater (BioNet record)
- ✚ Squirrel Glider (BioNet record)
- Yellow Polygon Potential Habitat - Regent H/eater & Squirrel Glider
- Red Polygon Potential Habitat - Regent H/eater only
- Hatched Polygon BAR footprint - Mine-site
- Blue Polygon BAR footprint - Pipeline
- Orange Polygon Study Area
- Chainage (kms - proposed pipeline)

Datum, proj: GDA94, MGA z55.

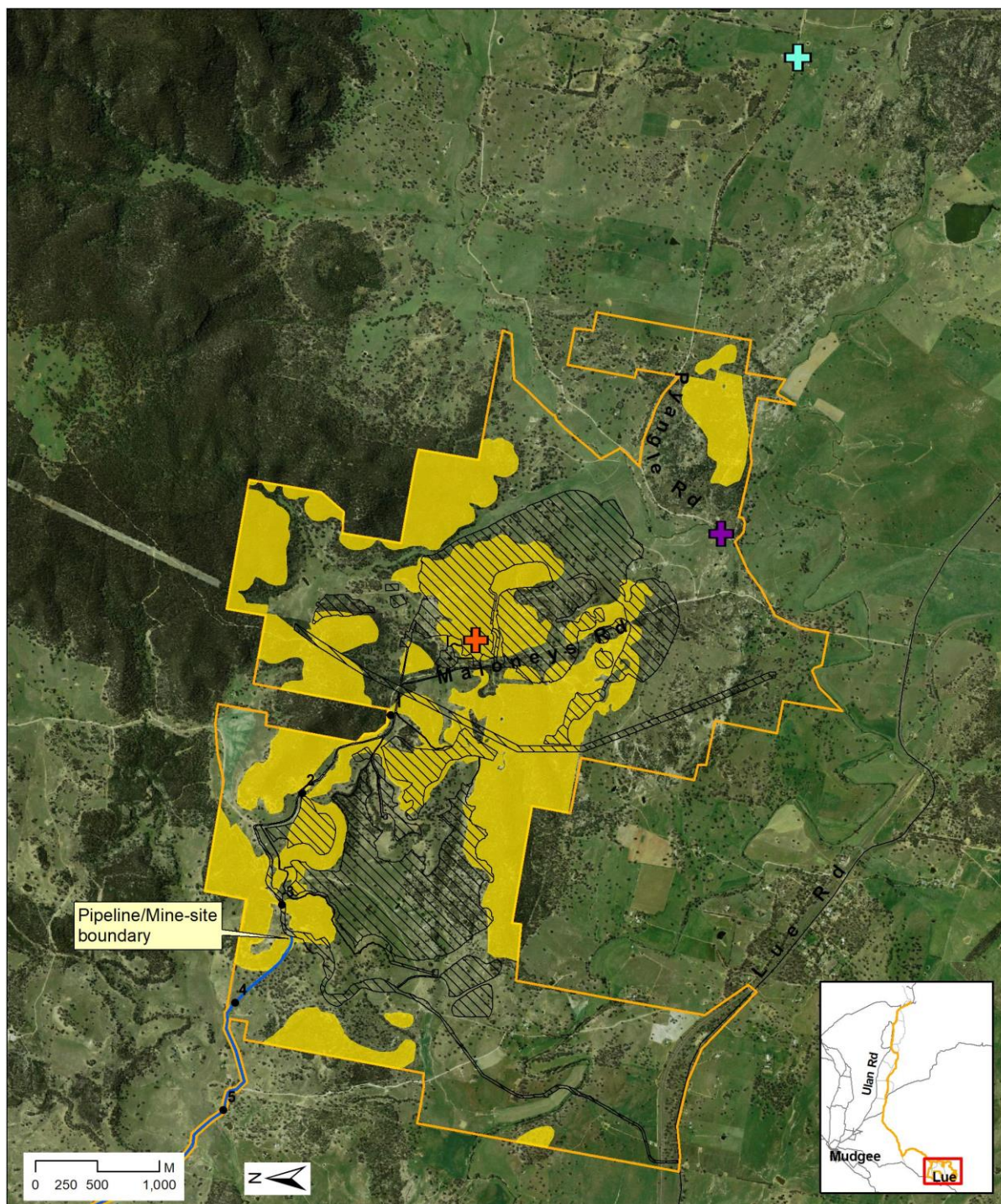
Data sources:  
 Study area, habitat: Envirokey.  
 Species records: DPIE BioNet - CON09007.  
 BAR footprint: Bowdens.  
 Aerial image: SIX (NSW Govt).

Mapping date: 21/9/2020

  
 www.envirokey.com.au



**Map 57 Species Polygon for Koala in the Study Area**



- |                                      |                                    |
|--------------------------------------|------------------------------------|
| Koala (recorded by Member of Public) | BAR footprint - Mine-site          |
| Koala (recorded by Bowdens Silver)   | BAR footprint - Pipeline           |
| Koala (OEH BioNet - CON09007)        | Study Area                         |
| Known Habitat - Koala                | Chainage (kms - proposed pipeline) |

Datum, proj: GDA94, MGA z55.

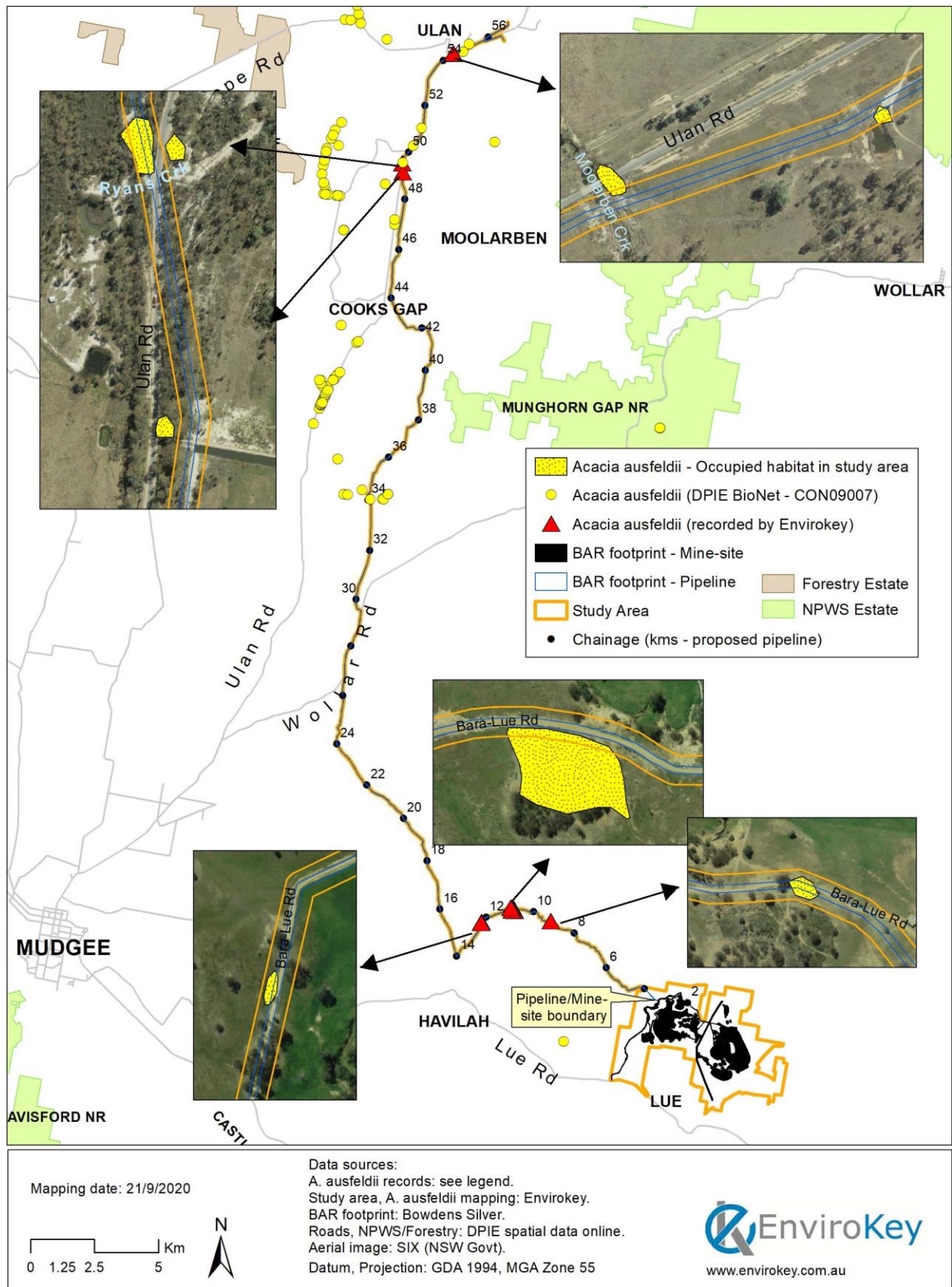
Data sources:  
Study area, habitat: Envirokey.  
Species records: see legend.  
BAR footprint: Bowdens.  
Aerial image: SIX (NSW Govt).

Mapping date: 21/9/2020

EnviroKey  
www.envirokey.com.au

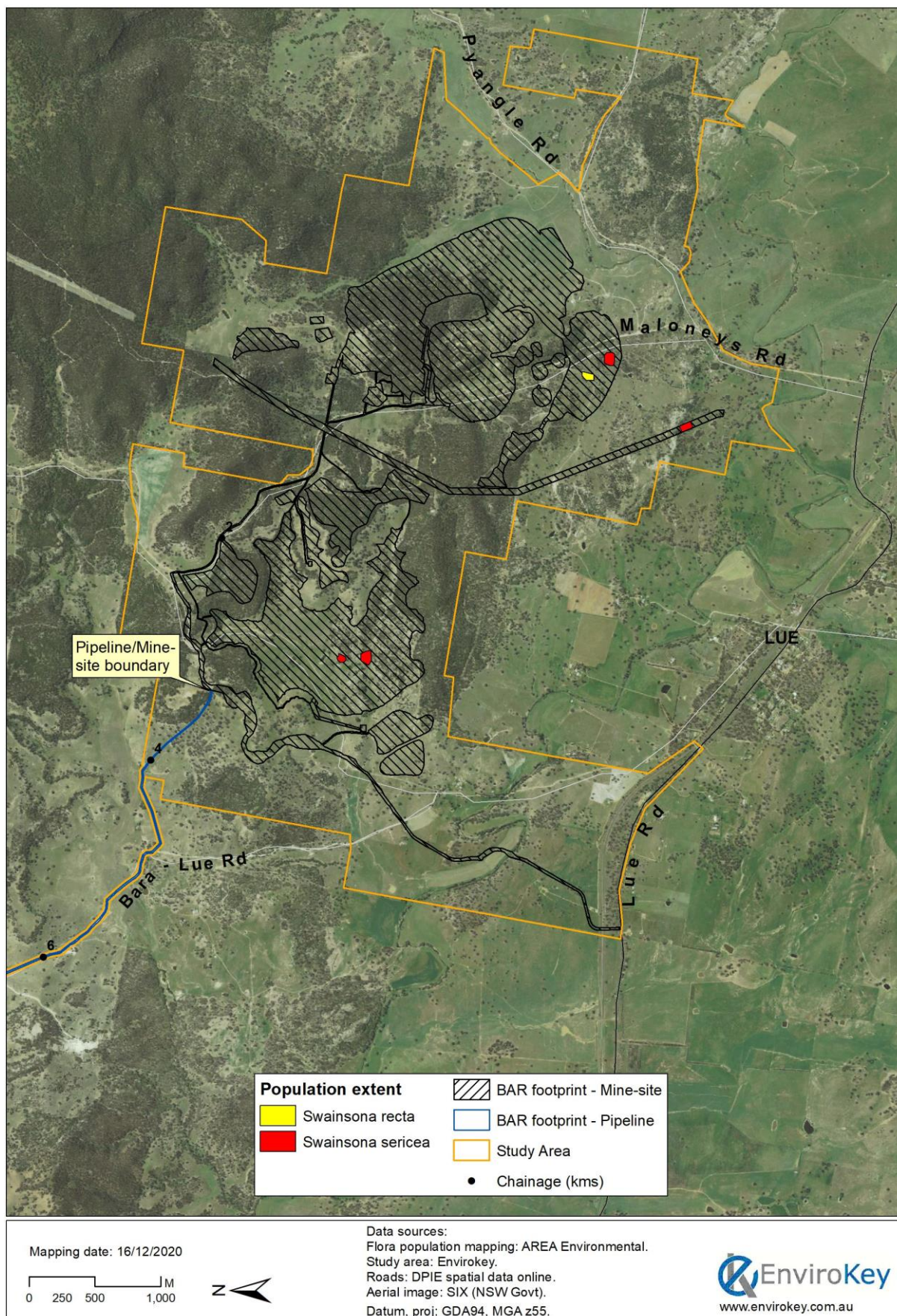


**Map 58 Species polygon for Ausfeld's Wattle in the Study Area**





Map 59 Species polygons for Silky Swainson-pea and Small Purple-pea within the BAR footprint



## **5.8 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE – MIGRATORY SPECIES**

EnviroKey identified two migratory biota during field surveys as listed by the EPBC Act:

- White-throated Needletail
- Rainbow Bee-eater

The locations of these species recorded during field surveys are provided on **Map 41** and **Map 42**.



**Table 30**  
**MNES Species Predicted to Occur in the Study Area**

Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Booroolong Frog <i>Litoria booroolongensis</i> E BC E EPBC	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins.	No	No	The Booroolong frog was not recorded within the Study Area despite adequate fauna surveys being carried out within the seasonal requirements of this species. Although some permanent creeks with fringing vegetation do occur, these areas are heavily degraded and modified by past agricultural and clearing activity. This species is not likely to occur within the Study Area and therefore, would not be impacted by the Project.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i> V BC V EPBC	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Petrochelidon ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features.	Yes	Yes (but foraging habitat only)	This species has been recorded within the Study Area, but roosting or maternity habitat is not present. Further discussion in Section 5.4.3. Further assessment is provided in <b>Annexure 6</b> .
Grey-headed Flying Fox <i>Pteropus poliocephalus</i> V BC V EPBC	Occurs in temperate and sub-tropical rainforest, sclerophyll forest and woodland, heaths and swamps generally within 200km of the east coast.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Common Sandpiper <i>Actitis hypoleucos</i> M EPBC	In Australia, this species is concentrated in the north and west of the mainland. Mainly breeds in Europe and Asia, the population that migrates to Australia breeds in Russia.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Magpie Goose <i>Anseranas semipalmata</i> V BC M EPBC	Mainly found in shallow wetlands (less than 1m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Regent Honeyeater <i>Anthochaera phrygia</i> CE BC CE EPBC	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	No	Yes	No Regent Honeyeater were recorded despite comprehensive surveys and surveys being completed during an appropriate sampling months. However, given the rarity of the species (critically endangered), suitable habitat is present, there are previous records in the locality, and the Study Area is located at the northern extent of the Capertee Important Bird Area (IBA) (a known Regent Honeyeater 'hotspot', it is probable that Regent Honeyeater uses the Study Area from time to time but went undetected. Further assessment is provided in <b>Annexure 6</b> .
Fork-tailed Swift <i>Apus pacificus</i> M EPBC	Mostly occurs over inland plains, but can sometimes be found in coastal areas. The species is found over dry and open habitats, including riparian woodlands and tea tress swamps, low scrub, heathland or saltmarsh.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Eastern Great Egret <i>Ardea alba (modesta)</i> M EPBC	The Eastern Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial).	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Cattle Egret <i>Ardea ibis</i> M EPBC	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands.	No	Yes	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality, and it may use the Study Area from time to time given its highly mobile nature. Further assessment is provided in <b>Annexure 6</b> .
Australasian Bittern <i>Botaurus poiciloptilus</i> E BC E EPBC	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes ( <i>Typha</i> spp.) and spikerushes ( <i>Eleocharis</i> spp.).	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Sharp-tailed Sandpiper <i>Calidris acuminata</i> M EPBC	A summer migrant from Serbia, also found in Indonesia, Papua New Guinea, the Solomon Islands, New Caledonia and New Zealand. During years of flood it can be found on the inland floodplains, and can be found on coastal tide flats in times without flood.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Curlew Sandpiper <i>Calidris ferruginea</i> E BC CE EPBC M EPBC	Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Pectoral Sandpiper <i>Calidris melanotos</i> M EPBC	A widespread but scattered Australian distribution, both along the eastern coast and west of the Great Dividing Range. It prefers shallow water, both fresh and salt, preferring wetlands that have open fringing mudflats and low vegetation. Breeding occurs in northern Russia and North America.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within not the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Black-eared Cuckoo <i>Chrysococcyx osculans</i> M EPBC	Found across much of Australia except wet coastal forest. Many migrate to northern Australia, Indonesia and southern New Guinea after breeding in Southern Australia in spring.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Latham's Snipe <i>Gallinago hardwickii</i> M EPBC	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	No	Yes	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality, and it may use the Study Area from time to time given its highly mobile nature.  Further assessment is provided in <b>Annexure 6</b> .



**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

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Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Painted Honeyeater <i>Grantiella picta</i> V BC V EPBC	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality near Ulan however, it is not likely to occur in the Mine Site due to its geographic location well to the south. Therefore, it would not be impacted by the Project.
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i> M EPBC	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the seashore) and around terrestrial wetlands in tropical and temperate regions.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within the locality however, it is not likely to occur in the Study Area due to lack of suitable habitat. Therefore, it would not be impacted by the Project.
White-throated Needletail <i>Hirundapus caudacutus</i> M EPBC	For a time it was commonly believed that this species does not land while in Australia. It has now been observed that birds would roost in trees, and radio-tracking has since confirmed that this is a regular activity.	Yes	Yes	This species was recorded within the Study Area. The species has been recorded previously within the locality, and it would likely use the Study Area from time to time given its highly mobile nature. Further assessment is provided in <b>Annexure 6</b> .
Caspian Tern <i>Hydroprogne caspia</i> M EPBC	Widespread along most of Australia's coastline and major inland water bodies. Feeds almost exclusively on fish.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has been recorded previously within the locality, but given a lack of suitable habitat, it is unlikely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Swift Parrot <i>Lathamus discolor</i> E BC CE EPBC	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. Gummifera</i> , Mugga Ironbark <i>E. Sideroxylon</i> , and White Box <i>E. Albens</i> .	No	Yes	No Swift Parrot have been recorded in the Study Area, despite some of the field surveys being carried out in a suitable season (April). Given the rarity of the species (critically endangered), suitable habitat is present, there are previous records in the locality, and the Study Area is located at the northern extent of the Capertee Important Bird Area (IBA), it is possible that Swift Parrot could use the Study Area from time to time but went undetected. Further assessment is provided in <b>Annexure 6</b> .

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Malleefowl <i>Leipoa ocellata</i> E BC V EPBC	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has been recorded previously within the locality, but given a lack of suitable habitat, it is unlikely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Rainbow Bee-eater <i>Merops ornatus</i> M EPBC	Most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. Also found on farmland with remnant vegetation and in orchards and vineyards. Uses disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	Yes	Yes	This species was recorded within the Study Area. The species has been recorded previously within the locality, and it would likely use the Study Area from time to time given its highly mobile nature. Further assessment is provided in <b>Annexure 6</b> .
Black-faced Monarch <i>Monarcha melanopsis</i> M EPBC	The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Yellow Wagtail <i>Motacilla flava</i> M EPBC	Occurs in a variety of damp or wet habitats with low vegetation, from rushy pastures, meadows, hay fields and marshes to damp steppe and grassy tundra.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Satin Flycatcher <i>Myiagra cyanoleuca</i> M EPBC	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality, and there is no suitable habitat present. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

<b>Common Name Scientific Name Legal Status</b>	<b>Habitat</b>	<b>Recorded during Field Survey</b>	<b>Potential to be Impacted by the Project</b>	<b>Justification</b>
Eastern Curlew <i>Numenius madagascariensis</i> CE EPBC M EPBC	Within Australia, the eastern curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern curlews are rarely recorded inland.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Superb Parrot <i>Polytelis swainsonii</i> V BC V EPBC	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina, the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area based on an absence of records. Therefore, it would not be impacted by the Project.
Rufous Fantail <i>Rhipidura rufifrons</i> M EPBC	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been not been recorded previously within the locality, and there is no suitable habitat present. Therefore, it would not be impacted by the Project.
Australian Painted Snipe <i>Rostratula australis</i> E BC E EPBC M EPBC	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded previously within not the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.
Painted Snipe <i>Rostratula benghalensis</i> (sensu lato) E EPBC M EPBC	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area as there is no suitable habitat. Therefore, it would not be impacted by the Project.



**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

<b>Common Name Scientific Name Legal Status</b>	<b>Habitat</b>	<b>Recorded during Field Survey</b>	<b>Potential to be Impacted by the Project</b>	<b>Justification</b>
Flathead Galaxias <i>Galaxias rostratus</i> CE EPBC	Occupies lowland water bodies associated with the southern Murray-Darling river system.	No	No	The species has not been recorded previously within the locality and is not likely to occur in the Study Area as it is not located on the southern Murray-Darling River system. Therefore, it would not be impacted by the Project.
Murray Cod <i>Maccullochella peelii</i> V EPBC	Found in the Murray-Darling Basin, generally preferring deep water around boulders, undercut banks, overhanging vegetation and logs.	No	No	There is no suitable habitat within the Study Area. Therefore, it would not be impacted by the Project.
Macquarie Perch <i>Macquaria australasica</i> E EPBC	Found in the Murray-Darling Basin, particularly upstream reaches.	No	No	There is no suitable habitat within the Study Area. Therefore, it would not be impacted by the Project.
Spotted-tailed Quoll <i>Dasyurus maculatus</i> V BC E EPBC	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	Yes	While not recorded by the comprehensive field surveys, two records of Spotted-tailed Quoll occur in relatively close proximity to the Study Area. The first, a roadkill male was found dead on Lue Road, 800 metres west of Lue Tip in 2017, while the second was on Maloneys Road near 'Bara Downs' about 5 kilometres north of the Study Area in 2005. Further assessment is provided in <b>Annexure 6</b> .
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i> E BC V EPBC	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	No	No	The Study Area does not contain any cliff lines, or other suitable habitat, therefore, it is not likely to occur there. Given this, the species would not be impacted by the Project.
Greater Glider <i>Petauroides volans</i> V EPBC	The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

<b>Common Name Scientific Name Legal Status</b>	<b>Habitat</b>	<b>Recorded during Field Survey</b>	<b>Potential to be Impacted by the Project</b>	<b>Justification</b>
Koala <i>Phascolarctos cinereus</i> V BC V EPBC	Inhabit eucalypt woodlands and forests. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size.	Yes	Yes	Koala has been recorded twice within the Study Area. The species has also been previously recorded in the locality. Further assessment is provided in <b>Annexure 6</b> .
New Holland Mouse <i>Pseudomys novaehollandiae</i> V EPBC	The New Holland Mouse has been found from coastal areas and up to 100km inland on sandstone country within open heathland, open woodland with a heathland understorey and vegetated sand dunes.	No	No	There is no suitable habitat within the Study Area. Therefore, it would not be impacted by the Project.
Pink-tailed Legless Lizard <i>Aprasia parapulchella</i> V BC V EPBC	Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass ( <i>Themeda australis</i> ). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Striped Legless Lizard <i>Delma impar</i> V BC V EPBC	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland.	No	No	This species was not recorded within the Study Area despite comprehensive fauna surveys carried out in accordance with the seasonal requirements of this species. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Broad-headed Snake <i>Hoplocephalus bungaroides</i> E BC V EPBC	Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	No	No	There is not suitable habitat for this species within the Study Area. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

<b>Common Name Scientific Name Legal Status</b>	<b>Habitat</b>	<b>Recorded during Field Survey</b>	<b>Potential to be Impacted by the Project</b>	<b>Justification</b>
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment <i>Cymbidium canaliculatum</i> E EPBC	A disjunct population of less than 500 individuals which occur in the upper Hunter Valley, NSW.	No	No	There is no suitable habitat for this species within the Study Area. Therefore, it would not be impacted by the Project.
Bluegrass <i>Dichanthium setosum</i> V BC V EPBC	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	No	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Euphrasia Arguta <i>Euphrasia arguta</i> CE BC CE EPBC	Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'.	No	No	Despite extensive vegetation survey, this species was not recorded within the Study Area. There is a single record south-east of Lue. However, this species is not likely to occur in the Study Area and therefore would not be impacted by the Project.
Hoary Sunray <i>Leucochrysum albicans</i> <i>var. tricolor</i> E EPBC	Occurs at relatively high elevations in woodland and open forest communities, in an area roughly bounded by Goulburn, Albury and Bega. The species has been recorded in the Yass Valley, Tumut, Upper Lachlan, Snowy River and Galong.	No	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Torrington Beard-heath <i>Leucopogon confertus</i> E EPBC E BC	Known only from a few records in Northern NSW, on the New England Tableland.	No	No	There is no suitable habitat for this species within the Study Area. Therefore, it would not be impacted by the Project.
Omeo Storksbill <i>Pelargonium sp.</i> <i>Striatellum</i> E BC E EPBC	Known from only 4 locations in NSW, with three on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	No	No	There is no suitable habitat for this species within the Study Area. Therefore, it would not be impacted by the Project.



**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

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Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
<i>Philotheca ericifolia</i> V EPBC	Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. Associated species include <i>Melaleuca uncinata</i> , <i>Eucalyptus crebra</i> , <i>E. rossii</i> , <i>E. punctata</i> , <i>Corymbia trachyphloia</i> , <i>Acacia triptera</i> , <i>A. burrowii</i> , <i>Beyeria viscosa</i> , <i>Philotheca australis</i> , <i>Leucopogon muticus</i> and <i>Calytrix tetragona</i> .	No	No	The species has been recorded previously within the locality (Munghorn Gap NR) Given its apparent absence from the Study Area as it has not recorded despite comprehensive vegetation surveys. it would not be impacted by the Project.
Tarengo Leek Orchid <i>Prasophyllum petilum</i> E BC E EPBC	Natural populations are known from four sites in NSW. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock <i>Poa labillardieri</i> , Black Gum <i>Eucalyptus aggregata</i> and tea-trees <i>Leptospermum spp.</i> at Captains Flat and within the grassy ground layer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford.	No	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. While seasonal requirements for surveys are not defined by the BBCC, the field surveys were carried out in months where the species is known to flower elsewhere. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
A leek-orchid <i>Prasophyllum sp.</i> <i>Wybong (C.Phelps ORG 5269)</i> CE EPBC	Known to occur in open eucalypt woodland and grassland. Leek orchids are generally found in shrubby and grassy habitats in dry to wet soil.	No	No	This species has not been recorded within the Study Area. While survey timing was not optimal for this species, the sensitivity of this species to grazing, confirms that it is unlikely to be present within the Study Area given the long grazing history of the site. It is highly unlikely to occur within the Study Area and therefore would not be impacted by the Project.
Small Purple-pea <i>Swainsona recta</i> E BC E EPBC	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum ( <i>Eucalyptus blakelyi</i> ), Yellow Box ( <i>E. melliodora</i> ), Candlebark Gum ( <i>E. rubida</i> ) and Long-leaf Box ( <i>E. goniocalyx</i> ). Grows in association with understorey dominants that include Kangaroo Grass ( <i>Themeda australis</i> ), poa tussocks ( <i>Poa spp.</i> ) and spear-grasses ( <i>Austrostipa spp.</i> ).	Yes	Yes	This species was initially not recorded within the Study Area despite comprehensive vegetation surveys carried out in accordance with the seasonal requirements of this species. The species has been recorded about 10km east and west of Lue. AREA Environmental identified a single discrete population comprising four plants within the BAR footprint.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

Common Name Scientific Name Legal Status	Habitat	Recorded during Field Survey	Potential to be Impacted by the Project	Justification
Austral Toadflax <i>Thesium australe</i> V BC V EPBC	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass ( <i>Themeda australis</i> ).	No	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
<i>Tylophora linearis</i> V BC E EPBC	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i> , <i>Eucalyptus sideroxylon</i> , <i>Eucalyptus albens</i> , <i>Callitris endlicheri</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i> . Also grows in association with <i>Acacia hakeoides</i> , <i>Acacia lineata</i> , <i>Melaleuca uncinata</i> , <i>Myoporum</i> species and <i>Casuarina</i> species.	No	No	This species was not recorded within the Study Area despite comprehensive vegetation surveys. The species has not been recorded previously within the locality and is not likely to occur in the Study Area. Therefore, it would not be impacted by the Project.
Central Hunter Valley eucalypt forest and woodland CE EPBC	This community is an open forest or woodland, typically dominated by eucalypt species; it has an open to sparse mid-layer of shrubs and a ground layer of grasses, forbs and small shrubs. The canopy of the ecological community is dominated by one or more of the following four eucalypt species: <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Corymbia maculata</i> (Spotted Gum), <i>E. dawsonii</i> (Slaty Gum) and <i>E. moluccana</i> (Grey Box).	No	No	This EEC was not recorded within the Study Area despite comprehensive vegetation surveys. Therefore, it would not be impacted by the Project.
Grey Box ( <i>Eucalyptus microcarpa</i> ) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia E EPBC	Mostly occurs from central NSW through to central northern Victoria and occurs in two forms; grassy woodland form and derived native grassland. It has a tree canopy dominated by Grey Box ( <i>Eucalyptus microcarpa</i> ).	No	No	This EEC was not recorded within the Study Area despite comprehensive vegetation surveys. Therefore, it would not be impacted by the Project.
Natural Temperate Grassland of the South Eastern Highlands CE EPBC	Occurs on a wide range of topographic positions and on soils derived from a variety of substrates, including granites, basalts, sediments, colluvium and alluvium. Occurs at altitudes up to around 1200 m, and as low as 250m in some parts of its distribution.	No	No	This EEC was not recorded within the Study Area despite comprehensive vegetation surveys. Therefore, it would not be impacted by the Project.

**Table 30 (Cont'd)**  
**MNES Species Predicted to Occur in the Study Area**

<b>Common Name Scientific Name Legal Status</b>	<b>Habitat</b>	<b>Recorded during Field Survey</b>	<b>Potential to be Impacted by the Project</b>	<b>Justification</b>
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion  E EPBC	The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion is typically tall open eucalypt forests found on basalt and basalt-like substrates in, or adjacent to, the Sydney Basin Bioregion. The ecological community usually occurs at elevations between 650m and 1 050m above sea level. Dominant canopy species are most often <i>Eucalyptus fastigata</i> (Brown Barrel), <i>E. viminalis</i> (Ribbon Gum) and <i>E. radiata subsp. radiata</i> (Narrow-leaved Peppermint). <i>Eucalyptus obliqua</i> (Messmate Stringybark), <i>E. elata</i> (River Peppermint), <i>E. quadrangulata</i> (White-topped Box) and <i>E. smithii</i> (Ironbark Peppermint)	No	No	This EEC was not recorded within the Study Area despite comprehensive vegetation surveys. Therefore, it would not be impacted by the Project.
White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)  E BC CE EPBC	Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles.  Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant.	Yes	Yes	This TEC was recorded in the Study Area during the comprehensive vegetation surveys. It also occurs within the BAR footprint.  Further assessment is provided in <b>Annexure 6</b> .



## **6. AVOIDANCE AND MITIGATION MEASURES**

### **6.1 TRAFFIC LIGHT MODEL FOR SITE SELECTION AND PLANNING AVOIDANCE**

Biodiversity surveys over a number of years have resulted in a comprehensive understanding of the terrestrial biodiversity of the Study Area. These surveys have identified and defined the areas of native vegetation, including areas of Box-Gum Woodland listed as an EEC under the NSW BC Act and CEEC under the Commonwealth EPBC Act.

To assist in the development of a final design footprint for the Project so that the FBA could be applied for the assessment, a 'traffic light model' was developed for the Study Area. Red, orange and green were applied to visualise the level of potential biodiversity value and assist the Applicant during the planning phase to avoid and minimise impacts to biodiversity, where possible.

Areas of potentially high biodiversity value were mapped as red, potentially medium ecological value were mapped as orange, and low ecological value were mapped as green. The definition of each of the 'traffic lights' is provided as follows.

- Red: presence of native vegetation that qualifies as a critically endangered TEC under the schedules of the BC Act or EPBC Act.
- Orange – presence of native vegetation that does not qualify as above.
- Green – presence of vegetation that is dominated by introduced flora species.

Should development occur in areas mapped as red, then it is likely that impacts to biodiversity would be greater than those in areas mapped as either orange or green.

The traffic light model for the Study Area around the Mine Site is displayed on **Map 60** and along the water supply pipeline corridor on **Map 61**.

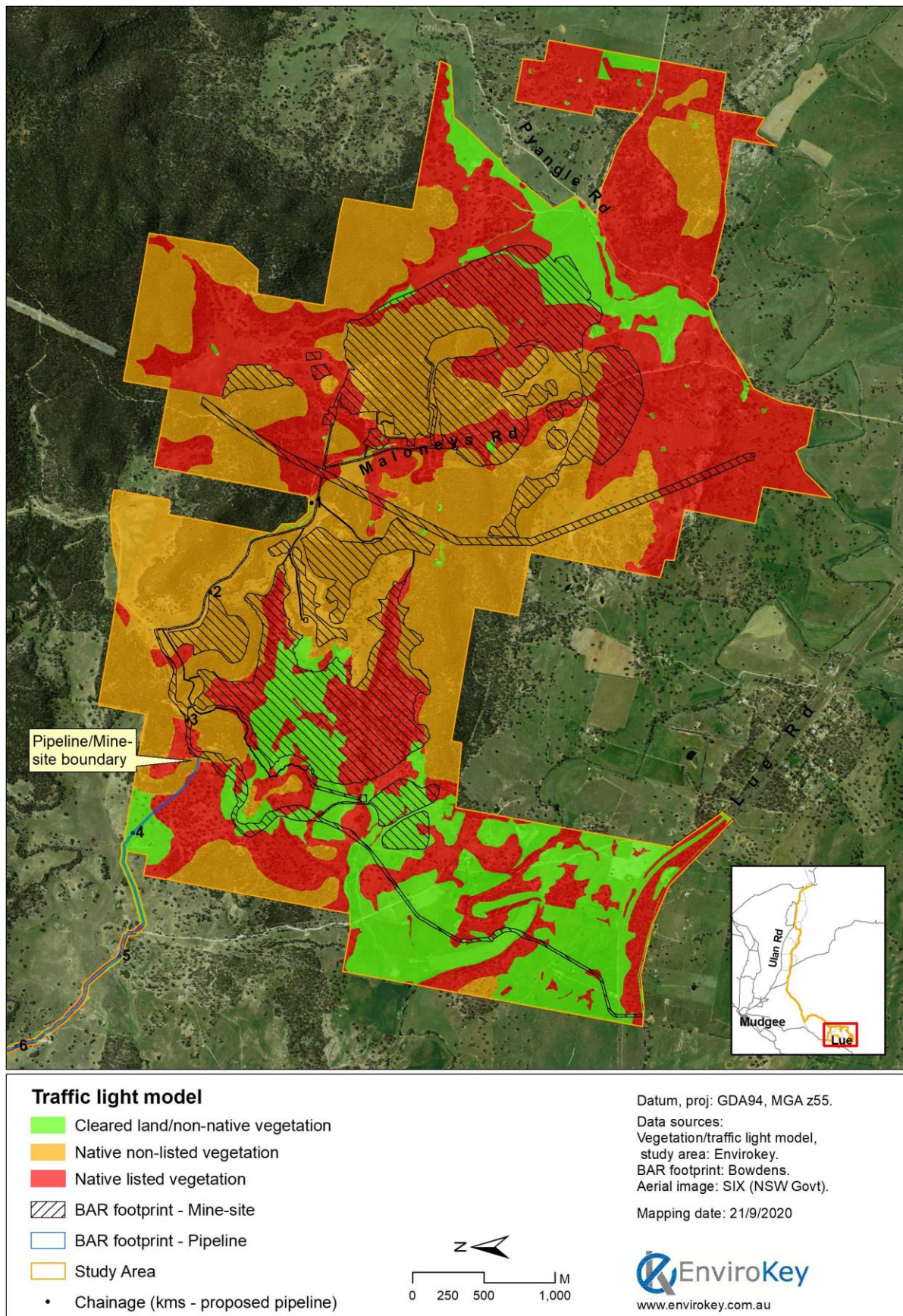
### **6.2 MITIGATION MEASURES TO BE UNDERTAKEN PRIOR TO PROJECT COMMENCEMENT**

An overarching Biodiversity Management Plan (BMP) would be prepared and approved by DPIE prior to commencement of the Project. The objective of the BMP would be to minimise and adequately manage impacts to biodiversity through a series of actions during construction and operation of the Project. A number of sub-plans / sections would target key actions as follows.

#### **Fauna Management Sub-plan**

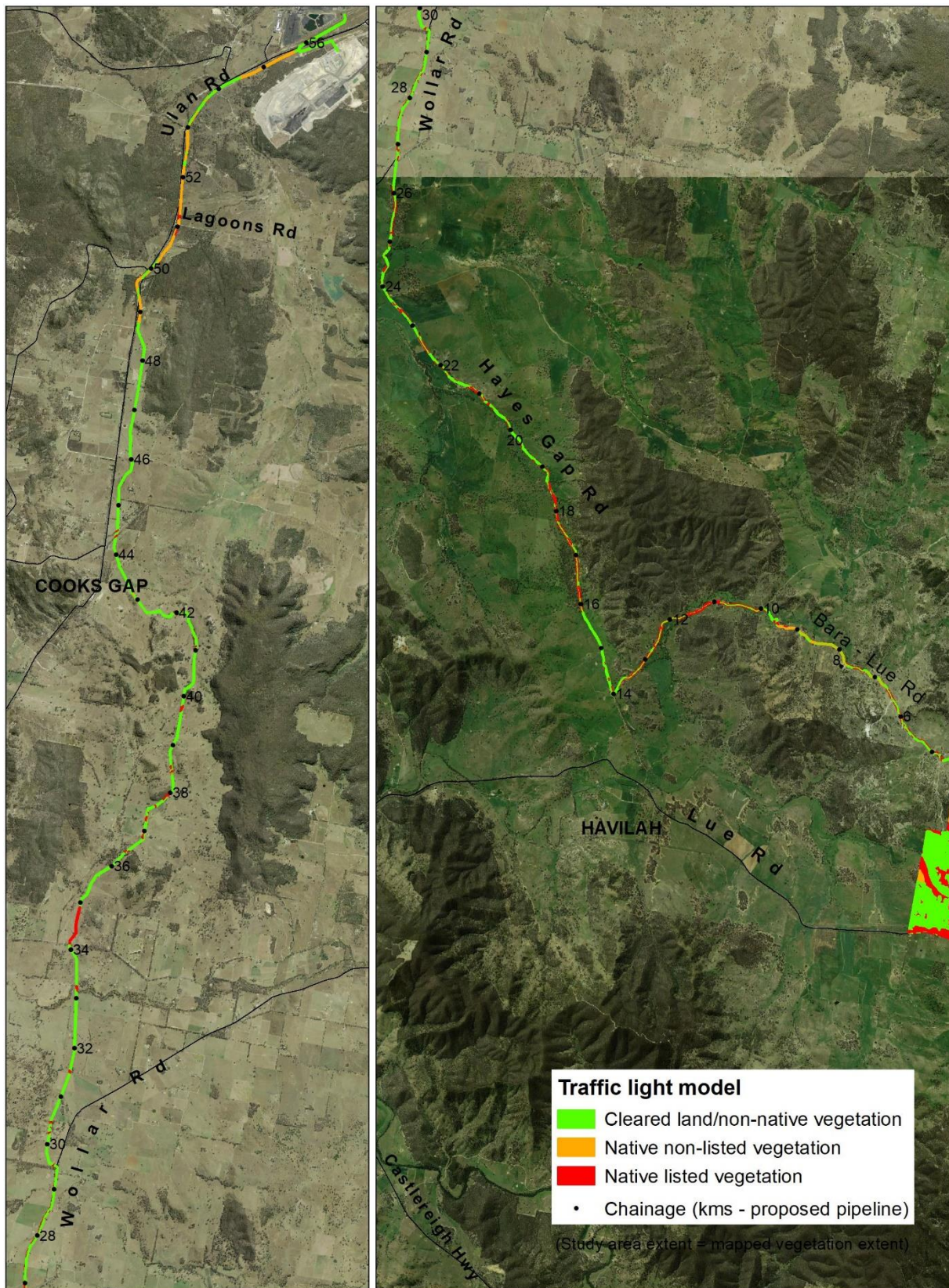
A Fauna Management Sub-plan (FMSP) would be prepared with the objective of minimising potential impacts to fauna species during the clearing of native vegetation required for construction. The FMSP should include a Hollow-bearing Tree Pre-clearance Survey Protocol including the use of personnel who are vaccinated for Australian Bat Lyssavirus, and a Vegetation Pre-clearance Protocol whereby a suitably qualified person holding an environmental science, or science (biology, zoology or ecology) qualification would supervise a team of suitably trained persons to search the area in front of and directly behind vegetation clearing machinery for any fauna species to relocate these fauna to areas of retained vegetation.

**Map 60 Traffic Light Model applied to the Proposed Mine Site**





**Map 61 Traffic Light Model applied to the Proposed Water Pipeline Route**



Mapping date: 21/4/2020

0 0.5 1 2 3 Km



Data sources:

Vegetation/traffic light model: Envirokey.

Aerial image: SIX (NSW Govt)

Datum, proj: GDA94, MGA z55.



### **Seed Collection Sub-plan**

While it is acknowledged that Bowdens Silver holds a substantial seed store on site (details in **Table A8, Annexure 8**), seed collection should be undertaken to ensure that, to the extent feasible, future planting and rehabilitation activity can be carried out with local provenance stock. The following specific mitigation measures are proposed.

- Native seed be collected from native vegetation prior to removal and/or immediately following felling.
- A seed inventory is maintained which includes the amount of seed collected of each species, and treatment and propagation measures.

### **Weed Management Sub-plan**

A Weed Management Sub-plan (WMSP) would be implemented for the Mine Site, specifically focussing upon the removal of priority and environmental weeds and reducing further weed invasion. The objectives within the WMSP would include actions to deter the growth of weeds in recently disturbed areas, control measures for any weeds and the transportation of weeds into and out of the Mine Site. A full list of weeds recorded is provided in **Annexure 4**.

### **Pest Animal Management Sub-plan**

A Pest Animal Management Sub-plan (PAMSP) would be developed targeting the introduced Fox, Feral Deer, Wild Dog, Feral Pig, European Rabbit and Feral Cat. The PAMSP objective would be to implement on-ground works to control these pest species if they are identified through rehabilitation (or other) monitoring as adversely impacting rehabilitation and habitat re-establishment or as part of local / regional control programs.

## **6.3 MITIGATION MEASURES TO BE UNDERTAKEN DURING THE PROJECT OPERATIONS**

The following mitigation measures should be undertaken in the event the Project is approved, and proceeds.

### **6.3.1 Cyanide Management**

The proposed use of cyanide in processing would result in a concentration of <10ppm WAD cyanide in the tailings entering the TSF. Therefore, in accordance with the Commonwealth *Priority Existing Chemical Assessment Report No. 31 Sodium Cyanide* (NICNAS, 2010) the TSF would be classified as Category 1. NICNAS (2010) states that for concentrations <10ppm “*no acute mortalities and minimal sublethal effects are expected*”. Notwithstanding, NICNAS (2010) recommends that, as a contingency precaution, it is still necessary to have steps in place to minimise wildlife visitation and for monitoring. Therefore, a Cyanide Management Plan (CMP) should be prepared and approved by DPE prior to commencement of cyanide use in processing operations. The objective of the CMP should be to outline the following.

- Measures to contain cyanide containing waste entirely within the Mine Site.
- Measures to maintain cyanide levels to within limits prescribed by any development consent.
- Contingency levels for cyanide reduction.
- Details of a cyanide monitoring program.

### **6.3.2 Construction and Operation of Tailings Storage Facility**

The following measures should be undertaken to minimise the risk of fauna interactions with the TSF.

1. The TSF should be constructed in a way that minimises the risk of shallow ponds forming on uneven ground after rain events.
2. The floor of the TSF should be contoured during construction to avoid island formation.
3. Vegetation should be removed and loose topsoil should be stripped within the TSF to minimise the risk of vegetation re-establishing.
4. Bare ground within the TSF should be covered with tailings as soon as practical.

### **6.3.3 General Vegetation and Habitat Removal**

1. Any native vegetation removal should be conducted under the auspices of the approved BMP and its sub-plans.
2. Any area of native vegetation to be removed, should be delineated to prevent accidental damage or removal of retained vegetation.
3. Vehicles, persons and machinery should not enter areas of retained vegetation (unless for required environmental monitoring or other valid purpose) so as to avoid unnecessary impacts to vegetation and habitat.
4. Implement a two-stage clearing protocol for all hollow-bearing trees.
5. Mark all hollow-bearing trees to be removed and catalogue their species and approximate dimensions so that hollows or nest boxes can be added to similar standing trees (i.e. 1 for 1).

### **6.3.4 Erosion Control**

1. Surface disturbance should be minimised as much as possible and access to undisturbed areas limited.
2. Suitable erosion and sediment controls should be in place prior to native vegetation removal.

### **6.3.5 Stock Grazing**

1. Stock grazing should only be permitted within the on-site biodiversity offset areas if it is commensurate with requirements of the management actions of the approved Biodiversity Offset Strategy.

### **6.3.6 Weed Control**

1. Ongoing management and monitoring of weed invasion should be undertaken during the Project life.

2. Regularly inspect and monitor to identify any weed issues.
3. Regularly undertake Control of Priority and environmental weeds in accordance with the relevant control category and the BMP.

#### **6.3.7 Feral Animal Control**

1. Regularly inspect and monitor to identify any feral animal issues.
2. Regularly undertake control of feral animals as determined by the BMP.

#### **6.4 MITIGATION MEASURES TO BE UNDERTAKEN AT THE COMPLETION OF THE PROJECT**

1. At the completion of the Project, rehabilitation and monitoring measures should be implemented within the framework of a Rehabilitation Plan.



## 7. ASSESSMENT OF IMPACTS

### 7.1 IMPACTS NOT REQUIRING FURTHER ASSESSMENT

The FBA does not require further assessment of areas of land without native vegetation. The Project would require the removal of 113.83 hectares of Cleared land that does not meet the definition of native vegetation and is dominated by non-native flora species including improved pasture species. This impact does not require further assessment under the FBA.

### 7.2 IMPACTS NOT REQUIRING OFFSETTING

Impacts on native vegetation not requiring offsets under the FBA include native vegetation that has a site value score of less than 17, and non-native vegetation or Cleared Land. One BVT along the pipeline has a site value score of 16, meaning that no offsets for the Vegetation Zone are required. Species of flora and fauna that are not listed as threatened species do not require offsets under the FBA.

### 7.3 DIRECT IMPACTS

#### 7.3.1 Loss of vegetation and/or habitat

The Project, should it be approved and proceed, would result in a total impact area of 495.67 hectares. This would consist of 113.83 hectares of Cleared land (non-native vegetation) and 381.84 hectares of native vegetation. A summary by BVT of the direct impact, the total hectares of each BVT within the Study Area and the percentage of the BVT to be directly impacted is provided in **Table 31**.

**Table 31**  
**Direct Impacts to Biometric Vegetation Types**

Page 1 of 2

Biometric Vegetation Type	Total hectares in Study Area (includes BAR footprints)	BAR Footprint – Mine Site^ (hectares)	BAR Footprint – Pipeline (hectares)	Percentage Impacted in Study Area (%)
CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Medium)	336.30	88.33	4.53	27.5
CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Poor)	201.71	64.02	2.36	32.9
CW112 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	273.15	21.80	0	8

**Table 31 (Cont'd)**  
**Direct Impacts to Biometric Vegetation Types**

Page 2 of 2

<b>Biometric Vegetation Type</b>	<b>Total hectares in Study Area (includes BAR footprints)</b>	<b>BAR Footprint – Mine Site^ (hectares)</b>	<b>BAR Footprint – Pipeline (hectares)</b>	<b>Percentage Impacted in Study Area (%)</b>
CW216 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	9.18	0	1.24	13.51
CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the central western slopes (Moderate/Good_Medium)	69.42	21.68	0	31
CW242 Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes (Moderate/Good_High)	71.86	1.04	0	1.5
CW249 Derived grassland of the NSW South Western Slopes (Moderate/Good_Poor)	21.87	0	5.18	23.7
CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes (Moderate/Good_High)	102.57	56.65	0	55.2
CW270 Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion (Moderate/Good_High)	3.2	0.77	0	24
CW272 Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills (Moderate/Good_Medium)	2.59	0	0.65	25.1
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_High)	420.69	81.69	0.21	19.2
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	39.19	11.81	0.20	30.6
CW291 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	96.32	18.92	0	19.5
CW299 Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region (Moderate/Good_Medium)	2.87	0	0.76	26.5
^ Includes relocated Maloneys Road and Transmission Line				

## 7.4 INDIRECT IMPACTS

### 7.4.1 Cyanide Interactions

It is generally accepted that cyanide at unmanaged and inappropriate levels, presents a level of risk to biodiversity (Eisler and Wiemeyer, 2004). Whilst the Project would utilise cyanide during processing, the concentrations required are comparatively low and would result in cyanide levels at the discharge point to the TSF of <10ppm cyanide. Therefore, in accordance with NICNAS (2010) no acute mortality and minimal sublethal effects are expected. Notwithstanding, it is expected that the Applicant would take all reasonable steps to keep fauna away from the TSF as this would further reduce the risk of interaction with cyanide-bearing waste (Donato et al., 2007). It is also expected that the Applicant would keep cyanide levels within limits prescribed by the consent authority, should the Project be approved and proceed. Therefore, it is unlikely that any significant indirect impacts would occur as a result of cyanide use.

### 7.4.2 Feral Animals

The Study Area is already known to provide habitat for feral animals including cats, foxes and rabbits. Native vegetation removal as a result of the Project proceeding, may increase both habitat and landscape suitability for feral animals. However, with the implementation of the BMP, including control of feral animals if required, the potential for an increase in feral animals could be managed throughout operations.

### 7.4.3 Weeds

Despite portions of the Study Area being dominated by non-native vegetation and species considered weeds, some weed species could be inadvertently transported into the Mine Site with imported materials or machinery, or they could invade naturally through the removal of areas of native vegetation. There is also some potential to disperse priority and environmental weed plant material into retained areas of native vegetation from incoming equipment with the most likely cause being through the movement of soil by construction vehicles and machinery. However, with the implementation of the BMP, the potential for weed impacts could be adequately managed throughout operations.

### 7.4.4 Impact on relevant Key Threatening Processes

Key threatening processes (KTPs) are not directly assessed under the FBA. However, this Project is likely to contribute to the following KTPs.

1. Aggressive exclusion of birds by Noisy Miners (*Manorina melanocephala*)
2. Bushrock removal
3. Clearing of native vegetation
4. Competition and grazing by the feral European Rabbit
5. Herbivory and environmental degradation caused by feral deer
6. Invasion of native plant communities by exotic perennial grasses



7. Predation by the European Red Fox
8. Removal of dead wood and dead trees
9. Loss of hollow-bearing trees
10. Predation by feral cats
11. Predation, habitat degradation, competition and disease transmission by feral pigs

#### **7.4.5 Connectivity and Habitat Fragmentation**

The Project would result in some loss of connectivity and habitat fragmentation. However, the Study Area and BAR footprint occurs at the southern extent of a large expanse of native vegetation to the north, which then opens onto an existing fragmented landscape which is best described as variegated (Lindenmayer and Fischer, 2006). While some level of connectivity would be lost and levels of habitat fragmentation would increase, the landscape would still retain features suitable for landscape connectivity.

#### **7.4.6 Injury and Mortality**

Fauna injury or mortality can occur during the clearing phase of construction, during the removal of habitat, and from collision with vehicles during the operation of the Project.

During construction, it is anticipated that some diurnal and mobile fauna species such as birds and larger reptiles may be able to move from the path of construction equipment during any clearing operations, other fauna species such as those that are less mobile or nocturnal, are less likely to move away from clearing activity and high levels of injury or mortality are possible. This would be mitigated to the extent possible through the Vegetation Pre-clearance Protocol, however, some injuries and mortalities are likely.

#### **7.4.7 Inadvertent Impacts to adjacent Vegetation and/or Habitat**

Accidental impacts to areas of native vegetation to be retained can occur from time to time. Unmanaged, impacts from machinery, materials and persons entering areas of retained vegetation and habitat could occur beyond the boundaries of the BAR footprint. However, with the implementation of the BMP, this should be able to be adequately managed.

#### **7.4.8 Groundwater Drawdown**

Predicted groundwater drawdown is anticipated to be unlikely to have an adverse effect on terrestrial biodiversity on the basis of the Groundwater Assessment completed by Jacobs (2020). The predicted maximum drawdown beneath Hawkins Creek is typically between 1m to 2m with some isolated areas of increased drawdown to between 3m and 4m. With consideration of that analysis, the following conclusions are made regarding potential impacts as a result of groundwater drawdown.

- Riparian zones are dominated by non-native vegetation with native overstory vegetation virtually absent.

- It is likely that the vegetation remaining in the Study Area are not obligate phreatophytes.
- The vegetation within the Study Area is not likely to draw water from the regional groundwater table, but rather is more likely to rely on rainfall and subsequent infiltration or groundwater within drainage lines.

#### 7.4.9 Noise, Vibration and Lighting Impacts

Noise and vibration would result from the Project, particularly during blasts. While it is important to note that no multi-species study has found all species to be sensitive to noise and vibration, it is generally agreed that, for species which vocalise frequently such as birds and amphibians, there is some potential for negative effects over the long-term. In the context of the Project, avoidance behaviour may result during blasting. General industrial noise can also have some impacts on species, but there are many examples of fauna, and even threatened fauna species, co-existing on active mine projects. For example, the threatened Grey-crowned Babbler, a species known to occur within the Study Area, is recorded on an almost daily basis in the office carpark at the Girilambone Mine north-east of Nyngan. Nesting activity has also been recorded within the car park which is located directly next to the active mining operations.

Light pollution is likely to have both positive and negative effects. Some species of nocturnal bird and bat will frequently hunt around light poles given that the light attracts insects including moths and other flying invertebrates. For example, as the CSA Mine at Cobar, EnviroKey (2012) found that the highest abundance of microchiropteran bat activity recorded by echolocation calls was in the proximity of the carpark lights at the CSA Mine. The lights were attracting copious quantities of flying insects and moths, which in turn attracted high microchiropteran bat activity (Scanlon and Petit, 2008, Grindal and Brigham, 1998).

Other nocturnal species may avoid well-lit areas given that these may increase vulnerability to predation. It is important to note that lighting at the mine is unlikely to be directed toward vegetated areas, but rather at hardstand and active mining areas.

### 7.5 BVT AND THREATENED SPECIES REQUIRING OFFSETS

#### 7.5.1 Ecosystem Credits

**Table 32** provides a full overview of the BVT that would be impacted as a result of the Project and the ecosystem credits required to offset those impacts for the Mine Site, while **Table 33** provides this detail for the pipeline. A summary of the ecosystem credits required is provided in **Table 34**. The full BBCC reports are provided within **Annexure 7**.

#### 7.5.2 Species Credits

**Table 32** details the species credit species that would be impacted as a result of the Project and the species credits required to offset those impacts. The full BBCC report are provided in **Annexure 7**.

**Table 32**  
**Biometric Vegetation Type requiring Offsetting and the Ecosystem Credits Required (Mine Site)**

Veg Zone	Biometric Vegetation Type	Area to be Impacted (ha)	Loss in Landscape Value	Current Site Value Score	Future Site Value Score	TS with the Highest Credit Requirement	Threatened Species Offset Multiplier	Ecosystem Credits Required
1	CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the central western slopes (Moderate/Good_Medium)	21.70	29.7	72.40	0	Masked Owl	3.00	1 339
2	CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	21.80	29.7	62.67	0	Masked Owl	3.00	1 187
3	CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Medium)	88.33	29.7	90.00	0	Powerful Owl	3.00	9 792.51
4	CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Poor)	64.02	29.7	56.67	0	Powerful Owl	3.00	
5	CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion (Moderate/Good_High)	81.69	29.7	78.65	0	Powerful Owl	3.00	6 539
6	CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	11.81	29.7	52.60	0	Powerful Owl	3.00	
7	CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Poor)	18.92	29.7	34.20	0	Powerful Owl	3.00	
8	CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes (Moderate/Good_High)	56.65	29.7	84.38	0	Powerful Owl	3.00	4 006
9	CW242 Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes (Moderate/Good_High)	1.04	29.7	51.04	0	Powerful Owl	3.00	48
e	CW270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion (Moderate/Good_High)	0.77	29.7	69.27	0	Powerful Owl	3.00	46



**Table 33**  
**Biometric Vegetation Type requiring Offsetting and the Ecosystem Credits Required (Pipeline Site)**

<b>Veg Zone</b>	<b>Biometric Vegetation Type</b>	<b>Area to be Impacted (ha)</b>	<b>Loss in Landscape Value</b>	<b>Current Site Value Score</b>	<b>Future Site Value Score</b>	<b>TS with the Highest Credit Requirement</b>	<b>Threatened Species Offset Multiplier</b>	<b>Ecosystem Credits Required</b>
1	CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Medium)	4.53	4.5	46.67	0	Powerful Owl	3.00	164
2	CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (Moderate/Good_Poor)	2.36	4.5	16.0	0	Powerful Owl	3.00	
3	CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	0.20	4.5	38.54	0	Powerful Owl	3.00	6
4	CW216 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate/Good_Medium)	1.24	4.5	36.00	0	Masked Owl	3.00	35
5	CW272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo) (Moderate/Good_Medium)	0.65	4.5	76.56	0	Powerful Owl	3.00	38
6	CW299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region (Moderate/Good_Medium)	0.76	4.5	50.0	0	Powerful Owl	3.00	29
7	CW249 Derived grassland of the NSW South Western Slopes (Moderate/Good_Derived Grassland)	5.18	4.5	19.05	0	Yellow-bellied Sheathtail-bat	2.20	60

**Table 34**  
**Summary of Ecosystem Credits Required**

<b>Biometric Vegetation Type</b>	<b>Ecosystem Credits Required (Mine Site)</b>	<b>Ecosystem Credits Required (Pipeline)</b>
CW112 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1 187	0
CW242 Blue-leaved Stringybark open forest of the Mudgee region, NSW central western slopes	48	0
CW249 Derived grassland of the NSW South Western Slopes	0	60
CW263 Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	4 006	0
CW270 Mugga Ironbark – Red Box – White Box – Black Cypress Pine tall woodland on rises and hills in the northern NSW, South Western Slopes Bioregion	46	0
CW272 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	0	38
CW291 Red Stringybark – Inland Scribbly Gum open forest on steep hills in the Mudgee – northern section of the NSW South Western Slopes Bioregion	6 539	6
CW299 Rough-barked Apple – Blakely's Red Gum – Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region	0	29
CW111 Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	9 792.51	164
CW216 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	0	35
CW217 White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW	1 339	0
<b>Total</b>	<b>22 958</b>	<b>332</b>

**Table 35**  
**Species Credit Species requiring Offsets and the Species Credits Required (Mine Site)**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Loss</b>	<b>Units</b>	<b>Number of Species Credit Species</b>
Koala	<i>Phascolarctos cinereus</i>	140.15	hectares	3 664
Squirrel Glider	<i>Petaurus norfolcensis</i>	174.15	hectares	3 831
Regent Honeyeater	<i>Anthochaera phrygia</i>	280.89	hectares	21 629
Silky Swainson-pea	<i>Swainsona sericea</i>	64	Individuals	1 152
Small Purple-pea	<i>Swainsona recta</i>	4	Individuals	104

**Table 36**  
**Species Credit Species requiring Offsets and the Species Credits Required (Pipeline)**

Common Name	Scientific Name	Loss	Units	Number of Species Credit Species
Ausfeld's Wattle	<i>Acacia ausfeldii</i>	120.00	individuals	9,240
Koala	<i>Phascolarctos cinereus</i>	0.21	hectares	5
Squirrel Glider	<i>Petaurus norfolcensis</i>	8.12	hectares	179
Regent Honeyeater	<i>Anthochaera phrygia</i>	7.59	hectares	584

## 7.6 IMPACTS THAT REQUIRE FURTHER CONSIDERATION

Under the FBA, specific impacts on biodiversity values may require further consideration by the consent authority. These are generally the impacts that are considered to be potentially complicated or severe.

The SEARs identify Regent Honeyeater, Swift Parrot and White Box, Yellow Box, Blakely's Red Gum Woodland as requiring further consideration.

These biota are considered throughout the BAR and specifically in Sections 5, 7 and **Annexure 6**.

## 7.7 STATE ENVIRONMENTAL PLANNING POLICY KOALA HABITAT PROTECTION 2019

State Environmental Planning Policy (SEPP) Koala Habitat Protection (2019) encourages the conservation and management of natural vegetation areas that provide habitat for Koalas, to ensure that permanent free-living populations would be maintained over their present range, and reverse the current trend of koala population decline. Local councils listed under Schedule 1 of the SEPP cannot approve development in an area affected by the policy without consideration of the Approved Koala Management Plan for the land. The BAR footprint is located within the Northwest Slopes Koala Management Area (KMA) and currently, no Koala Plan of Management is present for the KMA. Notwithstanding, as the disturbance footprint includes areas within the "Koala Development Application Map", consideration of the Koala SEPP is required.

The BAR footprint contains Feed Tree Species as listed by Schedule 2 of the Koala SEPP for the Northwest KMA. Numerous tree species as listed by Schedule 2 are located within the BAR footprint including Rough-barked Apple (*Angophora floribunda*), White Cypress Pine (*Callitris glaucophylla*), White Box (*Eucalyptus albens*), Blakelys Red Gum (*Eucalyptus blakelyi*), Ribbon Gum (*Eucalyptus viminalis*) and Scribbly Gum (*Eucalyptus rossi*). This BAR provides a detailed assessment of the vegetation communities within the BAR footprint and confirms the previous presence of Koala based on two recent records.



A total of 140.36 hectares of Known Koala habitat would be removed should the proposed activity be approved and proceed. However, both appropriate mitigation measures and a BOS would be applied should the Project proceed. Further, a range of avoidance measures have been implemented during the planning phase to minimise the level of impact where possible. Where impacts are not able to be avoided, a range of detailed mitigation measures are proposed and these would be implemented. The development and implementation of a BOS would meet the requirements of the NSW offset policy for major projects to offset any potential residual impacts of the Project to Koala.

In exercising any functions of the previous Koala SEPP (SEPP 44, now repealed), a council must take into consideration given that SEPP 44 is of potential relevance to the Bowdens Silver Project, however, it is understood that SEPP 44 does not apply to SSD projects assessed under the FBA. It is unclear if the Koala SEPP applies to SSD projects assessed under the FBA.

## **7.8 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE**

Matters of National Environmental Significance are assessed in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (MNES) (DotE, 2013).

A number of EPBC Act listed species have been recorded within the Study Area, or in adjacent habitats that have similar characteristics to the Study Area. Additionally, the FBA is a mechanism to deal with residual adverse significant impacts on a listed threatened species, TEC or migratory species. The EPBC Act biota that have been recorded within the Study Area are:

- Large-eared Pied Bat
- White-throated Needletail
- Rainbow Bee-eater
- Box-Gum Woodland
- Small Purple-pea

While not recorded by the comprehensive field surveys, two records of Spotted-tailed Quoll occur in relatively close proximity to the Study Area. The first, a roadkill male was found dead on Lue Road, 800 metres west of Lue Tip in 2017, while the second was on Maloneys Road near 'Bara Downs' about 5 kilometres north of the Mine Site in 2005. Given these records, Spotted-tailed Quoll is also considered within **Annexure 6**.

After an analysis of all MNES within **Table 30**, the following biota are subject to the significant impact criteria assessment in **Annexure 6**:

- Large-eared Pied Bat
- Regent Honeyeater
- Cattle Egret (migratory)
- Latham's Snipe (migratory)
- White-throated Needletail (migratory)
- Swift Parrot

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- Rainbow Bee-eater (migratory)
- Spotted-tailed Quoll
- Koala
- Small Purple-pea
- Box-Gum Woodland

## **8. BIODIVERSITY OFFSETS**

A Biodiversity Offset Strategy (BOS) is currently being prepared by Niche.

This BAR acknowledges that Bowdens Silver currently have a substantial area designated for biodiversity offsetting within and surrounding the Mine Site and would secure additional biodiversity offsets to meet all offsetting requirements, the details of which are presented separately to this BAR (see Niche, 2020).

This section provides a brief overview of the policy and principles that form the framework for the BOS that is currently being prepared by Niche.

### **8.1 NSW MAJOR PROJECTS OFFSET POLICY**

The NSW biodiversity offsets policy for major projects in NSW commenced on 1 October 2014. The policy provides for the clarification, standardisation and improvement of biodiversity offsetting for major project approvals.

The policy applies to SSD and SSI projects, and as such, the Bowdens Silver Project is considered under this policy.

### **8.2 NSW OFFSET POLICY PRINCIPLES**

The NSW biodiversity offset policy for major projects is underpinned by six principles. This section identifies how the BAR meets those principles.

*Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.*

Bowdens Silver have made reasonable attempts to avoid impacts to biodiversity through the development of a traffic light model. Avoidance and minimisation measures are detailed in Section 6 of this BAR.

*Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.*

This BAR has been prepared in accordance with the FBA using the BBAM. This assessment has been identified as the appropriate assessment pathway for the Project.

*Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.*

The BOS currently being prepared by Niche targets any loss of biodiversity value.

*Principle 4: Offsets must be additional to other legal requirements.*

Biodiversity offsets are a legal requirement of projects assessed under the FBA.



*Principle 5: Offsets must be enduring, enforceable and auditable.*

It is expected that any biodiversity offsets established through the BOS, would be enduring, enforceable and auditable. This would be achieved through the establishment of Biodiversity Stewardship Agreements and potentially purchase of credits from third parties who have established Stewardship Agreements and/or payment into the Biodiversity Conservation Trust.

*Principle 6: Supplementary measures can be used in lieu of offsets.*

While some mitigation measures are detailed within Section 6 of this BAR, the BOS identifies the measures required to offset the biodiversity impacts of the Project in consideration of the 'Fulfilling offset requirements' (flowchart – point 6) within the NSW biodiversity offset policy for major projects.

## **9. CONCLUSION**

The Bowdens Silver Project would comprise seven principal components, including an open cut pit, WRE, stockpile, and TSF. These components would be supported by a range of on-site and off-site infrastructure. The on-site infrastructure comprises haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities. The off-site infrastructure comprises a relocated section of Maloneys Road (including a new railway bridge crossing and new crossing of Lawsons Creek), a 132kV power line and a water supply pipeline for the delivery of water from the Ulan coalfields. The Project was declared a State Significant Development by the NSW Government.

The key impacts of the Project include the following.

- The removal of a total of 381.84 hectares of native vegetation (366.71 hectares for the Mine Site, and 15.13 hectares for the Pipeline).
- This includes 182.27 hectares of BC Act listed Box-Gum Woodland, of which 147.82 hectares also meet the classification of the EPBC Act listed Box-Gum Woodland.
- Impacts to at least 13 threatened species that are listed as ecosystem credit species.
- Impacts to at least six threatened species that are listed as species credit species.

After referral to the Commonwealth Minister for the Environment, the Project was declared to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on listed threatened species and communities. However, an assessment against the EPBC Act Significant Impact Criteria (see **Annexure 6**) has subsequently been undertaken on the final Project and in light of the proposed management measures (see Section 6), including the implementation of the biodiversity offset strategy (see Section 8). This assessment has concluded that for all listed species, excluding the Regent Honeyeater, there would not be a significant impact.

The Project would impact habitats for locally occurring threatened biota. The Project could have a significant impact on Box-Gum Woodland as listed by the EPBC Act and Regent Honeyeater. However, both appropriate mitigation measures and a biodiversity offset strategy would be applied should the Project proceed. Further, a range of avoidance measures have been implemented during the planning phase to minimise the level of impact where possible. Where impacts are not able to be avoided, a range of detailed mitigation measures are proposed and these would be implemented. The development and implementation of a biodiversity offset strategy would meet the requirements of the NSW offset policy for major projects to offset any potential residual impacts of the Project.

Some revegetation is proposed in addition to the biodiversity offset strategy. In the order of 344 hectares (approximately 153ha woodland and 191ha native grassland) would be revegetated to native vegetation using species consistent with the existing plant communities. While not formally accounted for with the biodiversity offset or assessment of impact, in the long-term, the areas rehabilitated to native vegetation would further reduce impacts to biodiversity.

## 10. REFERENCES

- BARCLAY, R. M. R., CHRUSZEZ, B. J. & RHODES, M. 2000. Foraging behaviour of the large-footed myotis, *Myotis moluccarum* in south-eastern Queensland. *Australian Journal of Zoology*, 48, 385-392.
- BARRETT, G. W., SILCOCKS, A. F., CUNNINGHAM, A., OLIVER, D. L., WESTON, M. A. & BAKER, J. 2007. Comparison of Atlas data to determine the conservation status of bird species in New South Wales with an emphasis on woodland-dependent species. *Australian Zoologist*, 34, 37-77.
- BAUDINETTE, R. V., WELLS, R. T., SANDERSON, K. J. & CLARK, B. 1994. Microclimatic conditions in maternity caves of the bent-wing bat, *Miniopterus schreibersii*: an attempted restoration of a former maternity site. *Wildlife Research*, 21, 607-619.
- BELL, H. 1984. Polygamy in the speckled warbler *Sericornis sagittatus*. *Emu*, 84, 183-184.
- BIRDSAUSTRALIA 2011. National Recovery Plan for the Swift Parrot *Lathamus discolor*. Prepared by Debbie Saunders and Chris Tzaros.
- BLOMBERG, S. & SHINE, R. 1996. Reptiles. In: SUTHERLAND, J. (ed.) *Ecological Census Techniques: a handbook*. Cambridge University Press.
- BMS 2012. Fauna Survey of Potential Development Area, Bowdens Silver Mine, via Lue. A report by Biodiversity Monitoring Services for Kingsgate Bowdens Pty Ltd.
- BMS 2013. Additional Fauna Assessments, Bowdens Silver Project. A report by Biodiversity Monitoring Services.
- BRERETON, R., MALLICK, S. A. & KENNEDY, S. J. 2004. Foraging preferences of Swift Parrots on Tasmanian Blue-gum: tree size, flowering frequency and flowering intensity. *Emu*, 104, 377-383.
- BURROWS, G. E. 1999. A survey of 25 remnant vegetation sites in the South Western Slopes, New South Wales. *Cunninghamia*, 6, 283-314.
- CHURCHILL, S. 2008. Australian Bats. Reed New Holland, Frenchs Forest, Australia.
- CLARIDGE, A. W., MIFSUD, G., DAWSON, J. & SAXON, M. J. 2004. Use of infrared digital cameras to investigate aspects of the social behaviour of cryptic species. *Wildlife Research*, 31, 645-650.
- COONEY, S. J. N. & WATSON, D. M. 2005. Diamond Firetails (*Stagonopleura guttata*) preferentially nest in mistletoe. *Emu*, 105, 317-322.
- COOPER, C. B. & WALTERS, J. R. 2002. Independent effects of woodland loss and fragmentation on Brown Treecreeper distribution. *Biological Conservation*, 105, 1-10.
- COOPER, C. B., WALTERS, J. R. & FORD, H. 2002. Effects of remnant size and connectivity on the response of Brown Treecreepers to habitat fragmentation. *Emu*, 102, 249-256.
- DEC 2004. Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). NSW Department of Environment & Conservation, Hurstville, NSW.
- DECC 2007. Threatened Species Assessment Guidelines: The Assessment of Significance. Department of Environment & Climate Change, Hurstville, N.S.W.
- DECC 2008. Approved Recovery Plan for the Koala (*Phascolarctos cinereus*). Department of Environment & Climate Change, Hurstville, N.S.W.
- DECCW 2011. National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change & Water.
- DEH 2006. EPBC Act Policy Statement: White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived native grasslands. Canberra: Department of Environment & Heritage.



- DEWHA 2009. EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance. *Department of the Environment, Water, Heritage and the Arts*.
- DISQUE, D., THOMPSON, J., PREECE, H., DE VILLIERS, D. & CARRICK, F. N. 2003. Dispersal patterns in a regional koala population in south-east Queensland. *Wildlife Research*, 30, 281-290.
- DOE 2016. National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*). <http://www.environment.gov.au/system/files/resources/286c0b52-815e-4a6c-9d55-8498c174a057/files/national-recovery-plan-regent-honeyeater.pdf>.
- DOEE 2020. Protected Matters Search Tool. <http://www.environment.gov.au/erin/ert/epbc/index.html>. Department of the Environment.
- DONATO, D. B., NICHOLS, O., POSSINGHAM, H., MOORE, M., RICCI, P. F. & NOLLER, B. N. 2007. A critical review of the effects of gold cyanide-bearing tailings solutions on wildlife. *Environment International*, 33, 974-984.
- NOTE 2013. EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance. [http://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines\\_1.pdf](http://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf).
- NOTE 2014. EPBC Act referral guidelines for the vulnerable Koala. *Department of the Environment*, <http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-vulnerable-koala>.
- DPI 2017. Degradation of riparian vegetation. <http://www.dpi.nsw.gov.au/fishing/habitat/threats/removal-and-degradation-of-riparian-vegetation>.
- DWYER, P. D. 1962. The breeding biology of *Miniopterus schreibersi blopotis* in north-eastern New South Wales. *Australian Journal of Zoology*, 11, 219-240.
- DWYER, P. D. 1968. Populations ranges of *Miniopterus schreibersii* (Chiroptera) in south-eastern Australia. *Australian Journal of Zoology*, 17, 665-686.
- DYWER, P. 1966. Observations on *Chalinolobus dyweri* (Chiroptera: Vespertilionidae) in Australia. *Journal of Mammalogy*, 47, 86-91.
- EA 1999. The Action Plan for Australian Bats. *Environment Australia, Canberra*, <http://www.environment.gov.au/resource/action-plan-australian-bats>.
- EISLER, R. & WIEMEYER, S. N. 2004. Cyanide hazards to plants and animals from gold mining and related water issues. *Rev Environ Contam Toxicol*, 183, 21-54.
- ELA 2014. Biobanking plots/transects datasheets and vegetation mapping of the proposed Bowdens Silver Mine. *Data provided to Bowdens Silver Pty Ltd*.
- ENVIROKEY 2010a. Flora and Fauna Study: Tritton Mine, Hermidale, N.S.W. A report prepared by S. Sass of EnviroKey for Tritton Resources Pty. Ltd. Report No. ER 0127.
- ENVIROKEY 2010b. Winter Biodiversity Survey: 'Budgery' via Hermidale, N.S.W. A report prepared by S. Sass of EnviroKey for Tritton Resources Pty. Ltd. Report No. ER.0176. Final Version. 07/10/2010.
- ENVIROKEY 2011. Flora and Fauna Study: Murrawombie and North East Mine, Girilambone, N.S.W (ML1280, ML1383 & MPL295). A report prepared by S. Sass, S. Parsell and L. Sass for Tritton Resources Pty. Ltd. Report No. ER.0301. Final Report. Version 1. 12/12/2011.
- ENVIROKEY 2012. Biodiversity Assessment: CML5, CSA Mine, Cobar, western NSW. A report prepared by S. Sass, M. Harris & S. Parsell of EnviroKey Pty. Ltd for Cobar Management Pty. Ltd. Report No. ER.0406. Final Report. Version 1.0. 30<sup>th</sup> October 2012.

- ENVIROKEY 2013. Threatened Species Investigations: Selected Sections of Gocup Road (MR279). *A report prepared by S. Sass, S. Parsell & C. Metzler for Roads & Maritime Services. Report No. ER.0416. Final Report. Version 1.0. 2<sup>nd</sup> May 2013.*
- FORD, H., DAVIS, W., DEBUS, S., LEY, A., RECHER, H. & WILLIAMS, B. 1993. Foraging and Aggressive Behaviour of the Regent Honeyeater *Xanthomyza phrygia* in Northern New South Wales. *Emu - Austral Ornithology*, 93, 277-281.
- FRANKIN, D. C., MENKHORST, P. W. & ROBINSON, J. L. 1989. Ecology of the Regent Honeyeater *Xanthomyza phrygia*. *Emu*, 89, 140-154.
- GCNRC 2014. Flora Study of the Proposed Bowdens Silver Mine and Associated Relocation of Maloneys Road, via Lue, NSW. *A report prepared by Geoff Cunningham Natural Resource Consultants for Kingsgate Bowdens Pty Ltd.*
- GEERING, D. & FRENCH, K. 1998. Breeding Biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee Valley, New South Wales. *Emu - Austral Ornithology*, 98, 104-116.
- GRINDAL, S. D. & BRIGHAM, R. M. 1998. Short-term effects of small-scale habitat disturbance on activity by insectivorous bats. *Journal of Wildlife Management*, 62, 996-1003.
- KAVANAGH, R. P. 2002. Comparative diets of the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) in southeastern Australia. In: NEWTON, I., KAVANAGH, R. P., OLSEN, J. & TAYLOR, I. (eds.) *Ecology and Conservation of Owls*. Australia: CSIRO Publishing.
- KING, B. R. 1980. Social organisation and behaviour of the Grey-crowned Babbler *Pomastostomus temporalis*. *Emu*, 80, 59-76.
- LAW, B., CHIDEL, M. & MONG, A. 2005. Life under a sandstone overhang: the ecology of the Eastern Cave Bat *Vespudelus troughtoni* in northern New South Wales. *Australian Mammalogy*, 27, 137-145.
- LINDENMAYER, D. B. & FISCHER, J. 2006. *Habitat fragmentation and Landscape change: An ecological and conservation synthesis*, Melbourne, CSIRO.
- MAC NALLY, R. & HORROCKS, G. 2000. Landscape-scale conservation of an endangered migrant: the Swift Parrot (*Lathamus discolor*) in its winter range. *Biological Conservation*, 92, 335-343.
- MITCHELL, P. B. 2002. Descriptions for NSW Mitchell Landscapes. *A report prepared for the NSW National Parks and Wildlife Service, Hurstville, NSW.*
- MORCOMBE, M. 2004. *Field guide to Australian Birds*, Archerfield, Queensland, Steve Parish Publishing.
- NOSKE, R. 1998. Social organisation and nesting biology of the cooperatively breeding Varied Sittella (*Daphoenasitta chrysoptera*) in North-eastern New South Wales. *Emu*, 98, 85-96.
- NPWS 2001. Strategy for the Conservation of Bats in Derelict Mines. *NSW National Parks and Wildlife Service, Hurstville.*
- NPWS 2003a. The Bioregions of New South Wales: their biodiversity, conservation and history. *NSW National Parks and Wildlife Service, Hurstville.*
- NPWS 2003b. Draft Recovery Plan for the Barking Owl. *NSW National Parks and Wildlife Service, Hurstville.*
- NPWS n.d. Identification Guidelines for Endangered Ecological Communities: White Box Yellow Box Blakey's Red Gum Woodland (Box-Gum Woodland). <http://www.environment.nsw.gov.au/resources/nature/box-gumIdGuidelines.pdf>.
- OEH 2012a. Assessors'guide to using the Biobanking Credit Calculator v.2. *NSW Office of Environment & Heritage.*
- OEH 2012b. National Recovery Plan for Small Purple-pea (*Swainsona recta*). *Prepared by the NSW Office of Environment and Heritage,*

- <http://www.environment.gov.au/system/files/resources/18ed9fb5-5eeb-425b-a303-24e2aa74b849/files/swainsona-recta.pdf>.
- OEH 2014a. BioBanking Assessment Methodology 2014. <http://www.environment.nsw.gov.au/resources/biobanking/140661BBAM.pdf>.
- OEH 2014b. Biobanking Assessment Methodology (version 2). *NSW Office of Environment & Heritage*.
- OEH 2014c. Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects. <http://www.environment.nsw.gov.au/resources/biodiversity/140675fba.pdf>.
- OEH 2014d. Major Project offsets policy. *State Government of NSW*.
- OEH 2014e. Tura Star-hair *Astrotricha* sp. community mapping project. *A report by Sarah Golden, Ecosystems and Threatened Species, NSW Office of Environment and Heritage*.
- OEH. 2020a. *BioNET: The website for the Atlas of NSW Wildlife: A whole-of-government system for flora and fauna sightings information* [Online]. Available: [www.bionet.nsw.gov.au](http://www.bionet.nsw.gov.au) [Accessed].
- OEH 2020b. NSW Vegetation Information System: Classification. <http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>.
- OEH 2020c. Threatened species, populations and ecological communities of NSW. *NSW Office of Environment & Heritage*. , [www.threatenedspecies.environment.nsw.gov.au](http://www.threatenedspecies.environment.nsw.gov.au).
- OLIVER, D. 1998. The importance of insects and lerp in the diet of juvenile regent honeyeaters, *Xanthomyza phrygia*: implications for the conservation of an endangered woodland bird. *Wildlife Research*, 25, 409-417.
- PAVEY, C. R. & BURWELL, C. J. 2004. Foraging ecology of the horseshoe bat, *Rhinolophus megaphyllus* (Rhinolophidae), in eastern Australia. *Wildlife Research*, 31, 403-413.
- PB 2005. Grey-crowned Babbler Retention Plan. *A report prepared by Parsons Brinckerhoff Australia for Gloucester Shire Council*.
- PENNAY, M., LAW, B. & REINHOLD, L. 2004. Bat calls of NSW: A region based guide to echolocation calls of microchiropteran bats. *NSW Department of Environment & Conservation, Hurstville, NSW*.
- PLANTNET. 2019. *New South Wales Flora Online* [Online]. Sydney. Available: <http://plantnet.rbgsyd.nsw.gov.au/> [Accessed].
- PROBER, S. M. & THIELE, K. R. 1995. Conservation of the Grassy White Box Woodlands: Relative contributions of size and disturbance to floristic composition and diversity of remnants. *Australian Journal of Botany*, 43, 349-366.
- REID, J. R. W. 1999. Threatened and declining birds in the New South Wales sheep-wheat belt: Diagnosis, Characteristics and Management. *A consultancy report prepared for the NSW National Parks and Wildlife Service*.
- ROBINSON, D. 2006. Is revegetation in the Sheep Pen Creek area, Victoria, improving Grey-crowned Babbler habitat? *Ecological Management and Restoration*, 7, 93-104.
- SASS, S. 2009. An overview of bird assemblages within arid shrubland and woodland habitats of western New South Wales. *Consulting Ecology*, 23, 58-65.
- SASS, S. 2011a. Recent taxonomic changes and additions to the snake fauna of New South Wales. *Consulting Ecology*, 27.
- SASS, S. 2011b. Taxonomic changes and additions to the lizard fauna of New South Wales: A synthesis. *Consulting Ecology*, 24.
- SASS, S., MURRAY, J. & CHESNUT, K. 2014. Traps, Transects and Technology: Detectability of the threatened Rosenberg's Goanna (*Varanus rosenbergi*). *Consulting Ecology*, 33, 21-24.
- SAUNDERS, D. & HEINSOHN, R. 2008. Winter habitat use by the endangered, migratory Swift Parrot (*Lathamus discolor*) in New South Wales. *Emu*, 108, 81-89.
- SCANLON, A. T. & PETIT, S. 2008. Effects of site, time, weather and light on urban bat activity and richness: considerations for survey effort. *Wildlife Research*, 35, 821-834.



- SWAN, G., SHEA, G. & SADLIER, R. 2004. *Field guide to the reptiles of New South Wales*, Sydney, Reed New Holland.
- THACKWAY, R. & CRESWELL, I. D. 1995. An interim biogeographic regionalisation for Australia: a framework for establishing the national system of reserves. Version 4.0. *Australian Nature Conservation Agency, Canberra*.
- TRIGGS, B. 2008. *Tracks, Scats and other Traces: A Field Guide to Australian Mammals*, South Melbourne, Oxford University Press.
- TYLER, M. J. & KNIGHT, F. 2009. *Field Guide to the Frogs of Australia*, Melbourne, CSIRO Publishing.
- WATSON, D. M. 2003. The 'standardized search' : An improved way to conduct bird surveys. *Austral Ecology*, 28, 515:525.
- WATSON, J., FREUDENBERGER, D. & PAUL, D. 2001. An assessment of the focal-species approach for conserving birds in variegated landscapes in south-eastern Australia. *Conservation Biology*, 15, 1364-1373.
- YATES, C. J. & HOBBS, R. J. 1997. Temperate eucalypt woodlands: a review of their status, processes threatening their persistence and techniques for restoration. *Australian Journal of Botany*, 45, 949-973.

# Annexures

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Sheets (92 pages)
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Bowdens Silver (4 pages)
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# **Annexure 1**

## **Qualifications and Experience of Personnel**

(Total No. of pages including blank pages = 6)

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**Table A1**

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Name and Qualifications	Experience
<p>Steve Sass  B.App.Sci (Env.Sci) (Hons),  GradCert.CaptVertMngt (CSU)  Director / Project Manager /  Principal Ecologist</p> <p>Certified Environmental  Practitioner, EIANZ</p> <p>Practicing Member, Ecological  Consultants Association of NSW  (ECA)</p> <p>Accredited Biobanking &amp;  Biocertification Assessor (OEH)</p>	<p>Steve is a highly experienced Ecologist, having undertaken hundreds of ecological surveys and Biodiversity Assessments across Australia since 1992. Steve has an in-depth working knowledge of environmental and biodiversity legislation across all states and territories which allows him to provide detailed and accurate assessments and formulate practical solutions to clients and specific projects.</p> <p>His expertise extends across the widest range of projects including landscape scale biodiversity surveys and flora and fauna impact assessments in sensitive areas such as the recently approved Silverton Wind Farm, Australia's largest Wind Farm with 600 turbines (~30,000 hectares) near Broken Hill in far western New South Wales.</p> <p>Previous and current research holds Steve in high regard within both the scientific and ecological consultants' community. To date, Steve has published, submitted or has in preparation, thirty three manuscripts within peer-reviewed journals, many of which are related to threatened species survey, monitoring or management. Steve was recently appointed "Expert" Status by OEH for a number of threatened species listed under the NSW <i>Biodiversity Conservation Act 2016</i> and is currently a member of an expert advisory panel appointed by OEH to review wildlife licensing under this Act.</p> <p>He has extensive biodiversity experience in western and central NSW. He has completed hundreds of surveys across the region including Impact Assessments for numerous mining operations and exploration activities.</p> <p>Steve is accredited as a Certified Environmental Practitioner by the Environment Institute of Australia and New Zealand, is a past Council member of the Ecological Consultants Association of NSW.</p> <p>For this assessment, Steve was Project Manager, formulated the experimental design, led the field survey team, carried out many of the fauna surveys, conducted the echolocation call analysis and was the primary author of the BAR. Steve also managed the biobanking assessment process through the Biobanking Credit Calculator.</p>
<p>Mark Harris  B.App.Sci (Env Res Mgt)  Senior Botanist/GIS Analyst</p> <p>Biobanking Assessor (OEH)  Practicing Member, Ecological  Consultants Association of NSW  (ECA)</p>	<p>Mark is a highly experienced Botanist having undertaken flora surveys across eastern and central Australia. He has more than 12 years' experience in Biodiversity Assessment and Planning. Mark has extensive experience with the flora and vegetation communities of the region confirmed by his two year tenure with the State-wide Native Vegetation Mapping Project. Mark was responsible for vegetation mapping around the Nyngan, Nymagee and Condobolin districts.</p> <p>Mark completed the flora surveys and BBAM plots/transects for the vegetation community mapping, and prepared all mapping and spatial analysis. Mark also preparing sections of the BAR relating to flora.</p>



Table A1 (Cont'd)

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Name and Qualifications	Experience
<p>Joshua Wellington B. Sc (Environmental) Senior Project Officer/Botanist</p>	<p>Joshua is a highly experienced Ecologist having undertaken hundreds of biodiversity surveys in woodland and forests in NSW and Victoria and has more than 8 years' experience in Environmental Planning, Assessment and Management. He has extensive major project experience, having completed a Regional Biodiversity Assessment and Constraints and Opportunities Analysis for a proposed 2,500 hectare mining project in alpine and sub-alpine vegetation. This included a detailed Biobanking Assessment of the development site and the identification of suitable offset areas in the region. Field surveys were designed by Joshua to ensure compliance with the Biobanking Assessment Methodology (BBAM) and this lead to the completion of more than 100 biobanking/plot transects to ensure adequacy with BBAM.</p> <p>Joshua has also extensive flora and fauna assessment experience, having prepared REFs, Biodiversity Assessments and Route Options Analysis for electricity, road, pipeline and communications infrastructure. Joshua was also the senior ecologist and primary author of numerous REFs in coastal and near-coastal region for Bega Valley Council in the Bega Valley confirming his expertise in the region.</p> <p>For this project, Joshua led and assisted with the botanical surveys including conducting field data collection within potential offset sites on Bowdens Silver owned land.</p>
<p>Gerry Swan Adv. Herp. Tech Herpetologist</p> <p>Member, Ecological Consultants Association of NSW (ECA)</p>	<p>Gerry is one of Australia's leading field herpetologists having co-authored numerous field guides including 'A Field Guide to the Reptiles of New South Wales', now in its third edition and the Whitley Award Winning 'A complete guide to Reptiles of Australia', now in its fifth edition.</p> <p>Gerry is also a highly experienced ecologist conversant with a variety of mammals and birds. This includes the trapping and identification of hundreds of mammals along thousands of kilometres of open pipeline trenches in the QLD, SA and NT.</p> <p>Sass and Swan have collaborated on a number of ecological surveys, research and Major Project assessments over the past 10 years. Their collaborations have also included research on endangered species such as the Tawny Rock Dragon (<i>Ctenophorus decresii</i>), Barrier Range Dragon (<i>Ctenophorus mirrityana</i>) Marble-headed Snake-lizard (<i>Delma australis</i>) and Slender Mallee Blue-tongue (<i>Cyclodomorphus melanops</i>) and fauna community composition in a variety of landscapes in NSW.</p> <p>Gerry has carried out many of the herpetofauna surveys and assisted with nocturnal surveys.</p>
<p>Harrison Warne B. Sc (Zoology and Ecology) Ecologist</p>	<p>Harrison is a highly experienced ecologist despite graduating from James Cook University in 2018. He has extensive field identification skills in reptiles, frogs, mammals and birds. He has completed numerous fauna surveys on major projects including the Nyngan Scandium Project and Thackaringa Cobalt Project.</p> <p>For this project, Harrison both led and assisted some of the fauna surveys.</p>

Table A1 (Cont'd)

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Name and Qualifications	Experience
<p>Kylie Blain</p> <p>AssocDeg. App.Sci (Parks, Recreation &amp; Heritage)</p> <p>Ecologist</p>	<p>Kylie is a graduate of Charles Sturt University and has a variety of field ecological experience, both on the NSW south coast and in western and central NSW.</p> <p>For this project, Kylie carried out the database searches and assisted with the desktop analysis.</p>
<p>Brett Aitchison</p> <p>Assistant Herpetologist</p>	<p>Brett has over 10 years' experience surveying for Australian reptiles and amphibians as a volunteer for the Australian Herpetological Society. He is the current field trip coordinator given his experience in the identification of reptiles and amphibians. For this assessment, he assisted with the herpetofauna surveys.</p>
<p>Linda Sass</p> <p>Assoc.Deg. Gn.St (Science), B.A, Dip. Ed (Sec)</p> <p>Director / Senior Ecologist</p> <p>Member, Ecological Consultants Association of NSW (ECA)</p>	<p>Linda is an experienced ecologist having conducted flora and fauna surveys across NSW over the past 12 years.</p> <p>Linda has extensive experience with the flora and fauna of southern, central and western NSW. In recent years, she has completed flora surveys for a proposed water pipeline in western NSW and a biodiversity study of an existing mining operation on the Cobar Peneplain.</p> <p>Linda assisted in a preliminary analysis of the final water pipeline route and conducted an internal review of this report.</p>

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# **Annexure 2**

## **Matters of National Environmental Significance Protected Matters Search Tool**

(Total No. of pages including blank pages = 24)

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**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: 05/02/19 10:48:51

[Summary](#)

[Details](#)

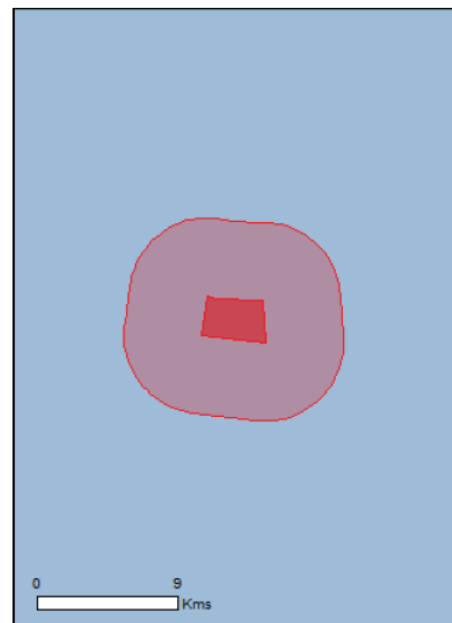
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are  
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[Coordinates](#)

[Buffer: 5.0Km](#)





## 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	4
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	4
<a href="#">Listed Threatened Species:</a>	34
<a href="#">Listed Migratory Species:</a>	12

### 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.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	19
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

### Extra Information

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

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	28
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

## Details

### Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[ Resource Information ]
Name	Proximity
<a href="#">Banrock station wetland complex</a>	800 - 900km upstream
<a href="#">Riverland</a>	800 - 900km upstream
<a href="#">The coorong, and lakes alexandrina and albert wetland</a>	1000 - 1100km
<a href="#">The macquarie marshes</a>	200 - 300km upstream

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
<a href="#">Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</a>	Endangered	Community likely to occur within area
<a href="#">Natural Temperate Grassland of the South Eastern Highlands</a>	Critically Endangered	Community may occur within area
<a href="#">Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</a>	Endangered	Community may occur within area
<a href="#">White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</a>	Critically Endangered	Community likely to occur within area

Listed Threatened Species	[ Resource Information ]	
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a>		
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a>		
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a>		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Grantiella picta</a>		
Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Lathamus discolor</a>		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Leipoa ocellata</a>		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a>		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Polytelis swainsonii</a>		
Superb Parrot [738]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
<a href="#">Rostratula australis</a>		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<b>Fish</b>		
<a href="#">Galaxias rostratus</a>		
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Maccullochella peelii</a>		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
<a href="#">Macquaria australasica</a>		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
<b>Frogs</b>		
<a href="#">Litoria booroolongensis</a>		
Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Chalinolobus dwyeri</a>		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a>		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<a href="#">Nyctophilus corbeni</a>		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Petauroides volans</a>		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
<a href="#">Petrogale penicillata</a>		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a>		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudomys novaehollandiae</a>		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pteropus poliocephalus</a>		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<b>Plants</b>		
<a href="#">Cryptostylis hunteriana</a>		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
<a href="#">Dichanthium setosum</a>		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Euphrasia arguta</a>		
[4325]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Homoranthus darwinioides</a>		
[12974]	Vulnerable	Species or species habitat likely to occur



Name	Status	Type of Presence
<a href="#">Leucochrysum albicans var. tricolor</a> Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	within area Species or species habitat likely to occur within area
<a href="#">Pelargonium sp. Striatellum (G.W.Carr 10345)</a> Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
<a href="#">Philothea ericifolia</a> [64942]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Prasophyllum petilum</a> Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
<a href="#">Prasophyllum sp. Wybong (C.Phelps ORG 5269)</a> a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Swainsona recta</a> Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat likely to occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

#### Reptiles

<a href="#">Aprasia parapulchella</a> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Delma impar</a> Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

#### Listed Migratory Species

#### [ Resource Information ]

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

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area

#### Migratory Terrestrial Species

<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat likely to occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat likely to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area

#### Migratory Wetlands Species

<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within
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Name	Threatened	Type of Presence area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

## Commonwealth Land

[\[ Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

## Name

Commonwealth Land - Commonwealth Trading Bank of Australia

## 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat likely to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

### Extra Information

#### **Invasive Species** **[ Resource Information ]**

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
<i>Acridotheres tristis</i> Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area



Name	Status	Type of Presence
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		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
Rattus rattus Black Rat, Ship Rat [84]		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

Name	Status	Type of Presence
<b>Plants</b>		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		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

-32.616805 149.847306,-32.617528 149.873399,-32.638057 149.875116,-32.634299 149.838895,-32.615504 149.841985,-32.615504 149.841985,-32.616805 149.847306



## 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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**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: 05/02/19 10:42:36

[Summary](#)

[Details](#)

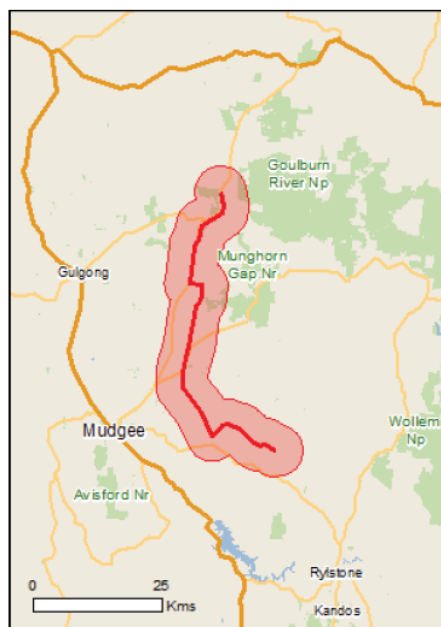
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

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[Coordinates](#)

[Buffer: 5.0Km](#)



## 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	5
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	5
<a href="#">Listed Threatened Species:</a>	36
<a href="#">Listed Migratory Species:</a>	12

### 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.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	19
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

### Extra Information

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

<a href="#">State and Territory Reserves:</a>	2
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	30
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None



## Details

### Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[ Resource Information ]
Name	Proximity
<a href="#">Banrock station wetland complex</a>	800 - 900km upstream
<a href="#">Hunter estuary wetlands</a>	150 - 200km upstream
<a href="#">Riverland</a>	800 - 900km upstream
<a href="#">The coorong, and lakes alexandrina and albert wetland</a>	900 - 1000km upstream
<a href="#">The macquarie marshes</a>	200 - 300km upstream

### 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
<a href="#">Central Hunter Valley eucalypt forest and woodland</a>	Critically Endangered	Community may occur within area
<a href="#">Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</a>	Endangered	Community likely to occur within area
<a href="#">Natural Temperate Grassland of the South Eastern Highlands</a>	Critically Endangered	Community may occur within area
<a href="#">Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</a>	Endangered	Community may occur within area
<a href="#">White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</a>	Critically Endangered	Community likely to occur within area

### Listed Threatened Species [ Resource Information ]

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence area
<a href="#">Polytelis swainsonii</a> Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<b>Fish</b>		
<a href="#">Galaxias rostratus</a> Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Maccullochella peelii</a> Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
<a href="#">Macquaria australasica</a> Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
<b>Frogs</b>		
<a href="#">Litoria booroolongensis</a> Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<a href="#">Nyctophilus corbeni</a> Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Petauroides volans</a> Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
<a href="#">Petrogale penicillata</a> Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudomys novaehollandiae</a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<b>Plants</b>		
<a href="#">Androcalva procumbens</a> [87153]	Vulnerable	Species or species habitat may occur within area
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
<a href="#">Dichanthium setosum</a> bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Euphrasia arguta</a> [4325]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Homoranthus darwinioides</a> [12974]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Leucochrysum albicans var. tricolor</a> Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat known to occur within area
<a href="#">Pelargonium sp. Striatellum (G.W.Carr 10345)</a> Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
<a href="#">Philotheca ericifolia</a> [64942]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Prasophyllum petilum</a> Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
<a href="#">Prasophyllum sp. Wybong (C.Phelps ORG 5269)</a> a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Swainsona recta</a> Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat known to occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
<a href="#">Tylophora linearis</a> [55231]	Endangered	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Aprasia parapulchella</a> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Delma impar</a> Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat likely to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat likely to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

#### Other Matters Protected by the EPBC Act

##### **Commonwealth Land** **[ Resource Information ]**

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Commonwealth Trading Bank of Australia

##### **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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat likely to occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Goulburn River	NSW
Munghorn Gap	NSW

## 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 Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species



Name	Status	Type of Presence
Feral deer		habitat likely to occur within area
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		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
Rattus rattus		
Black Rat, Ship Rat [84]		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
<b>Plants</b>		
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus		
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		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

-32.244207 149.770359,-32.265112 149.775166,-32.274401 149.773106,-32.294718 149.7374,-32.31387 149.732594,-32.324896 149.725041,-32.378262 149.717488,-32.381741 149.738087,-32.395077 149.736714,-32.404933 149.733967,-32.413048 149.726414,-32.472155 149.715492,-32.489243 149.708626,-32.51067 149.703476,-32.531224 149.703476,-32.565662 149.735405,-32.601534 149.755661,-32.594799 149.765928,-32.58641 149.773825,-32.586121 149.782408,-32.593353 149.806269,-32.599716 149.814852,-32.612297 149.828413,-32.616924 149.838541,-32.614321 149.847982,-32.616779 149.852617,-32.624442 149.864119,-32.623864 149.868925

## 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.

# **Annexure 3**

## **BBAM Plot/Transect Raw Field Data Sheets**

(Total No. of pages including blank pages = 92)

Note: This Annexure is only available on the digital version of this document



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[illegible]

0a - 201



Full species IDs are not required for BioBanking, but may be useful for identification of correct vegetation type and for monitoring and audit purposes.

Vegetation type: 273 - thinned

[illegible]

NB: Transects / plots should be placed randomly with the minimum number required for the zone in accordance with Table 4 of the Operational Manual.





[illegible]

$$\frac{\infty}{H}$$

## Transect plot worksheet

Full species IDs are not required for BioBanking, but may be useful for identification of correct vegetation type and for monitoring and audit purposes.

Site type: Development / BioBank

Proposal ID: \_\_\_\_\_

Date: 6/12/16

Recorder(s): \_\_\_\_\_

Vegetation type: 281- intact AMG Zone *col/abund* Easting/Northing: Photos: 1078

Photos: 1078

Easting/Northing: —

AMG Zone\_

281- intact

Vegetation type: \_\_\_\_\_

Native over-storey species list	Regeneration (✓/✗) (zone)	Native mid-storey species list (>1m to <over-storey) At 10 points along the 50-m transect	Native ground cover (grasses) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (shrubs) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (other) species list (ground stratum <1m) At 50 points along the 50-m transect	Exotic plants species list At 50 points along the 50-m transect	Fallen logs (min. 10 cm diameter x 50 cm long) (20 x 50m plot)
Eucalyptus 125 Callit end 115	(zone)	Antipiteria 3/10	Erag. lept → mural strip ✓ Rydid racem ✓ Austro scabeta ✓ Boerha mae ✓ Lachnag fl. lf ✓ Dichelac mic ✓ Rydid tenuis ✓ Chloris trunc	5/500 5/500 15/2000 5/500 10/1000 5/500 4/400 15/2000 4/400	5/100 1/40 1/40 1/40 4/20 Daisy 7/11 little 4/10 Chryso semi	At 50 points along the 50-m transect  Rumex crisp Coryza sp Carnoc amara Thistle - Carduus tenuifolius	60
8-12 m high (mostly regrowth? or started)		1.0 - 2.5 m high					
Total number of species = 2 Foliage cover (%) = 5% Benchmark value (%FC) = Average crown diameter = Average foliage cover (%) = Number of trees = Sample area =							
Whole zone Number of trees with hollows = 0 Sample area = 12 x 50 Benchmark value =							
SITE AND OTHER NOTES: 0, 0, 25, 10, 0, 0 = 5% 20, 0, 0, 0, 0, 0		0, 0, 0, 0, 0 60, 50, 0, 0, 0, 0	Total no of species = 9 Foliage cover (%) = 68% +++ +++ +++ +++ +++ +++ 1111	Total no of species = 0 Foliage cover (%) = 0	Total no of species = 6 Foliage cover (%) = 14% +++ 11	Total no of species = 4 Foliage cover (%) = 8% 1111	Total (m) = 60 Benchmark (m) =

NB: Transects / plots should be placed randomly with the minimum number required for the zone in accordance with Table 4 of the Operational Manual.

Field data sheets for BioBanking: local reference site data February 2009



# BioBanking

Biodiversity Banking and Offsets Scheme

## Transect plot worksheet

Full species IDs are not required for BioBanking, but may be useful for identification of correct vegetation type and for monitoring and audit purposes.

Site type: PCX Development / BioBank: 273 intact (prob thinned long past) Proposal ID: 7/12/16 Date: 7/12/16 Recorder(s): Mit Photos: 1087

Native over-storey species list At 10 points along the 50-m transect	Regeneration (zone)	Native mid-storey species list (>1m to <over-storey) At 10 points along the 50-m transect	Native ground cover (grasses) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (shrubs) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (other) species list (ground stratum <1m) At 50 points along the 50-m transect	Exotic plants species list At 50 points along the 50-m transect	Fallen logs (min. 10 cm diameter x 50 cm long) (20 x 50m plot)
Euc mac 15/2	1	10/1000 Micro stp	V	Dichandra rep	Vulpia sp 5/1000		40
Angoph 15/1		15/1000 Anastrost scab.		Desm vari	Anag arv		
		15/3000 Rytido sp.		Chail sieb	Hypoc fad		
		2/100 Echin <del>ovata</del>		Hydroc lax	Trifol ang		
		2/100 Diebelach mic.		Geran sol	Briza min		
17-20 m		15/1000 Butlr mac		Glyc clac	Centaur ery		
		10/500 Poa mern		Acacia nov.	Hyperic perf		0.2/50 each
		2/100 Elymus scab.		Wahlen sp.	Senecio sp		
				Microtis sp	Circ vulg		
				Veronica pleh	Lunex crisp		
					Carduus sp		
					Petror nanteu		
					Aipa sp. 5/1000		
					Chondril juncea		0.2/50
Total number of species = 2 Foliage cover (%) = 31% Benchmark value (%FC) = Average crown diameter = Average foliage cover (%) = Number of trees = Sample area =							
Whole zone Number of trees with hollows = 2 Sample area = 20 x 50 Benchmark value =							
Total no of species = 0 Foliage cover (%) = 0							
Total no of species = 8 Foliage cover (%) = 62%							
Total no of species = 10 Foliage cover (%) = 12%							
Total no of species = 14 Foliage cover (%) = 12%							
Total (m) = 40 Benchmark (m) =							
Total no of species = 14 Foliage cover (%) = 12%							
Total no of species = 14 Foliage cover (%) = 12%							

NB: Transects / plots should be placed randomly with the minimum number required for the zone in accordance with Table 4 of the Operational Manual.

Field data sheets for BioBanking: local reference site data February 2009





# Transect plot worksheet

Full species IDs are not required for BioBanking, but may be useful for identification of correct vegetation type and for monitoring and audit purposes.

Site type: \_\_\_\_\_  
Development / BioBank \_\_\_\_\_  
Proposal ID: \_\_\_\_\_  
Date: 9/12/16  
Recorder(s): M.L.

Vegetation type: 363 - *h. tract*  
AMG Zone \_\_\_\_\_ Easting/Northing: \_\_\_\_\_ Photos: \_\_\_\_\_

Native over-storey species list	Regeneration (✓) (zone)	Native mid-storey species list (>1m to <over-storey) At 10 points along the 50-m transect	Native ground cover (grasses) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (shrubs) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (other) species list (ground stratum <1m) At 50 points along the 50-m transect	Exotic plants species list At 50 points along the 50-m transect	Fallen logs (min. 10 cm diameter x 50 cm long) (20 x 50m plot)
3 E spars ✓ + Anzoph ✓ E rossi ✓ Callit end.	(✓) (zone)	3 O learia - small ✓ Pommy darts small (angiv) Leuca munitreugh ✓ Acac impl ✓ " caesil ✓ 3 Persoon lin ✓ 1.5 - 3.5 m high	3 Elytido sp ✓ " sp 2 (big) Stipa ✓ Echino caesp ✓ 2/Seach ✓ 3/300 ✓ 2/Seach ✓ 1/each	3 Otentia - slidy ✓ Micromyrtus ✓ Brachydaph ✓ 2/Seach ✓ 3/300 ✓ 2/Seach ✓ 1/each	3 Oxalis per ✓ Lomand long ✓ 3 Drachen rep ✓ Billard sead? ✓ Chail sieb ✓ Harden viol ✓ Pinarx umb ✓ 3 Bran mic ✓ 2 capot lap ✓ Lepido lat ✓ Halerag? ✓ Good hed. ✓ Daisy Ptero. yell fl.	4 Senecio sp. ✓ 2/5	80
Total number of species = 4 Foliage cover (%) = 31% Benchmark value (%FC) = Average crown diameter = Average foliage cover (%) = Number of trees = Sample area =			Total no of species = 5 Foliage cover (%) = 9%	Total no of species = 4 Foliage cover (%) = 8%	Total no of species = 2 Foliage cover (%) = 4%	Total no of species = 13 Foliage cover (%) = 10%	Total (m) = 80 Foliage cover (%) = 2% Benchmark (m) =
Whole zone Number of trees with hollows = Sample area = Benchmark value =							
SITE AND OTHER NOTES:- 40, 60, 10, 0, 60, 20, 20, 20, 0, 20, 0, 0, 40, 0, 10, 10, 0, 0, 20, 0			0, 0, 40, 0, 10, 10, 0, 0, 20, 0	1111	11	1	

10. **TRANSACTS:** Transacts / plots should be placed randomly with the minimum number required for the zone in accordance with Table 4 of the Operational Manual.

25% rock

field data sheets for BioBanking: local reference site data February 2009—  
L31, LUCK

**BioBanking**  
Biodiversity Banking and Offsets Scheme

## Transect plot worksheet

Full species IDs are not required for BioBanking, but may be useful for identification of correct vegetation type and for monitoring and audit purposes.

Site type: Development / BioBank  
Proposal ID:  
Date: 9/12/16  
Recorder(s):  
M.H.

Date: 9/12/16

Proposal ID:

Development / BioBank

Site type:

Vegetation type: 323 = Intact

Easting/Northing:

AMG Zone

Vegetation type: 323 - intact

Vegetation type:

Vegetation type:

Native over-storey species list	Regeneration (✓) (zone)	Native mid-storey species list (>1m to <over-storey) At 10 points along the 50-m transect	Native ground cover (grasses) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (shrubs) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (other) species list (ground stratum <1m) At 50 points along the 50-m transect	Exotic plants species list At 50 points along the 50-m transect	Fallen logs (min. 10 cm diameter x 50 cm long) (20 x 50m plot)
Bauc maner ✓ callit end ✓ <u>Eucrossii</u> ✓ <u>15-25 m high outside plot:</u> E.siderox E.aglam Angel L E.genieat lower fringe.		<del>25/609</del> 10/1000 20/1000	Micral stip ✓ Stipa scabra ✓ Lyside sp. ✓	Hib. obt. 1/5 ✓	Vilgine 8 head 0.5/20	Century 27 Hyp rad 2/100 Socrel 1/20	0.5/20 70
Total number of species = 3 Foliage cover (%) = 38% Benchmark value (%FC) = Average crown diameter = Average foliage cover (%) = Number of trees = Sample area =							
Whole zone Number of trees with hollows = Sample area = Benchmark value =							
SITE AND OTHER NOTES: 40' 30' 0' 50' 70' 20' 50' 60'		0,0,0,0,0, 0,0,0,0,0,	Total no of species = 3 Foliage cover (%) =	Total no of species = 1 Foliage cover (%) =	Total no of species = 3 Foliage cover (%) =	Total no of species = 3 Foliage cover (%) =	Total (m) = 70 m Benchmark (m) =

NB: Transects / plots should be placed randomly with the minimum number required for the zone in accordance with Table 4 of the Operational Manual.

Field data sheets for BioBanking: local reference site data February 2009





Site: EKV41.

Site type:

Development / ~~BioBank~~

Proposal ID: Bowdens pipeline Date: \_\_\_\_\_

Recorder(s): MM JW

AMG Zone 2 SS

Easting/Northing:

**Photos:**

[illegible]













**Transect plot worksheet**

Site type: Development / BioBank Proposal ID: Bowdens pipeline Date: 6/4/19 Recorder(s): MH, JW

Development / BioBank: PCT 4682 M/G Medium AMG Zone: Z 55 Easting/Northing: \_\_\_\_\_ Photos: \_\_\_\_\_

**Handwritten notes:**  
- cov: 1-5%, then to nearest 5% if <1%, and (importantly) then estimated cov should be recorded eg 0.2.  
- Abund: 1-10, 20, 50, 100, 1000, 2000 ...

Native over-storey species list	Regeration (✓) whole (zone)	Native mid-storey species list (>1m to <over-storey) At 10 points along the 50-m transect	Native ground cover (grasses) species list (ground stratum <1m) At 50 points along the 50-m transect	Native ground cover (other) species list (ground stratum <1m) At 50 points along the 50-m transect	Exotic plants species list At 50 points along the 50-m transect	Fallen logs (min. 10 cm diameter x 50 cm long) (20 x 50m plot)
<u>Anacardium 10/16</u>	<u>1</u>	<u>Alcornoque 10/16</u>	<u>Alcornoque 2/20</u>	<u>Dandelion 0.3/15</u>	<u>At 50 points along the 50-m transect</u>	
<u>Banksia 10/13</u>	<u>1</u>	<u>Cassia 5/30</u>	<u>Banksia 0.5/50</u>	<u>Juniper 0.2/100</u>	<u>Plumbago lance 0.1/19</u>	
<u>Callitris 10/17</u>	<u>1</u>	<u>Leptospermum 0.1/1</u>	<u>Leptospermum 0.5/50</u>	<u>Quercus 0.1/10</u>	<u>Hypochaeris 0.1/5</u>	
<u>Callitris 10/14</u>	<u>1</u>	<u>Callitris 0.3/2</u>	<u>Callitris 0.1/1</u>	<u>Callitris 0.1/1</u>	<u>Callitris 0.1/1</u>	
		<u>Dumetia densifolia 0.1/5</u>	<u>Cymbopogon ref 0.2/10</u>	<u>Acacia 0.1/5</u>		
		<u>Dodonaea vis 0.1/1</u>				
<b>Whole zone</b>						
Number of trees with hollows = <u>2</u>						
Total number of species = <u>4</u>						
Foliage cover (%) = <u>31</u>						
Total no of species = <u>7</u>						
Foliage cover (%) = <u>14.5</u>						
Total no of species = <u>5</u>						
Foliage cover (%) = <u>14</u>						
Total no of species = <u>7</u>						
Foliage cover (%) = <u>12</u>						
Total no of species = <u>3</u>						
Foliage cover (%) = <u>10</u>						
Total (m) = <u>18</u>						
transects: <u>30, 30, 70, 20, 10, 70, 40, 60, 10, 60, 20, 5, 20, 0, 0</u>						



## Transect plot worksheet

EK.52

Cov above notes:

- cov: 1-5%, then to nearest 5%. If  $\leq 1\%$ , and important then estimated cov should be recorded eg 0.2.

-- Abund: 1-10, 20, 50, 100, 1000, 2000 ...

Proposal ID: Bowdens pipeline Date: \_\_\_\_\_

PCT 281 m/a med.

Development / ~~BioBank~~

Site type:

CW 111

AMG Zone 255

Easting/Northing:

**Photos:**

[illegible]









Site type: **Development / BioBank**  
Proposal ID: **Bowdens pipeline** Date: **7/4/2019**  
Recorder(s): **MHJW**

Site: **EK 56**  
Transect plot worksheet

AMG Zone **Z 55**  
Eastings/Northings: \_\_\_\_\_ Photos: \_\_\_\_\_

Regeration (✓) **W hole 2 (zone)**  
Native over-storey species list **At 10 points along the 50-m transect** **c/a**  
**E albens 45/6**

Native mid-storey species list **(>1m to <over-storey)** **At 10 points along the 50-m transect** **c/a**  
**wide leaf x 10 forest**

Native ground cover (grasses) species list **(ground stratum <1m)** **At 50 points along the 50-m transect** **c/a**  
**Microstip 5/800**  
**Austroscab 5/800**  
**Rytidos**  
**Panicum efflu 0.1/1**  
**Trarost 0.2/5**  
**Pastipoc mac**

Native ground cover (other) species list **(ground stratum <1m)** **At 50 points along the 50-m transect** **c/a**  
**Sida caru 0.2/20**  
**Cyperus kudo 5/1000**  
**Rumex bro 0.1/2**  
**Einedi nat 0.5/30**  
**Oxalis per 0.1/10**  
**Senecio 6/200**  
**Zoraria? 0.1/2**  
**Stellaria 0.1/5**  
**Callotis lap 0.1/1**  
**Solanum stel**

Exotic plants species list **At 50 points along the 50-m transect** **c/a**  
**Lolium 20/5000**  
**Paspal 2/20**  
**Cirs vulg 0.1/1**  
**Sporob afr 1/20**  
**Brassicaceae 0.1/1**  
**Bromus cald 5/2000**  
**Silphium 0.1/20**  
**Mediola 0.2/10**  
**Polyg avic 0.1/1**  
**Cenchrus 0.2/200**

Fallen logs (min. 10 cm diameter x 50 cm long) **(20 x 50m plot)** **4.7m**

hgt range (tr) **15-22**  
hgt av (tr) **20**  
Total number of species = **1**  
Foliage cover (%) = **46**

Whole-zone  
Number of trees with hollows = **3**

Transects **40, 60, 70, 50, 5, 10, 40, 60, 10, 70, 0, 0, 0, 0, 0, 0**

HR 0.02 - 0.5 m  
HA 0.3  
Total no of species = **6**  
Foliage cover (%) = **22**

HR 0.03 - 0.4  
HA 0.2  
Total no of species = **9**  
Foliage cover (%) = **22**

Total no of species = **10**  
Foliage cover (%) = **34**

HA 11

Cov above notes:  
- cov: 1-5%, then to nearest 5%, if <1%, and important than estimated cov than be recorded eg 0.2:  
- Abund: 1-10, 20, 50, 100, 1000, 2000 ...







Eco Logical Australia - Biobank plot data sheet	Site Sheet No. <u>B7</u>
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Ref Site ID	Bowdens 7	Recorders	RM	Date	17.10.14
Wapoint/ Plot ID	440	Easting *	St: 769391 End: 769432	Northing*	St: 6386140 End: 6386117
GPS datum		Photo no. (Camera)	St: 707 End: 708	Plot orient/ Slope/Aspect	44° 12° / 183° / South

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PCT 324		
Ancillary Code (Usually condition description)	Dry, shrubby forest - lowland		
Condition (Low or Mod-Good)	Good	Habitat Features	Past logging, w road nearby but out of transect.

20 x 20m Quadrat	Number of <u>native</u> plant species	Use species list over page (full Id is <u>not</u> required)										27	(NPS)
50m Transect - 10 Points	Native over-storey cover (%)	40	70	90	80	60	50	50	30	25	50	Sum / 10	54.5% (NOS)
	Native mid-storey cover (%)	0	0	8	0	0	0	0	3	10	20	Sum / 10	4.1% (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	24% (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	6% (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	2% (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) 0%
	Midstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(b) Sum/10	
	Ground (50 points)	_____										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	111	(3)	Total length fallen logs >10cm width (m)					101 + 92 = 193m				
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)		Proportion				
		<i>E. sparsifolia</i>		N	<i>A. floribunda</i>		N	0%					
		<i>E. rostrata</i>		N									
		<i>C. endlicherii</i>		N									
Strata	Form	Species					Height range		PFC				
Upper 1	T	<i>E. sparsifolia</i>					30		25				
Upper 2	T	<i>C. endlicherii</i>					10-25		5				
Mid 1	S	<i>P. linearis</i>					1-4		4				
Mid 2	S	<i>L. muticus</i>					1-2.5		3				
Lower 1	S	"					0-1		1				
Lower 2	S	<i>P. linearis</i>					0-1		1				

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

sands tone

Plot#	7	Site Name	Bowdens	Date	17/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. spars	T	25	13					
2	low endl.	T	5	5					
3	E. rossii	T	3	3					
4									
5									
6									
7	(3)								
8									
MIDSTOREY									
9	Acacia caes	S	1	10					
10	Leuc. mult	S	3	7					
11	Pers line	S	4	20					
12	Shp trif	S	1	1					
13									
14									
15									
16									
17									
18									
19									
20									
21	(4)								
22									
GROUND COVER / other									
23	Mylla-thus bark	F	1	5					
24	basal hede	F	1	100					
25	Pine hnd	F	1	2					
26	Fento sim	G	1	100					
27	Micro shp	G	1	100					
28	Eurydoperna sp	G	1	100					
29	Arist sp	G	1	1					
30	Loma mult	F	1	20					
31	Lepi lat	F	1	2					
32	Loma confert	F	1	50					
33	Aristatipa : vert.	G	1	50					
34	Cassina. acm	S	1	3					
35	Hib. obt	S	1	10					
36	Loma hili	F	1	10					
37	Poma umb	F	1	20					
38	Ope smooth (c) diphylla	F	1	1					
39	Ruttenaea? micro	S	1	1					
40									
41	Philo salsol	S	1	2					
42	Leptospermum (c) sp.	S	1	3					
43	Calo cunei	F	1	1					
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Grey montail w/ pool Gang gang.

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. <b>B8</b>
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Ref Site ID	<b>Bowdens 8</b>	Recorders	<b>RM</b>	Date	<b>17.10.14</b>
Wapoint/ Plot ID	<b>441</b>	Easting *	St: <b>769415</b> End: <b>769467</b>	Northing*	St: <b>6386200</b> End: <b>6386183</b>
GPS datum		Photo no. (Camera)	St: <b>709</b> End: <b>710</b>	Plot orient/ Slope/Aspect	<b>78°</b> <b>5° / 78°</b>

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	<b>PCT 324</b>		
Ancillary Code (Usually condition description)	<b>Shrubby open forest along drainage line</b>		
Condition (Low or Mod-Good)	<b>Good</b>	Habitat Features	<b>Along drainage line</b>

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is <u>not</u> required)										<b>40</b>	(NPS)
50m Transect - 10 Points	Native over- storey cover (%)	50	30	50	60	60	30	60	50	60	25	Sum / 10	<b>47.5%</b> (NOS)
	Native mid-storey cover (%)	50	40	15	1	15	20	70	40	20	40	Sum / 10	<b>31.1%</b> (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	<b>     </b>										Double score out of 50 to get %	<b>50%</b> (NGCG)
	Native ground cover (hits/50 points) - Shrubs	<b>     </b>										Double score out of 50 to get %	<b>34%</b> (NGCS)
	Native ground cover (hits/50 points) - other	<b>   </b>										Double score out of 50 to get %	<b>2%</b> (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) <b>0%</b>
	Midstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(b) Sum/10	
	Ground (50 points)	<b>—————</b>										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	<b>      (5)</b>										Total length fallen logs >10cm width (m)	<b>106 + 74 = (180m)</b>

Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone				Regen (Y/N) (Indiv. <5cm?)	Proportion
		<b>E. gmelinifera</b>	<b>N</b>	<b>A. floribunda</b>	<b>N</b>	<b>2:5</b> <b>(40%)</b>	
		<b>E. spirofolia</b>	<b>Y</b>	<b>C. endlicherii</b>	<b>Y</b>		
		<b>E. rossii</b>	<b>N</b>				

Strata	Form	Species	Height range	PFC
Upper 1	<b>T</b>	<b>E. <del>gmelinifera</del> rossii</b>	<b>20-25</b>	
Upper 2	<b>T</b>	<b>C. endlicherii</b>	<b>15-20</b>	
Mid 1	<b>S</b>	<b>P. linearis</b>	<b>1-4</b>	
Mid 2	<b>S</b>	<b>L. muticus</b>	<b>1-2.5</b>	
Lower 1	<b>G</b>	<b>Micro. stip.</b>	<b>0-0.1</b>	
Lower 2	<b>S</b>	<b>L. muticus</b>	<b>0-1</b>	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Sandstone Drainage line.

Plot#	8	Site Name	Bowdens	Date	17/10/10
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Natives (20m Quadrat)				F	C	A	Exotics (20m Quadrat)				F	C	A
OVERSTOREY													
1	Erossii	T	10	4									
2	Call endi	T	10	10									
3	E. spars.	T	10	4									
4	E. gonio	T	2	3									
5													
6													
7													
8													
MIDSTOREY													
9	Styp trij	S	1	5									
10	Leuc multi	S	5	20									
11	Pers linea	S	3	20									
12	Acac obtu	S	1	1									
13	Acac caas	S	1	5									
14	Acac ulic	S	1	2									
15	Bodo ilic	S	1	3									
16	Bomadensis ferr	S	1	1									
17													
18													
19													
20													
21													
22													
GROUND COVER / other													
23	Ento stric.	G	1	100	Hippo radi					F	1	1	
24	Mier styp	G	5	500	Cyperis sp. (could be native)					V	1	1	
25	Bona umb	F	1	500									
26	Opuntaria dipliv	F	1	2									
27	Uibh dstr	S	1	20									
28	Brachy daph	S	1	1									
29	Leuca multi	F	1	5									
30	Good hede	F	1	100									
31	Opere hairy	F	1	5									
32	Bona fili	F	1	50									
33	Stack mond/vm (yellow)	F	1	5									
34	Phyt hirt	F	1	20									
35													
36	Cass arcu	S	1	5									
37	Lepi lark	F	1	5									
38	Alstia vert	G	1	50									
39	Caladenia sp Photo 713+716	F	1	3	Gonocarpus tenu					F	1	1	
40	Pine lind	F	1	2	Poa sp.					G	1	1	
41	Sola cane	F	1	2									
42	Hydr laxi	F	1	10	Hippetra acic					S	1	3	
43	Chen solo	F	1	2	Bell san					L	1	1	
44	Oral pre	F	1	1	Ruttenaen hairy sp.					S	1	2	
45	Calo canel	F	1	2	Mulathees salsol					S	1	2	

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. B10
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Ref Site ID	Bowdens 10	Recorders	RM	Date	17.10.14
Wapoint/ Plot ID	443	Easting *	St: 769437 End: 769427	Northing*	St: 6386767 End: 6386719
GPS datum		Photo no. (Camera)	St: 719 End: 720	Plot orient/ Slope/Aspect	170° 11° / 87° / East

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PCT 323
Ancillary Code (Usually condition description)	Dry open forest / advanced regrowth.
Condition (Low or Mod-Good)	Mod - good.
Habitat Features	Past logging

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is <u>not</u> required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	40	60	75	60	50	40	35	60	50	60	Sum / 10	53.0 % (NOS)
	Native mid-storey cover (%)	2	0	0	0	0	0	0	0	0	15	Sum / 10	1.7 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	36 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	2 % (NGCS)
	Native ground cover (hits/50 points) - other	_____										Double score out of 50 to get %	0 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(b) Sum/10	
	Ground (50 points)	_____										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	11	(2)		Total length fallen logs >10cm width (m)						24 + 55 + 49 = (128 m)		
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone				Regen (Y/N) (indiv. <5cm?)		Proportion					
		E. poly.		Y	E. rossii		Y	3:4 (75 %)					
		E. macro.		Y									
		C. endlichii		N									
Strata	Form	Species				Height range		PFC					
Upper 1	T	E. macrocarpa				20		10					
Upper 2	T	E. polyanthemus				20		5					
Mid 1	S	Pomadouris sp.				1-2		2					
Mid 2	S	L. noticus				1-2		1					
Lower 1	S	Pomadouris sp.				0-1		2					
Lower 2	G	Microkleana				0-0.5		2					

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	10	Site Name	Bowdens	Date	17/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. macro	T	10	24					
2	E. fossii	T	5	6					
3	E. poly.	T	5	3					
4	Call. eroll	T	1	1					
5									
6									
7									
8									
MIDSTOREY									
9	Acac. stric	S	1	3					
10	Leuc. muth	S	1	3					
11	Styp. trif	S	1	5					
12	Acac. filic	S	1	5					
13	Poma. angust	S	2	20.					
14	Pers. line	S	1	2					
15	Cass. arcu	S	1	10.					
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Loma. filic	F	2	100.					
24	Hibb. abelia	S	1	10					
25	Micro. stp	G	2	800					
26	Clupe. claud	L	1	2					
27	Cher. siels	E	1	50					
28	Loma. mult	F	1	10.					
29	Good. hedl	F	1	20.					
30	Alstipa	G	1	20.					
31	Poma. umbel	F	1	10					
32	Wahl. alt leaves	F	1	2					
33	Boss. folio	S	1	3					
34	Oper. smooth	F	1	1					
35	Meli. urce	S	1	1					
36	Lyth. stric	G	1	20					
37	Rutidosperma	G	1	50					
38									
39	Nich. rept	F	1	10.					
40	Hydr. laxi	F	1	5					
41	Dianella long	F	1	1					
42					Note: Clear 20m x 20m reading				
43									
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)



Eco Logical Australia - Biobank plot data sheet	Site Sheet No. <b>B11</b>
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Ref Site ID	<b>Bowdens 11</b>	Recorders	<b>RM</b>	Date	
Wapoint/ Plot ID	<b>444</b>	Easting *	St: <b>769342</b> End: <b>769332</b>	Northing*	St: <b>6387047</b> End: <b>6387091</b>
GPS datum		Photo no. (Camera)	St: <b>722</b> End: <b>723</b>	Plot orient/ Slope/Aspect	<b>336°</b> <b>S° 70° / East</b>

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	<b>PLT 281</b>
Ancillary Code (Usually condition description)	<b>Advanced regrowth / Grassy open Woodland</b>
Condition (Low or Mod-Good)	<b>Mod - good</b>
Habitat Features	<b>Advanced regrowth with some open spaces / gaps</b>

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is <u>not</u> required)										<b>53 (46) (NPS)</b>	
50m Transect - 10 Points	Native over- storey cover (%)	50	60	30	5	20	50	80	60	5	5	Sum / 10	<b>36.5 % (NOS)</b>
	Native mid-storey cover (%)	3	1	0	0	0	0	0	0	30	70	Sum / 10	<b>10.4 % (NMS)</b>
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	<b>      </b>										Double score out of 50 to get %	<b>44 % (NGCG)</b>
	Native ground cover (hits/50 points) - Shrubs	<b>    </b>										Double score out of 50 to get %	<b>8 % (NGCS)</b>
	Native ground cover (hits/50 points) - other	<b>    </b>										Double score out of 50 to get %	<b>16 % (NGCO)</b>
50m Transect - 10 points + 50 points	Overstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  <b>0 %</b>
	Midstorey (10 points)	/	/	/	/	/	/	/	/	/	/	(b) Sum/10	
	Ground (50 points)	<b>—————</b>										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	<b>1</b>										Total length fallen logs >10cm width (m)	<b>11 + 5 = 16m</b>
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		<b>E. mellidona</b>										<b>Y</b>	<b>3:3</b> <b>100 %</b>
		<b>E. blakelyi</b>										<b>Y</b>	
		<b>A. floribunda</b>										<b>Y</b>	
Strata	Form	Species										Height range	PFC
Upper 1	<b>T</b>	<b>E. blakelyi</b>										<b>5-20</b>	<b>15</b>
Upper 2	<b>T</b>	<b>E. mellidona</b>										<b>20</b>	<b>15</b>
Mid 1	<b>S</b>	<b>Cassinia acutata</b>										<b>1-1.5</b>	<b>1</b>
Mid 2	<b>T</b>	<b>Acacia sp. (bipinnate)</b>										<b>1-3</b>	<b>2</b>
Lower 1	<b>G</b>	<b>Microlema</b>										<b>0-0.1</b>	<b>15</b>
Lower 2	<b>G</b>	<b>Rhytidoloma</b>										<b>0-0.1</b>	<b>10</b>

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Sandstone

Plot#	11	Site Name	Bowdens	Date	17/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. mellis	T	15	10					
2	E. blakelyi	T	15	20					
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9	Acacia leucoclada?	S	2	8					
10	Cassia arm	S	1	20					
11	Pomadour (c)	S	1	1					
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Micror. stip.	G	15	500	Hypochaeris	F	1	5	
24	Chen. sato	E	1	20	Berardia janszara	F	1	20	
25	Loma fil.	F	1	100	Plant. lance.	F	1	20	
26	Hydro. lax	F	1	50	Sc. tr. nant	F	1	5	
27	Hubbertia acic.	S	1	20	Arag. arve	F	1	5	
28	Wahl. sp. comm	E	1	100	Sonc. oler	F	1	2	
29	Elyt. asperma race	G	10	500	Hype. perf	F	1	2	
30	Mist. jori	G	5	100	Daro. bras	F	1	5	
31	Leuc. mutre	S	1	1	Echi. pla.	F	1	1	
32	Desm. vari.	F	1	50					
33	Hype. gram.	F	1	20					
34	Oxal. pere	F	1	10					
35	Cymb. laws.	F	1	10					
36	Arth. mini.	F	1	20					
37	Chry. eland	L	1	5					
38	Erag. sp.	G	1	10					
39	Ento. stri.	G	1	20					
40	Cato. cune.	F	1	1					
41	Gera. sola.	F	1	2					
42	Eichl. ton / Graph.	F	1	1					
43	Pers. line.	S	1	1					
44	Sige. ore.	F	1	2					
45	Swain. galg. P.T.O.	F	1	1					
* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.									
Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.									
Form: * (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad									
Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%									

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	17	Recorders	AC	Date	28/10/2014
Wapoint/ Plot ID	S-18 E-17	Easting *	St: 0769195 End: 0769201	Northing *	St: 6387299 End: 6387343
GPS datum	GPS 11	Photo no. (Camera)	St: 0931-0930 End: 0928-0929	Plot orient/ Slope/Aspect	350 207.150

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PTC-273		
Ancillary Code (Usually condition description)			
Condition (Low or Mod-Good)	mod-good	Habitat Features	logs

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	50	10	15	40	0	0	0	0	0	0	Sum / 10	16.5 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	32										Double score out of 50 to get %	64 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	2										Double score out of 50 to get %	4 % (NGCS)
	Native ground cover (hits/50 points) - other	8										Double score out of 50 to get %	16 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  29 %
	Midstorey (10 points)											(b) Sum/10	
	Ground (50 points)	19										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	29m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
													0/0
Strata	Form	Species										Height range	PFC
Upper 1													
Upper 2													
Mid 1		cass arcu										1-2m	30%
Mid 2		Acacia bipinifolia										1-2m	5%
Lower 1		micro stip										<20cm	30%
Lower 2		vita desperma										<10cm	15%

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/acrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Tree of Heaven present in adjacent area



Plot#	(7)	Site Name	Bowdens	Date	28/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1								
2								
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9	Cass. arau	S	30	1000				
10	Acac. fili	S	5	20				
11	Cass. quai	S	1	5				
12	Myrsine - Al. acia	S	1	2				
13								
14								
15								
16								
17								
18								
19								
20	(4)							
21								
22								
GROUNDCOVER / other								
23	Lynda sp. race	G	15	500	Arac. arve	F	5	500
24	Roth. maer	G	5	500	Myrsine like	F	1	100
25	Coni. arab	L	1	10	Myrs. radi	F	3	500
26	Dasm. vari	F	1	100	Plant. lane	F	1	100
27	Myrs. stip	G	30	1000	Yellow. lin	F	1	100
28	Loma. fili	F	1	20	Trif. ave	F	1	100
29	Myrs. gran	F	1	5	Trif. glan	F	5	500
30	Chlo. thun	G	1	20	Arac. sp.	G	1	100
31	Cher. sols	E	1	100	Sile. grac	F	1	50
32	Oral. per	F	1	20	Blue. glum	F	1	1
33	Al. sp. sp	G	1	5	Cart. lan	F	1	5
34	Calo. lapp	F	1	1	Chen. juve	F	1	5
35	Chlo. elan	L	1	1	Vulpia. sp	G	1	30
36	Alac. ovum	F	1	20	Centaurium	F	1	20
37	Carex. inue	V	1	100	Stach. arve	F	1	20
38	Wahl. alt	F	1	10	Eich. plan	F	1	1
39	Aspe. conf	F	1	10	Rubus. frut	F	1	1
40	Acrosty. sp.	F	1	1				
41	Ans. lamo	G	1	20				
42	Trif. pygm	F	1	50				
43	Myrs. acie	S	1	20				
44	Rumex. browni	F	1	10				
45	Styp. trif	S	1	2				

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	19	Recorders	AC	Date	28/10/2014
Wapoint/ Plot ID	S → 22 E → 21	Easting *	St: 0169338 End: 0169350	Northing*	St: 6386910 End: 6386961
GPS datum	GPS-11	Photo no. (Camera)	St: 098-0989 End: 098-0987	Plot orient/ Slope/Aspect	150 6 160

\* Record from Easting and Northing from both ends of the 50m transect

#### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PTC-282		
Ancillary Code (Usually condition description)			
Condition (Low or Mod-Good)	LOW	Habitat Features	exposed Rocks

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is <u>not</u> required)										18	(NPS)
50m Transect - 10 Points	Native over- storey cover (%)										Sum / 10	17 % (NOS)	
	Native mid-storey cover (%)										Sum / 10	12 % (NMS)	
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	40 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	4 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)										(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) 68 %	
	Midstorey (10 points)										(b) Sum/10		
	Ground (50 points)												(c) Double score
20m x 50m Quadrat	Number of trees with hollows	○				Total length fallen logs >10cm width (m)				○			
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone								Regen (Y/N) (indiv. <5cm?)		Proportion  /	
Strata	Form	Species								Height range		PFC	
Upper 1												/	
Upper 2													
Mid 1													
Mid 2													
Lower 1	G	Vulpia								c10cm		25%	
Lower 2	G	micro slip								c10cm		20%	
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad													

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	20	Recorders	AC	Date	28/10/2019
Wapoint/ Plot ID	S → 24 G → 23	Easting *	St: 0768809 End: 0768179	Northing*	St: 6386995 End: 6386981
GPS datum	GPS-11	Photo no. (Camera)	St: 0998-0999 End: 0991-0992	Plot orient/ Slope/Aspect	310° 10% / 250°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PCT - 282
Ancillary Code (Usually condition description)	Scattered trees
Condition (Low or Mod-Good)	Good mod.
Habitat Features	pile of wood, exposed rock fallen logs

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(41) (NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	0	0	20	30	17	0	0	0	0	0	0	Sum / 10	6.7 % (NOS)
	Native mid-storey cover (%)	5	5	5	0	10	10	10	0	0	0	7	Sum / 10	4.7 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	31.6 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	2 % (NGCS)	
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	6.4 % (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)											0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) 12 %	
	Midstorey (10 points)											0 (b) Sum/10		
	Ground (50 points)											6 (c) Double score		
20m x 50m Quadrat	Number of trees with hollows	1										Total length fallen logs >10cm width (m)	7m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		Ang Flor										Y	2/2	
		E. Blak										Y		
Strata	Form	Species										Height range	PFC	
Upper 1	<del>F</del>	<del>Ang Flor</del>												
Upper 2	T	G. Blak										15-16m	10%	
Mid 1	BT	E. Blak										1-2m	5%	
Mid 2	S	Acacia Caes										1-2m	2%	
Lower 1	G	Micro Spt Strip										<20cm	40%	
Lower 2	G	Both macka										<20cm	5%	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L)

Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	20	Site Name	Bowdens	Date	28/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	± blakey:	T	5	1					
2									
3									
4									
5									
6									
7									
8		1							
MIDSTOREY									
9	Cass arcu	S	7	100					
10	Acac jili	S	1	3					
11	Acac caes	S	1	5					
12	E. blakey (regen)	T	5	50					
13									
14									
15									
16									
17									
18									
19									
20									
21									
22		3							
GROUND COVER / other									
23	Calo cune	F	1	100	Hypa radi	F	2	50	
24	Mier stip	G	40	1000	Sitel gam	F	1	1	
25	Echi coosp? oval?	G	5	500	Echi plant	F	1	1	
26	Hypa gran	F	1	10	Vulpia sp	G	3	500	
27	Chry Chapic	F	1	20	Senecio sp	F	1	2	
28	Trip pagon	F	1	500	Cent sp	F	1	20	
29	Both mdr	G	5	500					
30	Elytid sp. not race	G	5	100	Aira sp	G	1	50	
31	Gooden hede	F	2	100	Briza mino	G	1	20	
32	Anstida jeri	G	1	50	Conyza sp	F	1	2	
33	Antennaria foliosa	S	1	20	Ameg ane	F	1	5	
34	Loma jili	F	2	100					
35	Grona tetr	F	1	100					
36	Chlo trun	G	1	50					
37	Dasm jari	F	1	100					
38	Cher seb	E	1	20					
39	Hydr laxi	F	1	100					
40	Microtr sp (united?)	F	1	2					
41	Sannantha curri	S	1	1					
42	Scho apog	V	1	100					
43	Goodenma sp?	F	1	100					
44	Juncus usitat	R	1	2					
45	H. l. b. obtu	S	1	3					

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%;

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 58
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Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	14/175/58	Easting *	St: 769055 End: 769009	Northing*	St: 6384780 End: 6384786
GPS datum	WGS 84	Photo no. (Camera)	St: 7576 End: 7778	Plot orient/ Slope/Aspect	265° SW 1° / 265°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	277 - Blackelys Red Gum - YB grassy tall woodland		
Ancillary Code (Usually condition description)	Scattered Trees.		
Condition (Low or Mod-Good)		Habitat Features	rocky outcrop

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	5	5	5	0	0	Sum / 10	1.5 % (NOS)	
	Native mid-storey cover (%)	0	0	0	0	0	3	3	2	0	0	Sum / 10	0.8 % (NMS)	
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	72 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs	0										Double score out of 50 to get %	0 % (NGCS)	
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	18 % (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  66 %	
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10		
	Ground (50 points)											66 (c) Double score		
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	0	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		E. blackelyi										Y		
Strata	Form	Species										Height range	PFC	
Upper 1	---													
Upper 2	---													
Mid 1	---													
Mid 2	---													
Lower 1	G	Wrist jeni										0.1-0.2	10	
Lower 2	G	Aust. caes										0.1-0.2	10	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

(8)

Plot#	58	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Eucalyptus		2	1					
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22	TOTAL 28								
GROUND COVER / other									
23	Styph trif	S	1	1	Briza minor		2	100	
24	Aris jeri	C	10	1000	Aris cany		3	1000	
25	Them arst	G	2	100	Hypovadi		5	1000	
26	Hdr bri	F	1	100	Isis ting (C) yellow flower		5	2000	
27	Loma leuc	F	1	50	Vulpia		5	2000	
28	Choi sieb	E	1	50	Silene galica		1	100	
29	Calutis? (C) white		2	1000	<del>Triplodiscus pifigine</del> Triplodiscus pifigine		1	500	
30	Dichopogon Amb or stri		2	1000	Cent caji		1	50	
31	Calo cunei		1	100	Medicago		1	100	
32	Austrod caec		10	1000	Trif. arve		1	100	
33	Bulbin bulbosa		2	1000	Rubus		1	1	
34	<del>Senecio</del>				Hype perit		1	50	
35	Austroshya (1) bigenulata		2	50	Brag arve		1	50	
36	Cass arve		1	1	Bromus		2	100	
37	Lept squa		2	100	Gallium (C) Asperula native		1	10	
38	Wide-branched grass (C) Cymb refr		5	200	<del>Senecio</del> Senecio (C)		1	50	
39	<del>Styph trif</del> (1) Anthoxanthum odor		5	100	Trifolium 2		1	50	
40	Eucalyptus		1	100	Petrorhiza		1	20	
41	Tric plat		1	50	Tolpis umbellata		1	500	
42	Rumex bromii (C)		1	2					
43	Crassula (1) small brown		1	100					
44	Good weed		1	50					
45	Loma foli		1	20					

\* Cover (C): Estimate of the appropriate cover measure for each recorded species, from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blanket: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

↓  
one  
PTO  
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8



Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 71
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Ref Site ID	Bowdens	Recorders	KR MH	Date	30/10/14
Wapoint/ Plot ID	200/201	Easting *	St: 769455 End: 769422	Northing *	St: 6384711 End: 6384742
GPS datum	WGS 84	Photo no. (Camera)	St: 13940 End: 14142	Plot orient/ Slope/Aspect	270° W 3° 1220' SW

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	277 - BRG YB Crassybk woodland.		
Ancillary Code (Usually condition description)	Thinned		
Condition (Low or Mod-Good)	2	Habitat Features	logs

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(12) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	30	40	0	0	0	2	40	20	30	40	Sum / 10	20.2 % (NOS)
	Native mid-storey cover (%)	0	0	0	10	10	5	20	2	0	0	Sum / 10	5.2 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	1										Double score out of 50 to get %	2 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	0										Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	16 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  76 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10	
	Ground (50 points)											76 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	8m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		Ango flor											
Strata	Form	Species										Height range	PFC
Upper 1	T	Ango flor (Lambertia complanata)										0.3-1.8	300
Upper 2													
Mid 1													
Mid 2													
Lower 1	F	Plm lan										0.1-0.2	20
Lower 2	F	Hypo radi										0.1-0.2	20

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	Site Name	Date
71	Bowdens	30/10/14

Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
<b>OVERSTOREY</b>									
1	Ango flor	T	30	20					
2									
3									
4									
5									
6									
7									
8									
<b>MIDSTOREY</b>									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
<b>GROUND COVER / other</b>									
23	Care appx	V	3	60	Cirs vulg	F	1	50	
24	Gymb. v. r.	G	1	50	Plant. lenc	F	20	500	
25	Ecto. cone	F	1	20	Vulpia	G	10	1000	
26	Austrod. caes	G	1	50	Lol. pere	G	10	1000	
27	Orchid (an. l. m. s.) Diuris?	F	1	3	Hyp. radi	F	20	500	
28	Rume. brow	F	1	10	Briz. m. l. o	G	3	100	
29	Oxalis sp.	F	1	10	Sonch. oler	F	1	50	
30	Geranium sp.	F	1	50	Medicago (big)	F	1	50	
31	Eria. neta	F	1	20	Bromus (big)	G	5	100	
32	Junc. usit	R	1	20	Trifolium (big. l. m. s.)	F	1	100	
33	Euchiton. spha	F	1	20	Para. bras	F	1	50	
34					Brassica l.	F	1	50	
35					Senecio (dissected)	F	1	50	
36					Artichoke. n. l. e	F	1	20	
37					Rubus. frut	S	1	10	
38					Amag. are.	F	1	20	
39					? Erodium	F	1	50	
40					Carthamus (small)	F	1	50	
41					Penn. clau	G	1	10	
42	TOTAL				Sola. nigr	F	1	5	
43					Modi. caro	F	1	10	
44					Ecti. plan	F	1	20	
45					Hype. par. f.	F	1	50	

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

(21)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	21	Recorders	AC	Date	29/10/2019
Wapoint/ Plot ID	S7027 E7026	Easting*	St: 0769190 End: 0769160	Northing*	St: 6384785 End: 6384792
GPS datum	GRS-11	Photo no. (Camera)	St: 0958-0959 End: 0956-0957	Plot orient/ Slope/Aspect	140 41 10/100

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PIC → 277		
Ancillary Code (Usually condition description)	Thinned		
Condition (Low or Mod-Good)	mod-good	Habitat Features	mod-good

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0	0	2	20	25	20	1	15	25	12	Sum / 120	12 % (NOS)
	Native mid-storey cover (%)	35	5	3	5	5	4	10	5	12	30	Sum / 140	16.4 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	34 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	-										Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	16 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  20 %
	Midstorey (10 points)											(b) Sum/10	
	Ground (50 points)											(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	0
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		E. Blakii										Y	3/3
		Ang. Flora										Y	
		Call. endl										Y	
Strata	Form	Species										Height range	PFC
Upper 1		E. Blakii										1-10m	15%
Upper 2		Ang. Flora										4-5m	
Mid 1		Cas. arcu										1-2m	5%
Mid 2		Acacia bipin-julu										1-5m	1%
Lower 1		Poa sieb										<50cm	20%
Lower 2		Aris. ramosa										<50cm	5%

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	21	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. blakebyi	T	10	10					
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9	Cassia oreli	S	2	50					
10	Acacia feli	S	1	4					
11	Cassia quercifolia	S	1	1					
12	E. blakebyi	S	1	2					
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	low scrub	G	20	500	Anth. color	G	1	2	
24	Aristida ramosa	G	5	500	Petr. nant	F	1	20	
25	Lonicera muralis	F	1	3	Acacia sp	G	1	100	
26	Chen. scrubs	E	1	100	Hypochaeris	F	1	100	
27	Thymus arvensis	G	1	20	Sene. sp	F	1	10	
28	Lonicera feli	F	1	100	Trif. glom	F	1	10	
29	Desm. vari	F	1	20	Wormwood	F	1	10	
30	Portul. micr	F	1	20	Trif. ave	F	1	1	
31	Hydro. laxa	F	1	100	Rosa micr	G	1	1	
32	Arist. vari	G	5	500	Conyza sp	F	1	1	
33	Lonic. feli	G	1	1	Plant. lance	F	1	5	
34	Thym. gran	F	1	1	Comm. hard	G	1	10	
35	Andros. flor	T	1	1	Valer. sp	G	1	1	
36	Verb. plob	F	1	1	Rubus frut	S	1	1	
37	Lept. squa	F	1	20	Rosa rubr	S	1	1	
38	Centa. cune.	F	1	50					
39	Oxalis sp	F	1	2					
40	Aristida sp	G	1	20					
41	Aspe. conf	F	1	1					
42	Dicke. micr	G	1	20					
43	Plant. vari	F	1	1					
44	Trif. pign	F	1	20					
45	Both. micr	G	1	50					

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

1 tree

19

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 66
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Ref Site ID	Bowdens	Recorders	KR MH	Date	30/10/14
Wapoint/ Plot ID	190/191	Easting *	St: 768976 End: 768990	Northing*	St: 638581 End: 638539
GPS datum	WGS 84	Photo no. (Camera)	St: 118, 119 End: 120, 121	Plot orient/ Slope/Aspect	150° SE 170° NE

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	27S-Herb. WB Apple Box valley woodland		
Ancillary Code (Usually condition description)	H. Thinned		
Condition (Low or Mod-Good)	M-G	Habitat Features	creeping, logs, litter hollows

20 x 20m Quadrat	Number of <u>native</u> plant species	Use species list over page (full Id is <u>not</u> required)											(31) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	45	30	5	2	40	20	5	25	50	60	Sum / 10	28.2 % (NOS)	
	Native mid-storey cover (%)	0	2	2	2	5	0	10	2	2	5	Sum / 10	3 % (NMS)	
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses												Double score out of 50 to get %	82 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	0											Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other												Double score out of 50 to get %	40 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %	
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10		
	Ground (50 points)	6												0 (c) Double score
20m x 50m Quadrat	Number of trees with hollows	1 tree with multiple hollows					Total length fallen logs >10cm width (m)					36		
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone								Regen (Y/N) (indiv. <5cm?)		Proportion		
		Ango flor				Y								
		Eucal mini				N								
Strata	Form	Species								Height range		PFC		
Upper 1	T	Ango flor								0.5-18		20		
Upper 2	T	Eucal mini								12-15		1		
Mid 1	S	Acac pili								1.2-5		5		
Mid 2	S	Oass arcu								0.6-1.1		1		
Lower 1	G	Micr shp								0.1-0.7		50		
Lower 2	G	Therm auct								0.1-0.3		20		
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedg (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cvcad														

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	66	Site Name	Bowdens	Date	30/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Ango flor	T	20	20					
2	Euca vimi	T	1	2					
3									
4									
5									
6	(2)								
7									
8									
MIDSTOREY									
9	ACAC fili	S	5	20					
10	Cass areo	S	1	5					
11	Pers lne	S	1	1					
12									
13									
14									
15									
16									
17									
18									
19									
20	(3)								
21									
22									
GROUND COVER / other									
23	Loma fili	F	5	100	Rubia fruit	S	1	20	
24	Dian revo	F	2	50	Bromus 1	G	1	100	
25	Hydr laxi	F	2	500	Hype perf	F	1	50	
26	Glycine talba	F	1	50	Hypo radi	F	1	100	
27	Argemone ovina	F	1	100	Loli perc	G	1	50	
28	Aris jeni	G	2	100	Plan linc	F	1	100	
29	micr stip	G	50	2000	Cory bona	F	1	20	
30	Them aust	G	20	500	Ara cany	G	1	50	
31	Prostrat cars	G	2	50	Priza mnei	G	1	50	
32	Aris rano	G	10	500	Echi plan	F	1	50	
33	Jouc pall	G	5	100	Trifolium 1	F	1	20	
34	Euts spin	S	1	5	Dissected Senecio	F	1	20	
35	Carex	V	1	50	Bric mmo	G	1	10	
36	White Calotis	F	1	50					
37	Loma long (E. thalassoides)	F	5	100					
38	Loma fili	-	-	-					
39	Chei sieb	E	1	50					
40	Orchid - no scape - Diers?	F	1	10					
41	Nahl comm	F	1	100					
42	Dich revo	F	1	1000					
43	Junc usit	F	1	50					
44	Echi orat	F	1	100					
45	Poa labi	G	1	50					

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

over

(16)

TOTAL NATIVES (31)

(16)



Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	29	Recorders	AC	Date	29/10/2019
Wapoint/ Plot ID	S → 034 G → 033	Easting *	St: 0168813 End: 0168789	Northing *	St: 6386355 End: 6386519
GPS datum	GPS-11	Photo no. (Camera)	St: 0915-0916 End: 0913-0914	Plot orient/ Slope/Aspect	205 -21 / 205

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PTC - 282	
Ancillary Code (Usually condition description)	Intacted → thinned - high regrowth	
Condition (Low or Mod-Good)	mod-good	Habitat Features fallen logs, dry creekline debris, leaf litter

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(41) (NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	15	10	5	10	10	10	15	10	5	12	Sum / 10	11.2 % (NOS)	
	Native mid-storey cover (%)	3	2	5	3	1	3	5	15	12	Sum / 10	5.0 % (NMS)		
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	41 41 41 41 1										21	Double score out of 50 to get %	42 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs												Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other												Double score out of 50 to get %	0 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %	
	Midstorey (10 points)											(b) Sum/10		
	Ground (50 points)	111										(c) Double score		
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	22	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		E. Blakli										Y	4/5	
		E. macro										Y		
Ang. flor										Y				
Strata	Form	Species										Height range	PFC	
Upper 1		E. Blakli										10-16m	15%	
Upper 2		E. macro										10-16m	5%	
Mid 1		E. Blakli										1-10m	10%	
Mid 2		C. sessilis										1-2m	1%	
Lower 1		Rut. do sp.										2-30cm	15%	
Lower 2		micro st. p										2-30cm	5%	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L)

Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	24	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. blake	T	15	50					
2	E. macr	T	5	1					
3									
4	Ango jlo	T	5	2					
5									
6									
7									
8		(3)							
MIDSTOREY									
9	Cass arum	S	1	10					
10	Pers line	S	1	2					
11	Arac fili	S	1	1					
12	Arac caes	S	1	3					
13	Arac obtu	S	1	1					
14									
15									
16									
17									
18									
19									
20									
21		(6)							
22									
GROUND COVER / other									
23	Lytido sp	G	15	500	Echi plan	F	1	10	
24	Sole dami	F	1	100	Senecio	F	1	50	
25	Both maer	G	2	100	Gony-29	F	1	1	
26	Echi. quat	G	1	10	Anag aru	F	1	50	
27	Micr stir	G	5	500	Hydro radi	F	1	50	
28	Loma fili	F	5	500	Wulmbera 1/60	F	1	1	
29	Chei sals	E	1	100	Aira sp	G	1	5	
30	Pora micr	F	1	20					
31	Stip trif	S	1	3					
32	Angi rams	G	1	50					
33	Meli urce	S	1	3					
34	Brac daph	S	1	1					
35	Hove line	S	1	1					
36	Hibb aru	S	1	10					
37	Babingtonia	S	1	3					
38	Poa sals	G	1	20					
39	Hyge gram	F	1	2					
40	Dich peper	F	1	50					
41	Good wede	F	1	50					
42	Calo canoi	F	1	10					
43									
44	Hydro laxi	F	1	50					
45	Brachyscome (c) multi?	G	1	100					

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%;

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	26	Recorders	AC	Date	29/10/2019
Wapoint/ Plot ID	S38 E387	Easting *	St: 0768976 End: 0769012	Northing*	St: 6385693 End: 6385662
GPS datum	GPS-11	Photo no. (Camera)	St: 0983-0984 End: 0981-0982	Plot orient/ Slope/Aspect	120 -37 / 210

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	324		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)	mod-good	Habitat Features	exposed rock, fallen logs leaf litter

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) (35) (NPS)													
50m Transect - 10 Points	Native over- storey cover (%)	1	35	10	5	25	4	3	20	35	20	Sum / 198.10	19.8% (NOS)		
	Native mid-storey cover (%)	5	10	2	10	45	5	25	4	20	18	Sum / 198.10	18.4% (NMS)		
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	44	11	11	11							13	Double score out of 50 to get %	9.8% (NGCG)	
	Native ground cover (hits/50 points) - Shrubs	1										1	Double score out of 50 to get %	2% (NGCS)	
	Native ground cover (hits/50 points) - other	11										2	Double score out of 50 to get %	4% (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from		
	Midstorey (10 points)											(b) Sum/10	(a)+(b)+(c)		
	Ground (50 points)	1										2 (c) Double score	2%		
20m x 50m Quadrat	Number of trees with hollows	1	Total length fallen logs >10cm width (m) 95m												
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone								Regen (Y/N) (indiv. <5cm?)		Proportion			
		Callistris end.				Y				G. Poly		N		2/7	
		E. Agonio				N				Ang flor		N			
Strata		Form		Species								Height range		PFC	
Upper 1		T		Callistris								8-14m		15%	
Upper 2		T		E. Agonio								8-14m		10%	
Mid 1		T		Callistris end.								1-8m		5%	
Mid 2		S		personia								1-4m		2%	
Lower 1		G		soy pal.								<10cm		5%	
Lower 2		G		mido leaf slip.								<10cm		3%	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	26	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. ross	T	5	1					
2	Call. endl	T	15	4					
3	E. macr	T	5	1					
4	E. gonio	T	5	2					
5	Acac. implexa	T	1	1					
6									
7									
8									
MIDSTOREY									
9	Olea eli	S	2	20					
10	Cass. quin	S	3	20					
11	Styp. frag	S	1	2					
12	Podob. (Lec.)	S	1	5					
13	Indi. auct	S	1	3					
14	Anac. flor	T	2	1					
15	Pers. fine	S	1	1					
16	Call. <del>ross</del> endl	T	5	3					
17	Acac. implexa	T	1	1					
18	Acac. fili	S	1	1					
19									
20									
21									
22									
GROUND COVER / other									
23	Chen. steb	E	1	10	Ara		G	1	1
24	Mier. stip	G	2	100					
25	Joyce. pall	G	5	100					
26	Calo. curd	F	1	50					
27	Poa. micr	F	1	10					
28	Good. hede	C	1	50					
29	Glyc. clend	L	1	2					
30	Loma. fili	F	1	50					
31	Ans. jerr	G	5	100					
32	Astr. rest. vert	G	1	10					
33	Styp. glau	F	1	3					
34	Gal. grand	F	1	1					
35	Hibb. obtu	S	1	2					
36	Poa. sp. ?	G	1	5					
37	Dich. micr	G	1	1					
38	Loma. mult	C	1	2					
39	Clem. aris	L	1	1					
40	Echin. caes	G	1	1					
41	Lagen. 2 stip	E	1	1					
42	Acac. elong	S	1	1					
43	Dich. repe	F	1	1					
44	Hydr. laxi	F	1	1					
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	39	Recorders	AC	Date	30/10/2019
Wapoint/ Plot ID	S-056 E-055	Easting *	St: 0764067 End: 0769011	Northing*	St: 6285286 End: 6285292
GPS datum	GPS-11	Photo no. (Camera)	St001-0520 End: 0017-0018	Plot orient/ Slope/Aspect	270° 45°/255°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	329
Ancillary Code (Usually condition description)	intact
Condition (Low or Mod-Good)	mod-good
Habitat Features	rock outcrops surface rocks, fallen high loc. litter

20 x 20m Quadrat	Number of <u>native</u> plant species	Use species list over page (full Id is <u>not</u> required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	12	5	18	25	10	15	20	27	25	15	Sum / 10	17.2 % (NOS)
	Native mid-storey cover (%)	7	0	0	0	0	0	0	0	0	0	Sum / 10	0.7 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	22. % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	6. % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	26. % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from
	Midstorey (10 points)											(b) Sum/10	(a)+(b)+(c)
	Ground (50 points)											(c) Double score	0 %
20m x 50m Quadrat	Number of trees with hollows	1					Total length fallen logs >10cm width (m)					27m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone							Regen (Y/N) (indiv. <5cm?)		Proportion		
		E. ROSS		N						0/2.			
		Ang Flor		N									
Strata	Form	Species							Height range		PFC		
Upper 1		E. ROSS							10m		25%		
Upper 2		Ang Flor							1m		2%		
Mid 1		personia Lime							1-2m		1%		
Mid 2		Acacia <del>sp</del> jili							1-2m		1%		
Lower 1		Lomandra long							<1m		15%		
Lower 2		Jay Paul							<1m		10%		
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad													

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	34	Site Name	Bowdens	Date	30/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	E. ross	T	25	5					
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9	Pers line	S	1	2					
10	Acac fili	S	1	2					
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Acti holi	F	1	10					
24	Loma long	F	20	100					
25	Shp glau	F	1	20					
26	Podo ilie	S	1	50					
27	Juncus polli	G	10	100					
28	Hibb obt (c)	S	1	20					
29	Pine laui	S	1	10					
30	Poa sp.	G	5	100					
31	Gono petr	F	1	10					
32	Lopi late	F	1	1					
33	Loma fili	F	1	10					
34	Veru plots	F	1	2					
35	Good hool	F	1	1					
36	Unken (c)	F	1	2					
37	Acac buxi	S	1	1					
38	Acac elong	S	1	1					
39									
40									
41									
42									
43									
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	BS	Recorders	AC	Date	20/10/2019
Wapoint/ Plot ID	S → 58 6 → 57	Easting *	St: 6769097 End: 0769117	Northing*	St: 6385117 End: 6385013
GPS datum	GPS-11	Photo no. (Camera)	St: 0024-0025 End: 0022-0023	Plot orient/ Slope/Aspect	190° 35° 1240°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Vegetation Zone Identification			
Biometric Vegetation Type (Create a standard short version)	329		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)		Habitat Features	mistletoe, exposed rocks leaf litter

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	18	15	0	0	40	15	0	5	0		Sum / 10	9.3 % (NOS)
	Native mid-storey cover (%)	0	15	3	2	30	25	9	15	20		Sum / 10	11.9 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	8										Double score out of 50 to get %	16 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	3										Double score out of 50 to get %	6 % (NGCS)
	Native ground cover (hits/50 points) - other	17										Double score out of 50 to get %	34 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)											(b) Sum/10	
	Ground (50 points)											(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	41m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		E. mac. Y E. Poly EY											
		E. ROSS Y											
		Call end Y											
Strata	Form	Species										Height range	PFC
Upper 1	T	E. ROSS										14-16	15
Upper 2	T	E. macro										14-16	15
Mid 1	S	Cassinia querc?										1-2	2
Mid 2	S	Acac caes (outside 20x20)										2	1
Lower 1	F	Loma long										<1	15
Lower 2	G	cbye pau										<1	15

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L)

Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

\* - mistletoe counted in midstorey.



White-napped Hiv

Plot#	35	Site Name	Bowdens	Date	30/10/14				
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A	
OVERSTOREY									
1	E. ross	T	15	2					
2	E. maer	T	15	2					
3	E. blake ?	T	5	2					
4	E. poly	4	T	2	1				
5									
6									
7									
8									
MIDSTOREY									
9	Pers lin	S	1	2					
10	Acac fil	S	1	2					
11	Amyma sp.	S	3	10					
12	Cass quin	S	2	50					
13									
14									
15									
16									
17									
18									
19									
20									
21		4							
22									
GROUND COVER / other									
23	stall pung	F	1	100					
24	Loma long	F	10	100					
25	Junc para	G	15	100					
26	Poa sp.	G	5	100					
27	Poda chic	S	1	50					
28	Pine lin	S	1	10					
29	Hibb dety	S	1	50					
30	Misc sty	G	1	100					
31	Loma munt	F	1	10					
32	Dich micr	G	1	1					
33	Dodo spart	S	1	50					
34	styp glau	F	1	50					
35	Dian grev	F	1	2					
36	Good hede	F	1	5					
37	styp thf	S	1	1					
38	Caro cune	F	1	1					
39	Oulwynia sp	S	1	1					
40	Gono tetra	F	1	50					
41	Chen sals	E	1	1					
42	Cass arce	S	1	1					
43	Pora micr	F	1	5					
44	Meli uice	2	S	1	1	Call endi	T	1	2
45	Aspl fab	2	E	1	100	Wahit sp	F	1	1

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	36	Recorders	AC	Date	28/10/2019.
Wapoint/ Plot ID	S → 001 E → 000	Easting *	St: 0769107 End: 0769182	Northing*	St: 6385982 End: 6385996
GPS datum		Photo no. (Camera)	St: 0029 - 0030 End: 0026 - 0027	Plot orient/ Slope/Aspect	125° 17/130°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	329
Ancillary Code (Usually condition description)	Thinned
Condition (Low or Mod-Good)	Mod-good
Habitat Features	exposed rocks, fallen logs

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is <u>not</u> required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	30	5	30	35	25	1	0	0	15	0	Sum / 10	14.1 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	31										Double score out of 50 to get %	62 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	2										Double score out of 50 to get %	4 % (NGCS)
	Native ground cover (hits/50 points) - other	11										Double score out of 50 to get %	22 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	-										(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  6 %
	Midstorey (10 points)	-										(b) Sum/10	
	Ground (50 points)	3										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	1										Total length fallen logs >10cm width (m)	26m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		Call end.										Y	
		Ang flor										Y	
		E. Rossi										N	
Strata	Form	Species										Height range	PFC
Upper 1		Ang Flor										7m	1/1
Upper 2													
Mid 1		Cassin arca										1-2m	15%
Mid 2		Acacia caes										1-4m	5%
Lower 1		micro stip										<30cm	30%
Lower 2		arest rcmo										<30cm	30%

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	36	Site Name	Bowdens	Date	30/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
<b>OVERSTOREY</b>								
1	Ango flor	T	1	1				
2								
3								
4								
5								
6								
7								
8								
<b>MIDSTOREY</b>								
9	Cass arcu	S	10	60				
10	Acac caes	S	5	7				
11	Acac -fili	S	5	6				
12	Pors line	S	1	1				
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
<b>GROUNDCOVER / other</b>								
23	Shp glauc	F	1	5	Hype perf	F	1	20
24	Arist panno	G	10	500	Anag crub	F	1	20
25	Chen glob	E	1	50	Wurm like	F	1	50
26	Astipa scab	G	5	100	Ara sp.	G	1	100
27	Mier stip	G	40	1000	Hypo radi	F	1	100
28	Shp trif	S	1	3	Valpia sp	G	5	500
29	Hibb ob-lus	S	1	20	Redr nant	F	1	2
30	Wahl alt luteo?	F	1	20	Talp umbel	F	1	2
31	Loma fili	F	1	10	Erag sp.	G	1	1
32	Both niae	G	5	100	Trif arue	F	1	1
33	Calo cunei	F	1	50				
34	Trp pygm	F	1	100				
35	Oxal per	F	1	1				
36	Wahl stric	F	1	1				
37	Aspenula (c)	F	1	2				
38	Hydr laxi	F	1	20				
39	Gera sola	F	1	1				
40	Haloragel - Gonocarp like	F	1	20				
41	Glyc gland	L	1	1				
42	Tric elat	F	1	1				
43	Vitt grae	F	1	80				
44	Unb asteraceae	F	1	5				
45	Good head	F	1	20	Meritri duoc	F	1	5

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. <b>62</b>
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Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	821183	Easting *	St: 768240 End: 7682202	Northing*	St: 6386724 End: 6386683
GPS datum	WGS 84	Photo no. (Camera)	St: 9192 End: 9394	Plot orient/ Slope/Aspect	210° SW 5° 110° SE

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	358 - Mugga Creek		
Ancillary Code (Usually condition description)	Scattered trees		
Condition (Low or Mod-Good)	M-G	Habitat Features	

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										35 (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	5	10	50	30	10	40	40	25	25	5	Sum / 10	24 % (NOS)
	Native mid-storey cover (%)	2	2	10	5	5	2	5	0	2	0	Sum / 10	3.3 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	58 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	6 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	20 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10	
	Ground (50 points)	0										0 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	1 very small					Total length fallen logs >10cm width (m)					5m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)					Proportion	
		Ango flor					Y						
		Euca macr					Y						
		Euca poly					N						
Strata	Form	Species					Height range					PFC	
Upper 1	T	Euca macr					12-18					25	
Upper 2	T	Euca poly					12					1	
Mid 1	S	Acac caes					0.6-2.5					5	
Mid 2	S	Banksia lunn?					0.5-1					1	
Lower 1	G	Musc scab					0.1-0.4					25	
Lower 2	G	Musc strip					0.1-0.2					20	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Yellow orchid photos  
95-105.

(12)



Plot#	62	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)				F	C	A	Exotics (20m Quadrat)				F	C	A
OVERSTOREY													
1	Euca marc		T	25	10								
2	Euca poly		T	1	1								
3													
4													
5													
6		(2)											
7													
8													
MIDSTOREY													
9	Acac eacs			5	20								
10	Babingtonia (as in PL60)			1	5								
11	Evuninghami?												
12													
13													
14													
15													
16													
17													
18		(2)											
19													
20													
21													
22													
GROUND COVER / other													
23	Aust. scrub	(31)	G	25	500	Medicago?				F	1	100	
24	Chen semi		F	5	50	Anag arde				F	1	50	
25	Loma fili		F	5	1000	Yellow Linum				F	1	100	
26	Nahli str		F	1	100	Wurmbea-like iris				F	1	100	
27	Calo cone		F	1	100	Aira cany.				G	2	100	
28	Good hedge		F	1	100	Hypochaeris				F	1	50	
29	Vitt con		F	1	50								
30	Aris ramo		G	10	1000								
31	Chen sieb		E	1	500								
32	Cass arca		S	1	50								
33	Poa micr		F	1	50								
34	Trips pygm		F	2	500								
35	Cymb pter		G	5	500								
36	Pter bico		F	1	10								
37	Lepi late		R	1	50								
38	Micr stip		G	20	1000								
39	Loma mult		F	2	100								
40	Aris jeri		G	5	50								
41	Stip trif		S	1	50								
42	Ango flor	(22)	S	1	10								
43	Them tria		G	5	100								
44	Hibb elli		S	1	20								
45	Hairy Pultenaea (as in PL60)		S	1	20								

↓  
over

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

OTAL Natives: 35

(12)

12.

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	28	Recorders	AC	Date	30/10/2019
Wapoint/ Plot ID	S → 044 E → 043	Easting *	St: 076883 End: 076887	Northing*	St: 6385343 End: 6385342
GPS datum	GPS-11	Photo no. (Camera)	St: 0992-0994 End: 0990-0991	Plot orient/ Slope/Aspect	235 9% / 28560

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	281
Ancillary Code (Usually condition description)	Thinned
Condition (Low or Mod-Good)	mod-good
Habitat Features	fallen logs, exposed rocks wood piles

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	20	30	20	5	20	30	25	27	32	40	Sum / 250	24.9% (NOS)	
	Native mid-storey cover (%)	7	20	12	20	2	0	0	0	0	0	0	Sum / 10	6.1% (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											21	Double score out of 50 to get %	42% (NGCG)
	Native ground cover (hits/50 points) - Shrubs											0	Double score out of 50 to get %	0% (NGCS)
	Native ground cover (hits/50 points) - other											4	Double score out of 50 to get %	8% (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)											(a) Sum/10	Sum exotic cover (%) from	
	Midstorey (10 points)											(b) Sum/10	(a)+(b)+(c)	
	Ground (50 points)											7	(c) Double score	14% (NGCO)
20m x 50m Quadrat	Number of trees with hollows	1										Total length fallen logs >10cm width (m)	19	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		E. Blak										Y		3/3
		E. mel										Y		
Ang. Flor										Y				
Strata	Form	Species										Height range	PFC	
Upper 1		E. Blak										12-16m	15%	
Upper 2		E. mel										12-18m	5%	
Mid 1		E. mel										1-8m	5%	
Mid 2		Acacia bipin										6m	2%	
Lower 1		Pytado. Sperma										<0.5m	15%	
Lower 2		micro St. p										<20cm	10%	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	28	Site Name	Bowdens	Date	30/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1	E. blake	T	15	2				
2	E. mallee	T	5	3				
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9	Cass. alba	S	1	1				
10	Ango. glauc.	T	2	1				
11	Acac. alba	S	2	1				
12	Amymma	S	1	1				
13	E. mallee	T	10	50				
14	E. blake	T	1	5				
15								
16								
17								
18								
19								
20								
21								
22								
GROUNDCOVER / other								
23	Micro. stip	G	10	500	Utrix sp.	G	1	500
24	Styph. trif	S	1	1	Utrix radi	F	1	100
25	Trip. pygm	F	1	100	Petr. rant	F	1	100
26	Cora. micr	F	1	50	Vulp. sp	G	10	500
27	Ariz. ramo.	G	10	100	Bromus. hord	G	5	500
28	Desm. vari	F	1	50	Trif. arve	F	1	50
29	Aerostylis bico	F	1	10	Aras. arve	F	1	5
30	Lep. squa	F	1	10	Bizet. nuni	G	1	20
31	Wahl. sp	F	1	5	Senecio. sp	F	1	2
32	Both. naev	G	5	100	Sonc. eloc	F	1	1
33	Chen. seb	F	1	10	Sonc. aspe	F	1	10
34	Calo. cune	F	1	5	Trif. glom	F	1	50
35	Veru. pleb	F	1	2	Rumex. dent	S	1	1
36	Boa. sp	G	10	100	Cora. glom	F	1	1
37	Rurido. sp	G	15	500	Sile. gall	F	1	5
38	Gera. sola	F	1	50	Paro. bras.	F	1	5
39	Alcaena echin	F	1	20	Cardu. henn	F	1	4
40	Juncu. usil	R	1	1	Plant. lanc	F	1	10
41	Chry. apic	F	1	10	Cirs. vulg	F	1	5
42	Dich. repen	F	1	20	Lolium rigi	G	1	10
43	Elym. scab.	G	1	5	Trit. dub.	F	1	10
44	Meli. urce	S	1	2	Echi. plant	F	1	7
45	Echin. quad	G	1	1	Utrix. perf	F	1	5

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	30	Recorders	AC	Date	20/10/2019
Wapoint/ Plot ID	S→48 E→47	Easting *	St: 0769860 End: 6385893	Northing*	St: 6385893 End: 6385796
GPS datum		Photo no. (Camera)	St: 002-000 End: 099-0001	Plot orient/ Slope/Aspect	195° 10°/155°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	281	* grazed by cattle.
Ancillary Code (Usually condition description)	Scattered Trees	
Condition (Low or Mod-Good)		Habitat Features

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	38 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	19										Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	10 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	—										(a) Sum/10	Sum exotic cover (%) from
	Midstorey (10 points)	—										(b) Sum/10	(a)+(b)+(c)
	Ground (50 points)											(c) Double score	42 %
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	6m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		Angof										Y	2/2
		E. Black										Y	
Strata	Form	Species										Height range	PFC
Upper 1		Ang Flor										12m	5%
Upper 2													
Mid 1													
Mid 2													
Lower 1		Arist ramo										<30cm	10%
Lower 2		Spora ep										≥30cm	10%

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	30	Site Name	Bowdens	Date	30/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1	Ango flor.	T	1	1				
2								
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
GROUND COVER / other								
23	Cass. oreu	S	1	6	Trif. glom	F	5	1000
24	Arist. ramo	G	10	500	Plant. lanc.	F	5	1000
25	Loman. jili	F	1	5	Pero. bras.	F	1	100
26	Both. muer	G	10	500	Hirsch. inca	F	1	10
27	Mier. shp	G	5	500	Bram. hard	G	10	1000
28	Junc. ust	R	1	3	Vulp. sp	G	10	1000
29	Pytho. sp	G	5	500	Trif. ave	F	1	100
30	Ches. stas	E	1	5	Cart. lara	F	1	50
31	Trif. pygm	F	1	100	Chen. junc	F	1	50
32	Euchlo. spha	F	1	10	Warm. lilie	F	1	10
33	sporo. sp. creber	G	10	500	Hyss. rad.	F	5	500
34	dich. limb	F	1	3	aid. sp.	G	1	100
35	acae. echin	F	1	3	Trif. angu	F	1	1
36	elym. scab.	G	1	1	loli. rigi	G	1	10
37	worm. cluc	F	1	1	Sile. goll	F	1	10
38					Tops. umbe	F	1	1
39					erag. sp.	G	1	1
40					echi. panti	F	1	1
41					senec. (10 sp.)	F	1	10
42					petio. nant	F	1	1
43					cerca. glom	F	1	1
44								
45								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	33	Recorders	AC	Date	30/10/2019
Wapoint/ Plot ID	S→S4 E→S3	Easting *	St: 0769711 End: 0769788	Northing*	St: 6285253 End: 6285358
GPS datum	GPS-11	Photo no. (Camera)	St: 0015-0016 End: 0013-0014	Plot orient/ Slope/Aspect	75 07, 170°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	281		
Ancillary Code (Usually condition description)	Scattered trees		
Condition (Low or Mod-Good)	Low?	Habitat Features	grass?

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											20	Double score out of 50 to get %	40 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											0	Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											9	Double score out of 50 to get %	18 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  66 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	(b) Sum/10	
	Ground (50 points)											33	(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	0	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		Ango for										4		
Strata	Form	Species										Height range	PFC	
Upper 1														
Upper 2														
Mid 1														
Mid 2														
Lower 1		Micro shrub										< 30cm	20	
Lower 2		Eucalyptus										< 20cm	5	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	33	Site Name	Bowdens	Date	30/10/21				
		Natives (20m Quadrat)	F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY									
1									
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Euch. sp.	F	5	500	Ara. sp.	G	1	100	
24	Sporo sp.	G	10	500	Chulpa sp.	G	25	1000	
25	Micro shrp	G	20	1000	Hypo radi	F	2	500	
26	Scho. sp.	V	1	500	Riz. mnd	G	2	500	
27	Bol. mnd	G	5	500	Echi. plant	F	1	2	
28	Wahl. all	F	1	20	Sile. gall	F	1	3	
29	Junc. usit	R	1	2	Loli. fragi	G	1	50	
30	Euch. sp. 2	F	1	100	Rom. rose	F	1	2	
31	Elym. spab.	G	1	1	Acet. vulg	F	1	20	
32					Pasp. villos	G	1	20	
33					Cent. sp	F	1	50	
34					Cent. lana	F	1	1	
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restoid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	38	Recorders	AC	Date	31/10/2019
Wapoint/ Plot ID	S → 606 6 → 65	Easting *	St: 0769262 End: 0769219	Northing*	St: 6385161 End: 6385104
GPS datum		Photo no. (Camera)	St: 0039-0090 End: 0081-0088	Plot orient/ Slope/Aspect	15 8 / 1250

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PCT 281		
Ancillary Code (Usually condition description)	Scattered trees → Thinned		
Condition (Low or Mod-Good)	M-G	Habitat Features	Eph drainage line

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										30 (NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	3	0	0	0	0	0	0	0	0	25	Sum / 28 10	2.8 % (NOS)	
	Native mid-storey cover (%)	45	0	0	3	2	1	0	0	2	5	58	Sum / 58 10	5.8 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	UH MH MH MH MH MH										Double score out of 50 to get %	52 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs	1										Double score out of 50 to get %	2 % (NGCS)	
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	0 % (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	→									(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)	
	Midstorey (10 points)	0	→									(b) Sum/10		
	Ground (50 points)	11										(c) Double score	4 %	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	3m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		E. Blak										Y		3/3
		E. Mod										Y		
Ang Flor										Y				
Strata	Form	Species										Height range	PFC	
Upper 1	T	E. Blak										8-10	5	
Upper 2	T	E. Mod										8-10	5	
Mid 1	S	A. Jili										4-7	5	
Mid 2	T	E. Blak										1-6	2	
Lower 1	G	Micro shrub										<30cm	10	
Lower 2	G	Ang Flor										<40cm	20	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	38	Site Name	Bowdens	Date	31/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1	E. blakei	T	5	2				
2	E. mellea	T	3	1				
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9	E. mellea	T	2	1				
10	A. glabra	S	5	6				
11	Amymma	S	1	1				
12	E. blakei	T	2	6				
13	Ango. ylor	T	1	1				
14								
15								
16								
17								
18								
19								
20	both macro	G	1	10				
21	rutidlo sp. - race	G	1	20				
22	Chlo. trunc.	G	1	10				
GROUND COVER / other								
23	Styp. trif.	S	1	2	Hypo radi	F	5	500
24	Chen. siliq	E	1	10	Hype. pers	F	1	50
25	Micro. styp	G	50	1000	Plant. lanc	F	2	500
26	Arist. panic	G	20	1000	irid. glom	F	1	100
27	Dich. micr	G	1	50	Yellow. lorum	F	1	20
28	Cass. arum	S	1	10	Trif. sp	F	1	1
29	Desm. vari	F	1	10	Anag. arje	F	1	1
30	Calo. cune	F	1	5	Vulpes sp	G	2	100
31	Ptero. bicol	F	1	5	Briza. minis	G	1	1
32	Oxal. pers	F	1	10	Petr. nant	F	1	2
33	Dich. sepe	F	1	50	Site. gall	F	1	3
34	Poa. sp.	G	1	5	Cent. sp	F	1	1
35	Hydr. laxi	F	1	50	ech. plant	F	1	2
36	Vitt. grac	F	1	20	Coni. sp	F	1	1
37	Ans. jeri	G	1	50	loli. rigi	G	1	20
38	Loma. multi	F	1	1	sporo. sp.	G	1	1
39	Acac. calan	F	1	20	face. retu	F	1	2
40	Glyc. clon	L	1	1				
41	Meli. urce	S	1	1				
42	Carex. inu	V	1	20				
43	Elym. scab	G	1	10				
44								
45	Sola. domi	F	1	1				

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 57
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Ref Site ID	Bowdens	Recorders	KR/MH	Date	28/10/14
Wapoint/ Plot ID	171/172/57	Easting *	St: 768458 End: 768491	Northing *	St: 6386622 End: 6386642
GPS datum	WGS 84	Photo no. (Camera)	St: 71, 72 End: 73, 74	Plot orient/ Slope/Aspect	45° NE 4° 1 45' NE

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	17- (28%) Blackely, Red Gum, -WB-YB-Blow Cypress		
Ancillary Code (Usually condition description)	Scattered trees		
Condition (Low or Mod-Good)	M-G	Habitat Features	some hollows, flat grassland

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(21) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	50	20	20	40	40	25	10	40	40	0	Sum / 10	245 % (NOS)
	Native mid-storey cover (%)	5	5	10	0	0	0	5	5	10	0	Sum / 10	4 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	76 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	0										Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	16 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) 4 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10	
	Ground (50 points)	11										4 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	20cm dia. meter 4m high 1 (P3)										Total length fallen logs >10cm width (m)	0
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion
		E. albans										Y	
		E. macro										Y	
		E. blackelyi										Y	
Strata	Form	Species										Height range	PFC
Upper 1	T	E. albans										12	25
Upper 2	T	E. macro										10	10
Mid 1	S	Acacia deal										1.2 - 4	5
Mid 2													
Lower 1	G	Miris ranno										0.1	40
Lower 2	G	Micro ship										0.1	90

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	57	Site Name	Bowdens	Date	28/01/14				
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Euca albens		25	4					
2	Ango flor		5	1					
3	Euca macr		10	4					
4									
5									
6	(3)								
7									
8									
MIDSTOREY									
9	Acacia deal		5	20					
10	Acacia deal		1	10					
11									
12									
13									
14									
15									
16									
17									
18									
19									
20	(2)								
21									
22									
GROUND COVER / other									
23	Acacia ramp		40	1000	Hydrocotyle		1	20	
24	Chenopodium		2	50	Volcania		2	500	
25	Vitellaria		1	20	Hydrocotyle		3	100	
26	Hydrocotyle		1	500	Medicago		1	100	
27	Brickellia		40	1000	Conyza bonariensis		1	10	
28	Baccharis		1	1	Acacia ramp		1	100	
29	Austrobaileya		2	100	Trifolium		1	100	
30	Loma mult		1	5	Senecio w/ dissected leaves		5	50	
31	Good hope		1	10	Modiola		3	50	
32	Baccharis		1	5	Lolium perenne		1	50	
33	Acacia ramp		2	100	Plantago		2	100	
34	Xanthorrhoea	Calamagrostis	1	5	Parosela		2	50	
35	Glycine (long petiole) taba		1	10	Medicago		1	50	
36	Ornithoglossum		1	50	Centropogon		1	20	
37	Wahlbergia		1	1	Sticky pink flower plant	(2)	1	20	
38	Austrostipa	Scab.	1	50	Anagallis		1	20	
39					Trifolium		1	20	
40					Echinops		1	10	
41					Sonchella		1	10	
42					Bromus	1	20	500	
43									
44	TOTAL	(21)							
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	32	Recorders	AC	Date	30/10/2019
Wapoint/ Plot ID	S-32 E-81	Easting *	St: 011006S End: 011006S	Northing*	St: 6385289 End: 6385309
GPS datum	GPS-11	Photo no. (Camera)	St: 0011-0012 End: 0009-0010	Plot orient/ Slope/Aspect	350 17/150°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	Pct - 281?	
Ancillary Code (Usually condition description)	low - cleared?	
Condition (Low or Mod-Good)	low	Habitat Features open - drainage line

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(NPS)			
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses													Double score out of 50 to get %	0 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs													Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other													Double score out of 50 to get %	54 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  78 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	0	(b) Sum/10	
	Ground (50 points)													(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0		Total length fallen logs >10cm width (m)		0									
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone				Regen (Y/N) (indiv. <5cm?)		Proportion							
Strata	Form	Species				Height range		PFC							
Upper 1															
Upper 2															
Mid 1															
Mid 2															
Lower 1	G	Malaris aquatica				<60cm		30							
Lower 2	V	Carex appress				<60cm		45							

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad



Plot#	32	Site Name	Bowdens	Date	30/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1								
2								
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9					Rosa rubi	5	1	1
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
GROUNDCOVER / other								
23	Carex spp	V	45	1000	Phala aqua	G	30	1000
24	Gera sola	F	1	5	Senecio sp	F	1	50
25	Briza media sp	R	1	5	Hypochaeris	F	2	500
26					Plant lance	F	5	100
27					Trif glom	F	2	500
28					Aet Vulg	F	1	50
29					Vulpia sp.	G	5	1000
30					Bromus horat	G	5	1000
31					Trif dubi	F	1	50
32					Lol rigi	G	1	50
33					Felin plant	F	1	50
34					Cirs vulg	F	1	20
35					Sonic aloe	F	1	1
36					Brom carl	G	1	10
37					Trif subt	F	1	100
38					Verb bona.	F	1	5
39					Card lane	F	1	1
40					Bromus dian	G	1	2
41								
42								
43								
44								
45								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	37	Recorders	AC	Date	31/10/2017
Wapoint/ Plot ID	S-62 E-63	Easting *	St: 077083 End: 077089	Northing*	St: 628536 End:
GPS datum	GDA94	Photo no. (Camera)	St: 003-001 End: 003-004	Plot orient/ Slope/Aspect	0° 2° / 165°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	Pct - 281		
Ancillary Code (Usually condition description)	cleaned?		
Condition (Low or Mod-Good)	Low	Habitat Features	dam

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0 →										Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	0 →										Sum / 10	0 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	0 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	0 % (NGCS)
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %	69 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0 →										0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c) 88. %
	Midstorey (10 points)	0 →										0 (b) Sum/10	
	Ground (50 points)											88 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0	Total length fallen logs >10cm width (m)								0		
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone								Regen (Y/N) (indiv. <5cm?)	Proportion		
Strata	Form	Species								Height range	PFC		
Upper 1													
Upper 2													
Mid 1													
Mid 2													
Lower 1		canex appress								<1m	351		
Lower 2		sub claver								<20cm	151		
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad													

Plot#	37	Site Name	Bowdens	Date	31/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1								
2								
3								
4								
5								
6								
7								
8								
MIDSTOREY								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
GROUNDCOVER / other								
23	Carex appr	✓	35	100	Phala aqua	G	15	100
24	Lumn. brown	F	1	2	Sandwich aspe	F	1	5
25	Persicaria sp	F	1	1	Lolium rigi	G	2	500
26	Bauhinia sp./Chorizanthe?	R	4	50	Plant lance	F	3	500
27	Sporobolus sp	G	1	10	Woolly daisy	F	1	100
28	Juncus sp	R	1	50	Senecio	F	1	100
29	Euch. spha	F	1	1	Echin plant	F	5	100
30					Trif. subt	F	15	500
31					Hyper. radi	F	1	100
32					Vulpia. sp.	G	15	1000
33					Verb. bona	F	1	20
34					Brom. hood	G	2	500
35					Cent. lang	F	1	2
36					Trif. dub	F	1	50
37					Apiaceae	F	1	1
38					Trif. glom	F	1	20
39					Cirs. vulg	F	1	1
40					Ara. sp	G	1	1
41					Briza min.	G	1	1
42					Glac. covr	F	1	2
43					Brassicaceae	F	1	1
44					Pasp. dila	G	2	100
45								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

100, 52

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 53
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Ref Site ID	Bowdens	Recorders	KR/MH	Date	28/10/14
Wapoint/ Plot ID	W1/WP1 Plot ID 161/162/53	Easting *	St: 768877 End: 768882	Northing *	St: 6381376 End: 6381315
GPS datum	WGS 84	Photo no. (Camera)	St: 5556 End: 5758	Plot orient/ Slope/Aspect	160° SE 17° 120° SW

Transect  
Across  
slope.

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	325 Blue-leaved stringy bark open forest		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)	M-G.	Habitat Features	large logs, loose rocks, large rock overhang

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is <u>not</u> required)										21	(NPS)
50m Transect - 10 Points	Native over- storey cover (%)	50	70	70	40	15	80	5	0	25	0	Sum / 10	27.5 % (NOS)
	Native mid-storey cover (%)	10	10	10	5	20	15	10	15	20	30	40	Sum / 10
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	1										Double score out of 50 to get %	2 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	11										Double score out of 50 to get %	10 % (NGCS)
	Native ground cover (hits/50 points) - other	11 11 11										Double score out of 50 to get %	24 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10 (a)	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10 (b)	
	Ground (50 points)	0										Double score (c)	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	152 m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)		Proportion				
		E. aggl.	N										
		E. rossii	N										
Strata	Form	Species					Height range		PFC				
Upper 1	T	Euca aggl					8-15		40				
Upper 2	T	Euca ross					8		1				
Mid 1	S	Pers. lme					2-4		10				
Mid 2	S	Acac impl					3-4		3				
Lower 1	F	Loma Fili					0.3-0.6		40				
Lower 2	S	Gonocarpus looking					0.3-0.5		10				

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

(3)



Plot#	53 (3)	Site Name	Bowdens.	Date	28/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Euca aggl	T	40	1					
2	Eucrossi	T	1	1					
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9	Pers line	S	10	50					
10	Cassinia areu	S	10	100					
11	Acacia implexa	S	3	10					
12	Zieria? (2)	S	5	50					
13	Styphelia trif.	S	1	1					
14	Podia illiopolium	S	1	1					
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Lomandra filiformis	F	40	500					
24	Gonocarpus looking sm style (2)	F	10	500					
25	Gonocarpus scaberrimus (2) terr	F	1	20					
26	Microlaena stip.	G	3	100					
27	Pteris escul	E	4	20					
28	Solanum probably both sides	F	1	2					
29	Poa sieb.	G	5	500					
30	? Damp purp? (2)	F	1	1					
31	Lindaea linearis	E	1	1					
32	Bill scandens	L	1	3					
33	Pottieria? (2) High obtu	S	1	1					
34	Stylidium lani	F	1	2					
35	Austrostipa Scabra	G	1	3					
36									
37									
38									
39									
40									
41									
42									
43	toru								
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

(3)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 55
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Ref Site ID	Bowdens	Recorders	KR/MH	Date	28/10/14
Wapoint/ Plot ID	W384/284 166/167/55	Easting *	St: 769121 End: 769158	Northing*	St: 6387066 End: 6387072
GPS datum	WGS 84	Photo no. (Camera)	St: 63, 64 End: 65, 66	Plot orient/ Slope/Aspect	60° NE 21° 160° NE

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	White Box shrubby open forest 273		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)	M-G	Habitat Features	more rainfall; deep leaf-litter;

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)											(22) (NPS)		
50m Transect - 10 Points	Native over- storey cover (%)	20	30	10	5	30	20	20	20	10	5	Sum / 10	17 % (NOS)		
	Native mid-storey cover (%)	40	50	50	50	50	50	40	20	10	10	Sum / 10	37 % (NMS)		
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	1/11 1											Double score out of 50 to get %	22 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs	1/11 1											Double score out of 50 to get %	12 % (NGCS)	
	Native ground cover (hits/50 points) - other	1/11											Double score out of 50 to get %	10 % (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %		
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10			
	Ground (50 points)	0												(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0											Total length fallen logs >10cm width (m)	85 m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone											Regen (Y/N) (indiv. <5cm?)	Proportion	
		Eucalyptus											N		
		Eucalyptus											N		
Strata	Form	Species											Height range	PFC	
Upper 1	T	Eucalyptus											5-23	30	
Upper 2	T	Eucalyptus											10-15	5	
Mid 1	S	Allocasuarina											1-3	60	
Mid 2	S	Bursaria											0.1-2	5	
Lower 1	F	Lomandra											0.2-0.3	2	
Lower 2	F	Lomandra											0.1-0.2	2	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

3 hollow

Eco Logical Australia - Biobank plot data sheet				Site Sheet No. 59	
Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	WPS 176 / 177	Easting *	St: 768023 End: 768010	Northing*	St: 6386718 End: 6386760
GPS datum	WGS 84	Photo no. (Camera)	St: 7980 End: 8182	Plot orient/ Slope/Aspect	310 NW 18° 1310°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	358 - Muggs Ironbark RB 4W - Black Cypress Pine		
Ancillary Code (Usually condition description)	<del>Intact</del> Scattered Trees Intact		
Condition (Low or Mod-Good)	M-G	Habitat Features	100% 100%

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is <u>not</u> required)										(19) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	20	15	20	20	25	10	40	15	30	30	Sum / 10	22.5 % (NOS)
	Native mid-storey cover (%)	0	2	5	10	0	2	5	0	10	2	Sum / 10	3.6 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	0										Double score out of 50 to get %	0 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	11										Double score out of 50 to get %	10 % (NGCS)
	Native ground cover (hits/50 points) - other	11										Double score out of 50 to get %	4 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10	
	Ground (50 points)	0										0 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	3 large hollows					Total length fallen logs >10cm width (m)					24m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)					Proportion	
		Eucalypt					Y						
		Eucalypt					N						
		Eucalypt					Y						
Strata	Form	Species					Height range					PFC	
Upper 1	T	Eucalypt					15-20					20	
Upper 2	T	Eucalypt					12-15					15	
Mid 1	S	Shrub					0.3-1.2					5	
Mid 2	S	Poa line					0.1-1.1					2	
Lower 1	F	Chrysomelid					0.1-0.4					1	
Lower 2	G	Moss					0.1-0.3					1	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	Site Name	Date
59	Bowdens	29 / 10 / 14

Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
<b>OVERSTOREY</b>									
1	Call endl	T	10	6					
2	Eucalypt	T	15	3					
3	Euca spar	T	20	6					
4	Euca poly	T	5	3					
5									
6									
7									
8									
<b>MIDSTOREY</b>									
9	Styp trif	S	5	50					
10	Olear elli	S	1	8					
11	Pers inc	S	2	50					
12	Acar decora? (d)	S	1	3					
13	Lo caesilla								
14									
15									
16									
17									
18									
19									
20									
21									
22									
<b>GROUND COVER / other</b>									
23	Chrys. Semi	F	1	10					
24	Loma mult	F	1	10					
25	Austrostipa scab	G	1	10					
26	Aris ramo	G	1	20					
27	Poma umbra	F	1	1					
28	Lepi late	R	1	3					
29	Hibb obtu	F	1	2					
30	Austrocl. vana	G	1	10					
31	Calo cune	F	1	1					
32	Diem revu	F	1	1					
33	Lily bulb (d)	F	1	1					
34	Lo Styp glau								
35									
36									
37									
38									
39									
40									
41									
42	Tort								
43									
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)



202.

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 60
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Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	W19.11/179	Easting *	St: 768158 End: 768138	Northings*	St: 6386759 End: 6386805
GPS datum	WGS 84	Photo no. (Camera)	St: 83,84 End: 85,86	Plot orient/ Slope/Aspect	330° NW 17° 160° NE

Across  
Slope

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	358-Mungy Ironbark RB WB Black Cypress		
Ancillary Code (Usually condition description)	Intact.		
Condition (Low or Mod-Good)	M-G	Habitat Features	fallen logs,

20 x 20m Quadrat	Number of <u>native</u> plant species	Use species list over page (full Id is <u>not</u> required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	15	10	15	15	10	25	25	30	30	30	Sum / 10	20.5 % (NOS)
	Native mid-storey cover (%)	0	0	0	20	20	0	0	0	0	0	Sum / 10	0.4 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	HIT										Double score out of 50 to get %	10 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	11										Double score out of 50 to get %	4 % (NGCS)
	Native ground cover (hits/50 points) - other	1										Double score out of 50 to get %	2 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10	
	Ground (50 points)	0										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0					Total length fallen logs >10cm width (m)					46 m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone						Regen (Y/N) (indiv. <5cm?)		Proportion			
		Euca side		N	Euca alba		N						
		Euca poly		Y	Euca voss		N						
		Euca macr		N									
Strata	Form	Species						Height range		PFC			
Upper 1	T	Call endl						5-25		15			
Upper 2	T	Euca poly						7-15		5			
Mid 1	-	-						-		-			
Mid 2	-	-						-		-			
Lower 1	T	Loma Ali						0.1-0.3		7			
Lower 2	S	Acac decr						0.2-0.5		3			
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (c) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad													

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Plot#	60	Site Name	Bowdens	Date	29/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1	Call anell	T	15	20				
2	Euca poly	T	5	5				
3	euca albe	T	2	1				
4	Euca side	T	1	1				
5	Euca ross.	T	1	1				
6								
7								
8								
MIDSTOREY								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
GROUND COVER / other								
23	Loma Gili	F	7	100				
24	Glycine taba	F	1	50				
25	Pultenaea hairy (C)	S	1	10				
26	Loma mult	F	1	50				
27	Lepi tale	R	1	50				
28	Mucro crab	G	1	50				
29	hairy ligule grass (C) Juncifall	G	1	50				
30	Acac Zaes	S	3	50				
31	Avis ramo	G	1	50				
32	Burs spin	S	1	5				
33	Dian revo	F	1	10				
34	Good hede	F	1	20				
35	Cato cone	F	1	10				
36	Onys seny	F	1	10				
37	Styp trif	S	1	10				
38	Peis lme	S	1	10				
39	Hibb elli	S	1	1				
40	Arthrosporum? Dichopogon	F	1	1				
41	Macr comm	A	1	3				
42	Ones Gieb	E	1	10				
43	Asperum (21)	F	1	1				
44								
45	TOTAL = 26.							

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

[illegible]

\* **Cover (C):** Estimate of the appropriate cover measure for each recorded species; from 1–5 and then to the nearest 5%.

**Abundance (A):** A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet Site Sheet No. 59

Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	WPSB/WSE end 176/177	Easting*	St: 768023 End: 768010	Northings*	St: 6386718 End: 6386760
GPS datum	WGS 84	Photo no. (Camera)	St: 7980 End: 8182	Plot orient/ Slope/Aspect	310° NW 18° 1310°

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	358-Mugg Ironbark RB 4w - Black Cypress line		
Ancillary Code (Usually condition description)	<del>Intact</del> Scattered Trees Intact		
Condition (Low or Mod-Good)	M-G	Habitat Features	rocks, rocks

20 x 20m Quadrat	Number of <u>native</u> plant species	Use species list over page (full Id is <u>not</u> required)										(19) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	20	15	20	20	25	10	40	15	30	30	Sum / 10	22.5 % (NOS)
	Native mid-storey cover. (%)	0	2	5	10	0	2	5	0	10	2	Sum / 10	3.6 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	0										Double score out of 50 to get %	0 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	11										Double score out of 50 to get %	10 % (NGCS)
	Native ground cover (hits/50 points) - other	11										Double score out of 50 to get %	4 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10	
	Ground (50 points)	0										(c) Double score	
20m x 50m Quadrat	Number of trees with hollows	3 large hollows					Total length fallen logs >10cm width (m)					24m	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone							Regen (Y/N) (indiv. <5cm?)		Proportion		
		Euca poly			Y								
		Euca side			N								
		Euca spar			Y								
Strata	Form	Species							Height range		PFC		
Upper 1	T	Euca spar							15-20		20		
Upper 2	T	Euca side							12-15		15		
Mid 1	S	Shrub inf							0.3-1.2		5		
Mid 2	S	Poa line							0.1-1.1		2		
Lower 1	F	Chry rami							0.1-0.4		1		
Lower 2	G	Mys rami							0.1-0.3		1		
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad													



Plot#	Site Name	Date
59	Bowdens	29/10/14

Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
<b>OVERSTOREY</b>									
1	Call endl	T	10	6					
2	Eucalypt	T	15	3					
3	Euca spar	T	20	6					
4	Euca poly	T	5	3					
5									
6									
7									
8									
<b>MIDSTOREY</b>									
9	Styp trif	S	5	50					
10	Oleav elli	S	1	8					
11	Pers inc	S	2	50					
12	Acac dreaca? (d)	S	1	3					
13	Lo caesilla								
14									
15									
16									
17									
18									
19									
20									
21									
22									
<b>GROUND COVER / other</b>									
23	Chrys. Semi	F	1	10					
24	Loma mult	F	1	10					
25	Austrostipa scab	G	1	10					
26	Aris. ramo	G	1	20					
27	Poma. umbr	F	1	1					
28	Lepi. late	R	1	3					
29	Hibb obtu	F	1	2					
30	Austrocl. rare	G	1	10					
31	Calo. cune	F	1	1					
32	Dicm. revu	F	1	1					
33	Lily bulb (c)	F	1	1					
34	Lo Styp glau								
35									
36									
37									
38									
39									
40									
41									
42	TOTAL								
43									
44									
45									

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 60
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Ref Site ID	Bowdens	Recorders	KR MH	Date	29/10/14
Wapoint/ Plot ID	W141/179	Easting *	St: 768158 End: 768138	Northing *	St: 6386159 End: 6386805
GPS datum	WGS 84	Photo no. (Camera)	St: 8584 End: 8586	Plot orient/ Slope/Aspect	330° NW 17° 160° NE

Across  
Slope

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	358-Mungy Ironbark RB WB Black Cypress		
Ancillary Code (Usually condition description)	Intact.		
Condition (Low or Mod-Good)	M-G	Habitat Features	fallen logs,

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)											(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	15	10	15	15	10	25	25	30	30	30	Sum / 10	20.5 % (NOS)	
	Native mid-storey cover (%)	0	0	0	20	20	0	0	0	0	0	Sum / 10	0.4 % (NMS)	
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	HIT											Double score out of 50 to get %	10 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	11											Double score out of 50 to get %	4 % (NGCS)
	Native ground cover (hits/50 points) - other	1											Double score out of 50 to get %	2 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %	
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10		
	Ground (50 points)	0												0 (c) Double score
20m x 50m Quadrat	Number of trees with hollows	0											Total length fallen logs >10cm width (m)	46 m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone						Regen (Y/N) (indiv. <5cm?)		Proportion				
		Euca side	N	Euca albe	N									
		Euca poly	Y	Euca voss	N									
		Euca macr	N											
Strata	Form	Species		Height range		PFC								
Upper 1	T	Call endl		5-25		15								
Upper 2	T	Euca poly		7-15		5								
Mid 1	-	-		-		-								
Mid 2	-	-		-		-								
Lower 1	F	Loma Ali		0.1-0.3		7								
Lower 2	S	Acac decr		0.2-0.5		3								

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

10

Plot#	60	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Call endl	T	15	20					
2	Euca poly	T	3	5					
3	euca albe	T	2	1					
4	Euca side	T	1	1					
5	Euca ross	T	1	1					
6									
7									
8									
MIDSTOREY									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Loma Gili	F	7	100					
24	Glycine taba	F	1	50					
25	Pultenaea hairy (C)	S	1	10					
26	Loma null	F	1	50					
27	Lepi tale	R	1	50					
28	Metro crab	G	1	50					
29	hairy ligule grass (C) Joycefall	G	1	50					
30	Acac daes	S	3	50					
31	Avis ramo	G	1	50					
32	Burs spin	S	1	5					
33	Dian revd	F	1	10					
34	Good hede	F	1	20					
35	Cato cone	F	1	10					
36	Chrys seny	F	1	10					
37	Styl trif	S	1	10					
38	Peis lme	S	1	10					
39	Hibb elli	S	1	1					
40	Arthropodium? Dichopogon	F	1	1					
41	Maer comm	A	1	3					
42	Cher Sieb	E	1	10					
43	Asperula	F	1	1					
44									
45	TOTAL = 26.								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

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Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 68
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Ref Site ID	Bowdens	Recorders	KR MH	Date	30/10/14
Wapoint/ Plot ID	144/145	Easting *	St: 768540 End: 768630	Northing*	St: 6384792 End: 6384759
GPS datum	WGS 84	Photo no. (Camera)	St: 127, 128 End: 124, 130	Plot orient/ Slope/Aspect	105° SE 1/2 110° SE

\* Record from Easting and Northing from both ends of the 50m transect

UTM 551

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	277 - BRG YB grassy tall woodland		
Ancillary Code (Usually condition description)	Scattered trees		
Condition (Low or Mod-Good)	M-G?	Habitat Features	Logs,

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is <u>not</u> required)										(18) (NPS)			
50m Transect - 10 Points	Native over- storey cover (%)	5	5	1	0	0	0	0	0	0	0	Sum / 10	1.1 % (NOS)		
	Native mid-storey cover (%)	0	0	2	0	0	0	0	0	0	0	Sum / 10	0.2 % (NMS)		
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	111										Double score out of 50 to get %		6 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %		% (NGCS)	
	Native ground cover (hits/50 points) - other											Double score out of 50 to get %		% (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10	(a)	Sum exotic cover (%) from (a)+(b)+(c)  90 %	
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10	(b)		
	Ground (50 points)											Double score	(c)		
20m x 50m Quadrat	Number of trees with hollows	2 medium					Total length fallen logs >10cm width (m)					7 m			
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)					Proportion			
		Angio-flor					-								
		Eucalypt					1								
Strata	Form	Species					Height range					PFC			
Upper 1	T	Eucalypt					0.5-2.0					15			
Upper 2	-	-					-					-			
Mid 1	-	-					-					-			
Mid 2	-	-					-					-			
Lower 1	G	Vulpia					0.1-0.15					40			
Lower 2	F	Hypochaeris					0.1-0.15					10			

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

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Plot#	68	Site Name	Bowdens	Date	30/10/14				
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Euca. black	T	15	3					
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9	Amymma	S	1	1					
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Euchiton sp	F	5	500	Vulpia myuros	G	40	4000	
24	Salsola sp. <del>sp</del>		2	2000	Hypochaeris	F	10	3000	
25	Them. aust.	G	1	100	Echi. plan	F	1	100	
26	Conv. arab	F	1	20	Sporobolus	G	1	50	
27	Calo. cane.	F	1	20	Silene aca.	F	2	1000	
28	Rumen brow	F	1	10	Trifolium 1	F	2	1000	
29	Desm. vari	F	1	10	Loli. perle	G	5	2000	
30	Astrod. roll	G	2	100	Buz. mio	G	2	2000	
31	Poa. slab	G	1	50	Medicago (big)	F	1	1000	
32	Cerastium sp.	F	1	20	Lotpis. barb	F	1	100	
33	Loma 30li v. grazed.	F	1	1	Trif. one	F	1	100	
34	Junce. usit	R	1	10	Oxalis sp.	F	1	50	
35	Bath. macf	G	1	50	Bromus (big)	G	5	1000	
36	Nahl. pin	F	1	10	modi. can	F	1	10	
37	Micr. shp	G	1	50	Alea. can	G	5	2000	
38	Eragrostis? (c)	G	1	50	Carthamus (yellow)	F	1	50	
39					Hypochaeris	F	1	10	
40					Paro. bras	F	1	10	
41					Dissected Senecio	F	1	10	
42									
43									
44									
45	TOTAL								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%;

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 69
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Ref Site ID	Bowdens	Recorders	KR MH	Date	30/10/14
Wapoint/ Plot ID	196/197	Easting*	St: 768782 End: 768830	Northing*	St: 6384705 End: 6384707
GPS datum	WGS 84	Photo no. (Camera)	St: 131, 132 End: 133, 134	Plot orient/ Slope/Aspect	Y0° NE 2° 10° N

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	277 - BRG YB grassy tall woodland		
Ancillary Code (Usually condition description)	Thinned.		
Condition (Low or Mod-Good)	M-G.	Habitat Features	logs, burrow,

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										(14) (NPS)
50m Transect - 10 Points	Native over- storey cover (%)	25	40	35	15	0	10	40	45	5	10	Sum / 10 22.5% (NOS)
	Native mid-storey cover (%)	0	0	0	0	2	2	2	20	2	5	Sum / 10 3.3% (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	11										Double score out of 50 to get % 6% (NGCG)
	Native ground cover (hits/50 points) - Shrubs	1										Double score out of 50 to get % 2% (NGCS)
	Native ground cover (hits/50 points) - other	11										Double score out of 50 to get % 12% (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10
	Ground (50 points)	11										(c) Double score
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m) 10m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)
		Eucalyptus										Proportion
		Eucalyptus										
Strata	Form	Species										Height range
Upper 1	T	eucalypt										1.0 - 20
Upper 2												
Mid 1												
Mid 2												
Lower 1	G	Loli										0.1
Lower 2	G	Austrodath. - v. grazed										0.1

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

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Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 74
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Ref Site ID	Bowdens	Recorders	KR MH	Date	31 / 10 / 14
Wapoint/ Plot ID	206/207	Easting *	St: 768211 End: 768225	Northing*	St: 6385780 End: 6383828
GPS datum	WGS 84	Photo no. (Camera)	St: 151, 152 End: 153, 156	Plot orient/ Slope/Aspect	45° NE 5° 145° NE

\* Record from Easting and Northing from both ends of the 50m transect

UTM 55H

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	323 - Red stringy bark inland scrubby gum		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)	M-G	Habitat Features	logs, leaf litter.

20 x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required)										(19) (NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	20	20	20	15	20	20	25	20	15	5	Sum / 10	15 % (NOS)
	Native mid-storey cover (%)	0	5	5	15	7	5	0	5	10	2	Sum / 10	5.4 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	111										Double score out of 50 to get %	6 % (NGCG)
	Native ground cover (hits/50 points) - Shrubs	1										Double score out of 50 to get %	2 % (NGCS)
	Native ground cover (hits/50 points) - other	111 M1										Double score out of 50 to get %	16 % (NGCO)
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10 (a)	Sum exotic cover (%) from (a)+(b)+(c)  6 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	Sum/10 (b)	
	Ground (50 points)	0											
20m x 50m Quadrat	Number of trees with hollows	1										Total length fallen logs >10cm width (m)	45m
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)		Proportion				
		Euca ross	Y	Euca poly	N								
		Call emul	Y										
		Euca macr	N										
Strata	Form	Species					Height range		PFC				
Upper 1	T	Euca rossii					8-15		30				
Upper 2	T	Euca poly					10-12		5				
Mid 1	S	Acac raeb					0.8-2		2				
Mid 2	S	Pers line					0.2-2.5		5				
Lower 1	F	Loma fili					0.2-0.3		20				
Lower 2	G	Aust scrub					0.2-0.4		5				

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	74	Site Name	Bowdens	Date	3/10/14				
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1	Euca ross	T	30	50					
2	Call endl	T	1	4					
3	Euca macr	T	2	1					
4	Euca poly	T	5	3					
5									
6									
7									
8									
MIDSTOREY									
9	Acac caes	S	2	10					
10	Pers line	S	5	5					
11	Leuc multi	S	1	2					
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Loma mult	F	5	100					
24	Loma All con	F	20	500					
25	Aust scrub	G	5	500					
26	Lira shag	S	1	50					
27	Chei scrub	E	1	50					
28	Hibb obitu	S	1	20					
29	Ans ramo	G	1	50					
30	Ento shr	G	2	100					
31	Dian long	F	1	20					
32	Styp trif	S	1	5					
33	Phyl hirt	S	1	5					
34	Hibb elli	S	1	10					
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45	TOTAL								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%;

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)



Plot#	69	Site Name	Bowdens	Date	30/10/14			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
<b>OVERSTOREY</b>								
1	Eucalyptus	T	25	50				
2								
3								
4								
5								
6								
7								
8								
<b>MIDSTOREY</b>								
9	Amphiphaea	S	1	1				
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
<b>GROUND COVER / other</b>								
23	Austrobaileya	G	5	50	Paro. bratis	F	1	100
24	Juncus usit	R	1	100	Plan. lane	F	1	100
25	Calo. cane	F	5	500	Hypo radi	F	2	100
26	Mier. strip	G	1	50	Bromus (big)	G	5	500
27	Vittadinia cane	F	1	50	Vulpia. myuros	G	5	500
28	Geranium sp.	F	1	50	Medicago (big)	F	1	100
29	Flora nula	F	1	10	Sporobolus	G	1	50
30	Plectanthus 2grau	F	1	2	Pennis sp.	F	1	10
31	Calycine. tabat	F	1	2	Sonch. glav	F	1	50
32	Chel. sp.	E	1	1	Petrovaphia	F	1	10
33	Junc. pall.	G	1	50	Trif. ane	F	2	100
34	Aris. ramo	G	1	50	Loli. pass	G	20	1000
35					Senecio (dissected)	F	1	50
36					Cirs. vulg	F	1	5
37								
38								
39								
40								
41								
42								
43								
44								
45	TOTAL			14				

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

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Eco Logical Australia - Biobank plot data sheet	Site Sheet No.
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Ref Site ID	27	Recorders	AC	Date	29/10/2019
Wapoint/ Plot ID	S→40 E→39	Easting *	St: 0769990 End: 0769891	Northing*	St: 6389697 End: 6389699
GPS datum		Photo no. (Camera)	St: 6980989 End: 6980981	Plot orient/ Slope/Aspect	255° -21/195°

\* Record from Easting and Northing from both ends of the 50m transect

### Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	PTC → 2T7		
Ancillary Code (Usually condition description)	Scattered trees		
Condition (Low or Mod-Good)		Habitat Features	-

20 x 20m Quadrat	Number of native plant species	Use species list over page (full id is not required)										15	(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NOS)
	Native mid-storey cover (%)	0	0	0	0	0	0	0	0	0	0	0	Sum / 10	0 % (NMS)
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses											Double score out of 50 to get %	64 % (NGCG)	
	Native ground cover (hits/50 points) - Shrubs											Double score out of 50 to get %	0 % (NGCS)	
	Native ground cover (hits/50 points) - other											2 Double score out of 50 to get %	4 % (NGCO)	
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  62 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0	(b) Sum/10	
	Ground (50 points)											(c) Double score		
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	0	
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone										Regen (Y/N) (indiv. <5cm?)	Proportion	
		Ang. Flox										Y	2/2	
		E. Blaki										Y		
Strata	Form	Species										Height range	PFC	
Upper 1		-												
Upper 2		-												
Mid 1		-												
Mid 2		-												
Lower 1		Poa										<50cm	25%	
Lower 2		Vulp sp										<50cm	20%	

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Plot#	27	Site Name	Bowdens	Date	29/10/14
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Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)		F	C	A
OVERSTOREY									
1									
2									
3									
4									
5									
6									
7									
8									
MIDSTOREY									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
GROUND COVER / other									
23	Wurm disc	F	1	20	Hype porj	F	1	20	
24	Rytido sp	G	15	500	Vulp sp	G	20	1000	
25	Dahl sp	F	1	1	Hype rad	F	20	1000	
26	Poa sp	G	25	500	Trif comp	F	2	500	
27	Rumex brown	F	1	1	Loli lig	G	1	100	
28	Oxalis sp	F	1	10	Plant lola	G	1	50	
29	Argo flar	T	1	7	Trif dmb	F	1	50	
30	Cypho lavis	F	1	2	Rest nant	F	1	100	
31	Loma mult	F	1	2	Poa rad	G	5	100	
32	Elym scab	G	1	20	Aira sp	G	1	100	
33	Eula spha	F	1	2	Griza mind	G	1	50	
34	Carex spp	V	1	1	Poa bras	F	1	1	
35	Drach sp	F	1	1	Trif ane	F	1	5	
36	Panicum sp	G	1	1	Cent lara	F	1	10	
37	Micro sity	G	5	500	Oxalis sp	F	1	10	
38					Acet vulg	F	1	10	
39					Stac ane	F	1	10	
40					Woolly clover	F	1	1	
41					Wormee lise	F	1	20	
42					Cent sp	F	1	20	
43					echi plant	F	1	1	
44					Phedris sp	G	1	1	
45					Site call	F	1	1	

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

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Eco Logical Australia - Biobank plot data sheet	Site Sheet No. 75
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Ref Site ID	Bowdens	Recorders	MH KR	Date	31/OCT/2014
Wapoint/ Plot ID	208/209	Easting *	St: 768310 End: 768352	Northing*	St: 6385468 End: 6385439
GPS datum	WGS 84	Photo no. (Camera)	St: 157, 158 End: 159, 160	Plot orient/ Slope/Aspect	120° SE 12° 120° NE

\* Record from Easting and Northing from both ends of the 50m transect

## Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	323 - Red Stringy - Inland Scrubby		
Ancillary Code (Usually condition description)	Intact		
Condition (Low or Mod-Good)	M-G	Habitat Features	logs, open (sun) area

20 x 20m Quadrat		Number of native plant species		Use species list over page (full Id is <u>not</u> required)										(NPS)	
50m Transect - 10 Points	Native over- storey cover (%)	30	30	40	30	10	25	40	30	40	40	Sum / 10	31.5 % (NOS)		
	Native mid-storey cover (%)	0	2	2	5	0	2	2	5	0	0	Sum / 10	1.8 % (NMS)		
50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	11										Double score out of 50 to get %	4 % (NGCG)		
	Native ground cover (hits/50 points) - Shrubs	11										Double score out of 50 to get %	4 % (NGCS)		
	Native ground cover (hits/50 points) - other	11										Double score out of 50 to get %	6 % (NGCO)		
50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(a) Sum/10	Sum exotic cover (%) from (a)+(b)+(c)  0 %		
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	(b) Sum/10			
	Ground (50 points)	0										(c) Double score			
20m x 50m Quadrat	Number of trees with hollows	2					Total length fallen logs >10cm width (m)					83			
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone							Regen (Y/N) (indiv. <5cm?)			Proportion			
		Eucalyptus			N	Eucalyptus			N						
		Callery			Y										
		Eucalyptus			N										
Strata	Form	Species							Height range			PFC			
Upper 1	T	Eucalyptus							12-18			15			
Upper 2	T	Eucalyptus							15			3			
Mid 1	S	Persicaria							0.5-4			5			
Mid 2	S	Leuc. muti							0.6-1.5			4			
Lower 1	F	Good hedge							0.05-0.1			5			
Lower 2	G	Must. scrub							0.05-0.1			2			
Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad															



Plot#	FS	Site Name	Bowdens	Date	31 Oct 2019			
Natives (20m Quadrat)		F	C	A	Exotics (20m Quadrat)	F	C	A
OVERSTOREY								
1	Call endl	T	3	3				
2	Euca nuss	T	15	20				
3	Euca poly	T	3	1				
4	Euca macr	T	2	1				
5								
6								
7								
8								
MIDSTOREY								
9	Acac caes	S	3	10				
10	Leuc mult	S	4	10				
11	Pers line	S	5	5				
12	Olearia (ex. ball) small leaves	S	3	20				
13	microphylla							
14								
15								
16								
17								
18								
19								
20								
21								
22								
GROUND COVER / other								
23	Hibb obtu	S	1	20				
24	Good hede	F	5	500				
25	Aust scab	G	2	100				
26	Loma mult	F	1	20				
27	Vitt cane	F	1	10				
28	Styp mf	S	1	10				
29	olea eli	S	1	3				
30	Aris ramo	G	1	50				
31	Liss strig	S	1	20				
32	Loma Fili Fili	F	1	50				
33	Acac ulic	S	1	3				
34	Hibb eli	S	1	5				
35	Cheisieb	E	1	10				
36	Pora mifer	F	1	20				
37								
38								
39								
40								
41								
42								
43								
44	TOTAL			22				
45								

\* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: \* (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

\* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

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# **Annexure 4**

## **Flora Species Recorded**

(Total No. of pages including blank pages = 6)

Comprehensive vegetation and flora surveys by EnviroKey and ELA have identified a total of 370 flora species within the Study Area being:

- 267 species of native flora
- 103 species of exotic flora (weeds)

The full flora list is provided in **Table A4**.

In addition, one threatened flora species was recorded by Bowdens Silver on-site personnel. This was Silky Swainson-pea (*Swainsona sericea*) that occurs within the Study Area, but outside of the BAR footprint. These records have been included within this BAR.

**Table A4**  
**Flora Species Recorded within the Study Area by EnviroKey and ELA**

Page 1 of 5

Scientific Name	Common Name
<b>Natives</b>	
<i>Acacia ausfeldii</i>	Ausfeld's Wattle
<i>Acacia buxifolia</i>	Box-leaved Wattle
<i>Acacia caesiella</i>	Tableland Wattle
<i>Acacia dealbata</i>	Silver Wattle
<i>Acacia deanei</i>	Green Wattle
<i>Acacia decora</i>	Western Silver Wattle
<i>Acacia elongata</i>	Swamp Wattle
<i>Acacia filicifolia</i>	Fern-leaved Wattle
<i>Acacia implexa</i>	Hickory Wattle
<i>Acacia leucoclada</i>	Northern Silver Wattle
<i>Acacia linearifolia</i>	Narrow-leaved Wattle
<i>Acacia obtusifolia</i>	Blunt Leaf Wattle
<i>Acacia</i> sp.	
<i>Acacia stricta</i>	Straight Wattle
<i>Acacia triptera</i>	Spurwing Wattle
<i>Acacia ulicifolia</i>	Prickly Moses
<i>Acacia filicifolia</i>	Fern-leaved Wattle
<i>Acaena echinata</i>	
<i>Acaena novae-zelandiae</i>	Bidgee-widgee
<i>Acaena ovina</i>	Acaena
<i>Acaena</i> sp.	
<i>Actinotus helianthi</i>	Flannel Flower
<i>Adiantum aethiopicum</i>	Common Maidenhair
<i>Allocasuarina verticillata</i>	Drooping Sheoak
<i>Amyema pendula</i>	Mistletoe
<i>Amyema</i> sp.	
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Aristida jerichoensis</i>	Jericho Wire Grass
<i>Aristida ramosa</i>	Purple Wiregrass
<i>Arthropodium minus</i>	Small Vanilla Lily
<i>Asperula conferta</i>	Common Woodruff
<i>Asperula</i> sp.	

Scientific Name	Common Name
<b>Natives</b>	
<i>Oxalis perennans</i>	
<i>Ozothamnus diosmifolius</i>	White Dogwood
<i>Pandorea pandorana</i>	Wonga Wonga Vine
<i>Patersonia sericea</i>	Silky Purple-flag
<i>Persicaria prostrata</i>	Creeping Knotweed
<i>Persoonia linearis</i>	Narrow-leaved Geebung
<i>Philotheca salsolifolia</i>	
<i>Phyllanthus hirtellus</i>	Thyme Spurge
<i>Pimelea linifolia</i>	Slender Rice Flower
<i>Plantago debilis</i>	Shade Plantain
<i>Plantago varia</i>	
<i>Platysace lanceolata</i>	Shrubby Platysace
<i>Plectranthus graveolens</i>	
<i>Poa labillardierei</i>	Tussock
<i>Poa meionectes</i>	
<i>Poa sieberiana</i>	Snowgrass
<i>Podolobium ilicifolium</i>	Prickly Shaggy Pea
<i>Pomaderris angustifolia</i>	
<i>Pomaderris eriocephala</i>	
<i>Pomaderris ferruginea</i>	Rusty Pomaderris
<i>Pomax umbellata</i>	Pomax
<i>Poranthera microphylla</i>	Small Poranthera
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
<i>Pteridium esculentum</i>	Bracken Fern
<i>Pterostylis bicolor</i>	Black-tip Greenhood
<i>Pterostylis mutica</i>	
<i>Pterostylis</i> sp.	
<i>Pultenaea foliolosa</i>	Small-leaf Bush-pea
<i>Pultenaea microphylla</i>	
<i>Pultenaea retusa</i>	Notched Bush-pea
<i>Ranunculus</i> sp.	
<i>Rubus parvifolius</i>	Native Raspberry



**Table A4 (Cont'd)**  
**Flora Species Recorded within the Study Area by EnviroKey and ELA**

Page 2 of 5

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Asplenium flabellifolium	Necklace Fern
Asteracea unknown	
Astroloma humifusum	Native Cranberry
Atriplex spinibracteata	A Saltbush
Austrostipa bigeniculata	
Austrostipa scabra	Speargrass
Austrostipa sp.	
Austrostipa verticillata	Slender Bamboo Grass
Babingtonia sp.	
Baumea / Chorizandra sp.	
Baumea sp.	
Billardiera scandens	Hairy Apple Berry
Bossiaea foliosa	
Bothriochloa macra	Red Grass
Brachychiton populneus	Kurrajong
Brachyloma daphnoides	Daphne Heath
Brachyscome multifida	
Brachyscome sp.	
Bulbine bulbosa	
Bulbine sp.	
Bursaria spinosa	Native Blackthorn
Caladenia sp	
Calandrinia eremaea	
Callitris endlicheri	Black Cypress Pine
Calotis cuneifolia	Purple Burr-daisy
Calotis lappulacea	Yellow Burr-daisy
Calotis sp.	
Calytrix tetragona	Common Fringe-myrtle
Camaesyce drummondii	Caustic Weed
Carex appressa	Tall Sedge
Carex inversa	
Carex sp.	
Cassinia arcuata	Sifton Bush
Cassinia quinquefaria	
Cassytha pubescens	Downy Dodder-laurel
Cheilanthes distans	Bristly Cloak Fern
Cheilanthes sieberi	Rock Fern
Chiloglottis / Calochilus sp.	
Chloris truncata	Windmill Grass
Chrysocephalum apiculatum	Common Everlasting

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Rumex brownii	Swamp Dock
Rytidosperma caespitosum	Ringed Wallaby Grass
Rytidosperma caespitosum	Wallaby Grass
Rytidosperma laeve	Wallaby Grass
Rytidosperma pallidum	Redanther Wallaby Grass
Rytidosperma racemosum	Wallaby Grass
Rytidosperma sp.	Wallaby Grass
Rytidosperma tenuius	A Wallaby Grass
Sannantha cunninghamii	
Schoenus apogon	Fluke Bogrush
Senecio hispidulus	Hill Fireweed
Senecio prenanthoides	
Senecio quadridentatus	Cotton Fireweed
Sida corrugata	Corrugated Sida
Sigesbeckia orientalis	
Silene dioica	
Solanum campanulatum	
Solanum cinereum	
Solanum linearifolium	Mountain Kangaroo Apple
Solanum prinophyllum	Forest Nightshade
Solenogyne dominii	
Sporobolus creber	Slender Rat's Tail Grass
Sporobolus indeterminate sp.	
Stackhousia monogyna	
Stellaria pungens	
Stellaria pungens	Prickly Starwort
Stylidium laricifolium	Giant Triggerplant
Stylidium lineare	Narrow-leaved Triggerplant
Stypandra glauca	Nodding Blue Lily
Styphelia triflora	Pink Five-corners
Swainsona galegifolia	Smooth Darling-pea
Swainsona monticola	Notched Swainson-pea
Thelymitra sp.	
Themeda australis	Kangaroo Grass
Themeda triandra	Kangaroo Grass
Tricoryne elatior	Yellow Autumn-lily
Triptilodiscus pygmaeus	Common Sunray
Urtica incisa	Stinging Nettle
Veronica plebeia	Trailing Speedwell
Viola betonicifolia	Native Violet

**Table A4 (Cont'd)**  
**Flora Species Recorded within the Study Area by EnviroKey and ELA**

Page 3 of 5

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Chrysocephalum semipapposum	Clustered Everlasting
Clematis aristata	Old Man's Beard
Clematis sp.	
Convolvulus erubescens	Blushing Bindweed
Crassula sp.	
Cymbonotus lawsonianus	Bears Ears
Cymbopogon refractus	Barbed Wire Grass
Cynodon dactylon	Common Couch
Cynoglossum australe	
Cynoglossum sp.	
Cyperus sp.	
Dampiera purpurea	
Daucus glochidiatus	Native Carrot
Daviesia genistifolia	Broome Bitter Pea
Desmodium brachypodium	Large Tick-trefoil
Desmodium sp.	
Desmodium varians	Slender Tick-trefoil
Dianella longifolia	Blueberry Lilly
Dianella revoluta	Blueberry Lilly
Dianella sp.	
Dichelachne sp.	
Dichondra repens	Kidney Weed
Dichopogon fimbriatus	Nodding Chocolate Lilly
Dichopogon sp.	
Digitaria ramularis	Finger Panic Grass
Dillwynia sp.	
Diuris sp.	
Dodonaea viscosa subsp. Angustifolia	Sticky Hop-bush
Dodonaea viscosa subsp. Spatulata	
Drosera spatulata	
Echinopogon caespitosus	Bushy Hedgehog Grass
Echinopogon ovatus	Forest Hedgehog Grass
Einadia hastata	Berry Saltbush
Einadia nutans	Climbing Saltbush
Einadia trigonos	Fishweed
Elymus scaber	Common Wheatgrass
Entolasia stricta	Wiry Panic
Eragrostis brownii	Brown's Lovegrass
Eragrostis leptostachya	Paddock Lovegrass
Eucalyptus agglomerata	Blue-leaved Stringybark

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Vittadinia cuneata	Fuzzweed
Vittadinia gracilis	Woolly New Holland Daisy
Wahlenbergia communis	Tufted Bluebell
Wahlenbergia gracilis	Sprawling Bluebell
Wahlenbergia sp.	
Wahlenbergia stricta	Tall Bluebell
Wurmbea dioica	Early Nancy
Zieria sp.	
Zornia dyctiocarpa var. dyctiocarpa	Zornia
EXOTICS	
Acetosella vulgaris	Sorrel
Ailanthus altissima	Tree of Heaven
Aira caryophyllea	Silvery Hairgrass
Aira sp.	
Anagallis arvensis	
Anthoxanthum odoratum	Sweet Veral Grass
Apiacaea sp.	
Arctotheca calendula	Capeweed
Avena fatua	Wild Oats
Avena sp.	Oats
Bidens pilosa	Cobblers Pegs
Brassica sp.	
Briza maxima	Quaking Grass
Briza minor	Small Shivery Grass
Bromus catharticus	Prairie Grass
Bromus diandrus	Great Brome
Bromus hordaceus	Soft Brome
Bromus sp.	
Carduus tenuiflorus	Winged Slender Thistle
Carthamus lanatus	Saffron Thistle
Cenchrus incertus	Spiny Burr Grass
Centaurea melitensis	Maltese Cockspur
Centaurea erythraea	Common Centaury
Centaurea sp.	
Cerastium glomeratum	Mouse-ear Chickweed
Chloris gayana	Rhodes Grass
Chondrilla juncea	Skeleton Weed
Cirsium vulgare	Spear Thistle
Conyza bonariensis	Flaxleaf Fleabane
Cyclospermum leptophyllum	Slender Celery

**Table A4 (Cont'd)**  
**Flora Species Recorded within the Study Area by EnviroKey and ELA**

Page 4 of 5

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Eucalyptus albens	White Box
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus bridgesiana	Apple Box
Eucalyptus crebra	Narrow-leaved ironbark
Eucalyptus goniocalyx	Long-leaved Box
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus melliodora	Yellow Box
Eucalyptus microcarpa	Western Grey Box
Eucalyptus polyanthemus	Red Box
Eucalyptus rossii	Inland Scribbly Gum
Eucalyptus sideroxylon	Mugga Ironbark
Eucalyptus sparsifolia	Narrow-leaved Stringybark
Eucalyptus viminalis	Ribbon Gum
Euchiton sp.	A Cudweed
Euchiton sphaericus	Star Cudweed
Eutrepus latifolius	Wombat Berry
Exocarpos strictus	Dwarf Cherry
Fimbristylis dichotoma	Common Fringe-sedge
Galium gaudichaudii	
Galium propinquum	Maori Bedstraw
Galium sp.	
Geitonoplesium cymosum	
Geranium homeanum	
Geranium solanderi	Native Geranium
Glycine clandestina	Twining glycine
Glycine tabacina	
Gonocarpus elatus	
Gonocarpus tetragynus	
Goodenia hederacea	Ivy Goodenia
Goodenia sp.	
Grevillea triternata	
Haloragis heterophylla	Rough Raspwort
Hardenbergia violacea	
Hibbertia acicularis	
Hibbertia obtusifolia	Hoary Guinea Flower
Hibbertia sp.	
Hovea linearis	
Hydrocotyle laxiflora	Stinking Pennywort
Hypericum gramineum	Small St John's Wort
Indigofera australis	Australian Indigo
Isotoma axillaris	Rock Isotome
Isotoma fluviatilis	Swamp Isotome
Juncus homalocaulis	

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Cynara cardunculus	Artichoke Thistle
Daucus sp.	Carrot
Digitaria sanguinalis	Crab Grass
Echium plantagineum	Patterson's Curse
Eleusine tristachya	Goose Grass
Eragrostis cilianensis	Stinkgrass
Eragrostis sp.	A Lovegrass
Erodium sp.	
Galium aparine	Goosegrass
Gamochaeta americana	Cudweed
Hirschfeldia incana	Hairy Brassica
Hordeum sp.	
Hypericum perforatum	St. Johns Wort
Hypochaeris radicata	Catsear
Lactuca serriola	Prickly Lettuce
Linum trigynum	
Lolium perenne	Rerennial Ryegrass
Lolium rigidum	Wimmera Ryegrass
Lysimachia arvensis	Scarlet Pimpernel
Malva parviflora	Small-flowered Mallow
Marrubium vulgare	White Horehound
Medicago lupulina	
Medicago sp.	A Medic
Modiola caroliniana	Red-flowered Mallow
Oenothera biennis	Evening Primrose
Onopordum acanthium	Scotch Thistle
Opuntia stricta var. stricta	Common Prickly Pear
Panicum effusum	Hairy Panic Grass
Paronychia brasiliensis	Chilean Whitlow Wort
Paspalum dilatatum	Paspalum
Pennisetum clandestinum	Kikuyu Grass
Petrorhagia nanteuillii	Proliferous Pink
Petrorhagia sp.	
Phalaris aquatica	Phalaris
Phalaris minor?	Lesser Canary Grass
Picris sp.	
Plantago lanceolata	Lamb's Tongues
Polycarpon tetraphyllum	Four-leaved Allseed
Polygonum aviculare	Wireweed
Rosa rubiginosa	Sweet Briar
Rubus anglocandicans	Blackberry
Rubus fruticosus sp. Agg.	Blackberry
Rumex crispus	Curled Dock

**Table A4 (Cont'd)**  
**Flora Species Recorded within the Study Area by EnviroKey and ELA**

Page 5 of 5

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Juncus sp.	
Juncus usitatus	
Lachnagrostis filiformis	
Lagenophora stipitata	Blue Bottle-daisy
Laxmannia gracilis	Slender Wire Lilly
Lepidosperma laterale	Variable Sword-sedge
Leptospermum squarrosum	
Leucopogon muticus	Blunt Beard-heath
Lindsaea linearis	Screw Fern
Linum marginale	Native Flax
Lissanthe strigosa	Peach Heath
Lomandra confertifolia	Mat-rush
Lomandra cylindrica	
Lomandra filiformis subsp. Coriacea	Wattle Matt-rush
Lomandra filiformis subsp. Filiformis	Wattle Matt-rush
Lomandra leucocephala	Woolly Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora	Many-flowered Mat-rush
Macrozamia communis	Burrawang
Melichrus erubescens	Ruby Urn Heath
Melichrus urceolatus	Urn-heath
Melicytus dentatus	Tree Violet
Mentha diemenica	Slender Mint
Microlaena stipoides	Weeping Grass
Microtis sp.	
Mitrasacme polymorpha	
Olearia elliptica	Sticky Daisy-bush
Olearia microphylla	
Opercularia diphylla	Stinkweed
Opercularia hispida	Hairy Stinkweed
Orchidaceae	

Scientific Name	Common Name
<b>Natives (Cont'd)</b>	
Senecio jacobaea	Ragwort
Senecio sp.	
Silene gallica	French Catchfly
Silybum marianum	Variegated Thistle
Sisyrinchium sp.	
Solanum nigrum	Black-berry Nightshade
Solvia sessilis	Bindii
Sonchus asper	Prickly Sowthistle
Sonchus oleraceus	Common Sowthistle
Sporobolus africanus	Parramatta Grass
Sporobolus indeterminate sp.	
Stachys arvensis	Stagger Weed
Stellaria media	Common Chickweed
Tolpis barbata	Yellow Hawkweed
Tolpis umbellata	
Trifolium angustifolium	Narrow-leaved Clover
Trifolium arvense	Haresfoot Clover
Trifolium campestre	Hop Clover
Trifolium dubium	Yellow Suckling Clover
Trifolium glomeratum	Clustered Clover
Trifolium repens	White Clover
Trifolium sp.	A Clover
Trifolium subterraneum	Subterranean Clover
Trifolium tomentosum	Woolly Clover
Urtica urens	Small Nettle
Verbascum thapsus subsp. Thapsus	Great Mullein
Verbena bonariensis	Purpletop
Vulpia myuros	Rat's Tail Fescue
Vulpia sp.	Rat's-tail Fescue
Setaria parviflora	Pigeon Grass



# **Annexure 5**

## **Fauna Species Recorded**

(Total No. of pages including blank pages = 6)

Comprehensive fauna surveys have identified a total of 168 fauna species within the Study Area being:

- 123 species of bird
- 21 species of mammal
- 18 species of reptile
- 6 species of frog.

The full fauna list is provided in **Table A5**.

In addition, two threatened fauna species have also been recorded by previous surveys by ELA. These were Eastern Cave Bat and Greater Broad-nosed Bat. These records have been included within this BAR.

**Table A5**  
**Fauna Species Recorded within the Study Area by EnviroKey**

Page 1 of 5

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Common Name	Scientific Name	Field Survey Period				
		Dec 2016	Feb 2017	Nov 2017	Feb 2019	Apr 2019
Birds						
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>		P	P		
Australasian Pipit	<i>Anthus novaeseelandiae</i>	P		P	P	
Australian King-Parrot	<i>Alisterus scapularis</i>		P	P		
Australian Magpie	<i>Cracticus tibicen</i>	P	P	P	P	P
Australian Raven	<i>Corvus coronoides</i>	P	P	P	P	P
Australian Swiftlet	<i>Aerodramus terrareginae</i>		P		P	
Australian Reed-Warbler	<i>Acrocephalus australis</i>			P		P
Australian Wood Duck	<i>Chenonetta jubata</i>	P	P		P	P
<b>Barking Owl</b>	<b><i>Ninox connivens</i></b>		<b>P</b>			
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	P	P	P	P	P
Black-shouldered Kite	<i>Elanus axillaris</i>			P		
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>			P		
Brown Falcon	<i>Falco berigora</i>	P		P	P	P
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	P		P		P
Brown Thornbill	<i>Acanthiza pusilla</i>	P	P			
<b>Brown Treecreeper</b>	<b><i>Climacteris picumnus</i></b>	<b>P</b>				<b>P</b>
Brush Cuckoo	<i>Cacomantis variolosus</i>	P	P			
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>		P			
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	P		P		
Common Bronzewing	<i>Phaps chalcoptera</i>	P	P	P		P
Common Starling	<i>Sturnus vulgaris</i>	P	P	P	P	P
Crescent Honeyeater	<i>Phylidonyris pyrrhopterus</i>			P		
Crested Pigeon	<i>Ocyphaps lophotes</i>	P		P	P	P
Crested Shrike-tit	<i>Falcunculus frontatus</i>	P				
Crimson Rosella	<i>Platycercus elegans</i>		P		P	
<b>Diamond Firetail</b>	<b><i>Stagonopleura guttata</i></b>	<b>P</b>	<b>P</b>	<b>P</b>	<b>P</b>	<b>P</b>
(P=present) (bold=threatened or migratory species)						

**Table A5 (Cont'd)**  
**Fauna Species Recorded within the Study Area by EnviroKey**

Page 2 of 5

Common Name	Scientific Name	Field Survey Period				
		Dec 2016	Feb 2017	Nov 2017	Feb 2019	Apr 2019
Birds (Cont'd)						
Dollarbird	<i>Eurystomus orientalis</i>	P	P	P		
Double-barred Finch	<i>Taeniopygia bichenovii</i>	P		P	P	P
Dusky Woodswallow	<i>Artamus cyanopterus</i>	P	P	P	P	P
Eastern Koel	<i>Eudynamys orientalis</i>			P		
Eastern Rosella	<i>Platycercus eximius</i>	P	P	P	P	P
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	P	P	P		
Eastern Whipbird	<i>Psophodes olivaceus</i>	P				
Eastern Yellow Robin	<i>Eopsaltria australis</i>	P	P			
Emu	<i>Dromaius novaehollandiae</i>					P
Fairy Martin	<i>Petrochelidon ariel</i>	P				
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	P			P	
Galah	<i>Eolophus roseicapillus</i>	P	P	P	P	P
Golden Whistler	<i>Pachycephala pectoralis</i>				P	P
Grey Butcherbird	<i>Cracticus torquatus</i>	P	P	P	P	P
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	P	P	P	P	
Grey Fantail	<i>Rhipidura albiscapa</i>	P	P		P	P
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	P	P	P	P	P
Grey Teal	<i>Anas gracilis</i>		P			
Hooded Robin	<i>Melanodryas cucullata</i>	P		P	P	
Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>				P	
Jacky Winter	<i>Microeca fascinans</i>	P	P	P		P
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	P	P	P	P	P
Leaden Flycatcher	<i>Myiagra rubecula</i>	P		P		
Lewin's Honeyeater	<i>Meliphaga lewinii</i>	P				
Little Corella	<i>Cacatua sanguinea</i>	P				
Little Friarbird	<i>Philemon citreogularis</i>			P	P	P
Little Raven	<i>Corvus mellori</i>	P	P	P		P
Magpie-lark	<i>Grallina cyanoleuca</i>	P	P	P	P	P
Masked Lapwing	<i>Vanellus miles</i>	P			P	P
Masked Woodswallow	<i>Artamus personatus</i>	P		P		
Mistletoebird	<i>Dicaeum hirundinaceum</i>	P		P	P	P
Musk Lorikeet	<i>Glossopsitta concinna</i>	P		P		
Nankeen Kestrel	<i>Falco cenchroides</i>	P	P	P	P	P
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	P				
Noisy Friarbird	<i>Philemon corniculatus</i>	P	P	P	P	P
Noisy Miner	<i>Manorina melanocephala</i>	P	P	P	P	P
Olive-backed Oriole	<i>Oriolus sagittatus</i>	P	P	P		
Pacific Black Duck	<i>Anas superciliosa</i>					P
Painted Button-quail	<i>Turnix varius</i>	P				
(P=present) (bold=threatened or migratory species)						

**Table A5 (Cont'd)**  
**Fauna Species Recorded within the Study Area by EnviroKey**

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Common Name	Scientific Name	Field Survey Period				
		Dec 2016	Feb 2017	Nov 2017	Feb 2019	Apr 2019
Birds (Cont'd)						
Peaceful Dove	<i>Geopelia striata</i>	P	P	P	P	
Pied Butcherbird	<i>Cracticus nigrogularis</i>	P	P	P	P	P
Pied Currawong	<i>Strepera graculina</i>	P	P	P	P	P
<b>Rainbow Bee-eater</b>	<b><i>Merops ornatus</i></b>	<b>P</b>		<b>P</b>		<b>P</b>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>		P	P	P	
Red Wattlebird	<i>Anthochaera carunculata</i>	P	P	P		P
Red-browed Finch	<i>Neochmia temporalis</i>	P		P		P
Red-rumped Parrot	<i>Psephotus haematonotus</i>	P	P	P	P	P
Restless Flycatcher	<i>Myiagra inquieta</i>	P		P	P	
Rockwarbler	<i>Origma solitaria</i>	P	P			
Rufous Songlark	<i>Cincloramphus mathewsi</i>	P		P	P	
Rufous Whistler	<i>Pachycephala rufiventris</i>	P	P	P	P	P
Sacred Kingfisher	<i>Todiramphus sanctus</i>	P		P		
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	P				P
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>		P			
<b>Scarlet Robin</b>	<b><i>Petroica boodang</i></b>	<b>P</b>				
Silvereye	<i>Zosterops lateralis</i>	P	P			
Southern Boobook	<i>Ninox novaeseelandiae</i>	P				
Southern Whiteface	<i>Aphelocephala leucopsis</i>		P			
<b>Speckled Warbler</b>	<b><i>Chthonicola sagittate</i></b>		<b>P</b>			<b>P</b>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>				P	
Spotted Pardalote	<i>Pardalotus punctatus</i>	P	P	P		
Spotted Quail-thrush	<i>Cinclosoma punctatum</i>	P				
Straw-necked Ibis	<i>Threskiornis spinicollis</i>		P	P	P	P
Striated Pardalote	<i>Pardalotus striatus</i>	P		P	P	
Striated Thornbill	<i>Acanthiza lineata</i>	P	P	P	P	P
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>			P		
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	P	P	P	P	P
Superb Fairy-wren	<i>Malurus cyaneus</i>	P	P		P	P
Superb Lyrebird	<i>Menura novaehollandiae</i>	P				
Tawny Frogmouth	<i>Podargus strigoides</i>	p				P
Tree Martin	<i>Petrochelidon nigricans</i>					P
<b>Varied Sittella</b>	<b><i>Daphoenositta chrysoptera</i></b>	<b>p</b>		<b>P</b>		
Variegated Fairy-wren	<i>Malurus lamberti</i>			P		
Wedge-tailed Eagle	<i>Aquila audax</i>	P		P	P	P
Weebill	<i>Smicrornis brevirostris</i>	P				
Welcome Swallow	<i>Hirundo neoxena</i>	P	P	P	P	P
Whistling Kite	<i>Haliastur sphenurus</i>				P	P
White-backed Swallow	<i>Cheramoeca leucosterna</i>	P				
(P=present) (bold=threatened or migratory species)						



**Table A5 (Cont'd)**  
**Fauna Species Recorded within the Study Area by EnviroKey**

Page 4 of 5

Common Name	Scientific Name	Field Survey Period				
		Dec 2016	Feb 2017	Nov 2017	Feb 2019	Apr 2019
Birds (Cont'd)						
White-browed Babbler	<i>Pomatostomus superciliosus</i>	P			P	
White-browed Scrubwren	<i>Sericornis frontalis</i>	P	P			
White-browed Woodswallow	<i>Artamus superciliosus</i>			P		
White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>					P
White-eared Honeyeater	<i>Lichenostomus leucotis</i>	P				P
White-faced Heron	<i>Egretta novaehollandiae</i>	P	P	P	P	P
White-naped Honeyeater	<i>Melithreptus lunatus</i>	P				
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>		P	P	P	P
White-throated Gerygone	<i>Gerygone albogularis</i>	P	P	P	P	
White-throated Needletail	<i>Hirundapus caudacutus</i>		P			
White-throated Treecreeper	<i>Cormobates leucophaea</i>	P	P	P	P	P
White-winged Chough	<i>Corcorax melanorhamphos</i>	P	P	P	P	P
White-winged Triller	<i>Lalage sueurii</i>			P		
Willie Wagtail	<i>Rhipidura leucophrys</i>	P	P	P	P	P
Yellow Thornbill	<i>Acanthiza nana</i>	P	P	P	P	P
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	P	P	P		
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	P	P	P	P	P
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>		P			
Zebra Finch	<i>Taeniopygia guttata</i>					P
Mammals						
Brown Hare	<i>Lepus capensis</i>	P				
Cat	<i>Felis catus</i>	P				
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	P	P	P		
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	P				P
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>		P			P
Common Wallaroo	<i>Macropus robustus</i>	P	P	P		
Common Wombat	<i>Vombatus ursinus</i>	P	P	P	P	
Eastern Bentwing Bat	<i>Miniopterus schreibersii oceanensis</i>	P				
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	P	P	P	P	P
Fox	<i>Vulpes vulpes</i>	P	P			
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	P	P	P		
Koala	<i>Phascolarctos cinereus</i>	P				
Large-eared Pied Bat	<i>Chalinobolus dwyeri</i>	P				
Little Forest Bat	<i>Vespadelus vulturnus</i>	P	P	P		
Pig	<i>Sus scrofa</i>	P				
Rabbit	<i>Oryctolagus cuniculus</i>	P		P	P	
Red-necked Wallaby	<i>Macropus rufogriseus</i>	P	P	P		
Sugar Glider	<i>Petaurus breviceps</i>					P
(P=present) (bold=threatened or migratory species)						

**Table A5 (Cont'd)**  
**Fauna Species Recorded within the Study Area by EnviroKey**

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Common Name	Scientific Name	Field Survey Period				
		Dec 2016	Feb 2017	Nov 2017	Feb 2019	Apr 2019
Mammals (Cont'd)						
Swamp Wallaby	<i>Wallabia bicolor</i>	P		P		
White-striped Freetail Bat	<i>Austronomus australis</i>	P	P	P		
Yellow-footed Antechinus	<i>Antechinus flavipes</i>	P	P			
Reptiles						
Blackish Blind Snake	<i>Anilius nigrescens</i>				P	
Boulenger's Snake-eyed Skink	<i>Morethia boulengeri</i>		P			
Copper-tailed Skink	<i>Ctenotus taeniolatus</i>				P	
Eastern Bearded Dragon	<i>Pogona barbata</i>			P		P
Eastern Brown Snake	<i>Pseudonaja textilis</i>			P		
Eastern Long-necked Turtle	<i>Chelodina longicollis</i>	P	P		P	P
Eastern Striped Skink	<i>Ctenotus robustus</i>				P	P
Grass Skink	<i>Lampropholis delicata</i>				P	P
Jacky Dragon	<i>Amphibolurus muricatus</i>			P	P	P
Lace Monitor	<i>Varanus varius</i>	P			P	
Lesueur's Velvet Gecko	<i>Amalosia lesueurii</i>				P	
Nobbi Dragon	<i>Diporiphora nobbi</i>					P
Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>				P	
Red-naped Snake	<i>Furina diadema</i>				P	
Shingleback	<i>Tiliqua rugosa</i>				P	
South-eastern Morethia Skink	<i>Morethia boulengeri</i>				P	
Southern Rainbow-skink	<i>Carlia tetradactyla</i>			P		P
Two-clawed Worm-skink	<i>Anomalopus leuckartii</i>				P	P
Amphibians						
Broad-palmed Rocket Frog	<i>Litoria latopalmata</i>	P				P
Chubby Gungan	<i>Uperoleia rugosa</i>			P		
Clicking Froglet	<i>Crinia signifera</i>	P				P
Eastern Gungan	<i>Uperoleia laevigata</i>	P				
Emerald-spotted Tree Frog	<i>Litoria peronii</i>	P				P
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>					P

# **Annexure 6**

## **EPBC Act Significant Impact Criteria**

(Total No. of pages including blank pages = 18)

Based on the analysis in **Table 30**, the following biota has been assessed against the significant impact criteria.

- Large-eared Pied Bat
- Regent Honeyeater
- Cattle Egret (migratory)
- Latham's Snipe (migratory)
- White-throated Needletail (migratory)
- Swift Parrot
- Rainbow Bee-eater (migratory)
- Spotted-tailed Quoll
- Koala
- Small Purple-pea
- Box-Gum Woodland

### Migratory species

Protected under several international agreements to which Australia is a signatory, Migratory species are considered Matters of National Environmental Significance under the EPBC Act. Two migratory species were recorded within the Study Area; namely the Rainbow Bee-eater and White-throated Needletail while two further species were found to be potentially impacted by the Project based on likelihood of occurrence with the Study Area; namely the Cattle Egret and Latham's Snipe (**Table 30**).

Under the EPBC Act, an action is likely to have a significant impact on a migratory species if it substantially modifies, destroys or isolates an area of 'important habitat' for the species (DEWHA, 2009). The Study Area is not considered to comprise 'important habitat' as it does not contain habitat:

- used by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species; or
- that is of critical importance to the species at particular life-cycle stages; or
- used by a migratory species that is at the limit of the species' range; or
- within an area where the species is declining.

Given this, the Project would not impact on Rainbow Bee-eater, White-throated Needletail, Latham's Snipe, Cattle Egret or any migratory species and are therefore not considered further.

### Threatened species and ecological communities

The Study Area and BAR footprint contains known habitat for four biota listed as threatened under the EPBC Act; namely Box-Gum Woodland, Koala, Large-eared Pied Bat and Spotted-tailed Quoll (quoll based on BioNET records). Two additional species have potential to be impacted by the Project based on the evaluation in **Table 30**. These being Swift Parrot and



Regent Honeyeater. The following section provides significance assessments against the significant impact criteria for these biota.

### **Critically endangered and endangered ecological communities (Box Gum Woodland)**

*Will the action reduce the extent of an ecological community?*

Box-gum Woodland (BGW) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*). Intact sites contain a high diversity of plant species including some shrub species, several climbing plant species, many grasses and a very high diversity of herbs (OEH, 2020c). It generally occurs on fertile lower parts of the landscape where resources such as water and nutrients are abundant (DECCW, 2011, NPWS, n.d, DEH, 2006, Burrows, 1999, Yates and Hobbs, 1997, Prober and Thiele, 1995). Sites that retain only a grassy groundlayer, with few or no trees remaining are considered important for rehabilitation and to rebuild connections between sites of better quality (OEH 2019c).

Three biometric vegetation types were recorded in the Study Area that are consistent with BGW, and parts of these (subject to specific identification criteria), meet the definition of the EPBC Act listed CEEC. The three BVT and their representation within the Study Area as the CEEC are detailed in **Table 24**. A total of 673.2 hectares of BGW occurs within the Study Area and the CEEC extends beyond the boundaries of the Study Area and into the locality.

The proposed action would result in the removal of about 147.82 hectares of Box-gum Woodland that meets with the EPBC Act criteria. However, in the context of the extent of this TEC, up to 519.2 hectares of BGW that also meets with the EPBC Act criteria would remain within the Study Area.

*Will the action fragment or increase fragmentation of an ecological community?*

Yes. The proposed action would result in the fragmentation of some areas of BGW within the Study Area based on the BAR footprint.

*Will the action adversely affect habitat critical to the survival of an ecological community?*

No. While about 147.82 hectares of BGW would be removed, up to 519.2 hectares of BGW that also meets with the EPBC Act criteria would remain within the Study Area.

*Will the action modify or destroy abiotic (non-living) factors necessary for an ecological communities survival, including reduction of groundwater levels or substantial alteration of surface water drainage patterns?*

The proposed action would result in the removal of 147.82 hectares of BGW. However, the proposed action is unlikely to modify or destroy any abiotic factors associated with the remaining areas of BGW that occur within the Study Area, or beyond the boundaries of the Study Area.

*Will the action cause a substantial change in species composition of an occurrence of an ecological community, including causing a decline or loss of functionality of important species?*

The BGW within the BAR footprints would be removed by the proposed action. However, there would be no modification to remaining BGW CEEC that would cause a decline in condition or composition assuming mitigation measures include adequate weed control.

*Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:*

- *Assisting invasive species, that are harmful to the listed ecological community, to become established?*
- *Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?*

Yes. About 147.82 hectares of BGW would be removed should the proposed action proceed. The proposed action has the potential to assist invasive species that are harmful to the CEEC, and it could cause mobilisation of chemicals or pollutants into the CEEC that could destroy or inhibit growth. Mitigation measures proposed within this BAR suggest that it is unlikely that these matters could reduce the potential of these to cause a substantial reduction in the quality or integrity of the occurrence of the CEEC. This is particularly important given that only about 22% of the total extent of BGW CEEC that occurs within the Study Area would be directly impacted.

*Will the action interfere with the recovery of an ecological community?*

Yes. The specific objective of the national recovery plan for BGW (DECCW, 2011) is to minimise the risk of extinction of the ecological community by:

- Achieving no net loss in extent and condition throughout its geographic distribution
- Increasing protection of sites with high recovery potential
- Increasing landscape functionality through management and restoration of degraded sites
- Increasing transitional areas around remnants and linkages between remnants
- Bringing about enduring changes in participating land managers attitudes and behaviours toward environmental protection and sustainable land management practices to increase extent, integrity and function of BGW.

Should the proposed action proceed, about 147.82 hectares of BGW would be removed, which equates to about 22% of the total extent of BGW CEEC within the Study Area. This interferes with the first objective of the national recovery plan. However, the CEEC does extend across the boundaries of the Study Area and into the locality, so the CEEC is reasonably well represented in the wider locality. This comment is based on the basis of personal observations rather than a reliance on broad-scale regional mapping by OEH, given that in our experience, this is largely inaccurate. Therefore, the extent of CEEC in the wider locality cannot be accurately quantified.

The BOS provides a framework to protect and manage in the long-term, areas of BGW CEEC in perpetuity that may have otherwise been subject to intense agricultural activity over time. This is consistent with the remaining objectives of the recovery plan.

## **Conclusion**

In the absence of any mitigation measures and biodiversity offsets, the Project is likely to have a significant impact on Box-Gum Woodland. The Applicant has made all reasonable attempts to avoid impacts to BGW where possible, through a substantial planning and design phase. A series of detailed mitigation measures are proposed within this BAR to minimise potential impacts to BGW (see Section 6). A suitable biodiversity offset strategy must be considered.

## **Koala (combined populations of QLD, NSW and ACT) (vulnerable species)**

*Will the action lead to a long-term decrease in the size of an important population of a species?*

Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (DotE, 2014, DECC, 2008). In NSW, it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It inhabits eucalypt woodlands and forests where it feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area would select preferred browse species. Home range of Koala is known to vary according to habitat quality and can range from two hectares to several hundred hectares.

Under the EPBC Act, an important population is defined as:

- Likely to be key source populations either for breeding or dispersal
- Likely to be necessary for maintaining genetic diversity, and/or
- At or near the limit of the species range.

The occurrence of two individuals within the Study Area are not at the limit of the species' distribution, nor are they likely to be key source populations for breeding and dispersal, or necessary for maintaining genetic diversity. As such, the Study Area can only be considered to represent a part of the range of widely occurring individuals. For these reasons, the proposed action would not lead to a long-term decrease in the size of an important population as one does not occur there.

*Will the action reduce the area of occupancy of an important population?*

No. This is not applicable as an important population is not present (see above).

*Will the action fragment an existing population into two or more populations?*

No. This is not applicable as an important population is not present (see above).

*Will the action adversely affect habitat critical to the survival of a species?*

No. Critical habitat is not listed for this species under the EPBC Act. Habitat critical for the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development

The proposed action would remove about 140.36 hectares of habitat that could be used by Koalas within the Study Area. This represents only a small proportion of the same habitats that also occur within the Study Area which total 460.1 hectares, that would be retained as well as higher quality habitats to the north and east of the Study Area (in the wider locality) that would remain unaffected. For these reasons, the removal of the habitat required for the proposed action would not be considered critical to the survival of this species.

*Will the action disrupt the breeding cycle of an important population?*

No. An important population is not present (see reasons above).

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. While it is acknowledged that the loss of 140.36 hectares of habitat that is suitable for Koala is a negative impact, in the context of the remaining habitats of the same vegetation types that remain within the Study Area (460.1 hectares remain), as well as the higher quality habitats to the north and east of the Study Area (defined by existing records) in the wider locality, it is unlikely to impact habitat to the extent that Koala is likely to decline.

*Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?*

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Koala would become further established than what already pre-exists in the Study Area or wider locality.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Koala would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

The overall objectives of the NSW Koala Recovery Plan are to:

- Reverse the decline of Koala in NSW
- Ensure adequate protection, management and restoration of Koala habitat
- Maintain healthy breeding populations of Koala throughout their current range (DECC, 2008).

The proposed action would be in conflict with the second objective above by removing 140.36 hectares of habitat that is suitable for Koala. However, it would also provide adequate protection of the same vegetation types within the Mine Site. Further, higher quality habitats where clusters of Koala records occur to the north and east of the Mine Site (**Map 6**) would remain unaffected by the proposed action.



## **Conclusion**

While two Koala have been recorded within the Study Area and the Project would result in the loss of 140.36 hectares of habitat that is suitable for Koala, the proposed action is unlikely to result in a significant impact due to the:

- Relatively localised nature of the BAR footprint when compared to the wider local and regional distribution of Koala
- Greater extent of habitat in the locality known to be used by Koala.

## **Large-eared Pied Bat (vulnerable species)**

*Will the action lead to a long-term decrease in the size of an important population of a species?*

Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from central QLD to the NSW Southern Highlands (OEH, 2020c, Churchill, 2008, Dywer, 1966). They generally occur in well-timbered habitats containing gullies, and roost in caves as well as crevices in cliffs. This species has been recorded in the Study Area during surveys by ELA (source unknown) and EnviroKey field survey with echolocation call recording. Large-eared Pied Bat are also known from previous records across the locality around Munghorn Gap Nature Reserve and in the north around Ulan (OEH, 2020a) (**Map 6**). The Study Area contains woodland foraging habitat for this species. However, the Large-eared Pied Bat is only listed as a species-credit species when there is potential breeding habitat for the species likely to be impacted. This species breeds in caves, rock crevices and disused mine shafts, none of which occur within the BAR footprint.

Under the EPBC Act, an important population is defined as:

- Likely to be key source populations either for breeding or dispersal
- Likely to be necessary for maintaining genetic diversity, and/or
- At or near the limit of the species range.

The Study Area contains only foraging habitat for Large-eared Pied Bat. Extensive cliffs, crevices and possibly caves in the sandstone country to the north (beyond the Study Area) would provide roosting and maternity habitat. The species occurs across eastern NSW so the Study Area is not at, or near the limit of its range.

For these reasons, the proposed action would not lead to a long-term decrease in the size of an important population as one does not occur there.

*Will the action reduce the area of occupancy of an important population?*

No. This is not applicable as an important population is not present (see above).

*Will the action fragment an existing population into two or more populations?*

No. This is not applicable as an important population is not present (see above).

*Will the action adversely affect habitat critical to the survival of a species?*

No. Critical habitat is not listed for this species under the EPBC Act. Habitat critical for the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development

The proposed action would remove about 381.84 hectares of potential foraging habitat that could be used by Large-eared Pied Bat within the Study Area. This represents only a small proportion of the same habitats that would be retained within the Study Area (1269 hectares), as well as higher quality habitats to the north and east of the Study Area (in the wider locality) that would remain unaffected. Additionally, microbats are regarded as highly mobile extending their foraging ranges over tens of kilometres (Barclay et al., 2000, Pavey and Burwell, 2004) enabling them to access areas of native vegetation across the locality.

For these reasons, the removal of the habitat required for the proposed action would not be considered critical to the survival of this species.

*Will the action disrupt the breeding cycle of an important population?*

No. An important population is not present (see reasons above).

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. It is acknowledged that the loss of 381.84 hectares of potential foraging habitat for Large-eared Pied Bat is a negative impact. However, in the context of the remaining habitats of the same vegetation types that remain within the Study Area (1269.5 hectares), as well as the higher quality habitats to the north of the Study Area in the wider locality, it is unlikely to impact habitat to the extent that Large-eared Pied Bat is likely to decline.

*Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?*

It is not likely that invasive species (such as introduced predators) that are potentially harmful to Large-eared Pied Bat would become further established than what already pre-exists in the Study Area or wider locality.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Large-eared Pied Bat would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

While there is no recovery plan for the Large-eared Pied Bat, there are a number of activities that have been identified to assist with their recovery (OEH, 2020c):

- Protect known and potential habitat from burning at too-frequent intervals
- Avoid damage to known roosting and maternity sites from mining activities and from recreational caving
- Reduce the use of pesticides
- Protect known and potential forest and woodland habitat around cliffs, rock overhangs and old mine workings from clearing and isolation
- Control goats to reduce disturbance to roosting sites.

The proposed action would not interfere with any of the recovery activities, but rather allow for protection of 1,269.5 hectares that would be retained in the Study Area. Habitats around cliff lines and rock overhangs to the north would remain unaffected by the proposed action.

## **Conclusion**

While Large-eared Pied Bat have been detected by echolocation call recording, the BAR footprint contains only potential foraging habitat. Potential roosting and maternity sites in rock outcrops, cliffs and crevices are outside of the Study Area and it is these sites, that are of the most importance to this species for long-term viability. For these reasons, the proposed action is unlikely to result in a significant impact to Large-eared Pied Bat.

## **Spotted-tailed Quoll (southeastern mainland population) (endangered species)**

*Will the action lead to a long-term decrease in the size of a population of a species?*

Spotted-tailed Quoll is considered a habitat generalist and is known to occur in a range of habitats including woodland, forest and rainforest. They occupy very large home ranges with females from between 200-500 hectares and males to over 4,000 hectares (OEH, 2020c). Individuals are known to use large, fallen hollow logs, caves, rock outcrops and rocky cliff faces as denning sites.

While not recorded by the comprehensive field surveys, two records of Spotted-tailed Quoll occur in relatively close proximity to the Study Area. The first, a roadkill male was found dead on Lue Road, 800 metres west of Lue Tip in 2017, while the second was on Maloneys Road near 'Bara Downs' about 5 kilometres north of the Mine Site in 2005. These records confirm the presence of a population in the general locality. With consideration of these factors, the Study Area and BAR footprint could form part of a home range for this species.

The Project would result in the removal of 381.84 hectares of native vegetation and potentially a portion of a home range for one or two individuals. However, the proposed action is unlikely to lead to a long-term decrease in the size of a population given that the relatively localised nature of the potential impact in the BAR footprints when compared to habitats within the Study Area and the wider locality, which are known to support this species.

*Will the action reduce the area of occupancy of the species?*

No. There is no evidence to suggest that a population relies solely upon the resources of the Study Area in its entirety particularly given the lack of records for this species during the comprehensive field survey. For this reason, the action is unlikely to reduce any area of occupancy to the detriment of this species.

*Will the action fragment an existing population into two or more populations?*

No population would be fragmented into two or more populations given the context of vegetation across the landscape and beyond the boundaries of the Study Area.

*Will the action adversely affect habitat critical to the survival of a species?*

No. Critical habitat is not listed for this species under the EPBC Act. Habitat critical for the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development

The proposed action would remove about 381.84 hectares of potential habitat that could be used by Spotted-tailed Quoll within the Study Area. This represents only a small proportion of the same habitats that would be retained within the Study Area (1,269 hectares), as well as higher quality habitats outside of the Study Area but within wider locality (and importantly, in proximity to the two previous records) that would remain unaffected. With such large home ranges, the Study Area is unlikely to be of critical importance. For these reasons, the removal of the habitat required for the proposed action would not be considered critical to the survival of this species.

*Will the action disrupt the breeding cycle of a population?*

No. Given the absence of rock outcrops, caves, rock overhangs and other suitable denning sites, the proposed action is unlikely to disrupt a breeding cycle of a population, particularly in context of habitats outside of the Study Area.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. It is acknowledged that the loss of 381.84 hectares of potential foraging habitat for Spotted-tailed Quoll is a negative impact. However, in the context of the remaining habitats of the same vegetation types that remain within the Study Area (1,269.5 hectares), as well as the higher quality habitats to the north, south and east of the Study Area in the wider locality, it is unlikely to impact habitat to the extent that Spotted-tailed Quoll is likely to decline particularly given that both previous records are beyond the boundaries of the Study Area.



*Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?*

It is not likely that invasive species (such as introduced predators) that are potentially harmful to Spotted-tailed Quoll would become further established than what already pre—exists in the Study Area or wider locality.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Spotted-tailed Quoll would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

While there is no recovery plan for the Spotted-tailed Quoll, there are a number of activities that have been identified to assist with their recovery (OEH, 2020c):

- Conserve old-growth forest stands and other areas of known habitat under perpetual, funded conservation agreements such as BioBanking agreements
- Identify and target restoration and revegetation projects to improve connectivity between large areas of habitat
- Implement (or augment) coordinated, cross-tenure, landscape scale predator control programs
- Monitor significant populations to investigate the impact of fox and wild dog baiting
- Modify poultry runs and aviaries based on best practice guidelines
- Incorporate methods to reduce the numbers of quolls killed at sections of roads where road kills are frequently reported
- Monitor survival of quolls in habitat newly colonised by cane toads.

The proposed action would not interfere with any of the recovery activities, but rather include a Biobanking or Stewardship agreement as part of the BOS for the Project.

## **Conclusion**

While Spotted-tailed Quoll has been detected within the generally vicinity of the Study Area, it has not been recorded within the BAR footprint despite comprehensive fauna surveys. Nonetheless, vegetation types within the BAR footprint contains only potential foraging habitat. Large expanses of woodland and forest remain within the Study Area and in the wider locality, important features at the landscape level. For these reasons, the proposed action is unlikely to result in a significant impact to Spotted-tailed Quoll.

## **Small Purple-pea (endangered species)**

*Will the action lead to a long-term decrease in the size of a population of a species?*

Small Purple-pea was historically recorded across the NSW South Western Slopes and Southern Highlands and adjacent ACT. While not recorded by the comprehensive field surveys over many years, a targeted threatened flora survey promoted by excellent

seasonal conditions, revealed the presence of a single population within the BAR footprint comprising of four plants. The species is also known from the wider locality from a number of populations including the Mudgee Lookout and along the Mudgee-Lue Road. These records confirm the presence of a population in the general locality and the National Recovery Plan for the species identifies the Wellington-Mudgee population as the most significant in NSW.

The Project would result in the removal of four individual Small Purple-pea. Known and managed sites outside of the BAR footprint would remain unaffected by the Project and given this, the proposed action is unlikely to lead to a long-term decrease in the size of a population in the wider locality, which are known to support this species.

*Will the action reduce the area of occupancy of the species?*

Yes. A small area (0.46 hectares) containing four plants would be impacted.

*Will the action fragment an existing population into two or more populations?*

No. The Mudgee-Wellington population is already highly fragmented.

*Will the action adversely affect habitat critical to the survival of a species?*

No. Critical habitat is not listed for this species under the EPBC Act. Habitat critical for the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development

The proposed action would remove four individual Small Purple-pea but it would be generally accepted that these four plants alone do not comprise plants critical to the survival of the species, nor that the habitat to be removed is critical to the survival of the species. For these reasons, the removal of the habitat required for the proposed action would not be considered critical to the survival of this species.

*Will the action disrupt the breeding cycle of a population?*

No. The wider population known the Mudgee district would be able to continue to reproduce unaffected by the Project. Four plants would be impacted and removed, and therefore, by nature of the Project would be disrupted.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. It is acknowledged that the loss of four individual Small Purple-pea is a negative impact. However, in the context of the known sites for this species in the Wellington-Mudgee population, it is unlikely to impact habitat to the extent that Small Purple-pea is likely to decline.

*Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?*

The only area of known habitat for Small Purple-pea within the BAR footprint would be removed. Comprehensive weed management would occur during the life of the Project and would therefore, not affect other known sites in the wider population outside of the Study Area.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Small Purple-pea would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

The National Recovery Plan identifies a number of actions for the species:

- Undertake additional survey in the vicinity of recently recorded sites
- Monitor all known sites
- Weed control
- Undertake ecological burns
- Negotiate improved management and/or formal protection of sites
- Continue research into the biological/ecological effects of fire
- Investigate potential sites suitable for enrichment planting or reestablishment.

The field surveys identified a previously unknown site for this species comprising only 4 plants. The proposed action would not interfere with any of the recovery activities, but rather include a Biobanking or Stewardship agreement as part of the BOS for the Project which would maintain and improve Small Purple-pea habitat, particularly in the context of the predictive modelling currently being prepared by AREA Environmental for the NSW State Government.

## Conclusion

The action would result in the removal of 4 Small Purple-pea located within a discrete area in the BAR footprint. The species is also known from the wider locality from a number of populations including the Mudgee Lookout and along the Mudgee-Lue Road. These records confirm the presence of a population in the general locality and the National Recovery Plan for the species identifies the Wellington-Mudgee population as the most significant in NSW.

However, it would be generally accepted that these four plants alone do not comprise plants critical to the survival of the species, nor that the habitat to be removed is critical to the survival of the species. For these reasons, the proposed action is unlikely to result in a significant impact to Small Purple-pea.

**Swift Parrot (critically endangered species)**

*Will the action lead to a long-term decrease in the size of a population of a species?*

Swift Parrot is a winter (March-September) visitor to southern and eastern New South Wales, where it inhabits eucalypt forests and woodlands (OEH, 2020c, Brereton et al., 2004, Mac Nally and Horrocks, 2000, BirdsAustralia, 2011, Saunders and Heinsohn, 2008). It feeds mostly on the flowers of eucalypts (particularly prolifically flowering species), but also eats psyllids and exotic fruits (Brereton et al., 2004, Mac Nally and Horrocks, 2000). This species is highly nomadic and relatively large numbers can arrive at and vacate areas depending on local and regional flowering of favoured species (Mac Nally and Horrocks, 2000). Comprehensive field surveys detected no Swift Parrot within the Study Area however, two records are known from the locality. The first at Munghorn Gap Nature Reserve in 1984 (no further details in BioNET) and the second near Ulan in 2014 where at least two individuals were recorded feeding in *Angophora floribunda* (OEH, 2020a).

The Project would result in the removal of 381.84 hectares of native vegetation and potentially, foraging habitat for Swift Parrot. However, at the landscape level (the most appropriate way to assess potential habitat for this species given that it is a migratory species), potential foraging habitat is well represented in the locality with more than 3,000 hectares of native vegetation remaining in the BAR landscape assessment circle and pipeline buffer.

However, the proposed action is unlikely to lead to a long-term decrease in the size of a population given that the relatively localised nature of the potential impact in the BAR footprint when compared to similar quality habitats within the Study Area and the wider locality.

*Will the action reduce the area of occupancy of the species?*

No. There is no evidence to suggest that a population relies solely upon the resources of the Study Area in its entirety particularly given the lack of records for this species during the comprehensive field survey. For this reason, the action is unlikely to reduce any area of occupancy to the detriment of this species.

*Will the action fragment an existing population into two or more populations?*

No population would be fragmented into two or more populations given the context of vegetation across the landscape and beyond the boundaries of the Study Area and the highly mobile nature of the species.

*Will the action adversely affect habitat critical to the survival of a species?*

No. Critical habitat is not listed for this species under the EPBC Act. Habitat critical for the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting or dispersal
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development



The proposed action would remove about 381.84 hectares of potential foraging habitat that could be used by Swift Parrot within the Study Area. This represents only a small proportion of the same habitats that would be retained within the Study Area (1,269 hectares), as well as higher quality habitats outside of the Study Area but within wider locality that would remain unaffected. Being such a highly mobile species, the Study Area is unlikely to be of critical importance. For these reasons, the removal of the habitat required for the proposed action would not be considered critical to the survival of this species.

*Will the action disrupt the breeding cycle of a population?*

No. Swift Parrot breed only in Tasmania so the proposed action would not disrupt this.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. It is acknowledged that the loss of 381.84 hectares of potential foraging habitat for Swift Parrot is a negative impact. However, in the context of the remaining habitats of the same vegetation types that remain within the Study Area (1,269.5 hectares), as well as the higher quality habitats to the north, south and east of the Study Area in the wider locality, it is unlikely to impact habitat to the extent that Swift Parrot is likely to decline, particularly given that they occur across east NSW when on the mainland.

*Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?*

It is not likely that invasive species (such as introduced predators) that are potentially harmful to Swift Parrot would become further established than what already pre-exists in the Study Area or wider locality.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Swift Parrot would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

The National Recovery Plan for Swift Parrot has two overall objectives (BirdsAustralia, 2011):

- To prevent further decline of the Swift Parrot population
- To achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carry capacity.

The proposed action would not interfere with any of the recovery activities given that only potential habitat is to be removed. The Project would result in a significant biodiversity offset which in the long-term, provides security for potential Swift Parrot habitat elsewhere.

## Conclusion

Swift Parrot are unlikely to be significantly impacted by the proposed action given the following.

- The species does not breed in NSW.
- The relatively localised nature of the potential habitat in the BAR footprint in comparison to the distribution of Swift Parrot in NSW.
- The species is highly mobile and migratory meaning that it would not rely solely on the habitats of the Study Area.

## Regent Honeyeater (critically endangered species)

*Will the action lead to a long-term decrease in the size of a population of a species?*

Regent Honeyeater occurs in temperate woodlands and open forests of the inland slopes of south-eastern Australia, with occasional records in coastal areas (OEH, 2020a, OEH, 2020c, DoE, 2016, Oliver, 1998, Franklin et al., 1989, Geering and French, 1998, Ford et al., 1993). There are only four known breeding areas, with one of these located within the Capertee Valley (DoE, 2016). Breeding has also been recorded in the Mudgee-Wollar areas which is now considered one of the key areas for this species (DoE, 2016). Birds are known to breed in the Capertee Valley and then at Mudgee-Wollar and vice versa. As the location of the Study Area is in between the Mudgee-Wollar key area and the Capertee Valley breeding area, it is reasonable to expect that the Study Area (and any native vegetation in the Lue district) could contain important habitat for Regent Honeyeater. As a species, Regent Honeyeater is considered a single population with some genetic exchange of individuals between regularly used areas (DoE, 2016).

The Project would result in the removal of 288.48 hectares of potential foraging and breeding habitat for Regent Honeyeater. However, at the landscape level, potential foraging and breeding habitat is well represented in the locality with more than 3,000 hectares of native vegetation remaining in the BAR landscape assessment circle and the wider locality being well vegetated when reviewing satellite imagery.

The proposed action is unlikely to lead to a long-term decrease in the size of a population given that the relatively localised nature of the potential impact in the BAR footprint when compared to similar quality habitats within the Study Area and the wider locality.

*Will the action reduce the area of occupancy of the species?*

There is no evidence to suggest that a population relies solely upon the resources of the Study Area in its entirety particularly given the lack of records for this species during the comprehensive field surveys. However, there is a reasonable expectation that Regent Honeyeater could use the habitats of the Study Area from time to time given their seemingly mobile nature. Overall, the action is unlikely to reduce any area of occupancy to the detriment of this species.

*Will the action fragment an existing population into two or more populations?*

No population would be fragmented into two or more populations given the context of vegetation across the landscape and beyond the boundaries of the Study Area, the reasonable mobile nature of the species and the confirmation in the national recovery plan that only a single population exists despite it being highly fragmented across their range.

*Will the action adversely affect habitat critical to the survival of a species?*

Yes. Habitat critical to the survival of Regent Honeyeater has been defined in the national recovery plan and includes:

- Any breeding or foraging habitat in areas where the species is likely to occur (based on Figure 1 in the national recovery plan)
- Any newly discovered breeding or foraging locations.

The proposed action would remove about 288.48 hectares of potential foraging and breeding habitat. The Study Area is located within the Mudgee-Wollar key area and within close proximity to the Capertee Valley key breeding area making it habitat potentially critical to the survival of Regent Honeyeater.

*Will the action disrupt the breeding cycle of a population?*

Regent Honeyeater has been recorded breeding in the Capertee Valley and then at Mudgee-Wollar key area and vice versa suggesting that breeding, foraging and potential landscape level movements could occur within the Study Area. In the context of the Regent Honeyeater population, it is unlikely the proposed action would disrupt the entire population (it is defined as a single population in the national recovery plan). Disruption could only occur to the breeding cycle of the population should all Regent Honeyeater attempt to breed within the Study Area which is highly unlikely.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. It is acknowledged that the loss of 288.48 hectares of potential foraging and breeding habitat for Regent Honeyeater is a negative impact. However, in the context of the remaining habitats of the same vegetation types that remain within the Study Area (1,269.5 hectares), as well as the potential foraging and breeding habitats to the north, south and east of the Study Area in the wider locality, it is unlikely to impact habitat to the extent that Regent Honeyeater is likely to decline.

*Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?*

No. It is not likely that invasive species (such as introduced predators) that are potentially harmful to Regent Honeyeater would become further established than what already pre-exists in the Study Area or wider locality. Noisy Miners, which are listed as a key threatening process as *Aggressive exclusion of birds from woodland and forest by abundant Noise Miners* are already present within the Study Area.

*Will the action introduce disease that may cause the species to decline?*

It is unlikely that diseases that are potentially harmful to Regent Honeyeater would become established or introduced as a result of the proposed action.

*Will the action interfere with the recovery of the species?*

The National Recovery Plan for Regent Honeyeater has two overall objectives (DoE, 2016):

- To reverse the long-term population trend of decline and increase the numbers of Regent Honeyeater to a level where there is a viable, wild breeding population, even in poor breeding years
- Enhance the condition of habitat across the range of Regent Honeyeater to maximise survival and reproductive success, and provide refugia during periods of extreme environmental fluctuation.

The proposed action would interfere with the recovery activities for this species given the direct loss of potential foraging and breeding habitat. However, the Project would result in a significant biodiversity offset which would provide long-term security for potential foraging and breeding habitat in perpetuity that may have otherwise been subject to intense agricultural activity over time. This is consistent with the objectives of the recovery plan.

**Conclusion**

The Project has the potential to have a significant impact on Regent Honeyeater. The Applicant has made all reasonable attempts to avoid impacts to potential foraging and breeding habitat where possible, through a substantial planning and design phase. A series of detailed mitigation measures are proposed within this BAR to minimise potential impacts (see Section 6). A suitable biodiversity offset strategy must be considered for Regent Honeyeater.



# **Annexure 7**

## **Development Site Biodiversity Credit Reports**

(Total No. of pages including blank pages = 38)

Note: This Annexure is only available on the digital version of this document

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# Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 3/06/2021

Time: 5:55:55AM

Calculator version: v4.0

## Major Project details

<b>Proposal ID:</b>	0143/2020/5083MP
<b>Proposal name:</b>	Bowdens PipelineOnly June2021 MajPr
<b>Proposal address:</b>	Envirokey P/L PO Box 7231 Tathra NSW 2550
<b>Proponent name:</b>	Bowdens Silver Limited
<b>Proponent address:</b>	68 Maloneys Road Lue NSW 2850
<b>Proponent phone:</b>	0263736420
<b>Assessor name:</b>	Steve Sass
<b>Assessor address:</b>	PO Box 7231 Tathra NSW 2550
<b>Assessor phone:</b>	02 6494 5422
<b>Assessor accreditation:</b>	0143

## Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Derived grassland of the NSW South Western Slopes	5.18	60.00
Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	0.65	38.00
Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion	0.20	6.00
Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region	0.76	29.00
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	6.89	164.00
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1.24	35.00
<b>Total</b>	<b>14.92</b>	<b>332</b>

## Credit profiles



**1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)**

Number of ecosystem credits created

164

IBRA sub-region

Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)</p> <p>Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103)</p> <p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139)</p> <p>Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209)</p> <p>White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211)</p> <p>White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225)</p> <p>Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226)</p> <p>Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231)</p> <p>White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion, (CW320)</p> <p>Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295)</p> <p>Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p> <p>Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

2. White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)

Number of ecosystem credits created	35
IBRA sub-region	Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

3. Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Number of ecosystem credits created29

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)	Capertee  and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)	
Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)	
Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)	
Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)	
Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)	
Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)	
Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)	
Motherumbah (Acacia cheelii) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)	
Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)	
Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)	
Mugga Ironbark - Buloke - Pilliga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)	
Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)	
Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)	
Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Peneplain Bioregion, (CW201)	
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)	
White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)	
White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)	
Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)	
Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)	
Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion,	



Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)

4. Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

Number of ecosystem credits created38

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)

Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)

Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)

Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)

Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)

Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)

Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)

Motherumbah (*Acacia cheelii*) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)

Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)

Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)

Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)

Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)

Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)

Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Peneplain Bioregion, (CW201)

Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)

White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)

White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)

Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)

Red Stringybark - Inland Scribbly Gum open forest on steep hills in the

Capertee

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)



5. Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion, (CW291)

Number of ecosystem credits created6

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion, (CW291)

Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)

Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)

Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)

Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)

Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)

Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)

Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)

Motherumbah (*Acacia cheelii*) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)

Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)

Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)

Mugga Ironbark - Buloke - Pilliga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)

Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)

Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)

Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Peneplain Bioregion, (CW201)

Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)

White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)

White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)

Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)

Inland Scribbly Gum - Black Cypress Pine - Red Ironbark open forest of

Capertee

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Red Stringybark woodland on hillslopes, northern NSW South Western Slopes Bioregion, (CW292)

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Red Stringybark - Long-leaved Box - Black Cypress Pine - grassy/shrubby low woodland on ranges, central NSW South Western Slopes Bioregion, (CW287)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Dwyer's Red Gum - Black Cypress Pine - ironbark low woodland on sandstone hillcrests in the Dubbo - Gilgandra region, south-western Brigalow Belt South Bioregion, (CW255)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/-  
- Narrow-leaved Wattle shrubby open forest on sandstone hills in the  
southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)



6. Derived grassland of the NSW South Western Slopes, (CW249)

Number of ecosystem credits created	60
IBRA sub-region	Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Derived grassland of the NSW South Western Slopes, (CW249)</p> <p>Bluegrass - Redleg Grass - Common Woodruff clay plain grassland of northern Brigalow Belt South Bioregion, (CW113)</p> <p>Derived tussock grassland of the central western plains and lower slopes of NSW, (CW130)</p> <p>Derived tall spear grass grassland on mainly basalt hills of the Liverpool Plains, Liverpool Range and in the upper Hunter Valley (Merriwa district), south-eastern Brigalow Belt South Bioregion, (CW253)</p> <p>Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion, (CW254)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Squirrel Glider	Petaurus norfolcensis	8.12	179
Regent Honeyeater	Anthochaera phrygia	7.59	584
Ausfeld's Wattle	Acacia ausfeldii	120.00	9,240
Koala	Phascolarctos cinereus	0.21	5

# Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 3/06/2021

Time: 5:45:02AM

Calculator version: v4.0

## Major Project details

<b>Proposal ID:</b>	0143/2020/5088MP
<b>Proposal name:</b>	Bowdens MineSiteOnly Jun2021 MajPr
<b>Proposal address:</b>	Envirokey P/L PO Box 7231 Tathra NSW 2550
<b>Proponent name:</b>	Bowdens Silver Limited
<b>Proponent address:</b>	68 Maloneys Road Lue NSW 2850
<b>Proponent phone:</b>	0263736420
<b>Assessor name:</b>	Steve Sass
<b>Assessor address:</b>	PO Box 7231 Tathra NSW 2550
<b>Assessor phone:</b>	02 6494 5422
<b>Assessor accreditation:</b>	0143

## Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	21.80	1,187.00
Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes	1.04	48.00
Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	56.65	4,006.00
Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion	0.77	46.00
Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion	111.37	6,539.00
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	152.05	9,792.51
White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW	21.70	1,339.00
<b>Total</b>	<b>365.38</b>	<b>22,958</b>

## Credit profiles

**1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)**

Number of ecosystem credits created

9,793

IBRA sub-region

Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)</p> <p>Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103)</p> <p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139)</p> <p>Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209)</p> <p>White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211)</p> <p>White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225)</p> <p>Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226)</p> <p>Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231)</p> <p>White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion, (CW320)</p> <p>Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295)</p> <p>Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p> <p>Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>



2. Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)

Number of ecosystem credits created	1,187
IBRA sub-region	Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)</p> <p>Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)</p> <p>White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)</p> <p>Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

**3. White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)**

Number of ecosystem credits created	1,339
IBRA sub-region	Capertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)</p> <p>Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)</p> <p>Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)</p> <p>Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)</p> <p>Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)</p> <p>Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)</p> <p>Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)</p> <p>Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)</p> <p>Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)</p> <p>Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)</p> <p>Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)</p>	<p>Capertee</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

4. Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion, (CW291)

Number of ecosystem credits created6,539

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Red Stringybark - Long-leaved Box - Black Cypress Pine - grassy/shrubby low woodland on ranges, central NSW South Western Slopes Bioregion, (CW287)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

Narrow-leaved Ironbark - Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Dwyer's Red Gum - Black Cypress Pine - ironbark low woodland on sandstone hillcrests in the Dubbo - Gilgandra region, south-western Brigalow Belt South Bioregion, (CW255)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)

Capertee

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Mudgee - northern section of the NSW South Western Slopes Bioregion, (CW291)

Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)

Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)

Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)

Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)

Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)

Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)

Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)

Motherumbah (*Acacia cheelii*) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)

Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)

Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)

Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)

Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)

Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)

Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Penepplain Bioregion, (CW201)

Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)

White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)

White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)

Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)

Inland Scribbly Gum - Black Cypress Pine - Red Ironbark open forest of the NSW central western slopes, (CW259)



Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Red Stringybark woodland on hillslopes, northern NSW South Western Slopes Bioregion, (CW292)

5. Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes, (CW263)

Number of ecosystem credits created4,006

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes, (CW263)	Capertee
Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)	and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)	
Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)	
Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)	
Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)	
Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)	
Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)	
Motherumbah ( <i>Acacia cheelii</i> ) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)	
Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)	
Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)	
Mugga Ironbark - Buloke - Pilliga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)	
Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)	
Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)	
Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Peneplain Bioregion, (CW201)	
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)	
White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)	
White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)	
Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)	
Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)	
Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion,	

Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes, (CW242)

Inland Scribbly Gum - Black Cypress Pine - Red Ironbark open forest of the NSW central western slopes, (CW259)

Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Red Stringybark woodland on hillslopes, northern NSW South Western Slopes Bioregion, (CW292)

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Red Stringybark - Long-leaved Box - Black Cypress Pine - grassy/shrubby low woodland on ranges, central NSW South Western Slopes Bioregion, (CW287)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion, (CW262)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Red gum - Rough-barked Apple +/- tea tree sandy creek woodland (wetland) in the Pilliga - Goonoo sandstone forests, Brigalow Belt South Bioregion, (CW238)

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Bloodwood - Red Ironbark - Black Cypress Pine shrubby sandstone woodland of the Pilliga Scrub and surrounding regions, (CW318)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion, (CW235)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Spur-wing Wattle heath on sandstone substrates in the Goonoo - Pilliga forests, Brigalow Belt South Bioregion, (CW307)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

Blue-leaved Ironbark - Black Cypress Pine shrubby sandstone open forest in the southern Brigalow Belt South Bioregion (including Goonoo), (CW241)

shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Dwyer's Red Gum - Black Cypress Pine - ironbark low woodland on sandstone hillcrests in the Dubbo - Gilgandra region, south-western Brigalow Belt South Bioregion, (CW255)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Narrow-leaved Wattle low open forest / very tall shrubland on ridges in northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW276)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)



6. Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes, (CW242)

Number of ecosystem credits created48

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions

Blue-leaved Stringybark open forest of the Mudgee region NSW central western slopes, (CW242)	Capertee
Black Cypress Pine - Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion, (CW107)	and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Black Cypress Pine shrubby woodland of the Brigalow Belt South Bioregion, (CW108)	
Blue-leaved Ironbark heathy woodland of the southern part of the Brigalow Belt South Bioregion, (CW114)	
Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion, (CW115)	
Brown Bloodwood - cypress - ironbark heathy woodland in the Pilliga region of the Brigalow Belt South Bioregion, (CW120)	
Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)	
Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion, (CW149)	
Motherumbah ( <i>Acacia cheelii</i> ) woodlands on sandstones of the Brigalow Belt South Bioregion, (CW153)	
Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion, (CW155)	
Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion, (CW156)	
Mugga Ironbark - Buloke - Pilliga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion, (CW157)	
Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South bioregion, (CW160)	
Scribbly Gum - Brown Bloodwood woodland on volcanic slopes of the southern Brigalow Belt South Bioregion, (CW186)	
Tumbledown Red Gum - Black Cypress Pine - Currawang woodland of ridges and rocky hills mainly of the Cobar Peneplain Bioregion, (CW201)	
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the NSW South Western Slopes Bioregion, (CW202)	
White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes, (CW212)	
White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW, (CW217)	
Red Stringybark - Long-leaved Box - Black Cypress Pine shrub/grass woodland on siliceous sedimentary ranges in the upper NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (CW288)	
Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes, (CW261)	
Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion,	

Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes, (CW263)

Inland Scribbly Gum - Black Cypress Pine - Red Ironbark open forest of the NSW central western slopes, (CW259)

Mugga Ironbark - Black Cypress Pine - Red Stringybark - Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes, (CW268)

Red Stringybark woodland on hillslopes, northern NSW South Western Slopes Bioregion, (CW292)

Bottlebrush riparian shrubland wetland of the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (CW243)

Red Stringybark - Long-leaved Box - Black Cypress Pine - grassy/shrubby low woodland on ranges, central NSW South Western Slopes Bioregion, (CW287)

Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)

Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion, (CW262)

Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion, (CW273)

Red gum - Rough-barked Apple +/- tea tree sandy creek woodland (wetland) in the Pilliga - Goonoo sandstone forests, Brigalow Belt South Bioregion, (CW238)

Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region, (CW299)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (CW271)

White Bloodwood - Red Ironbark - Black Cypress Pine shrubby sandstone woodland of the Pilliga Scrub and surrounding regions, (CW318)

White Mallee - Dwyer's Red Gum mallee heath on sands in the Goonoo - Pilliga region, Brigalow Belt South Bioregion, (CW327)

Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion, (CW235)

Red Stringybark - Rough-barked Apple +/- Nortons Box open forest on hillslopes in the Warrumbungle NP - Coolah regions, (CW290)

Spur-wing Wattle heath on sandstone substrates in the Goonoo - Pilliga forests, Brigalow Belt South Bioregion, (CW307)

Red Stringybark - Narrow-leaved Ironbark - Black Cypress Pine - hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion, (CW289)

Blue-leaved Ironbark - Black Cypress Pine shrubby sandstone open forest in the southern Brigalow Belt South Bioregion (including Goonoo), (CW241)

shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), (CW272)

White Cypress Pine - Narrow-leaved Ironbark - Buloke grassy open forest of the Dubbo region, southern Brigalow Belt South Bioregion, (CW326)

Mugga Ironbark - Narrow-leaved Ironbark - Buloke - Black Cypress Pine shrub grass open forest in the Goonoo forests and surrounding region, southern Brigalow Belt South Bioregion, (CW269)

Dwyer's Red Gum - Black Cypress Pine - ironbark low woodland on sandstone hillcrests in the Dubbo - Gilgandra region, south-western Brigalow Belt South Bioregion, (CW255)

Thyme Honey-myrtle - red gum - Mugga Ironbark shrubland / woodland in impeded drainage flats or depressions in the southern Brigalow Belt South Bioregion, (CW308)

Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion, (CW281)

Inland Scribbly Gum - Red Stringybark - Black Cypress Pine - Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion, (CW260)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (CW282)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (CW275)

**7. Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)**

Number of ecosystem credits created46

IBRA sub-regionCapertee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Mugga Ironbark - Red Box - White Box - Black Cypress Pine tall woodland on rises and hills in the northern NSW South Western Slopes Bioregion, (CW270)  Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion, (CW121)	Capertee  and any IBRA subregion that adjoins the IBRA subregion in which the development occurs



Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	140.15	3,644
Regent Honeyeater	Anthochaera phrygia	280.89	21,629
Squirrel Glider	Petaurus norfolcensis	174.15	3,831
Small Purple-pea	Swainsona recta	4.00	104
Silky Swainson-pea	Swainsona sericea	64.00	1,152

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# **Annexure 8**

## **Local Provenance Seed Bank held by Bowdens Silver**

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Note: This Annexure is only available on the digital version of this document

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The following is an inventory of the Bowdens Silver Seed Bank currently held on site by Bowdens Silver (**Table A8**).

**Table A8**  
**Current inventory of Bowdens Silver Seed Bank**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Total Seed Weight (g)</b>
<i>Acacia buxifolia</i>	Box-leaf wattle	268
<i>Acacia caesia</i>	Soap Bark	13152
<i>Acacia cultriformis</i>	Knife-leaf wattle	1686
<i>Acacia filicifolia</i>	Ferned-leaf wattle	84
<i>Acacia gladiiformis</i>	Sword wattle	92
<i>Acacia gunnii</i>	Ploughshare wattle	7
<i>Acacia longissima</i>	Long-leaf wattle	6
<i>Acacia sp.</i>	Wattles	23
<i>Acacia triptera</i>	Spur-wing wattle	1697
<i>Acacia ulicifolia</i>		50
<i>Acacia vestita</i>	Weeping boree	29758
<i>Allocasuarina</i>	Black she-oak	1490
<i>Allocasuarina verticillata</i>	Drooping she-oak	30
<i>Eucalyptus bridgesiana</i>	Apple box	70
<i>Acacia mearnsii</i>	Black Wattle	721
<i>Calytrix tetragona</i>	Fringe-murtle	14
<i>Clematis glycinoides</i>	Headache vine	200
<i>Bellis perennis</i>	Daisy sp.	37
<i>Dodnaea Boronifolia</i>	Fern-leaf hop bush	117
<i>Dodonaea</i>		58
<i>Dodonaea Viciosa</i>	Hop bush	155
<i>Eucalyptus blakelyi</i>	Blakely's red gum	1050
<i>Glycine sp.</i>	Soybean	15
<i>Grevillea triternata</i>	Grevillea	172
<i>Eucalyptus punctata</i>	Grey Gum	500
<i>Hardenbergia violacea</i>	sarsaparilla	5
<i>Hovea lanceolata</i>	Hovea sp.	113
<i>Eucalyptus paniculata</i>	Ironbark	37
<i>Kunzea ambigua</i>	Kunzea	178
<i>Melaleuca sp.</i>	Paperbark	173
<i>Oleria elliptica</i>	Sticky daisy bush	355
<i>Podolobium ilicifolium</i>	Prickly shaggy-pea	28
<i>Eucalyptus haemastoma</i>	Scribbly gum	1015
<i>Eucalyptus obliqua</i>	Stringybark	187
<i>Styphelia triflora</i>	Pink five-corners	760
<i>Eucalyptus albens</i>	White Box	3
<i>Eucalyptus longifolia</i>	Woolly Butt	5
<i>Eucalyptus melliodora</i>	Yellow Box	289



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# **Annexure 9**

## **Targeted Threatened Species Searches by AREA Environmental**

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# Bowdens Silver Proposal

## Targeted Threatened Species Searches

Mid-Western Regional Council LGA, NSW

December 2020



**AREA Environmental Consultants & Communication**

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**AREA Environmental Consultants & Communication acknowledge Traditional Owners of the  
country on which we work**



## Document controls

Proponent		Bowdens Silver
Client		RW Corkery & Co Pty Limited Geological and Environmental Consultants
Quote number		Q0447
Project No / Purchase Order No		N/A
Document Description		Threatened Species Surveys at Bowdens Silver Mine
Clients Representative Managing this Document		Nick Warren Principal Environmental Consultant
AREA Person(s) Managing this Document		Phil Cameron (PJC)
Cover image		Agricultural land displaying unsuitable habitat for target species.
DOCUMENT STATUS: DRAFT		
DRAFT: Series V1.X AREA internal edits	Date	Action
V1.0	8/12/2020	DS to internal edit
V1.1	8/12/2020	PJC review
V1.2	9/12/2020	DS edits
V1.3	9/12/2020	AD edits
DRAFT Series V2.X Client / AREA internal edits	Date	Action
V2.0	9/12/2020	AREA to Client
V2.1	3/06/2021	GB edits. AREA to Client
FINAL (Draft approved by client)	Date	Action
V3.0	03/06/2021	AREA to Client
<div>Prepared for</div> <div></div>	Nick Warren Principal Environmental Consultant B.Sc., M. Bus., M. Env.Sc. Phone: 02 9985 8511 Mobile: 0437 635 975 Email: <a href="mailto:nick@rwcorkery.com">nick@rwcorkery.com</a> RW Corkery & Co Pty Limited Geological and Environmental Consultants	
<div>Prepared by</div> <div></div>	Dave Sturman Environmental Consultant AREA Environmental & Heritage Consultants 72 Brisbane Street Dubbo NSW 2830 E <a href="mailto:dave@areaenv.com.au">dave@areaenv.com.au</a> M 0407 439 410 ABN:29 616 529 867	
<div>COPYRIGHT</div> <div>© AREA Environmental &amp; Heritage Consultants, 2021 and © R.W Corkery, 2021</div> <div>All intellectual property and copyright reserved.</div> <div>Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the <i>Copyright Act 1968</i>, no part of this report may be reproduced, transmitted, stored in a retrieval system or adapted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission.</div> <div>Enquiries would be addressed to AREA Environmental Consultants &amp; Communication Pty Ltd.</div>		

# 1 Introduction

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## 1.1 Objectives

The objectives of this assessment were consistent with the objectives for targeted threatened plant survey described in surveying which are to (refer to Section 5.2 of this guide):

- 1) Establish, with a high level of confidence, the presence of a threatened plant species on the subject land.
- 2) Where threatened plant species are present, to collect data to determine the number of resident individuals or area of habitat, which is used to calculate species credits.

The targeted threatened plant survey aimed to minimise the risk of the target species being reported absent when they are present (Department of Planning, Industry and Environment, 2020)

## 1.2 Background

AREA Environmental Consultants & Communication (AREA) was commissioned by R.W Corkery Pty Limited on behalf of Bowdens Silver Pty Limited to complete targeted threatened species searches on the proposed Bowdens Silver Mine Site after previously undetected populations of *Swainsona recta* were observed (after favourable weather conditions) in and adjacent to the development footprint.

During routine environmental management of the Bowdens Silver-owned property, Bowdens Silver Environmental Officers discovered a small population of *Swainsona recta* in the development footprint. An additional population was also identified outside of the development footprint in the proposed biodiversity offset area. Due to time constraints only a selection of individuals outside the development footprint were confirmed to be *Swainsona recta* during this survey. The remainder of time was spent ensuring that the assessment of areas impacted by the proposed development was comprehensive. AREA Environmental was commissioned to conduct additional targeted surveys for this species in consultation with EnviroKey, who prepared the Biobanking report for the proposed development (as the Project is being assessed under the repealed NSW TSC Act). This letter report provides details of resident individuals comprising the viable local population.

AREA Ecologists followed the guideline *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020). This guideline details a systematic approach for the targeted survey of threatened flora species and targeted survey effort requirements. This additional assessment was undertaken within an allowable survey period according to the Biodiversity Assessment Method Credit Calculator (September to November).

Two AREA suitably qualified and experienced ecologists conducted systematic searches over seven full days from November 24 to 30 2020.

According to the NSW BioNet database *Swainsona recta* is listed as having an association with *Plant community type (PCT) 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* and *PCT281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion*.

All areas of this PCT in the development footprint were surveyed and four individuals in one population (0.44 hectares species polygon) were recorded (See Figures 2-2 and 2-5). Two of the identified plants were flowering at the time.

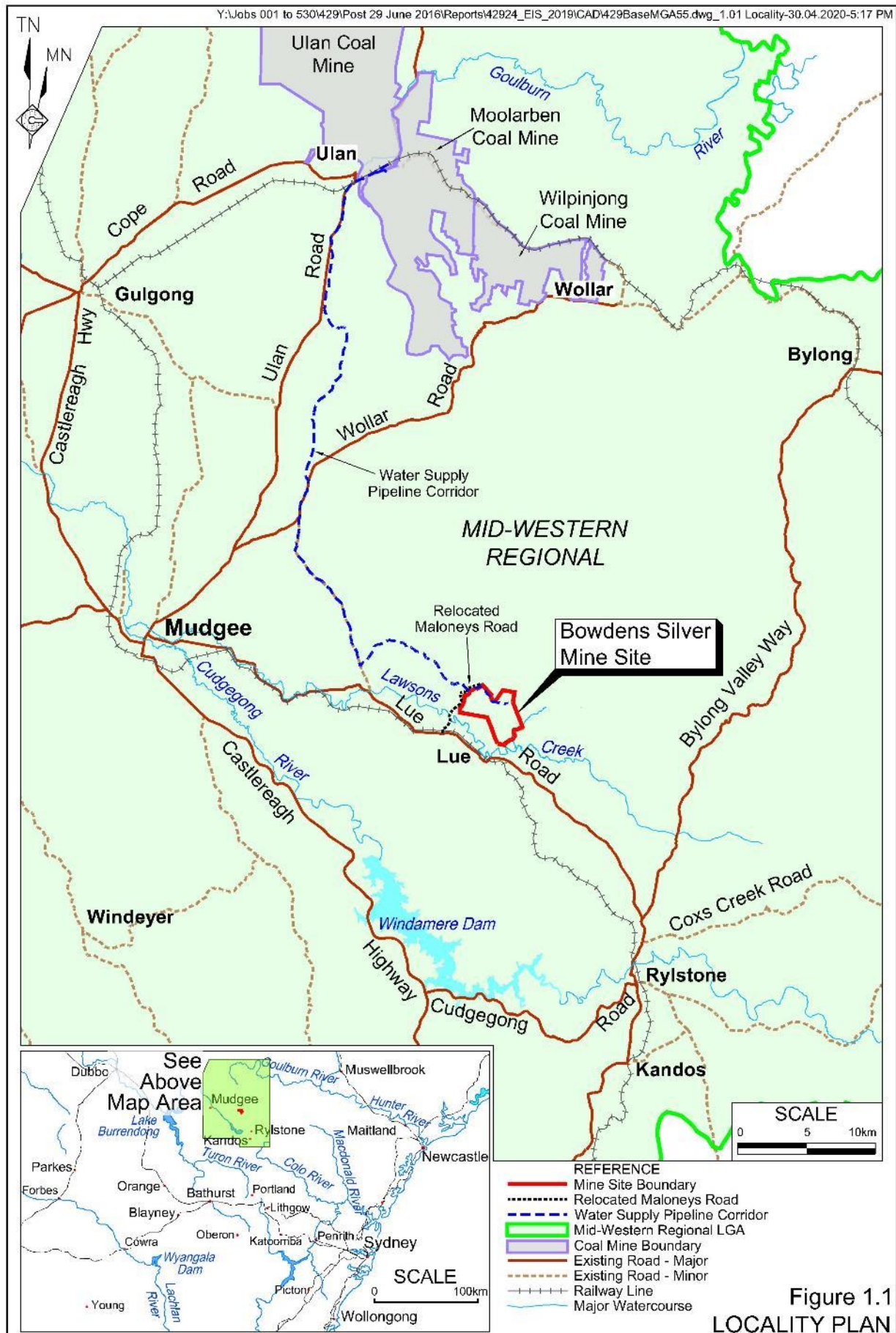
*Additional searches during the field survey also identified Swainsona sericea in PCT281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion and PCT277: Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion in the development footprint. Approximately 65 individuals in four populations (2.14 hectares of species polygons) of this species were observed (see Figures 2-3 to 2-6)*

Other targeted searches undertaken during these surveys included searches for the following species.

- *Euphrasia arguta*
- *Prasophyllum* sp. Wybong
- *Prasophyllum petilum* Tarengo Leek Orchid

None of these species were recording during this additional assessment.

**Figure 1-1: Location of the development**



## 2 Updated assessment

Desktop and field assessments have been completed to inform this biodiversity assessment.

### 2.1 Personnel

This biodiversity assessment completed by appropriately qualified and experienced ecologists (Table 2-1). AREA support staff are listed in Table 2-2

**Table 2-1: Summary of AREA project teams' qualifications**

Name	CV Details	Role in this ecology report and experience
<b>Greg Bible</b> Environmental Consultant	<ul style="list-style-type: none"> <li>• BEnvSc University of New England</li> <li>• BSc Honours University of New England</li> <li>• WHS White Card</li> <li>• First Aid Certificate (Cert No. 93287)</li> </ul>	<p><b>Role</b></p> <p>Field assessment, editing.</p> <p>Greg has in depth knowledge of plant classification having completed Honour studies in botanical related disciplines. Greg has recently completed extensive surveys across the region identifying several new <i>Swainsona recta</i> and <i>Swainsona sericea</i> populations as well as conducting annual monitoring of known populations.</p> <p>Greg has experience in all aspects of consulting, implementing biodiversity assessments and monitoring operations.</p>
<b>Dave Sturman</b> Ecologist AREA Environmental & Heritage Consultants  Manager AREA Landscape Design Consultants	<ul style="list-style-type: none"> <li>• B. Env. Sc. Charles Sturt University</li> <li>• Cert III (Horticulture)</li> <li>• White card – general construction induction card.</li> <li>• RMS-worker on foot training.</li> <li>• Senior First Aid</li> <li>• Chainsaw operator ticket</li> <li>• Confined Space worker and atmospheric monitoring.</li> <li>• Risk assessment training.</li> <li>• AHPCPM201- Recognising grasses</li> </ul>	<p><b>Role</b></p> <p>Field assessment, report writing, ecology lead</p> <p>Dave is an Ecologist with in-depth experience of <i>Swainsona</i> in the Central West and Central Tablelands regions having worked as a subject matter expert on developing a predictive habitat model for <i>Swainsona recta</i> over 2019 and 2020. Dave has recently completed extensive surveys across the region identifying several new <i>Swainsona recta</i> and <i>Swainsona sericea</i> populations as well as conducting annual monitoring of known populations.</p> <p>Dave has experience implementing biodiversity assessments and monitoring operations pre and post approval for projects including linear developments, mining operations, quarry expansions and conservation projects green field mining and construction projects as well as site rehabilitation, weed management, vegetation mapping and targeted threatened species searches.</p>



**Table 2-2: AREA support staff**

Name	CV Details	Role in this ecology report and experience
<b>Addy Watson</b> Principal Environment and Community Consultant	<ul style="list-style-type: none"> <li>• Grad. Dip. Captive Vertebrate Management, Charles Sturt University</li> <li>• Grad. Cert. Social Impact, University of NSW</li> <li>• B. Env. Sc. University of New England.</li> <li>• Diploma Project Management</li> <li>• NSW Biodiversity Assessment Method Assessor: accreditation number BAAS19066).</li> </ul>	<b>Role</b>  Technical advisor
<b>Phil Cameron</b> Principal Consultant	<ul style="list-style-type: none"> <li>• BSc. Macquarie University</li> <li>• Ass Dip App Sci. University of Queensland.</li> <li>• Certified Environmental Practitioner (EIANZ) and practicing member.</li> <li>• NSW OEH BioBanking and Bio-certification Assessor: accreditation number 0117.</li> <li>• NSW Biodiversity Assessment Method Assessor: accreditation number BAAS17082).</li> <li>• AHCPCM201- Recognising grasses</li> <li>• NSW DPIE Scientific License: 101087.</li> <li>• NSW DPI Ethics Approval 17/459 (3).</li> <li>• Practicing member of the NSW Ecological Consulting Association.</li> <li>• WHS White Card and Blue Card.</li> <li>• Apply First Aid (Parasol) ID: 6007221.</li> </ul>	<b>Role</b>  Planning  Editing  Technical advisor

## 2.2 Field survey

The survey included assessment of existing vegetation in the impact footprint and completed targeted searches for threatened species in accordance with guidelines - *Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020)

Field assessment was carried out by Greg Bible and Dave Sturman between 24 and 30 November 2020. No rainfall or adverse weather conditions impacted the field survey results. Survey effort is provided in Figure 2-1. The assessment teams surveyed all PCTs identified on the BioNet Atlas database as having an association with *Swainsona recta* as well as any areas predicted to support the species by the recently developed modelling prepared by AREA Environmental.

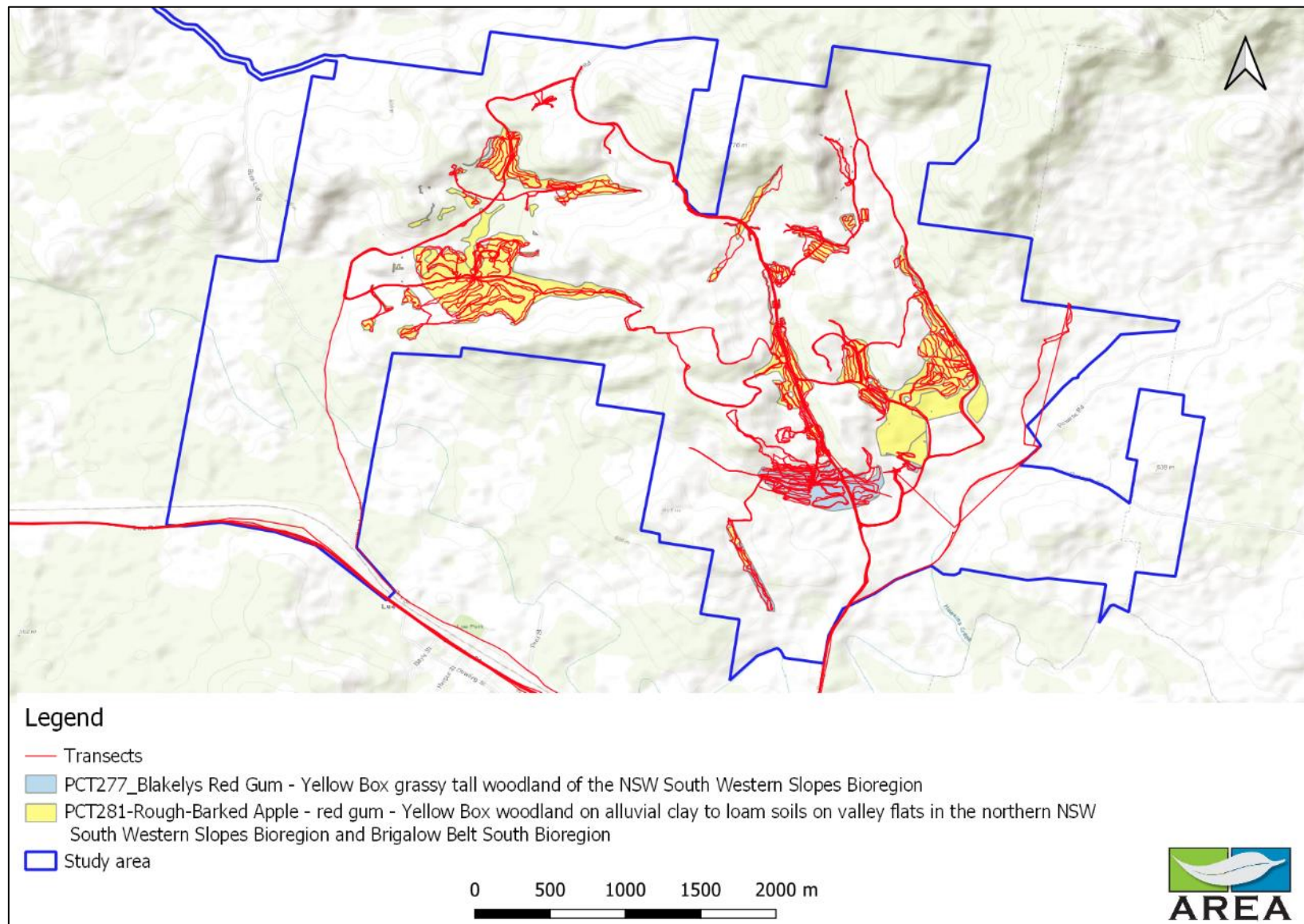
The scope of the field surveys was to ground truth records of *Swainsona recta* as identified by Bowdens Silver environmental staff and to survey other areas of the proposed Mine Site that may support this or similar species. Only one PCT with a known association with *Swainsona recta* as identified on the BioNet database collection is identified in the development footprint. This is *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*. This PCT was surveyed in full by two suitably qualified and experienced staff on foot following requisite survey guidelines.

AREA Ecologists also surveyed additional areas within the Mine Site and identified *Swainsona sericea* in the development footprint in the following two PCTs.

- *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* and
- *PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion*

These PCTs were also assessed using pedestrian transects.

Figure 2-1: Survey effort



## 2.3 Targeted Species

### 2.3.1 *Swainsona recta*

*Swainsona recta* is listed on the BioNet Atlas- Threatened Species Data Collection (TBDC- [https://www.environment.nsw.gov.au/AtlasApp/UI\\_Modules/TSM\\_/ProfileEdit.aspx?pld=10782&pType=SpeciesCode&a=1](https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/ProfileEdit.aspx?pld=10782&pType=SpeciesCode&a=1)) as having an association with *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*.

This PCT occurs in the development footprint. For the purpose of this assessment, this PCT association is a recognised exclusion/inclusion filter. Consequently, AREA ecologists conducted pedestrian transect over all areas mapped as *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*. Our additional assessments were also informed from work on our predictive model for the species.<sup>1</sup>

A total of four *Swainsona recta* individuals were identified as one discrete population in an area mapped as PCT 277, consistent with the BioNet database collection. No individuals were identified in areas mapped as PCT281 which were identified as 'likely' habitat in AREAs predictive model (images in appendix A).

No other *Swainsona recta* were found in the development footprint after targeted searches following requisite survey guidelines.

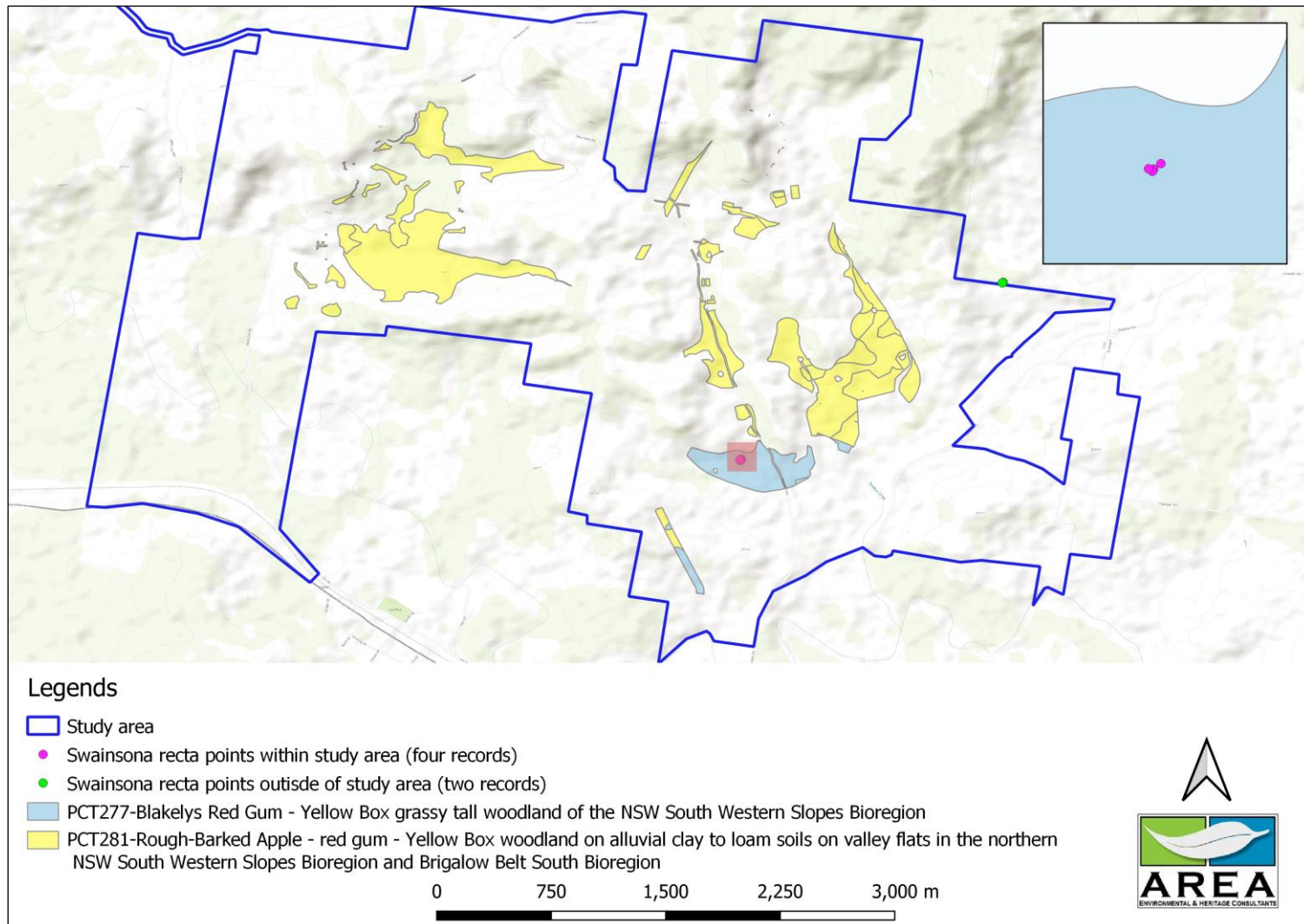
One of the influencing factors of the survey results was much of the mapped area of PCT277 had been historically cleared and used for agricultural purposes leaving unsuitable habitat for the species. This is consistent with AREA's predictive model which clearly shows only areas of PCT277 which has not been cleared or exposed to grazing would be likely (or have a real chance) to provide habitat for the species. This outcome is also consistent with the EnviroKey survey outcomes which did not identify the species and concluded that historic disturbance constrained likely habitat.

The location of the records can be found in Figure 2-2

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<sup>1</sup> AREA Environmental & Heritage Consultants (EHC) have conducted population monitoring, and have been designing a predictive model, for populations of *Swainsona recta* in the NSW Central West and Central Tablelands regions since 2019 (AREA Environmental & Heritage Consultants, 2021)

**Figure 2-2: Swainsona recta records**





### 2.3.2 Swainsona sericea

*Swainsona sericea* records were identified in both of the surveyed PCTs; *PCT277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* and *PCT281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion*, both of which are listed on the BioNet Atlas- Threatened Species Data Collection as associated PCTs.

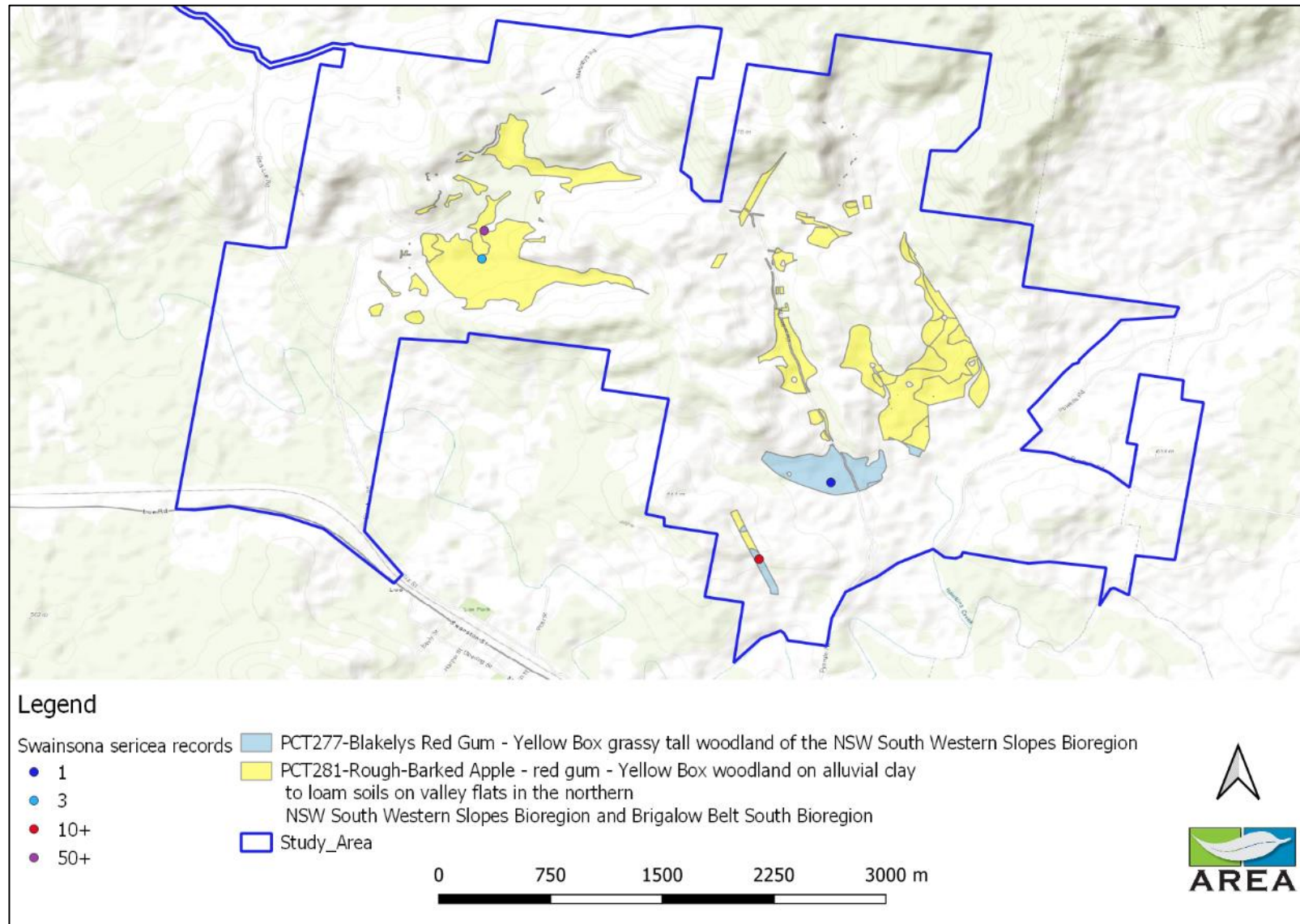
(TBD[https://www.environment.nsw.gov.au/AtlasApp/UI\\_Modules/TSM\\_/ProfileEdit.aspx?pld=10783&pType=SpeciesCode&a=1](https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/ProfileEdit.aspx?pld=10783&pType=SpeciesCode&a=1)).

AREA ecologists conducted pedestrian transects over all areas of suitable habitat within land mapped as containing these two PCTs. The BioNet Atlas- Threatened Species Data Collection list threats to *Swainsona sericea* which were used to determine areas of suitable habitat. Areas excluded from survey are described in Section 2.4.

Four discrete populations comprised of the following resident individuals were found across PCT277 and PCT281 (Figure 2-3) (Images in Appendix B).

- One solitary plant in PCT277
- 10 plants in PCT277
- Three plants in PCT281
- Approximately 50 plants in PCT281

**Figure 2-3: Swainsona sericea records**



### 2.3.3 Species polygons

Species polygons have been mapped to include the areas of occupancy where viable local populations have been found. Areas not consisting of a species polygon have been excluded due to being surveyed by a suitably qualified person, specifically targeting the species during the correct survey period. Species polygons have been created to comprise those areas of suitable habitat containing records of *Swainsona sericea* and *Swainsona recta* in the development footprint. Where target species were located, finer scale surveys were conducted. The extent of the polygons was determined, considering habitat type vegetation condition and type and other ancillary landscape features as per the guidelines for surveying threatened plants and their habitats (Department of Planning, Industry and Environment, 2020). Species polygons are presented in Figures 2-4, 2-5 and 2-6.

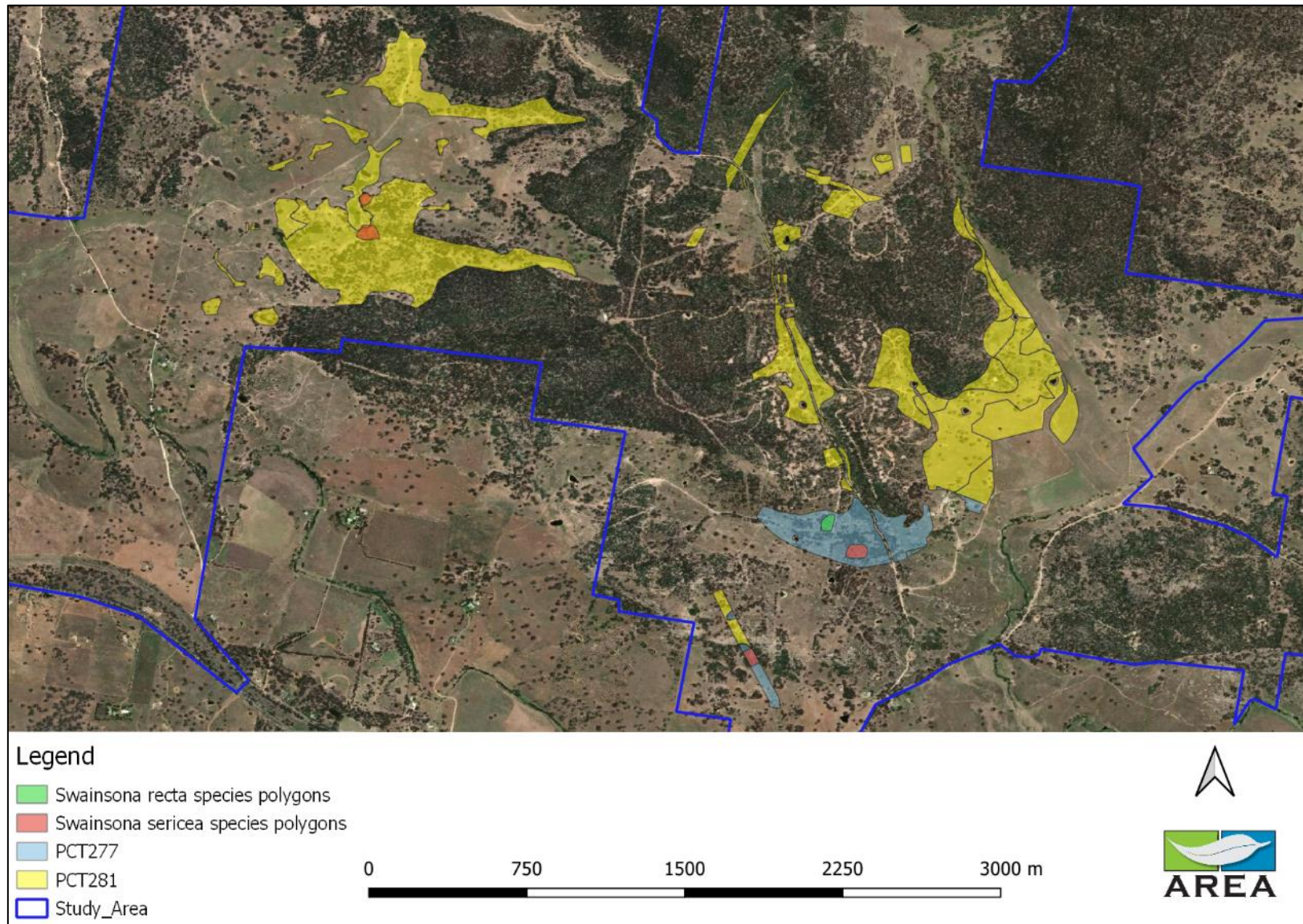
The total of each species polygon area is presented in Table 2-3.

**Table 2-3: Area of species polygons**

Species	Area (hectares)
<i>Swainsona recta</i>	0.47
<i>Swainsona sericea</i>	2.14

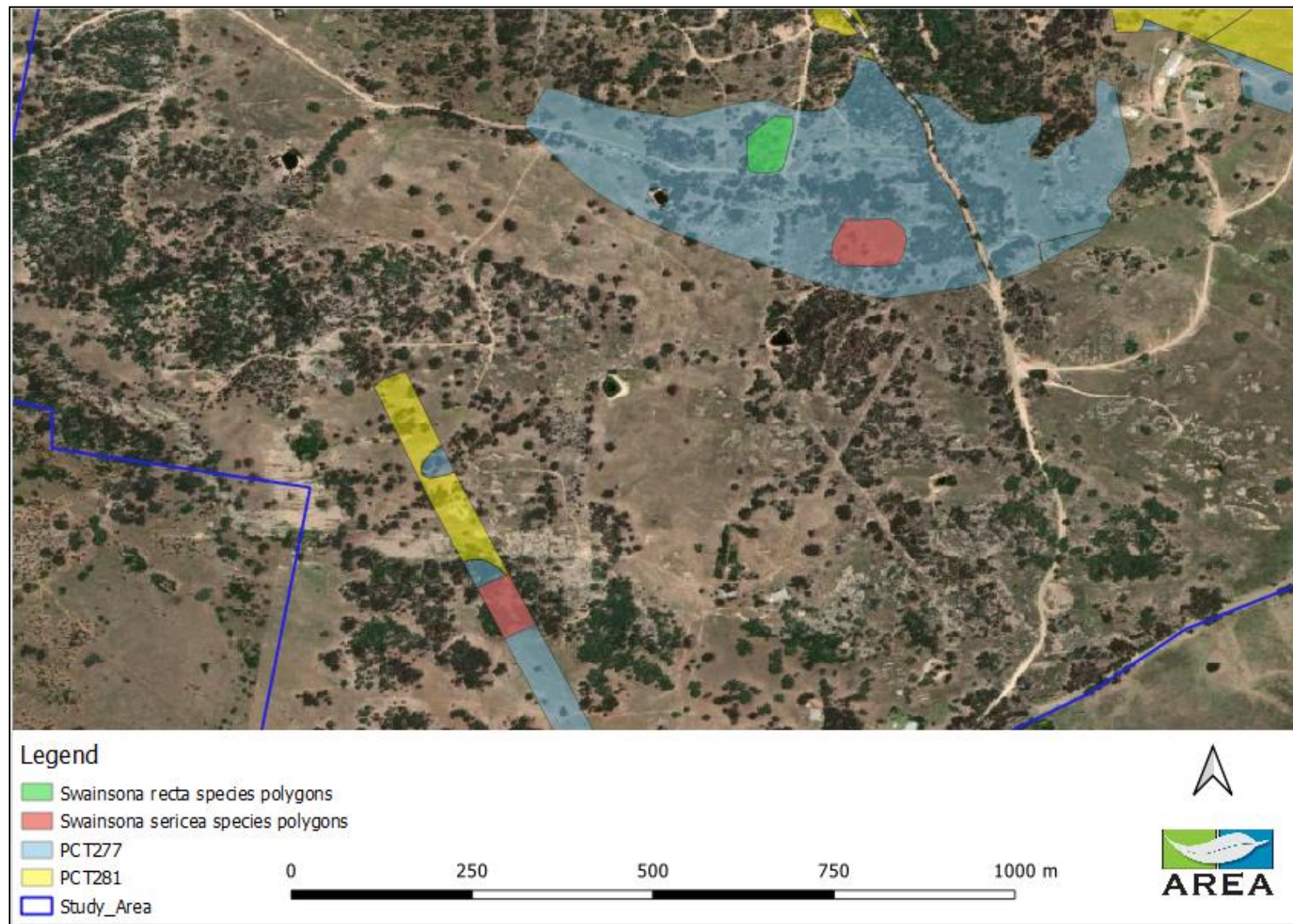


Figure 2-4: Species polygons overview



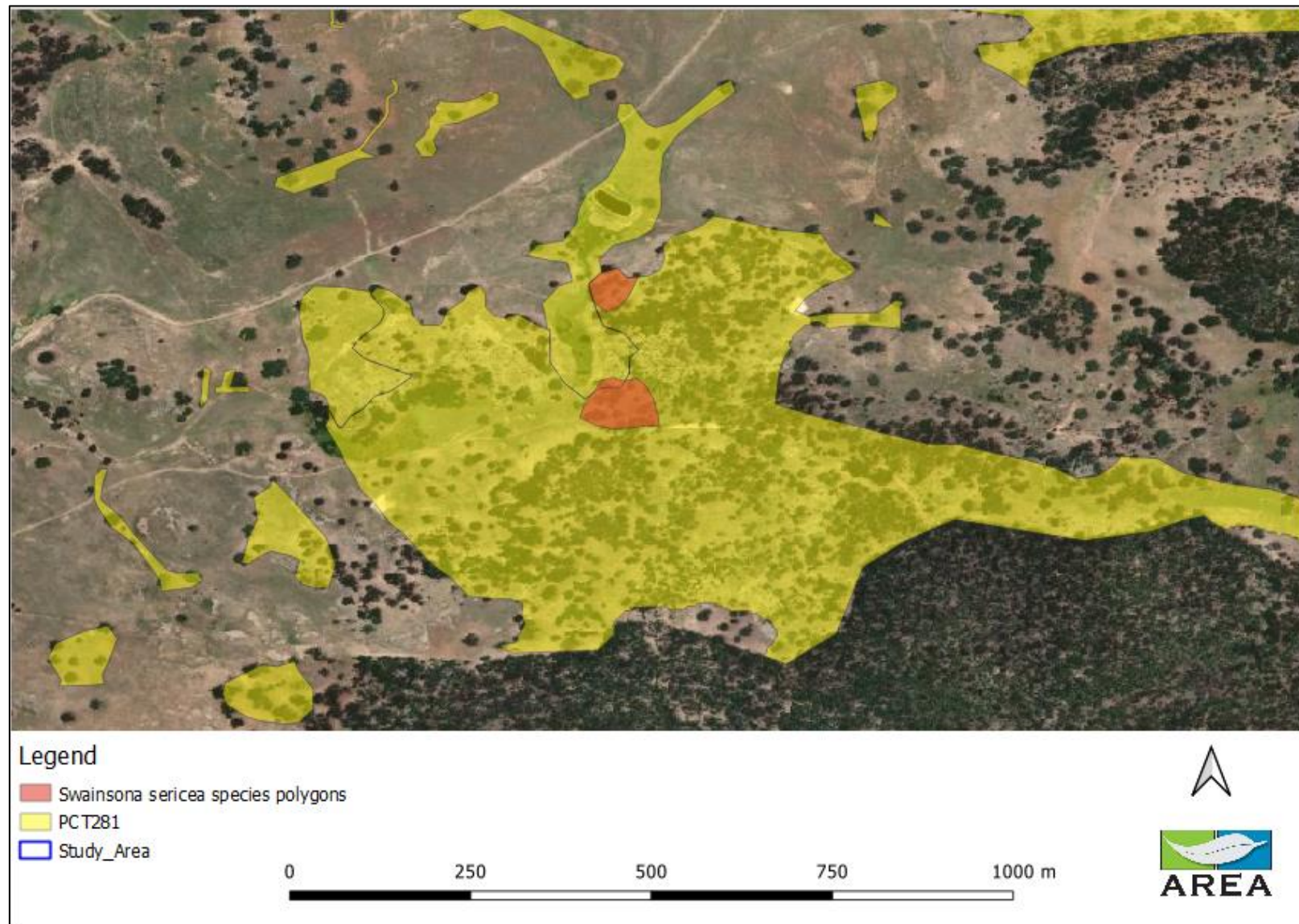


**Figure 2-5: *Swainsona recta* and *Swainsona sericea* species polygons in PCT277: Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion**





**Figure 2-6: *Swainsona sericea* species polygons in PCT281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion.**



## 2.4 Areas excluded from survey

No areas of *Swainsona recta* habitat were excluded from survey. Areas mapped as containing PCT277: *Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*, which is listed as an associated PCT for this species were surveyed in full.

The BioNet Atlas - Threatened Species Data Collection list threats to *Swainsona sericea* which were considered in determining areas of suitable / unsuitable habitat.

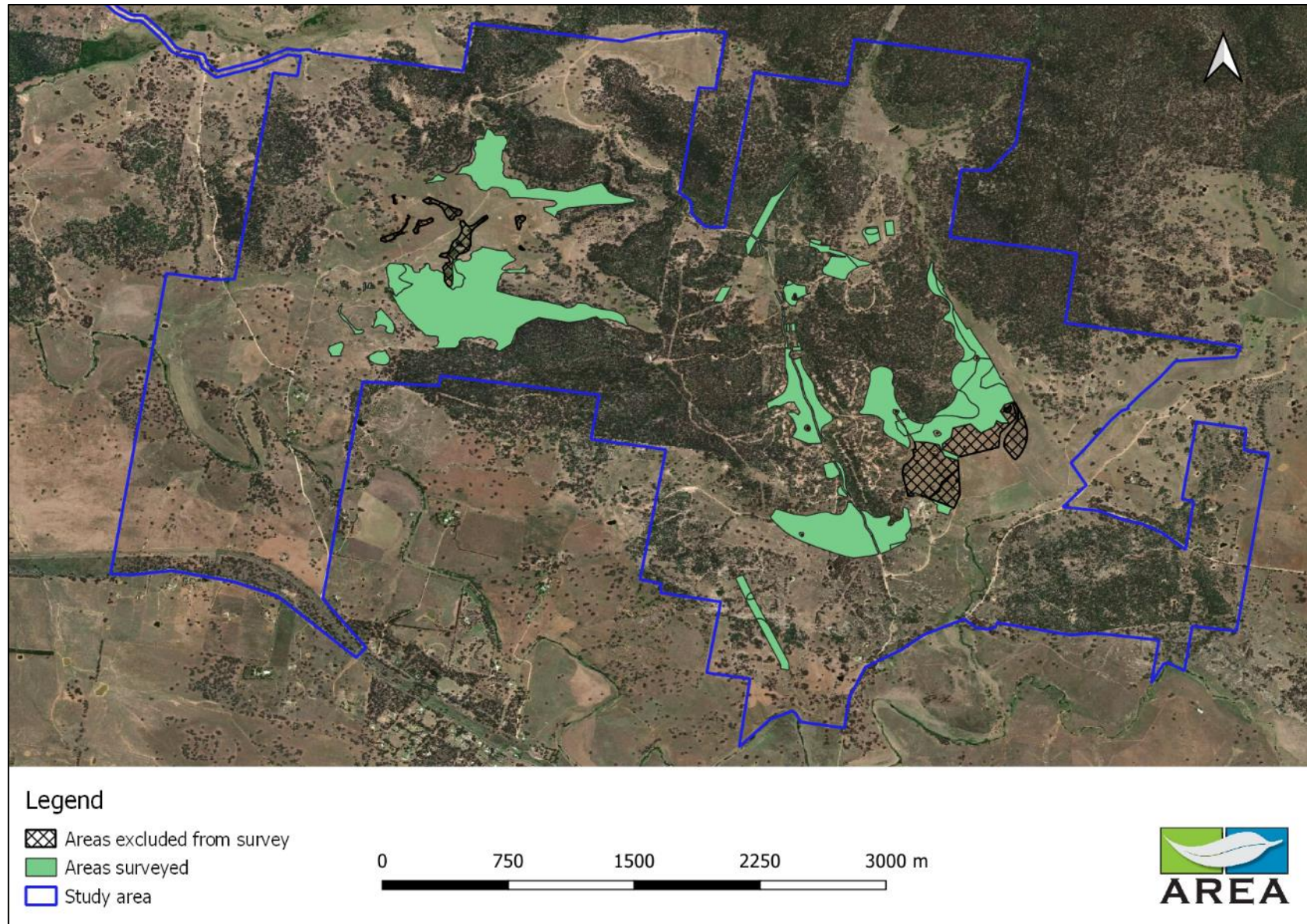
**Table 2-4: Listed threats to *Swainsona sericea***

Threat Category 1	Threat Category 2	Threat	Order
Habitat loss	Rural/residential/industrial development	Loss and degradation of habitat and/or populations for residential developments.	1
		Populations exhibit variations in ploidy level indicating that they are separate taxa.	2
Weed	Mixed weeds	Loss and degradation of habitat and/or populations by invasion of weeds.	3
Overgrazing	Domestic stock	Loss and degradation of habitat and/or populations by intensification of grazing regimes.	4
Habitat loss	Vegetation clearing for agricultural purposes	Loss and degradation of habitat and/or populations for agricultural developments.	5
Disturbance	Disturbance due to infrastructure	Infrastructure developments such as the Googong to Murrumbidgee pipeline project are known to have destroyed populations of the Silky Swainson-pea.	6
Habitat loss	Road / motorway development	Loss and degradation of habitat and/or populations from road works (particularly widening or re-routing).	7

A history of land degradation due to overgrazing from domestic stock, habitat loss due to vegetation clearing for agricultural purposes and a heavy weed burden led to some areas being deemed unsuitable habitat and not requiring survey (Figure 2-3). Plates 1 through 5 show the vegetation conditions that were deemed unsuitable habitat for survey based on the listed threats identified in Table 2-4.



Figure 2-7: Areas excluded from survey





**Plate 1: Example of crop excluded from survey**



**Plate 2: Excluded from survey due to farmed land with heavy weed burden**





**Plate 3: Excluded from survey due to farmed land with heavy weed burden**



**Plate 4: Excluded from survey due to farmed land with heavy weed burden**





**Plate 5: Excluded from survey due to farmed land with heavy weed burden and presence of grazing**



## 2.5 Other species

Other targeted searches undertaken during the field survey and in a time period identified on the BAMC as suitable to detect them, included:

- *Euphrasia arguta*
- *Prasophyllum* sp. Wybong
- *Prasophyllum petilum* Tarengo Leek Orchid

None of these species were detected during this additional field survey. It is also noted that these species have all been previously surveyed for and not detected.

## 2.6 Limitations

There were no limitations to the survey process or outcomes. Recent inundating rain followed by warm and clear conditions during field assessment provided excellent conditions for flora survey. In addition, both species were seen to be flowering/fruiting at the time of survey (refer to Appendix A for detailed images).

### 3 References

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- AREA Environmental & Heritage Consultants. (2021). *Defining habitat critical for the survival of the Swainsona recta - habitat modelling of the Small Purple-pea in the NSW Central Tablelands and Central West LLS Regions*. NSW Local Land Services.
- Department of Planning, Industry and Environment. (2020). *Surveying threatened plants and their habitats- NSW survey guide for the Biodiversity Assessment Method*. Parramatta: Department of Planning, Industry and Environment.















Appendix B- *Swainsona sericea* images









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# **Annexure 10**

## **SEARs and where Addressed in this BAR**

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**Table A9.1**  
**Coverage of SEARs and Other Government Agency Requirements**

Page 1 of 4

Relevant Requirement(s)	Coverage in Report
<b>Secretary's Environmental Assessment Requirements</b>	
The EIS must include:	
<ul style="list-style-type: none"> <li>an assessment of the likely biodiversity impacts of the development, in accordance with the <i>Framework for Biodiversity Assessment</i>, and having regard to OEH's requirements; and</li> </ul>	Sections 7.3, 7.4 and throughout BAR
<ul style="list-style-type: none"> <li>a strategy to offset any residual impacts of the development in accordance with the <i>NSW Biodiversity Offsets Policy for Major Projects</i>.</li> </ul>	Section 7.5, 8
While not exhaustive, Attachment 1 Extract (below) contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development.	
<ul style="list-style-type: none"> <li>Framework for Biodiversity Assessment (OEH)</li> </ul>	Considered throughout BAR
NSW Biodiversity Offsets Policy for Major Projects (OEH)	Section 7.5, 8
Threatened Species Assessment Guidelines (OEH)	Section 2.1.2
State Environmental Planning Policy No. 44 – Koala Habitat Protection	SEPP 44 does not apply to SSD projects. However, SEPP 44 discussed in Section 7.7
<b>Relevant Requirements Nominated by Department of Environment &amp; Energy</b>	
<b>Consideration of listed Threatened Species and Communities nominated by Department of Environment &amp; Energy</b>	
<ul style="list-style-type: none"> <li>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland -Critically Endangered;</li> </ul>	Section 4.3
<ul style="list-style-type: none"> <li>Koala (Qld, NSW and the ACT) (<i>Phascolarctus cinereus</i>) – Vulnerable;</li> </ul>	Sections 5.2, 5.4, 5.7, 7.5.2, 7.7, 7.8, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Regent Honeyeater (<i>Anthochaera phrygia</i>) - Critically Endangered;</li> </ul>	Sections 5.4.2-5.4.4, 5.7.1, 5.2, <b>Table 29</b> , 7.5.2, 7.6, 7.8
<ul style="list-style-type: none"> <li>Swift Parrot (<i>Lathamus discolor</i>) - Critically Endangered; and</li> </ul>	Sections 5.3, 5.7.1, 7.6, 7.8, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (SE mainland population) (<i>Dasyurus maculatus maculatus</i> (SE mainland population)) – Endangered.</li> </ul>	<b>Table 26</b> , Sections 5.7.1, 5.8.7, 7.8
<ul style="list-style-type: none"> <li>a leek-orchid (<i>Prasophyllum sp. Wybong</i> (C.Phelps ORG 5269)) – Critically Endangered (pipeline only);</li> </ul>	Sections 5.2, 5.4.2, <b>Table 2</b>
<ul style="list-style-type: none"> <li>Philotheca ericifolia – Vulnerable;</li> </ul>	<b>Table 29</b>
<ul style="list-style-type: none"> <li>Tarengo Leek Orchid (<i>Prasophyllum petilum</i>) – Endangered;</li> </ul>	Sections 5.1, 5.2, 5.4.1, 5.4.2, 5.7.1, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Small Purple-pea (<i>Swainsona recta</i>) – Endangered;</li> </ul>	Sections 5.2, 5.4.2, 5.7.1, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Euphrasia arguta – Critically Endangered;</li> </ul>	Sections 5.2, 5.4.2, 5.7.1 <b>Table 29</b>
<ul style="list-style-type: none"> <li>Booroolong Frog (<i>Litoria booroolongensis</i>) – Endangered;</li> </ul>	Sections 5.1, 5.2, 5.4.1, 5.4.2, 5.7.1, <b>Table 98</b>
<ul style="list-style-type: none"> <li>Striped Legless Lizard (<i>Delma impar</i>) – Vulnerable;</li> </ul>	<b>Table 29</b>
<ul style="list-style-type: none"> <li>Superb Parrot (<i>Polytelis swainsonii</i>) – Vulnerable;</li> </ul>	Section 5.7.1, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Brush-tailed Rock Wallaby (<i>Petrogale penicillata</i>) – Vulnerable;</li> </ul>	Section 5.4.1, 5.4.2, <b>Table 29</b>
<ul style="list-style-type: none"> <li>Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) – Vulnerable;</li> </ul>	<b>Table 29</b>

**Table A9.1 (Cont'd)**  
**Coverage of SEARs and Other Government Agency Requirements**

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Relevant Requirement(s)	Coverage in Report
• Pink-tailed Worm-lizard ( <i>Aprasia parapulchella</i> ) – Vulnerable;	<b>Table 29</b>
• Corben's Long-eared Bat ( <i>Nyctophilis corbeni</i> ) – Vulnerable;	Section 5.3
• Painted Honeyeater ( <i>Grantiella picta</i> ) – Vulnerable; and	Sections 5.3, 5.7.1, <b>Table 29</b>
• Large-eared Pied Bat ( <i>Chalinolobus dwyeri</i> ) – Vulnerable.	Sections 5.3.1, 5.4, 5.7, 7.8, <b>Annexure 6</b> , <b>Table 29</b>
<b>General</b>	
The Environmental Impact Statement (EIS) must address the matters outlined in Schedule 4 of the EPBC Regulations and the matters outlined below in relation to the controlling provisions.	Sections 5, 7 and 8, <b>Annexure 6</b>
The title of the action, background to the action of the action and current status.	Section 1
The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.	Section 1
How the action relates to any other actions that have been, or are being taken in the region affected by the action.	Not Relevant
How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	See EIS Section 2 and Appendix 5
The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including:	
i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts;	Sections 5, 7.3, 7.4, 8 and <b>Annexure 6</b>
ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;	Sections 5, 7.6, 7.4.7, <b>Annexure 6</b>
iii. analysis of the significance of the relevant impacts; and	<b>Annexure 6</b>
iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	Section 10
For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including:	
i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures,	Section 6
ii. any statutory policy basis for the mitigation measures;	Section 6
iii. the cost of the mitigation measures;	See SCSC Part 15
iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;	See EIS Section 1
v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	DPIE
Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	See SCSC Part 9b

**Table A9.1 (Cont'd)**  
**Coverage of SEARs and Other Government Agency Requirements**

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Relevant Requirement(s)	Coverage in Report
<b>General (Cont'd)</b>	
For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any:	
i. conservation advice or recovery plan for the species or community,	Section 7, <b>Annexure 6</b> , Section 8
ii. relevant threat abatement plan for a process that threatens the species or community	Section 7, <b>Annexure 6</b> , Section 6
iii. wildlife conservation plan for the species	Not Applicable
iv. any strategic assessment.	Not Applicable
Key risks from the Commonwealth perspective include:	
<ul style="list-style-type: none"> <li>Impacts to threatened species and the ecological community listed above from clearing the vegetation.</li> </ul>	Section 7
The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	Section 7, <b>Annexure 6</b> , <b>Table 29</b>
For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate:	
a. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Section 5
b. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements;	Section 2
c. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and	<b>Annexure 6</b>
d. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action;	Section 6
e. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account;	Section 7, <b>Annexure 6</b>
f. a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established.	Section 8 See SCSC Part 9b
g. details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and	Not covered by this BAR, see Biodiversity Offset Strategy
h. details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites;	Not covered by this BAR, see Biodiversity Offset Strategy

**Table A9.1 (Cont'd)**  
**Coverage of SEARs and Other Government Agency Requirements**

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Relevant Requirement(s)		Coverage in Report
[Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action and deliver an overall conservation outcome that improves or maintains the viability of the MNES i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.]		
Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy. <a href="http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy">http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy</a> .		Noted
Relevant Requirements Nominated by Other Government Agencies		
Office of Environment & Heritage 13/12/16	1. Biodiversity impacts related to the proposed Bowdens Silver Project are to be assessed and documented in accordance with the <a href="#">Framework for Biodiversity Assessment</a> , unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the <i>Threatened Species Conservation Act 1995</i> .	BAR is provided and is in accordance with FBA Section 2.1.2
	2. Impacts on the following species/populations/ecological communities will require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment:	
	a. Anthochaera phrygia (Regent Honeyeater)	Throughout the BAR, but specifically within section 5, 7 and <b>Annexure 6</b> .
	b. Lathamus discolor (Swift Parrot)	
	c. White Box Yellow Box Blakely's Red Gum Woodland	
	3. Impacts on the following species/populations/ecological communities will not require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment, unless they are recorded during the ecological surveys:	
	a. Bossiaea fragrans	Not recorded during the ecology surveys, so not considered further in BAR.
	b. Caladenia attenuata	
	c. Calidris ferruginea (Curlew Sandpiper)	
	d. Euphrasia arguta	
	e. Pomaderris reperta (Denman Pomaderris)	
	f. Prasophyllum sp. Wybong	
	g. Pultenaea sp. Genowlan Point	
	h. Synemon plana (Golden Sun Moth)	

**Table A9.2**  
**Issues raised by Lue and District Community**

<b>Issue(s)</b>	<b>Coverage in Report</b>
Scale of environmental offsets and property acquisitions for biodiversity offsets.	Not covered by this BAR, see Biodiversity Offset Strategy
What impacts will the mine have on wildlife habitat (e.g. Koalas)?	Section 7, <b>Annexure 6</b>
Where will the biodiversity offsets for EECs be located?	Not covered by this BAR, see Biodiversity Offset Strategy
How would exposure to cyanide and other toxins impact wildlife?	Section 7.4
Will there be an increase in invasive species as a result of mining?	Section 7.4
Will a more detailed environmental risk assessment be conducted?	See EIS Section 4.8.9
Will Bowdens Silver continue to actively manage weeds and pests in the future?	Section 6.3.6, 6.3.7
Will a detailed Preliminary Hazard Assessment be included in the EIS?	See EIS Section 4.16
Scale of environmental offsets and property acquisitions for biodiversity offsets.	Not covered by this BAR, see Biodiversity Offset Strategy
What investigations have been completed into effects on flora/fauna?	Section 2.3
Do you take into account the use of vegetation for breeding when considering its value for an offset?	Not covered by this BAR, see Biodiversity Offset Strategy
Visual impact of lighting on local community, livestock and wildlife.	Section 7.4.9



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