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Biodiversity Offsets Strategy

BYLONG COAL PROJECT

Biodiversity Offsets Report

For:

Hansen Bailey

July 2015

Final



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**Report No. 12052RP2**

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Glossary of Terms

AHD	Australian Height Datum
BBAM	BioBanking Assessment Methodology
BMP	Biodiversity Management Plan
BOP	Biodiversity Offsets Package
BOS	Biodiversity Offsets Strategy
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
DoE	Commonwealth Department of the Environment
DP&E	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIA	Ecological Impact Assessment
EIS	Environmental Impact Statement
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
GDE	Groundwater Dependent Ecosystem
GPS	Global Positioning System
KEPCO	KEPCO Bylong Australia Pty Ltd
LGA	Local Government Area
MNES	'Matters of National Environmental Significance' that are listed by the EPBC Act
Mtpa	Million tonnes per annum
NSW	New South Wales
OEA	Overburden Emplacement Area
OEH	NSW Office of Environment and Heritage
Offsite Offset Area	Land within the Yarran View Offset Area (see Figure 1.6)
Onsite Offset Area	Land within Offset Area 1, Offset Area 2, Offset Area 3, Offset Area 4 and Offset Area 5 (see Figure 1.6)
the Project	The Bylong Coal Project
Project Disturbance Boundary	The area directly impacted by the Project and includes the Open Cut Mining Areas, internal access roads and the associated Mining Infrastructure Areas (see Figure 1.1)
RDP	Rapid Data Point



RGA	Rapid Grassland Assessment
RMP	Rapid Mapping Point
ROM	Run of Mine
SEARs	Secretary's Environmental Assessment Requirements
Study Area	The area within Authorisations 287 and 342 (see Figure 1.1)
Subsidence Study Area	The area predicted and mapped as being indirectly impacted by subsidence (see Figure 1.1)
TEC	'Threatened Ecological Community' as listed under the TSC Act and/or EPBC Act
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
VEC	Vulnerable Ecological Community
WorleyParsons	WorleyParsons Services Pty Ltd



Chapter 1

Introduction

Cumberland Ecology was commissioned by Hansen Bailey on behalf of WorleyParsons Services Pty Ltd (WorleyParsons) to prepare a Biodiversity Offsets Report for the Bylong Coal Project (the 'Project'). This report will form part of the Environmental Impact Statement (EIS) being prepared by Hansen Bailey to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this report is to demonstrate that the Biodiversity Offset Strategy (BOS) adequately offsets the predicted impact of the Project on biodiversity values as detailed within the EIS Ecological Impact Assessment (EIA) (Cumberland Ecology, 2015), as well as providing detailed information on the Biodiversity Offset Package (BOP) for the Project.

Biodiversity values considered include native flora and fauna species collectively, and threatened species and ecological communities protected under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Further detail on the legislative requirements related to biodiversity values is provided within the EIA.

1.1 Background

In December 2010 KEPCO Bylong Australia Pty Ltd (KEPCO) acquired Authorisations (A) 287 and 342 (the Authorisations). Since this time, extensive exploration and mine planning work has been undertaken to determine the most socially responsible and economically viable mine plan to recover the known coal resources within the Authorisations.

In August 2014, KEPCO commissioned WorleyParsons to manage the Project exploration activities, mine feasibility study planning, environmental approvals and ongoing environmental monitoring for the Project.

The Project is located wholly within A287 and A342, which are located within the Mid-Western Regional Local Government Area (LGA). The closest regional centre is Mudgee, located approximately 55 km south-west from the Project. The Project is approximately 230 km by rail from the Port of Newcastle.



1.1.1 Project Description

The Project life is anticipated to be approximately 25 years, comprising a two year construction period and a 23 year operational period, with underground mining operations commencing in Year 7. Various rehabilitation and decommissioning activities will be undertaken during both the course of, and following the 25 years of the Project. It is noted that further mineable coal resources exist within both A287 and A342.

The Project generally comprises:

- The initial development of two open cut mining areas with associated haul roads and Overburden Emplacement Areas (OEAs), utilising a mining fleet of excavators and trucks and supporting ancillary equipment;
- The two open cut mining areas will be developed and operated 24 hours a day, 7 days a week over an approximate 10 year period and will ultimately provide for the storage of coal processing reject materials from the longer term underground mining activities;
- Construction and operation of administration, workshop, bathhouse, explosives magazine and other open cut mining related facilities;
- Construction and operation of an underground coal mine operating 24 hours a day, 7 days a week for a 20 year period, commencing mining in around year 7 of the Project;
- A combined maximum extraction rate of up to 6.5 Million tonnes per annum (Mtpa) Run of Mine (ROM) coal;
- A workforce of up to approximately 800 during the initial construction phase and a peak of 470 full-time equivalent operations employees at full production;
- Underground mining operations utilising longwall mining techniques with primary access provided via drifts constructed adjacent to the rail loop and Coal Handling and Preparation Plant (CHPP);
- The construction and operation of facilities to support underground mining operations including personnel and material access to the underground mining area, ventilation shafts, workshop, offices and employee amenities, fuel and gas management facilities;
- Construction and operation of a CHPP with a designed throughput of approximately 6 Mtpa of ROM coal, with capacity for peak fluctuations beyond this;
- The dewatering of fine reject materials through belt press filters within the CHPP and the co-disposal of dewatered fine and coarse reject materials within OEAs and final open cut voids (avoiding the need for a tailings dam);



- Construction and operation of a rail loop and associated rail load out facility and connection to the Sandy Hollow to Gulgong Railway Line to facilitate the transport of product coal;
- The construction and operation of surface and groundwater management and water reticulation infrastructure including diversion drains, dams (clean, dirty and raw water), pipelines and pumping stations;
- The installation of communications and electricity reticulation infrastructure;
- Construction and operation of a Workforce Accommodation Facility and associated access road from the Bylong Valley Way;
- The upgrade of Upper Bylong Road and the construction and operation of a Mine Access Road to provide access to the site facilities;
- Relocation of sections of some existing public roads to enable alternate access routes for private landholders surrounding the Project; and
- Infilling of mining voids, progressive rehabilitation of disturbed areas, decommissioning of Project infrastructure and rehabilitation of the land progressively following mining operations.

Figure 1.1 illustrates the Conceptual Project Layout. Within the Study Area, which comprises the Authorisation, the area directly impacted by the Project including the Open Cut Mining Areas, internal access roads and the associated Mining Infrastructure Areas is referred to as the Project Disturbance Area. The area predicted and mapped as being indirectly impacted by subsidence is referred to as the Subsidence Study Area.

1.1.2 Project Disturbance Boundary Biodiversity Values Impacted

Cumberland Ecology prepared an EIA for the Project, which will be included within the EIS prepared by Hansen Bailey. The EIA documents the findings of an ecological investigation of the Project and assesses the impacts of the Project on the biodiversity values present within the Study Area, including species and communities listed under the TSC Act and EPBC Act. A summary of the biodiversity values impacted by the Project is provided below.

i. Vegetation and Associated Habitat

The primary direct impact of the Project is the loss of vegetation and associated habitat within the Project Disturbance Boundary. Although there are different types of flora and fauna habitat within the Study Area, such as natural and semi-cleared vegetation, cliff lines, gullies and ephemeral creeks, the most extensive habitat to be directly impacted is represented by native vegetation. In addition to the direct removal of vegetation and associated habitat, the Project will also indirectly impact ecological values that will remain within the Study Area through a range of indirect impacts, including subsidence, fragmentation, edge effects, alteration to wildlife corridors, alteration to hydrological regimes and changes to weed occurrence and feral animal abundance. Most indirect impacts cannot be mapped with



precision. Subsidence impacts are able to be predicted (using conservative assumptions) and the impacts have been predicted and mapped as occurring within an area defined as the Subsidence Study Area.

The total Project Disturbance Boundary (direct impact) is 1,160 ha in size and includes the Open Cut Mining Areas the associated Mining Infrastructure Areas. **Table 1.1** provides a summary of the areas of each vegetation community within the Project Disturbance Boundary and Subsidence Study Area and **Figure 1.2** shows their distribution. The direct clearing of vegetation within the Project Disturbance Boundary will occur gradually over the proposed mining stages. An additional 1,714 ha of land occurs above the Subsidence Study Area (indirect impact).

Table 1.1 Vegetation communities recorded within the Project Disturbance Boundary and Subsidence Study Area

Vegetation Community	Project Disturbance Boundary (ha) [~]	Subsidence Study Area (ha) [~]
2: Grey Myrtle Dry Rainforest		<1
4: Apple Riparian Forest		
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	5	15
5: Blakely's Red Gum / Paperbark Forest		15
6: Yellow Box Woodland		
6a: <i>Yellow Box Woodland (Grassy)</i>	8	112
7: White Box Woodland		
7a: <i>White Box Woodland (Grassy)</i>	55	407
7b: <i>White Box Woodland (Shrubby)</i>	71	34
8: Blakely's Red Gum Woodland		
8b: <i>Blakely's Red Gum Woodland (Shrubby)</i>		15
9: Slaty Box Woodland	11	124
10: Coastal Grey Box Woodland	31	4
11: Fuzzy Box Woodland	5	
13: Shrubby Regrowth	40	2
14: Dwyer's Red Gum Low Open Forest		31
15: Caley's Ironbark Forest		348
16: Blue-leaf Ironbark / Cypress Forest		86
17: Red Ironbark / Cypress Forest		105
18: Cypress Pine Forest	4	
19: Bloodwood / Ironbark Forest		17



Table 1.1 Vegetation communities recorded within the Project Disturbance Boundary and Subsidence Study Area

Vegetation Community	Project Disturbance Boundary (ha) [~]	Subsidence Study Area (ha) [~]
20: Scribbly Gum / Grey Gum Forest		1
21: Exposed Grey Gum / Stringybark Forest		33
22: Sheltered Grey Gum / Stringybark Forest		
DNG: Derived Native Grasslands		
<i>DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland</i>	11	1
<i>DNG – 4: Blakely's Redgum / Apple Riparian Forest Derived Native Grassland</i>		
<i>DNG – 6: Yellow Box Woodland Derived Native Grassland</i>	14	67
<i>DNG – 7: White Box Woodland Derived Native Grassland</i>	174	251
<i>DNG – 8: Blakely's Redgum Woodland Derived Native Grassland</i>		2
<i>DNG – 9: Slaty Box Woodland Derived Native Grassland</i>	31	16
<i>DNG – 10: Coastal Grey Box Woodland Derived Native Grassland</i>	241	12
<i>DNG – 11: Fuzzy Box Woodland Derived Native Grassland</i>	53	
CC: Cultivated Lands	386	
Other (cleared, planted vegetation)	21	16
GRAND TOTAL⁺	1,160	1,714

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate

ii. Threatened Ecological Communities

Two threatened ecological communities (TECs) have been identified as occurring within the Project Disturbance Boundary and Subsidence Study Area, including:

- Hunter Valley Footslopes Slaty Gum Woodland; and
- Box Gum Woodland and Derived Native Grassland.

A third TEC, Hunter Floodplain Red Gum Woodland, is also known to occur within the Study Area; however no area of this community will be cleared by the Project. **Table 1.2** summaries the extent of each TEC within the Project Disturbance Boundary and Subsidence Study Area. **Figure 1.3** shows the distribution of these communities within these areas.



Table 1.2 TECs recorded within the Project Disturbance Boundary and Subsidence Study Area

Vegetation Community	TSC Act			EPBC Act		
	Status	PDB (ha) ~	SSA (ha) ~	Status	PDB (ha) ~	SSA (ha) ~
Hunter Valley Footslopes Slaty Gum Woodland						
9: Slaty Box Woodland	VEC	11	124	-	-	-
Box Gum Woodland and Derived Native Grassland						
6: Yellow Box Woodland	EEC	8	112	CEEC	8	112
7a: White Box Woodland (Grassy)	EEC	53	407	CEEC	53	407
DNG – 6(1) ^A : Yellow Box Woodland Derived Native Grassland	EEC	6	5	CEEC	6	5
DNG – 6(2) ^B : Yellow Box Woodland Derived Native Grassland	EEC	8	62	-	-	-
DNG – 7(1) ^A : White Box Woodland Derived Native Grassland	EEC	68	146	CEEC	68	146
DNG – 7(2) ^B : White Box Woodland Derived Native Grassland	EEC	63	105	-	-	-
DNG – 8(1) ^A : Blakely's Redgum Woodland Derived Native Grassland	EEC	0	2	CEEC	0	2
<i>Subtotal Box Gum Woodland and Derived Native Grassland</i>		206	839		135	672
TOTAL⁺		217	964		135	672

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

~ Area calculations are approximate

⁺ In some cases totals may not equal the appropriate total number due to rounding

PDB = Project Disturbance Boundary, SSA = Subsidence Study Area



iii. Threatened Species

A suite of threatened flora and fauna species have been recorded within the Study Area and a number of other species known from the locality have the potential to occur. **Table 1.3** lists the threatened species known or potentially occurring within the Study Area that may be impacted by the Project. **Figure 1.4** and **Figure 1.5** show the distribution of threatened flora and fauna species recorded within the Study Area, respectively.

Table 1.3 Threatened and/or migratory flora and fauna species known or potentially occurring within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area
FLORA				
<i>Tylophora linearis</i>		V	E	Known
<i>Ozothamnus tessellatus</i>		V	V	Known
<i>Acacia pendula</i>	<i>Acacia pendula</i> population in the Hunter catchment	EP		Known
<i>Prostanthera cryptandroides</i> subsp. <i>cryptandroides</i>	Wollemi Mint-bush	V	V	Potential
<i>Prostanthera discolor</i>		V	V	Potential
<i>Commersonia rosea</i> (syn. <i>Androcalva rosea</i>)		E	E	Potential
<i>Eucalyptus camaldulensis</i>	<i>Eucalyptus camaldulensis</i> population in the Hunter catchment	EP		Known
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V		Potential
<i>Homoranthus darwinoides</i>		V	V	Potential
<i>Cymbidium canaliculatum</i>	<i>Cymbidium canaliculatum</i> population in the Hunter Catchment	EP		Known
<i>Diuris tricolor</i>	Pine Donkey Orchid	V		Known
<i>Pomaderris queenslandica</i>	Scant Pomaderris	E		Known
<i>Pomaderris sericea</i>	Silky Pomaderris	E	V	Potential
<i>Philothea ericifolia</i>			V	Potential
<i>Thesium australe</i>	Austral Toadflax	V	V	Potential
FAUNA				
Birds				
<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known



Table 1.3 Threatened and/or migratory flora and fauna species known or potentially occurring within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area
<i>Circus assimilis</i>	Spotted Harrier	V		Known
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known
<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential
<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*
<i>Ardea ibis</i>	Cattle Egret		M	Potential
<i>Ardea modesta</i>	Eastern Great Egret		M	Potential
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known
<i>Grantiella picta</i>	Painted Honeyeater	V		Potential
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known
<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known
<i>Petroica boodang</i>	Scarlet Robin	V		Potential
<i>Petroica phoenicea</i>	Flame Robin	V		Potential
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known
<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential
<i>Neophema pulchella</i>	Turquoise Parrot	V		Known
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential
<i>Ninox connivens</i>	Barking Owl	V		Known*
<i>Ninox strenua</i>	Powerful Owl	V		Known*



Table 1.3 Threatened and/or migratory flora and fauna species known or potentially occurring within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area
<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential
Mammals				
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential
<i>Phascolarctos cinereus</i>	Koala	V	V	Potential
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential
<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known*
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Potential
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Potential
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known
Reptiles				
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)



1.2 Requirement for Offsetting

In NSW and for Commonwealth-assessed projects, the requirement for offsetting is considered within the following hierarchy for managing impacts:

- Avoid: to the extent possible, projects should be designed to avoid or minimise ecological impacts;
- Mitigate: where certain impacts are unavoidable through design changes, mitigation measures should be introduced to ameliorate the ecological impacts of the project; and
- Compensate: the residual impacts of the project, following the implementation of mitigation measures, should be compensated for in some way to offset what would otherwise be a net loss of habitat.

A suite of avoidance and mitigation measures have been proposed for the Project and are outlined within the EIA. The BOS that is discussed within this document has been developed to compensate for the residual impacts of the Project once the appropriate avoidance and mitigation measures have been implemented.

The considerations for offsetting the residual ecological impacts of the Project have been guided by the following policies:

- NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014c); and
- *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (SEWPaC, 2012).

For biodiversity offsets to be considered 'appropriate', the principles outlined within these policies must be adhered to where possible.

1.3 Project Biodiversity Offset Strategy and Package

1.3.1 Development

Due to the nature, magnitude and location of most open cut coal mining projects, broad areas of forest, woodland, grassland and threatened species habitat are usually required to be cleared. In this regard, it was apparent during the early design and assessment phases that the Project would be required to develop a BOS to compensate for any residual ecological impacts of the Project, particularly those to TECs.

Several high level desktop analyses and site specific field surveys of suitable offset properties have been undertaken since 2013. Important considerations in determining which properties were to form the BOP included:

- The known occurrence of the TEC Box Gum Woodland and Derived Native Grassland;



- The likely availability of habitat for relevant threatened flora and fauna species that could be impacted by the Project;
- Linkages to sustainable ecological features (particularly permanent water sources);
- The potential to form new, or improve existing ecological corridors; and
- Land currently owned by KEPCO.

The properties selected for inclusion within the BOP were further assessed and the results are presented within this report.

1.3.2 Consultation

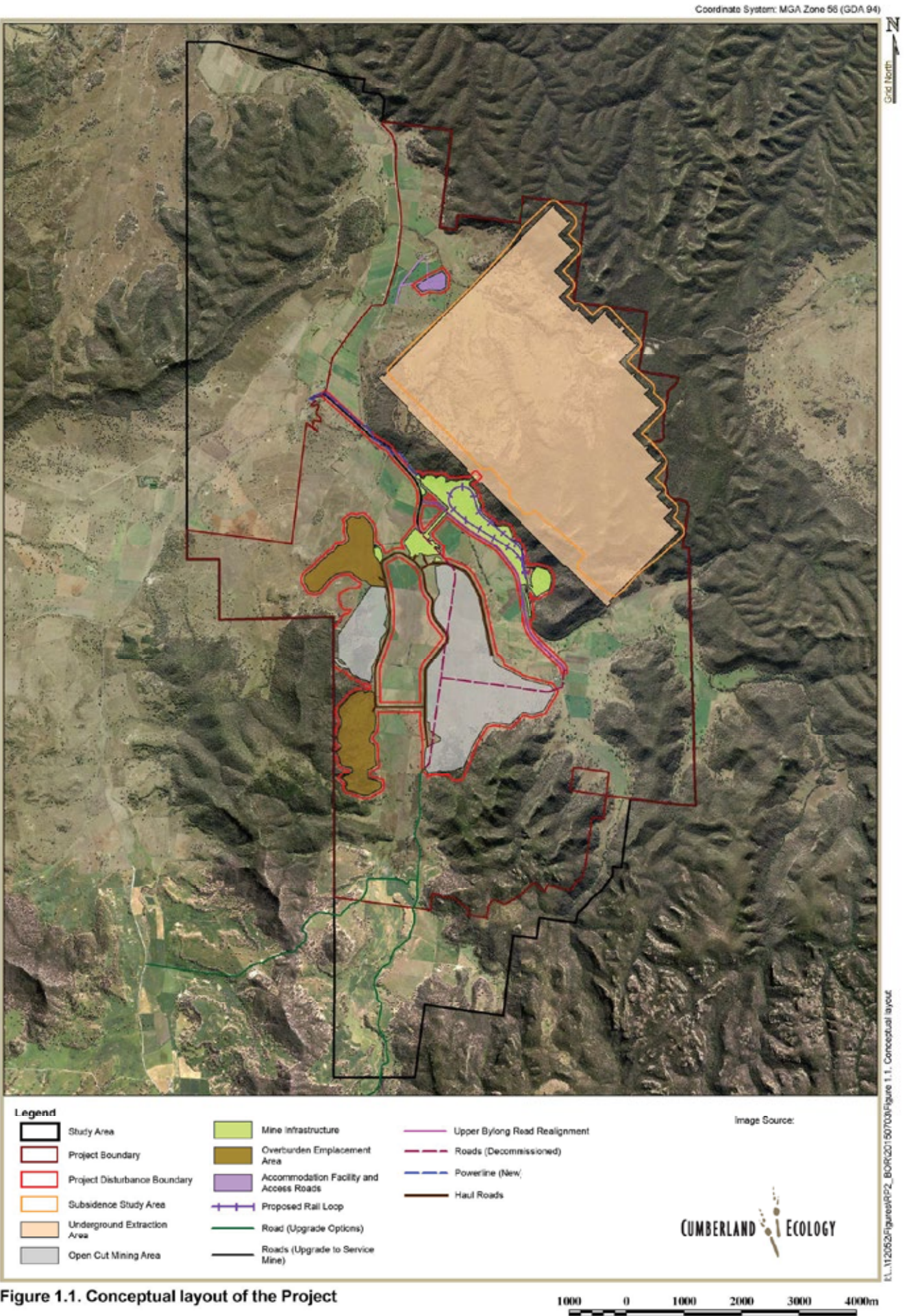
Since the commencement of the Project, consultation relating to biodiversity values has been undertaken with the NSW Department of Planning and the Environment (DP&E), the NSW Office of Environment and Heritage (OEH) and the Commonwealth Department of the Environment (DoE). Discussions regarding the ecological impacts of the Project and the preliminary offsets package were held with OEH on 25 July 2014, 11 February 2015 and 8 April 2015 and with DoE on 6 August 2014. The purpose of the consultation is to assist in the development of the BOS to ensure it meets the requirements for offsetting under State and Commonwealth legislation. Further consultation is proposed to assist in the finalisation of the BOS.

1.3.3 Biodiversity Offset Strategy and Package

The BOS entails acquisition and management of offset properties for permanent conservation of flora and fauna, including species predicted to be impacted by the Project. The current composition of the BOP includes:

1. **Onsite Offset Areas**, comprising:
 - a. Conservation and ongoing management of existing vegetated land within Offset Area 1, Offset Area 2, Offset Area 3, Offset Area 4 and Offset Area 5; and
 - b. Restoration of vegetation communities and associated habitat within the aforementioned onsite offset areas.
2. **Offsite Offset Area**, comprising:
 - a. Conservation and ongoing management of existing vegetated land within the Yarran View Offset Area;
 - b. Restoration of vegetation communities and associated habitat within the aforementioned offsite offset area; and

The location of the Onsite and Offsite Offset Areas are shown in **Figure 1.6**.



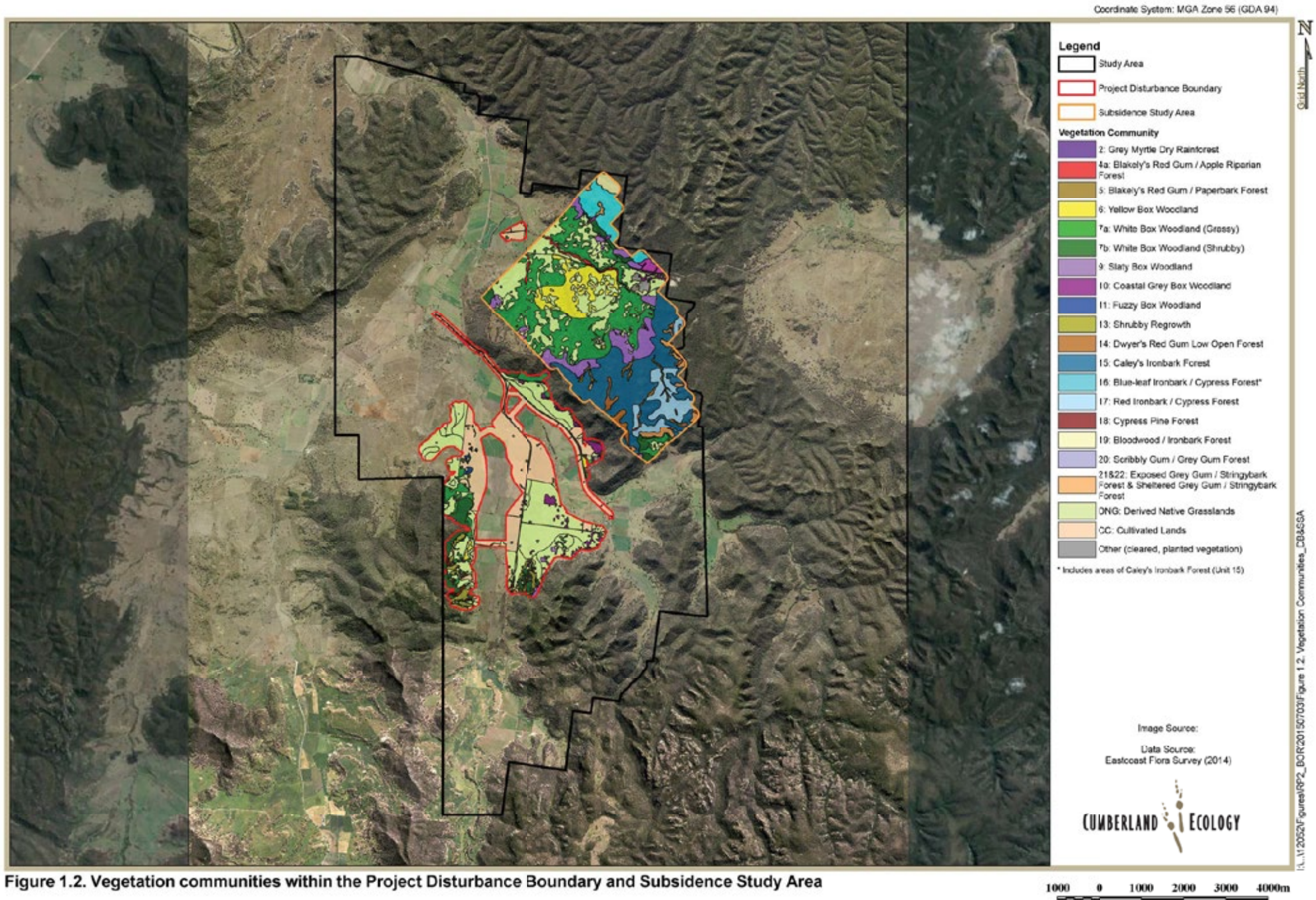
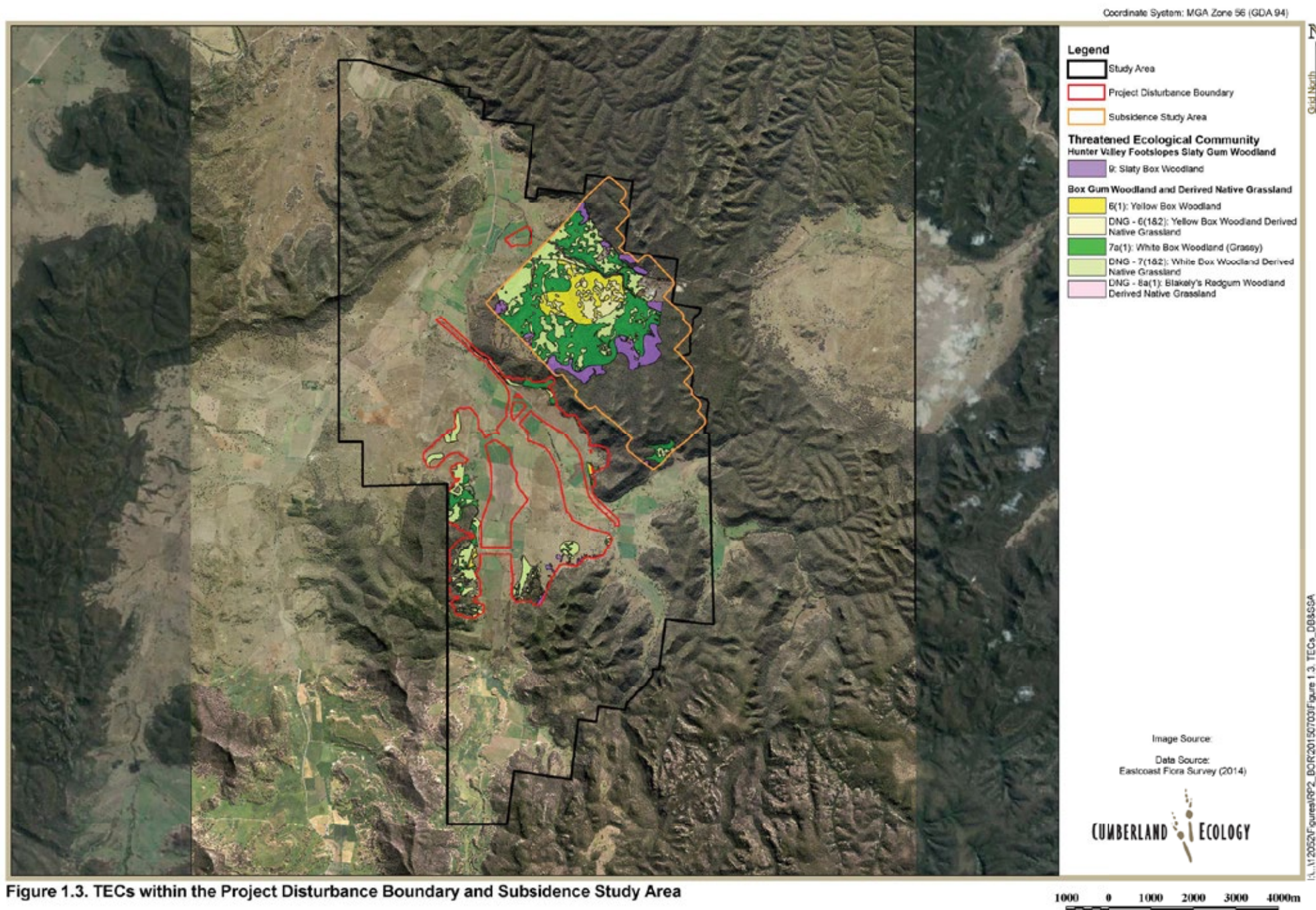


Figure 1.2. Vegetation communities within the Project Disturbance Boundary and Subsidence Study Area



Coordinate System: MGA Zone 56 (GDA 94)

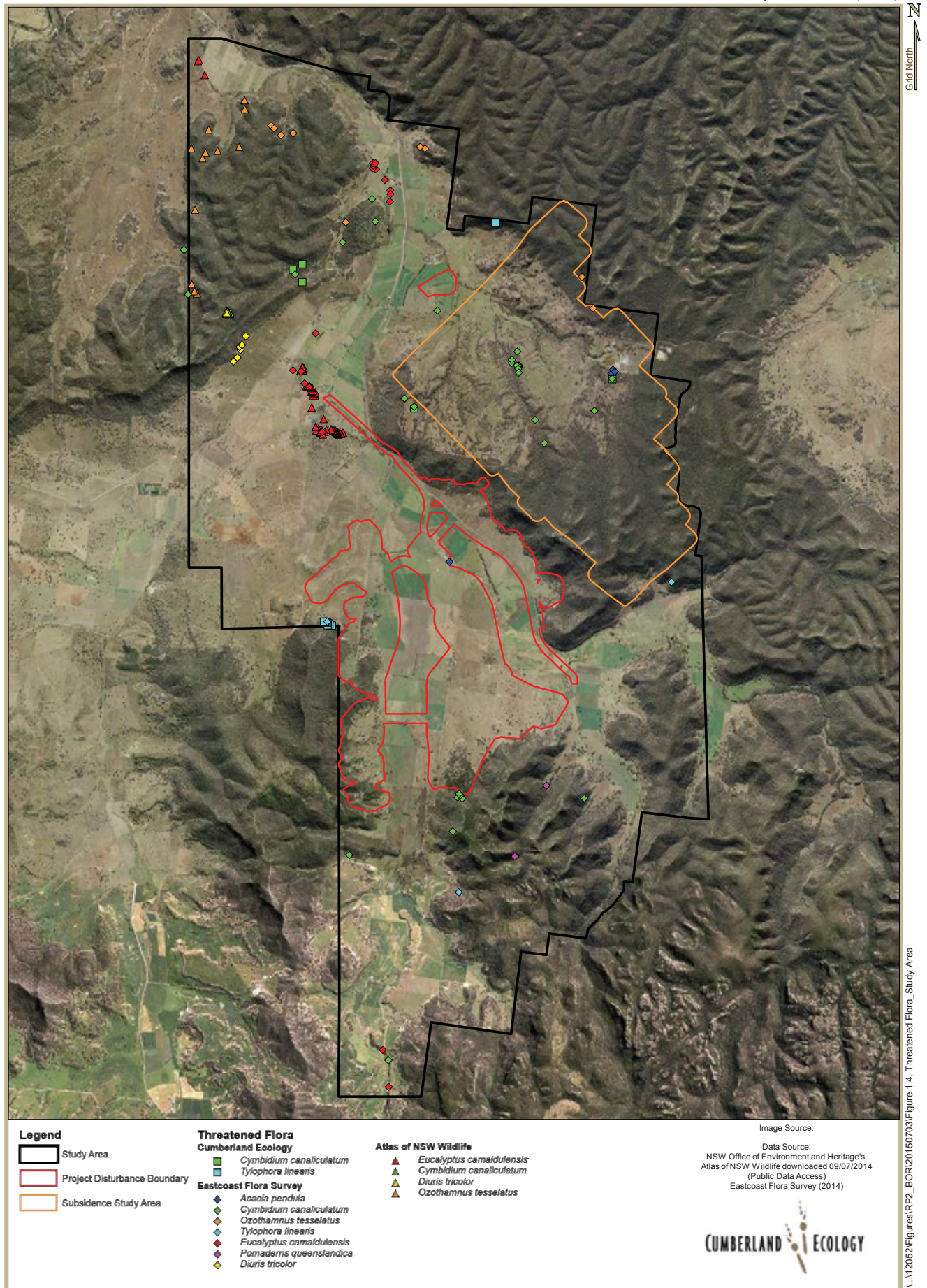


Figure 1.4. Threatened flora species recorded within the Study Area

1000 0 1000 2000 3000 4000m

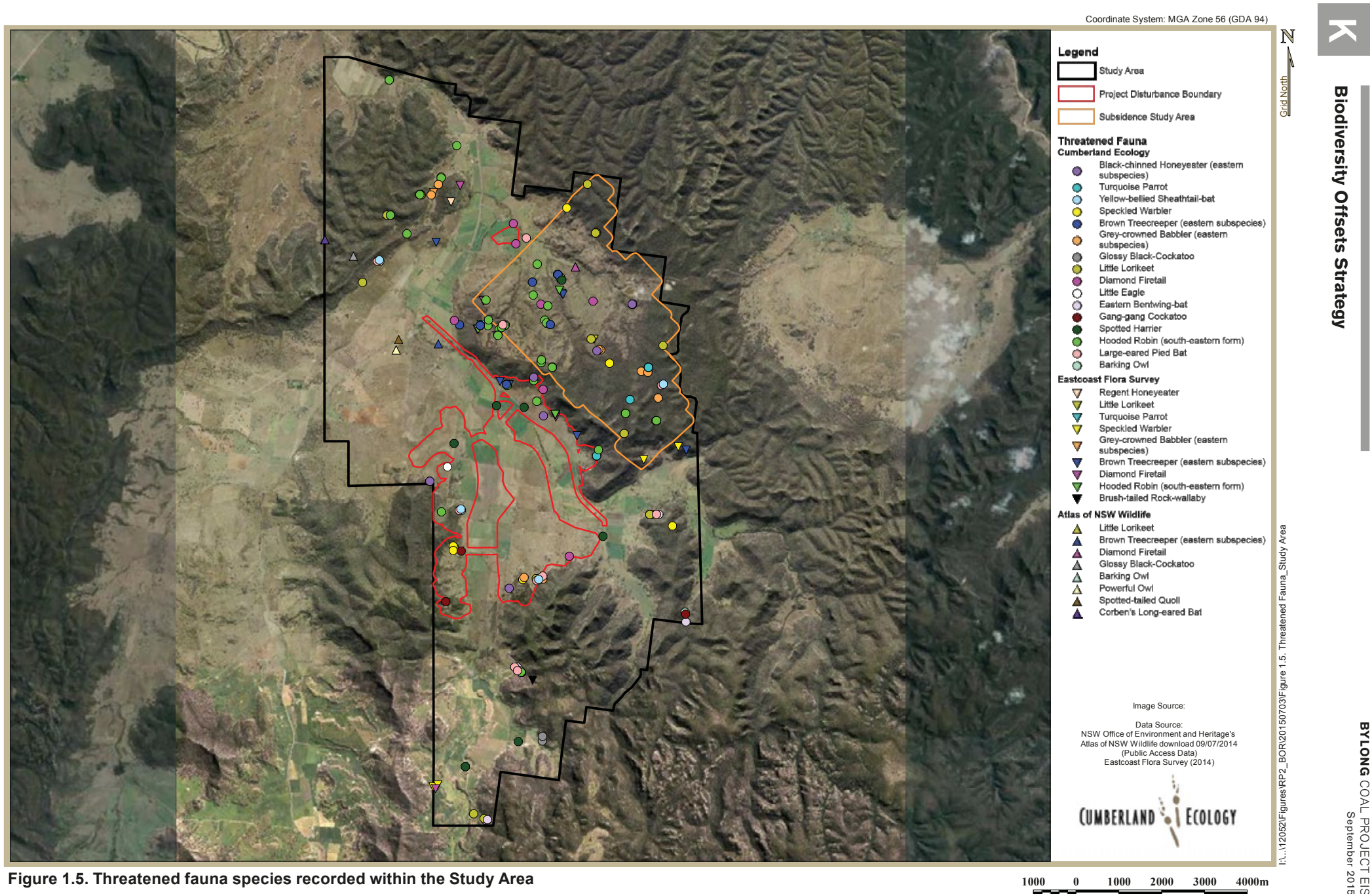
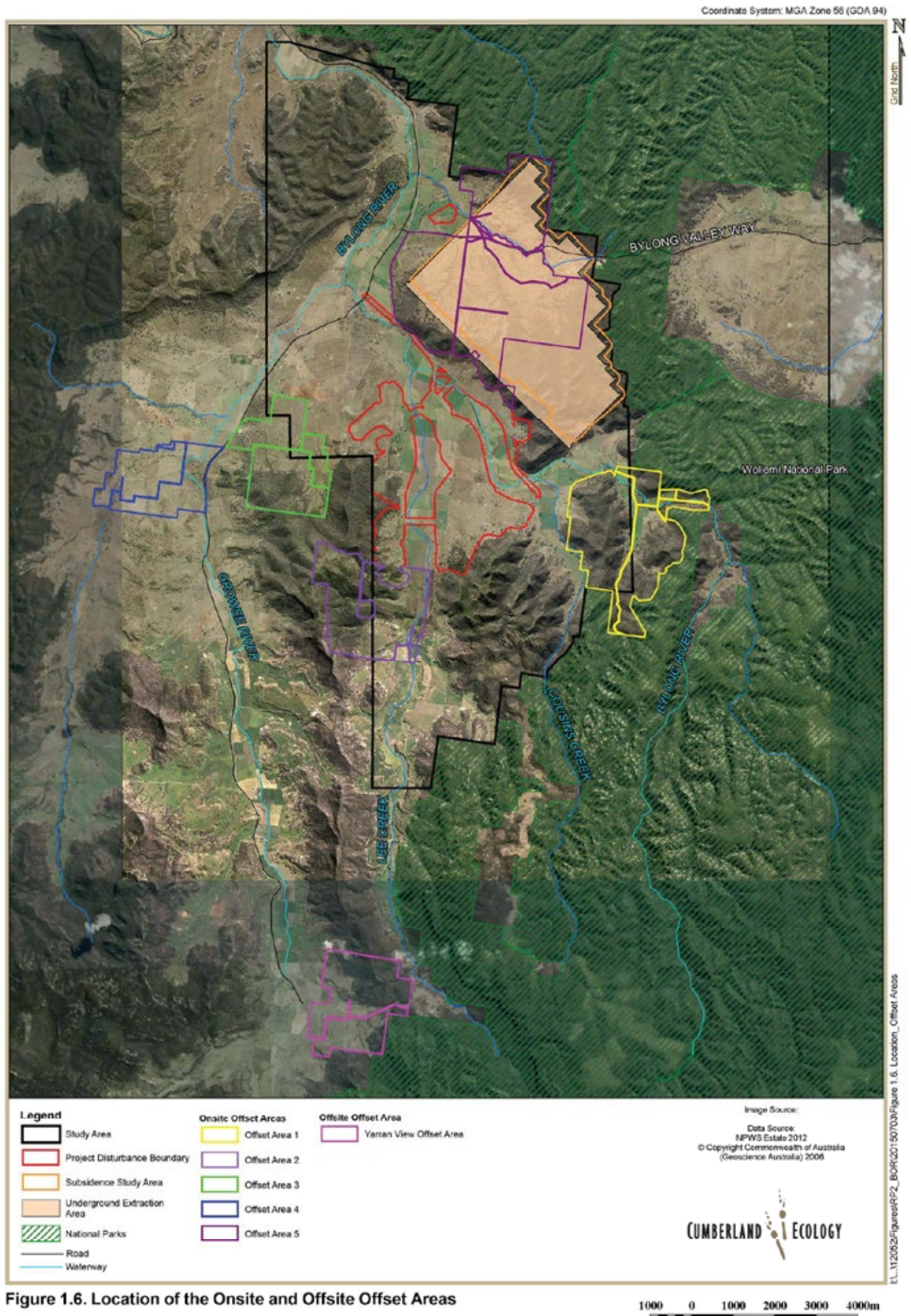


Figure 1.5. Threatened fauna species recorded within the Study Area





Chapter 2

Methodology

2.1 Literature Review

A review of ecological literature relevant to the Project offsets was undertaken as part of this assessment to evaluate the flora and fauna values associated with the locality of the offsets. Key literature reviewed includes:

- Geological and soil landscape maps;
- Existing vegetation mapping (North-west Wollemi National Park and Surrounds, Greater Hunter Native Vegetation Mapping Project);
- Plans of Management (Wollemi National Park, Goulburn River National Park and Munghorn Gap Nature Reserve); and
- Previous ecological reports from the locality of the offsets (Vertebrate Fauna of North-western Wollemi National Park (DEC, 2006), Mt Penny Preliminary Assessment (Wells Environmental Services, 2011)).

Information within the literature that was reviewed was used in determining the likelihood of threatened species occurring within the offsets and assessing the similarities of the biodiversity values within the offsets to those within the Study Area.

2.2 Database Analysis

Database analysis was conducted for the immediate vicinity (5 km radius) around each of the offsets using the OEH Atlas of NSW Wildlife Database (OEH, 2014a) and the DoE EPBC Protected Matters Search Tool (DoE, 2014b). The Atlas of NSW Wildlife Database search facility was used to generate records of threatened flora and fauna species and populations listed under the TSC Act and EPBC Act within the immediate vicinity of the offsets. The abundance, distribution and age of records generated within the search areas provided supplementary information for the assessment of likelihood of occurrence of those threatened species within the offsets. The Protected Matters Search Tool generated a list of potentially occurring Matters of National Environmental Significance (MNES) listed under the EPBC Act within the locality of the offsets.



2.3 Site Inspections

A number of preliminary site inspections were undertaken to develop a short list of properties for further consideration. Notes on potential offset properties were made regarding the following:

- Threatened species and their habitats;
- Key habitat features (rock outcrops, streams, etc.);
- Major weed infestations;
- Current and historical land use;
- Dominant vegetation types and broad patterns of occurrence; and
- Other relevant attributes or management issues.

This work was supplemented with a desktop review of available information on vegetation mapping and threatened species occurrences in the locality of each property.

2.4 Flora Surveys

Flora surveys have been undertaken within Offset Area 5 and portions of Offset Areas 1-3 as part of the surveys within the Study Area for the EIA. These surveys were undertaken by Cumberland Ecology and Eastcoast Flora Survey from 2011 to 2014. Additional flora surveys were undertaken in 2014 by Cumberland Ecology across all the offset areas to provide a suitable level of floristic information to allow for adequate assessment of the offsets.

Survey techniques utilised included vegetation mapping, quadrat sampling and BioBanking surveys which are described further below. **Figure 2.1** and **Figure 2.2** show the locations of these surveys within the Onsite Offset Areas and Offsite Offset Area, respectively.

2.4.1 Vegetation Mapping

Several vegetation mapping studies have been undertaken across the offset areas and surrounds, including broad scale mapping. The portions of the Onsite Offset Areas that occur within the Study Area have previously been mapped by Eastcoast Flora Survey (2014). The vegetation map developed by Eastcoast Flora Survey was prepared following review of data collected from Rapid Data Points (RDPs), floristic quadrats and targeted grassland surveys. Eastcoast Flora survey also incorporated the results of additional grassland assessments undertaken by Cumberland Ecology.

Cumberland Ecology conducted additional site-specific vegetation surveys to revise and update the existing vegetation mapping for the offset areas. The vegetation within the offset areas was ground-truthed to examine and verify the mapping of the condition and extent of



the different vegetation communities. The following methods were utilised as part of the vegetation mapping process:

- Quadrat sampling to characterise vegetation units by their species composition and community structure;
- Collection of data from Rapid Mapping Points (RMP) to obtain information on community distribution;
- Rapid Grassland Assessments (RGA) to obtain information on the condition of grasslands; and
- Recording vegetation community boundary amendments using a handheld Geographical Positioning System (GPS) unit.

The resultant information was synthesised using Geographical Information Systems to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of each of the offset areas. Aerial, topographical, geological and soil landscape data were also used to interpret the survey data. Mapping was completed using MapInfo.

Note that area values presented within this report are approximate and are derived from a combination of aerial photo-interpretation, field based mapping and data extrapolation. Due to the extensive area of land within the Study Area and offset areas, this approach is considered to be appropriate and provides adequate and reliable information for the ecological assessments completed for the Project.

The EIA for the Project provides a detailed description of how Box Gum Woodland and Derived Native Grassland within the Study Area were mapped. The same methods were utilised as part of this assessment for the offset areas. The identification of TSC Act listed TECs within the offset areas was guided by the final determinations prepared by the NSW Scientific Committee and OEH threatened species profiles. The identification of other EPBC Act listed TECs was guided by the DoE Community and Species Profile and Threats Database listing advice.

2.4.2 Quadrat Sampling

A total of 129 quadrats have been sampled within the offset areas. The locations of these quadrats were stratified so that sampling was conducted in the majority of the vegetation types discernible across the offset areas. An additional 48 quadrats that were undertaken within the Project Disturbance Boundary and immediate surrounds have also been utilised within this assessment.

The process of quadrat sampling included the following:

- Identifying and recording all vascular flora species present in each strata within the plot or directly adjacent to the plot;



- Assigning a cover-abundance value to each species recorded within the standard 20 m x 20 m quadrat, using a modified Braun-Blanquet (1932) scoring system, to reflect their relative cover and abundance in the plot;
- Recording details about vegetation structure such as percentage, foliage cover and height of each strata;
- Taking photographs of the quadrat to provide a record of vegetation condition and appearance; and
- Recording a waypoint using a handheld GPS to mark the location of the quadrat.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Other references used to assist identification of plant taxa include Richardson et al. (2006), Jacobs et al. (2008) and Brooker and Kleinig (1990). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust, 2015). Any specimens that were of potential conservation significance were lodged for identification with the National Herbarium of NSW at the Royal Botanic Gardens, Sydney.

2.4.3 BioBanking

BioBanking surveys were undertaken concurrently with quadrat surveys. Surveys followed the BioBanking Assessment Methodology (BBAM) (DECC, 2009) and data collected included:

- Native species richness recorded within each stratum of the 20 m x 20 m plot;
- Native overstorey projected foliage cover recorded at 10 points along a 50 m transect;
- Native midstorey projected foliage cover recorded at 10 points along a 50 m transect;
- Native groundcover projected foliage cover recorded at 10 points along a 50 m transect for three life forms (shrubs, grasses and other);
- Weed species projective foliage cover expressed as a percentage of overstorey, midstorey and ground cover along a 50 m transect;
- Number of trees with hollows where entrance width is over 5 cm and hollow is at least 1m above ground within the 20 m x 50 m plot;
- The percentage of regenerating canopy species within the vegetation zone; and
- The total length in metres of fallen logs over 10 cm in diameter within the 20 m x 50 m plot.



2.4.4 Threatened Flora Searches

Threatened flora surveys were undertaken as part of the vegetation mapping ground-truthing and quadrat surveys, and included targeted searches within suitable habitat. Searches were also conducted in the vicinity of recorded specimens. The locations of threatened flora specimens were recorded using a handheld GPS. Eastcoast Flora Survey also undertook targeted terrestrial orchid surveys during the EIA surveys.

2.5 Fauna Surveys

Fauna surveys have been undertaken within Offset Area 5 and portions of Offset Areas 1, 2 and 3 as part of the surveys within the Study Area for the EIA. Additional fauna surveys were undertaken as part of this assessment, within all offset areas to specifically target fauna species known to occur within the Study Area for the Project.

Table 2.1 indicates the types of fauna surveys undertaken within each of the offset areas. Survey techniques utilised are described below. **Figure 2.3** and **Figure 2.4** show the locations of these surveys within the Onsite and Offsite Offset Areas, respectively.

Table 2.1 Fauna survey types undertaken within the offset areas

Survey Type	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
General Habitat Assessment	X	X	X	X	X	X
Trapping Transects (Elliot A, Elliot B, Cage)	X				X	X
Hair Tube Transects					X	
Diurnal Bird Survey	X	X	X	X	X	X
Ultrasonic Call Detection	X	X	X	X	X	X
Harp Trapping	X	X	X		X	X
Spotlighting Transects	X	X	X	X	X	X
Call Playback	X	X	X	X	X	X
IR Camera Detection	X	X	X		X	X
Incidental Observations	X	X	X	X	X	X

2.5.1 Habitat Assessments

General habitat assessments were undertaken within the offset areas throughout the survey period. Assessments included consideration of the abundance of various habitat features (such as hollow-bearing trees, ground cover, rocky outcropping, water and mistletoes) as well as an assessment of the likelihood of occurrence of potentially occurring threatened fauna species.



2.5.2 Trapping Transects

Trapping was undertaken to detect arboreal and terrestrial fauna. Each trap line was comprised of the following:

- 25 Elliot A traps for small terrestrial and arboreal fauna;
- 10 Elliot B traps for small to medium sized terrestrial and arboreal fauna; and
- 2 wire cage traps for large terrestrial fauna.

Spacing between the terrestrial Elliot traps was approximately 10 - 20 m. Arboreal traps were positioned along the terrestrial line in suitable habitat trees at a height of approximately 2 m. Wire cage traps were positioned at the start and middle of the terrestrial line. Elliot A and Elliot B traps were baited with a mixture of peanut butter, honey and rolled oats. Wire cage traps were baited with chicken necks. Trapping lines were checked in the morning, and any fauna captured were identified and released.

2.5.3 Hair Tube Transects

Hair tube sampling was undertaken to detect arboreal and terrestrial mammals. 'Faunatech' hair tubes were utilised as they target both small and medium sized fauna. Each hair tube transect comprised 20 hair tubes with half placed on the ground and half on trees. Hair tubes were baited with a mixture of peanut butter, honey and rolled oats. Hair samples collected from the hair tubes were sent to Georgeanna Story of 'Scats About' for identification.

2.5.4 Diurnal Bird Surveys

Visual observation and call identification of diurnal birds was carried out throughout the offset areas. Targeted surveys were undertaken at bird census points which included recording all bird species observed and heard calling during a 30 minute period. Diurnal birds were also identified and recorded as they were encountered throughout the offset areas. In addition, call playback was used to elicit a response from threatened diurnal bird species. GPS coordinates were recorded near sightings of any threatened bird species.

2.5.5 Microchiropteran Bat Surveys

i. Ultrasonic Call Detection

Ultrasonic call detection surveys for microchiropteran bats were undertaken using Anabat or SongMeter units. Units were positioned in suitable habitat, such as along tracks and near caves. Units were set to activate before dusk each evening and switch off after dawn. Ultrasonic calls collected from the units were sent to Greg Ford of 'Balance Environmental' for identification.



ii. *Harp Trapping*

Harp traps were set up at suitable flyway locations and utilised for two nights at each site. Microbats were collected from harp traps at dawn and the bat species subsequently identified. All microbats collected from harp traps were kept in a cool dark place during the day, and released at the point of capture the following evening to prevent unnecessary stress on collected individuals.

2.5.6 *Spotlighting Transects*

Spotlighting surveys for amphibians, birds, mammals and reptiles were undertaken throughout the survey period. Spotlighting surveys were conducted using a handheld spotlight while walking, or from a slow moving vehicle.

2.5.7 *Call Playback*

During spotlighting surveys, call playback of nocturnal calls were broadcast using a megaphone to illicit a response from targeted threatened nocturnal species. The Powerful Owl (*Ninox strenua*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Koala (*Phascolarctos cinereus*), Squirrel Glider (*Petaurus norfolcensis*) and Spotted-tailed Quoll (*Dasyurus maculatus*) were targeted during call playback surveys. Call playback was followed with quiet listening and spotlighting in the immediate vicinity.

2.5.8 *IR Camera Detection*

IR cameras were set up at numerous locations within the offset areas for varying periods of time. The cameras were attached to trees or boulders and focused upon nearby buried bait (chicken necks), tracks or habitat features. The cameras are triggered when nearby fauna movement activates the motion sensor. Cameras were set to record a series of three still images during each trigger. Recorded footage was analysed to identify the detected fauna species. IR cameras used during surveys included Reconyx HC500 HyperFire Lo-Glow Semi-Covert cameras or Reconyx HC600 Hyperfire H.D Covert IR cameras.

2.5.9 *Incidental Observations*

Any incidental vertebrate fauna species that was observed, heard calling, or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for each offset area.

2.6 *Surveys Dates*

Surveys within the offset areas were undertaken over several periods from 2011 to 2014. Surveys of Offset Area 5 and portions of Offset Area 1, 2 and 3 were undertaken by Cumberland Ecology and Eastcoast Flora Survey for the EIA. Additional surveys were undertaken across all offset areas by Cumberland Ecology in 2014. **Table 2.2** indicates the dates of surveys undertaken within the offset areas by Cumberland Ecology.



Table 2.2 Dates of survey within the offset areas

Location	Flora Surveys	Fauna Surveys
Offset Area 1	<p><i>Eastcoast Flora Survey:</i> 16/02/2012, 27/06/2012, 29/06/2012, 8/11/2013</p> <p><i>Cumberland Ecology:</i> 29/04/2014, 12-14/08/2014, 1-3/12/2014, 5/12/2014</p>	<p>18-22/02/2013, 19/03/2014, 17-21/11/2014 (Long-term IR camera surveys: 21/02/2014 to 21/05/2014, 19/11/2014 to 18/12/2014)</p>
Offset Area 2	<p><i>Eastcoast Flora Survey:</i> 31/10/2011, 15/02/2012, 4/05/2012</p> <p><i>Cumberland Ecology:</i> 30/04/2014, 25/08/2014, 4/12/2014, 15-19/12/2014</p>	<p>23/05/2013, 19/03/2014, 11-14/11/2014 (Long-term IR camera surveys: 13/11/2014 to 18/12/2014)</p>
Offset Area 3	<p><i>Eastcoast Flora Survey:</i> 28/06/2012</p> <p><i>Cumberland Ecology:</i> 3/04/2014, 11/04/2014, 1/05/2014, 15/08/2014, 19-20/11/2014, 4-5/12/2014, 15-16/12/2014, 19/12/2014</p>	<p>11-14/11/2014, 19/11/2014, 16/12/2014 (Long-term IR camera surveys: 12/11/2014 to 19/12/2014)</p>
Offset Area 4	<p><i>Cumberland Ecology:</i> 11/04/2014, 28/04/2014, 1/05/2014, 11/08/2014, 17-19/11/2014</p>	<p>12-14/11/2014, 17-19/11/2014</p>
Offset Area 5	<p><i>Eastcoast Flora Survey:</i> 31/10/2011, 1-2/11/2011, 16/02/2012, 9-11/10/2012*, 22-23/08/2013, 6/11/2013</p> <p><i>Cumberland Ecology:</i> 2/04/2014, 10-11/04/2014, 1-5/09/2014</p>	<p>12-16/11/2012, 19-22/02/2013, 21/05/2013, 19-23/08/2013, 13-15/11/2013, 7/05/2014 (Long-term IR camera surveys: 15/11/2012 to 19/02/2013, 2/04/2013 to 12/05/2013, 20/11/2014 to 18/12/2014) (Hair tube surveys: 20/02/2013 to 21/03/2013)</p>
Yarran View Offset Area	<p><i>Cumberland Ecology:</i> 1-4/12/2014, 17/12/2014</p>	<p>1-5/12/2014, 17/12/2014</p>

*Surveys also conducted in other areas during these dates.

2.7 Survey Effort

A summary of survey effort for each of the offset areas is provided in **Table 2.3**.

Table 2.3 Survey effort within the offset areas

Survey Type	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
FLORA SURVEYS						
<i>Eastcoast Flora Survey</i>						
Vegetation Mapping	Throughout survey period	Throughout survey period	Throughout survey period	-	Throughout survey period	-
Rapid Data Points	128 RDPs	116 RDPs	27 RDPs	-	443 RDPs	-
Quadrats	5 quadrats	-	-	-	6 quadrats	-
Threatened Flora Searches	Throughout survey period	Throughout survey period	Throughout survey period	-	Throughout survey period	-
Targeted Orchid Survey	-	-	-	-	1 random meander	-
<i>Cumberland Ecology</i>						
Vegetation Mapping	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period	-	Throughout survey period
Rapid Mapping Points	111 RMPs	103 RMPs	98 RMPs	27 RMPs	-	120 RMPs
Rapid Grassland Assessments	9 RGAs	6 RGAs	12 RGAs	13 RGAs	23 RGAs	-
Quadrats/BioBanking Plots	18 quadrats/plots	15 quadrats/plots	26 quadrats/plots	12 quadrats/plots	40 quadrats/plots	17 quadrats/plots
Threatened Flora Searches	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period

Table 2.3 Survey effort within the offset areas

Survey Type	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
FAUNA SURVEYS						
General Habitat Assessment	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period	Throughout survey period
Trapping – Elliot A (terrestrial)	100 trap nights (1 site)	-	-	-	400 trap nights (4 sites)	300 trap nights (3 sites)
Trapping – Elliot B (arboreal)	40 trap nights (1 site)	-	-	-	160 trap nights (4 sites)	120 trap nights (3 sites)
Trapping - Cage	8 trap nights (1 site)	-	-	-	32 trap nights (4 sites)	24 trap nights (3 sites)
Trapping – Hair Tubes	-	-	-	-	58 trap nights (2 sites)	-
Diurnal Bird Survey	4.5 hours (9 sites)	3 hours (6 sites)	4 hours (8 sites)	3.5 hours (7 sites)	2.5 hours (5 sites)	6 hours (12 sites)
Ultrasonic Call Detection	14 trap nights (4 sites)	3 trap nights (1 site)	5 trap nights (2 site)	1 trap night (1 site)	6 trap night (3 site)	8 trap nights (4 sites)
Harp Trapping	6 trap nights (3 sites)	3 trap nights (1 site)	3 trap nights (1 site)	-	8 trap nights (4 sites)	6 trap nights (3 sites)
Spotlighting Survey	3.75 person hours	Approx. 3 person hours	Approx. 2.25 person hours	Approx. 2.25 person hours	8.5 person hours	Approx. 6 person hours
Call Playback	4 sites	4 sites	3 sites	2 sites	7 sites	4 sites
IR Camera Detection	207 trap nights (6 sites)	35 trap nights (1 site)	65 trap nights (2 sites)	-	366 trap nights (9 sites)	30 trap nights (2 sites)



2.8 Limitations

The data produced by the surveys is indicative of the types of species that are likely to occur and not an absolute census of all flora and fauna species present in the offset areas. The Onsite Offset Areas either overlap with, or occur in close proximity to the Study Area. As the Onsite Offset Areas generally occur within or adjacent to the Study Area and contain essentially the same habitats as have been surveyed for the EIA, survey information can be extrapolated and used to predict the flora and fauna values within the Onsite Offset Areas. These surveys were supplemented by additional surveys undertaken specifically for assessing the offset areas.

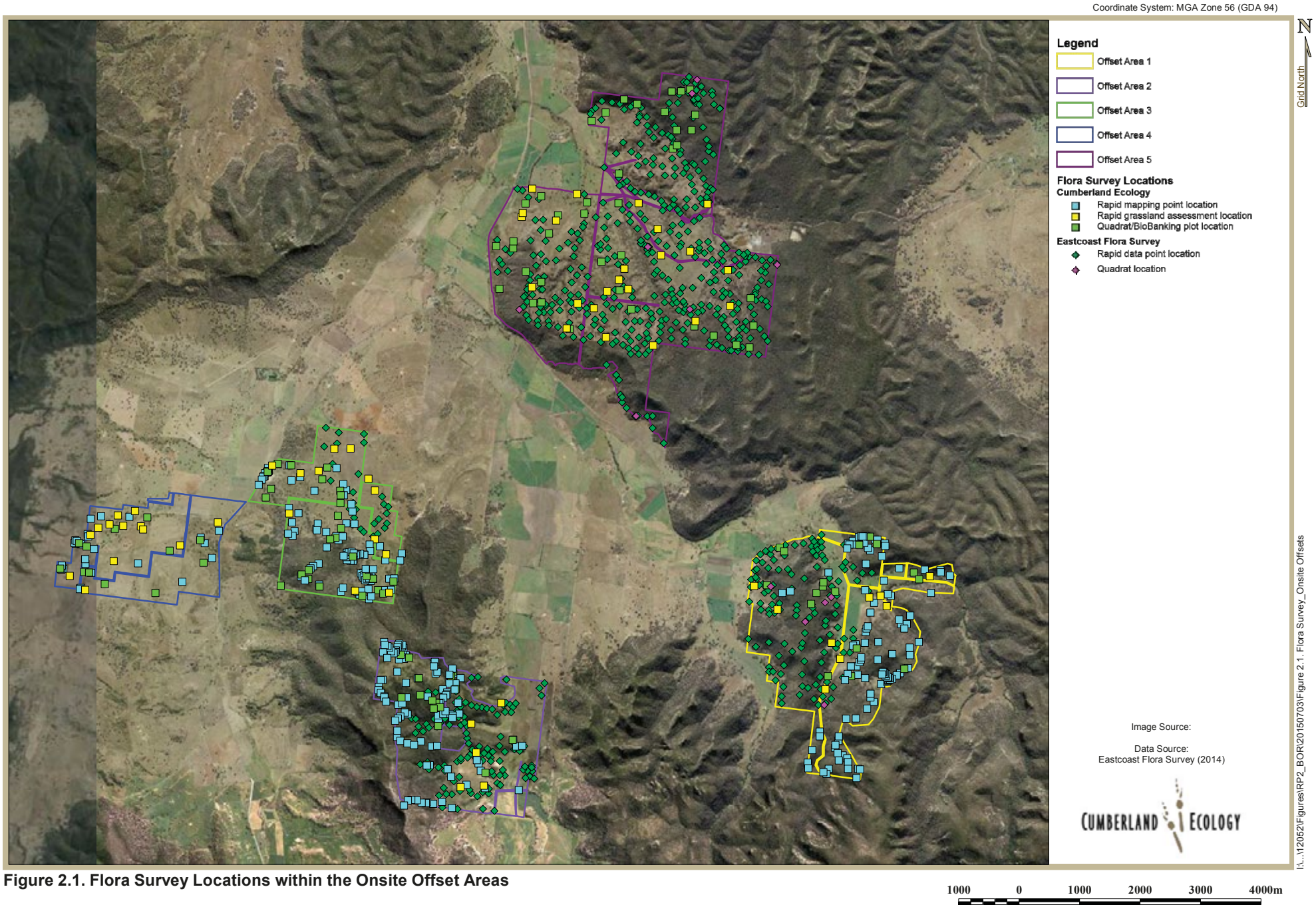
Detailed survey of portions of the intact woodland and forest within the offset areas, with the exception of Offset Area 4 was constrained by access due to steep topography and weather conditions. As such, mapping within some of these areas has been extrapolated from the accessible areas. Additionally, the extrapolation of mapping into these areas was aided by the use of remote sensing techniques, whereby aerial photography, geology maps and other GIS data was examined. Note that area values presented within this report are approximate and are derived from a combination of aerial photo-interpretation, field based mapping and data extrapolation. Due the extensive area of land within the Study Area and offset areas, this approach is considered to be appropriate and provides adequate and reliable information for the ecological assessment.

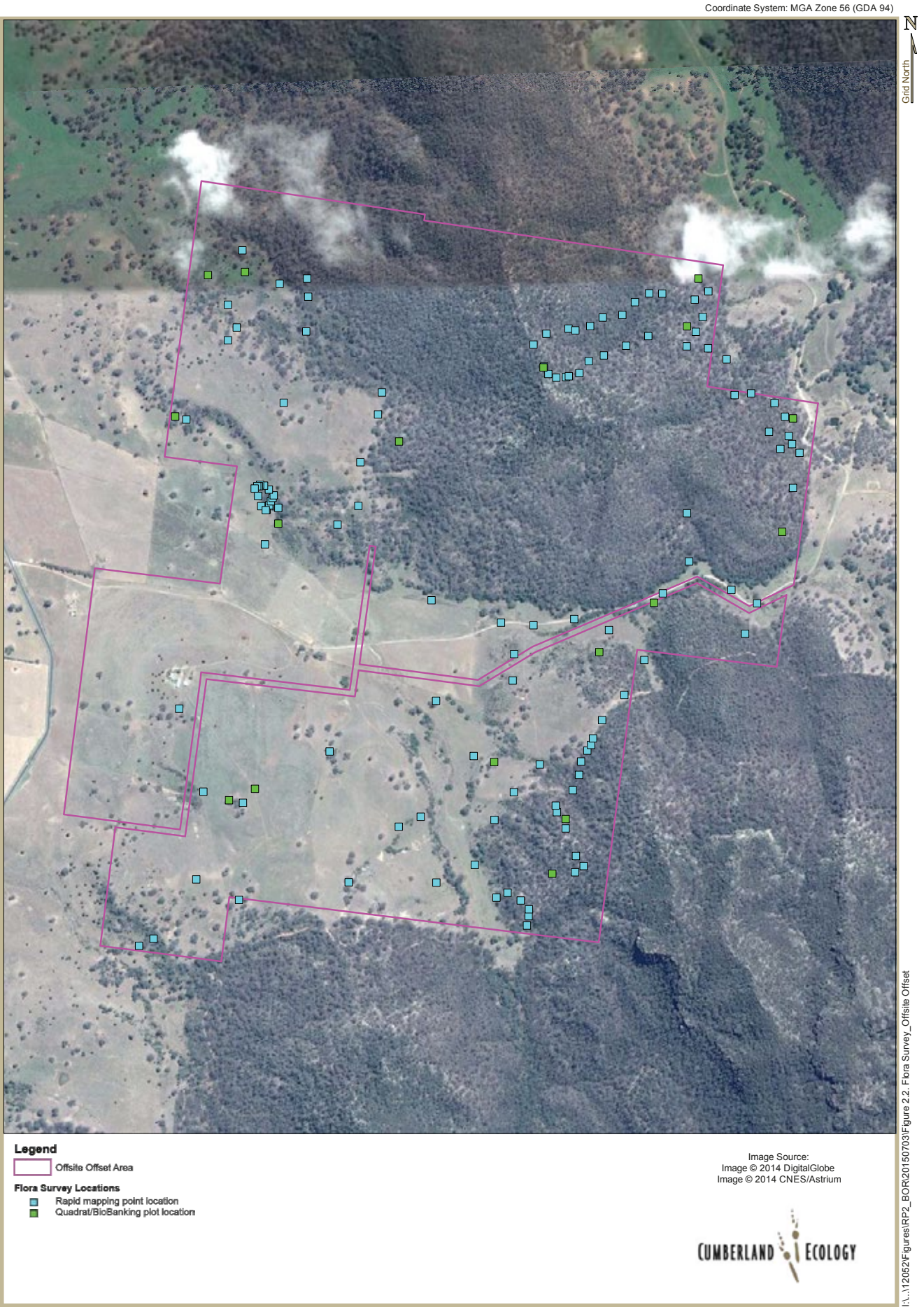
A number of the flora surveys were undertaken in November and December 2014, during dry conditions. Such conditions were not considered optimal to undertake extensive grassland surveys within the offset areas. As such this assessment has included data collected November and December 2014 and incorporated additional data collected during surveys in April 2014 within the Study Area.

Given the extensive land contained within the offset areas, there are some cases where the minimum number of plots required for calculations under the Framework for Biodiversity Assessment (FBA) and BBAM were not sampled within each property. Given that the vegetation types and condition are generally consistent across the Onsite Offset Areas, the data collected from all properties was used for calculations of each Onsite Offset Area. Where there was a shortfall of plots, the existing plots were duplicated to meet the shortfall.

Given the extensive fauna surveys that were undertaken for the EIA, the offset surveys were primarily targeted towards surveys for threatened species known to occur within the Project Disturbance Boundary. Although the additional surveys were undertaken during November and December 2014, it is considered that an appropriate level of information regarding threatened fauna species was collected to adequately assess the suitability of the offset areas.

It is considered that adequate data exists for the assessment of the suitability of the proposed offsets for the Project - using both the NSW FBA and BBAM calculators and the Commonwealth *Offset Assessment Guide*.





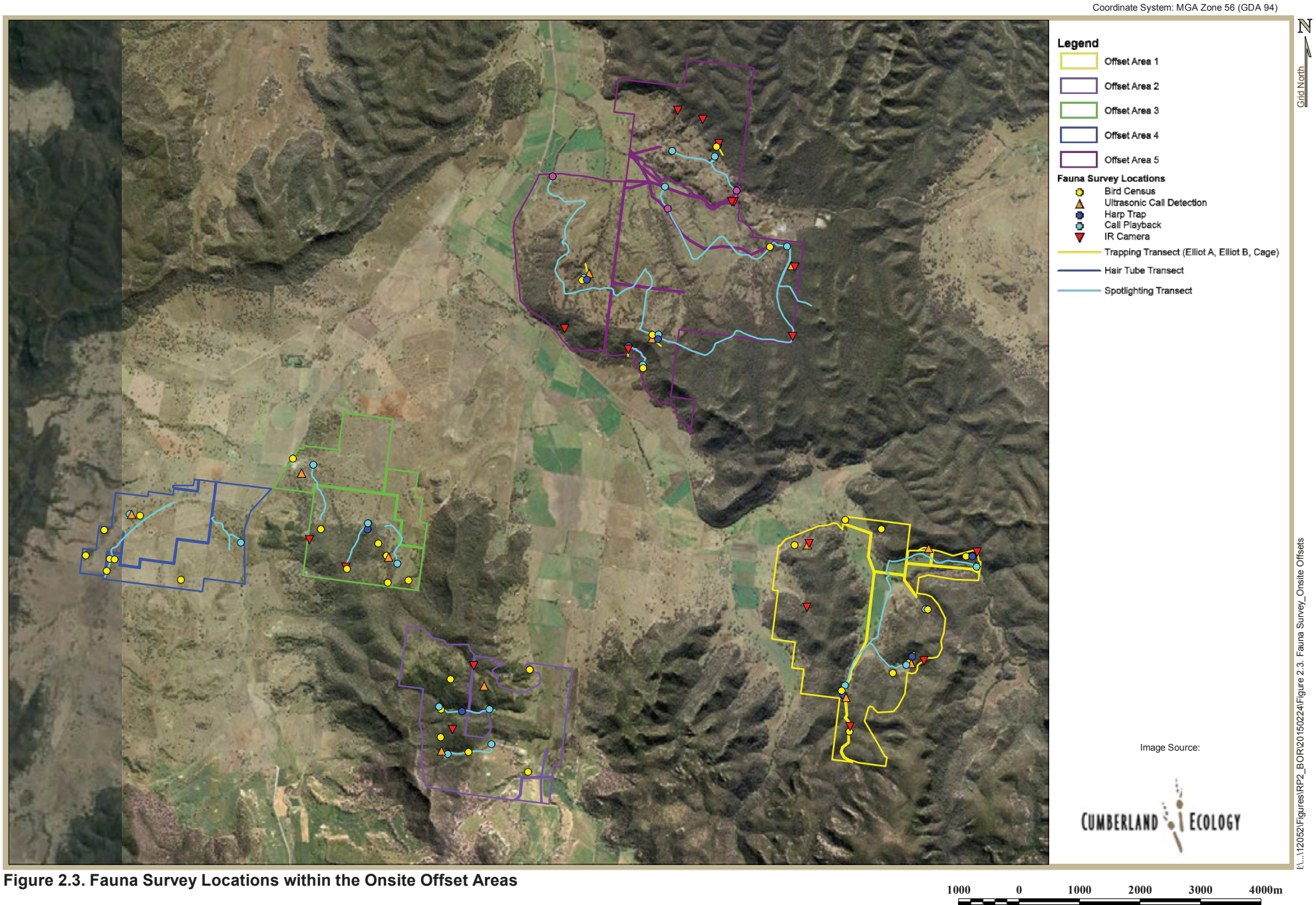
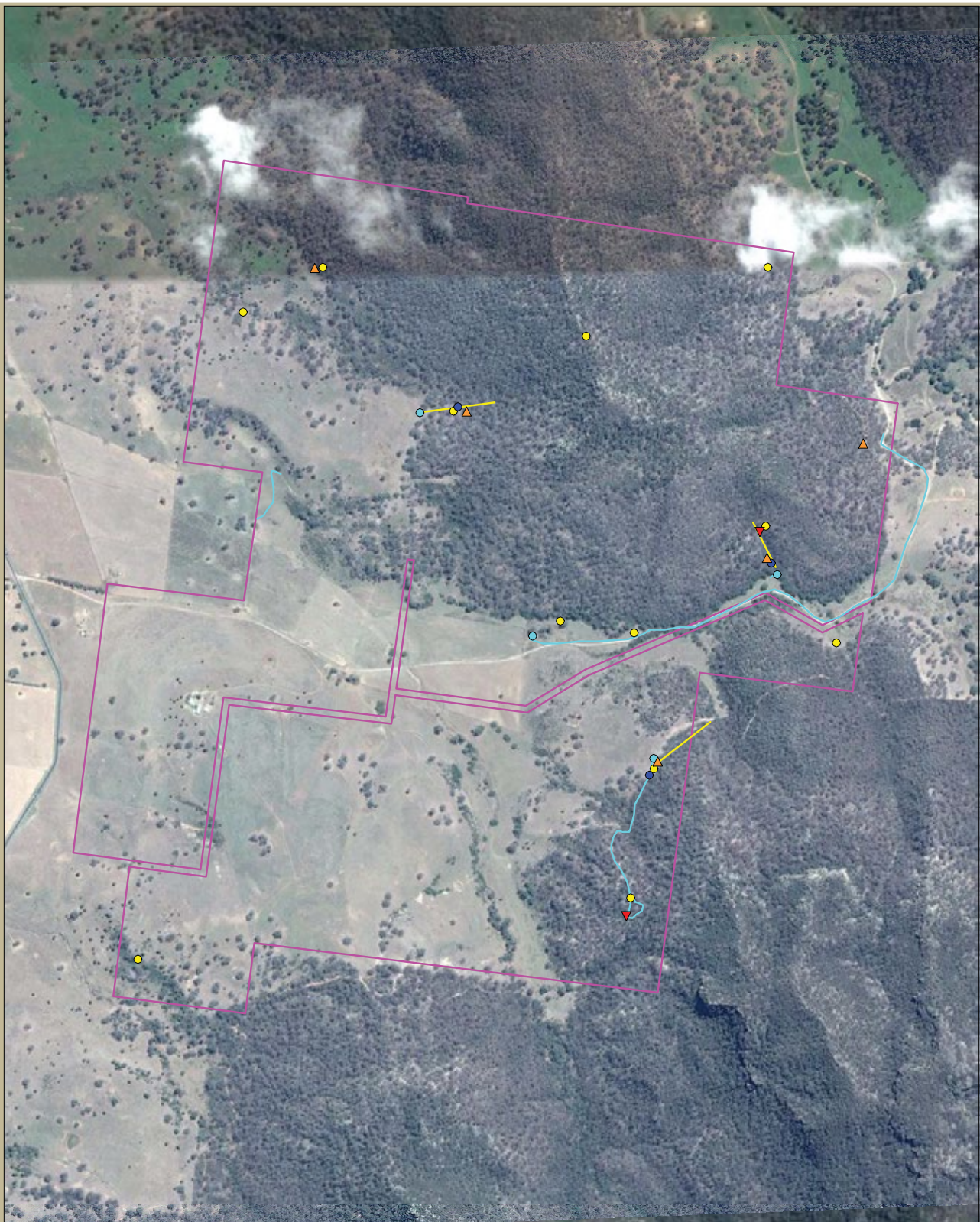


Figure 2.3. Fauna Survey Locations within the Onsite Offset Areas

Coordinate System: MGA Zone 56 (GDA 94)



Legend

Offsite Offset Area

Fauna Survey Locations

- Bird Census
- Call Playback
- Harp Trap
- ▼ IR Camera
- Spotlighting
- ▲ Ultrasonic Bat Detection
- Trap Line
- Spotlighting Transect

Image Source:
Image © 2014 DigitalGlobe
Image © 2014 CNES/Astrium



I:\12052\Figures\RP2_BOR\20150224\Figure 2.4. Fauna Survey Offsite Offset

Figure 2.4. Fauna Survey Locations within the Offsite Offset Area





Chapter 3

Summary of Offset Areas

3.1 Introduction

This chapter summarises the key biodiversity and strategic values of the Onsite and Offsite Offset Areas. Descriptions of the surveyed Onsite and Offsite Offset Areas, including vegetation community descriptions and assessments of the occurrence of threatened flora and fauna species are provided in the following appendices:

- Offset Area 1 – 762 ha (**Appendix A**);
- Offset Area 2 – 526 ha (**Appendix B**);
- Offset Area 3 – 458 ha (**Appendix C**);
- Offset Area 4 – 380 ha (**Appendix D**);
- Offset Area 5 – 1,512 ha (**Appendix E**); and
- Yarran View Offset Area – 443 ha (**Appendix F**).

Flora and fauna species lists for the offset areas are provided in **Appendix G** and **Appendix H**, respectively.

3.2 Location

All the offset areas are located in close proximity to the Project Disturbance Boundary and fall within the following areas:

- LGA: Mid-Western Regional;
- Local Land Services Area: Hunter;
- Bioregion: Sydney Basin; and
- Subregion: Kerrabee.

Table 3.1 summarises the size of the Onsite and Offsite Offset Areas and their distance to the Project Disturbance Boundary.

**Table 3.1 Location of offset areas in relation to the Project Disturbance Boundary**

Offset Area	Area (ha)	Distance to Project Disturbance Boundary
Offset Area 1	726	<1 km east
Offset Area 2	526	Adjoining the southern boundary
Offset Area 3	458	<1 km west
Offset Area 4	380	3 km west
Offset Area 5	1,512	Adjoining the north eastern boundary
Yarran View Offset Area	443	9 km south

3.3 Geology

Table 3.2 summarises the geological details present in of the Project Disturbance Boundary and offset areas. All of the geological units occurring within the Project Disturbance Boundary are represented within the offset areas.

Table 3.2 Geological formations within the Project Disturbance Boundary and offset areas

Area	Geological Unit and Occurrence
Project Disturbance Boundary	Ph – shale, conglomerate, sandstone (6%) Ps – sandstone, shale, mudstone, conglomerate and coal seams (78%) Qa – gravel, sand, silt clay (15%) Tv – olivine basalt with occasional sediment interbeds, dolerite, trachyte, microsyenite (1%)
Offset Area 1	Ps – sandstone, shale, mudstone, conglomerate and coal seams (64%) Rn – sandstone, conglomerate, red and green claystone, shale (36%)
Offset Area 2	Ph – shale, conglomerate, sandstone (37%) Ps – sandstone, shale, mudstone, conglomerate and coal seams (51%) Qa – gravel, sand, silt clay (7%) Rn – sandstone, conglomerate, red and green claystone, shale (6%)
Offset Area 3	Ph – shale, conglomerate, sandstone (17%) Ps – sandstone, shale, mudstone, conglomerate and coal seams (73%)
Offset Area 4	Ph – shale, conglomerate, sandstone (44%) Ps – sandstone, shale, mudstone, conglomerate and coal seams (7%) Qa – gravel, sand, silt clay (49%)
Offset Area 5	Ps – sandstone, shale, mudstone, conglomerate and coal seams (16%) Qa – gravel, sand, silt clay (1%) Rn – sandstone, conglomerate, red and green claystone, shale (46%) Tv – olivine basalt with occasional sediment interbeds, dolerite,



Table 3.2 Geological formations within the Project Disturbance Boundary and offset areas

Area	Geological Unit and Occurrence
	trachyte, microsyenite (37%)
Yarran View Offset Area	Ph – shale, conglomerate, sandstone (10%) Ps – sandstone, shale, mudstone, conglomerate and coal seams (85%) Rn – sandstone, conglomerate, red and green claystone, shale (5%)

3.4 Soil Landscapes

A number of soil landscapes have been identified as occurring within the Project Disturbance Boundary and offset areas by Kovac and Lawrie (1991). **Table 3.3** summarises the extent of each soil landscape within the Project Disturbance Boundary and offset areas. All of the soil landscapes occurring within the Project Disturbance Boundary are represented within the offset areas.

Although the soils landscapes within the Study Area have been refined as part of studies conducted for the EIS, broad-scale mapping has been utilised within this report to allow for comparison across all assessed areas.

Table 3.3 Soil landscapes within the Project Disturbance Boundary and offset areas

Area	Soil Landscape and Occurrence
Project Disturbance Boundary	Bylong (20%) Growee (60%) Lees Pinch (4%) Ogilvie (2%) Sandy Hollow (14%)
Offset Area 1	Growee (6%) Lees Pinch (49%) Munghorn Plateau (3%) Ogilvie (19%) Sandy Hollow (23%)
Offset Area 2	Bylong (16%) Growee (37%) Lees Pinch (7%) Ogilvie (39%)
Offset Area 3	Bald Hill (2%) Benjang (22%) Growee (47%) Ogilvie (29%)



Table 3.3 Soil landscapes within the Project Disturbance Boundary and offset areas

Area	Soil Landscape and Occurrence
Offset Area 4	Benjang (10%) Bylong (8%) Growee (82%)
Offset Area 5	Bald Hill (29%) Benjang (49%) Growee (8%) Lees Pinch (12%) Sandy Hollow (2%)
Yarran View Offset Area	Benjang (52%) Bylong (12%) Growee (11%) Lees Pinch (19%) Ogilvie (6%)

3.5 Mitchell Landscapes

Mitchell landscapes are landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH, 2014b). Mitchell landscapes are utilised in both FBA and BBAM calculations. **Table 3.4** details the extent of each Mitchell landscape within the Project Disturbance Boundary and offset areas.

Table 3.4 Mitchell landscapes within the Project Disturbance Boundary and offset areas

Area	Mitchell Landscape and Occurrence
Project Disturbance Boundary	Upper Goulburn Valleys and Escarpment (83%) Goulburn River Channels and Floodplains (15%) Lees Pinch Foothills (1%) Sydney Basin Basalt Caps (1%)
Offset Area 1	Wollemi Ranges (53%) Goulburn River Channels and Floodplains (30%) Upper Goulburn Valleys and Escarpment (12%) Lees Pinch Foothills (4%)
Offset Area 2	Upper Goulburn Valleys and Escarpment (78%) Goulburn River Channels and Floodplains (13%) Wollemi Ranges (10%)
Offset Area 3	Upper Goulburn Valleys and Escarpment (100%)
Offset Area 4	Goulburn River Channels and Floodplains (51%)



Table 3.4 Mitchell landscapes within the Project Disturbance Boundary and offset areas

Area	Mitchell Landscape and Occurrence
	Upper Goulburn Valleys and Escarpment (49%)
Offset Area 5	Lees Pinch Foothills (52%) Sydney Basin Basalt Caps (37%) Upper Goulburn Valleys and Escarpment (10%) Goulburn River Channels and Floodplains (1%)
Yarran View Offset Area	Upper Goulburn Valleys and Escarpment (92%) Wollemi Ranges (8%)

3.6 Vegetation Communities

A suite of vegetation communities have been identified within the Offset Areas. **Table 3.5** summarises the vegetation communities recorded in the Project Disturbance Boundary and each of the offset areas. The offset areas provide 3,791 ha of native vegetation. Vegetation mapping within the Onsite and Offsite Offset Areas is shown in **Figure 3.1** and **Figure 3.2**, respectively.

Table 3.6 summarises the TECs recorded in the Project Disturbance Boundary and each of the offset areas. The offset areas provide 2,022 ha of TSC Act listed communities, including 421 ha of Hunter Valley Foothills Slaty Gum Woodland, 15 ha of Hunter Floodplain Red Gum Woodland and 1,586 ha of Box Gum Woodland and Derived Native Grassland. The offset areas also provide 1,332 ha of EPBC Act listed Box Gum Woodland and Derived Native Grassland.

Table 3.5 Vegetation communities within the offset areas

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Yarran View Offset Area (ha)~	Total Offsets (ha)~+
3: River Oak / Redgum Riparian Forest	EEC	-		15						15
4: Apple Riparian Forest										
4a: Blakely's Red Gum / Apple Riparian Forest	-	-	5	26	14			13	10	63
4b: Apple/Yellow Box Riparian Forest	-	-					7			7
5: Blakely's Red Gum / Paperbark Forest	-	-						1		1
6: Yellow Box Woodland										
6a(1) ^A : Yellow Box Woodland (Grassy)	EEC	CEEC	8	6		5	19	129		159
6a(3) ^C : Yellow Box Woodland (Grassy)	-	-	<1					<1		<1
6b: Yellow Box Woodland (Shrubby)	-	-		8						8
7: White Box Woodland										
7a (1) ^A : White Box Woodland (Grassy)	EEC	CEEC	53	36	15	49	5	429	19	553
7a(3) ^C : White Box Woodland (Grassy)	-	-	1	2	<1					2
7b: White Box Woodland (Shrubby)	-	-	71	159	135	111		84	173	662
8: Blakely's Red Gum Woodland										
8a: Blakely's Red Gum Woodland (Grassy)	EEC	CEEC			3					3
8b: Blakely's Red Gum Woodland (Shrubby)	-	-						4		4

Table 3.5 Vegetation communities within the offset areas

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha) ~	Offset Area 1 (ha) ~	Offset Area 2 (ha) ~	Offset Area 3 (ha) ~	Offset Area 4 (ha) ~	Offset Area 5 (ha) ~	Yarran View Offset Area (ha) ~	Total Offsets (ha) ~ ⁺
9: Slaty Box Woodland	VEC	-	11	141	17	2		209	52	421
10: Coastal Grey Box Woodland	-	-	31	1		5	2	7		14
11: Fuzzy Box Woodland	-	-	5			<1				<1
13: Shrubby Regrowth	-	-	40	3	47	5		1	8	64
14: Dwyer's Red Gum Low Open Forest	-	-		2				1		3
15: Caley's Ironbark Forest	-	-		167				57		224
16: Blue-leaf Ironbark / Cypress Forest*	-	-		21				103		123
17: Red Ironbark / Cypress Forest	-	-		11						11
18: Cypress Pine Forest	-	-	4		47	14				60
19: Bloodwood / Ironbark Forest	-	-						29		29
21: Exposed Grey Gum / Stringybark Forest[^]	-	-		14	<1			11	3	29
22: Sheltered Grey Gum / Stringybark Forest[^]										
23: Grey Gum / Caley's Ironbark Forest	-	-		4						4
24: Grey Gum / White Box Forest	-	-			13					13
25: Rough-barked Apple Forest	-	-			15					15
26: Rough-barked Apple Woodland/Tall Shrubland	-	-			23					23
DNG: Derived Native Grassland										

Table 3.5 Vegetation communities within the offset areas

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Yarran View Offset Area (ha)~	Total Offsets (ha)~+
<i>DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	-	-	11	21	11		33	1	19	85
<i>DNG – 4: Apple Riparian Forest Derived Native Grassland[#]</i>										
<i>DNG – 6(1)^A: Yellow Box Woodland Derived Native Grassland</i>	EEC	CEEC	6	8		2	49	20		79
<i>DNG – 6(2)^B: Yellow Box Woodland Derived Native Grassland</i>	EEC	-	8				11	77		88
<i>DNG – 6(3)^C: Yellow Box Woodland Derived Native Grassland</i>	-	-	1	2			25			27
<i>DNG – 7(1)^A: White Box Woodland Derived Native Grassland</i>	EEC	CEEC	68	32	19	152	34	168	133	538
<i>DNG – 7(2)^B: White Box Woodland Derived Native Grassland</i>	EEC	-	63		22	7	17	119		166
<i>DNG – 7(3)^C: White Box Woodland Derived Native Grassland</i>	-	-	43	<1	34	11	109			154
<i>DNG – 8(1)^A: Blakely's Redgum Woodland Derived Native Grassland</i>	EEC	CEEC						<1		<1
<i>DNG – 9: Slaty Box Woodland Derived Native Grassland</i>	-	-	31	3				22	1	26
<i>DNG – 10: Coastal Grey Box Woodland Derived Native Grassland</i>	-	-	241	9		90	<1	12		111
<i>DNG – 11: Fuzzy Box Woodland Derived Native Grassland</i>	-	-	53			1				1
<i>DNG – 18: Cypress Pine Forest Derived Native Grassland</i>	-	-			<1					<1
<i>DNG – 25: Angophora floribunda Forest Derived Native Grassland</i>	-	-			5					5

Table 3.5 Vegetation communities within the offset areas

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Yarran View Offset Area (ha)~	Total Offsets (ha)~ ⁺
TOTAL NATIVE VEGETATION^A			753	688	420	455	311	1,497	418	3,791
TOTAL NON-NATIVE VEGETATION AND CLEARED			407	74	105	2	69	15	25	292
TOTAL AREA⁺			1,160	762	526	458	380	1512	443	4,082

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

*Includes areas of Caley's Ironbark Forest (Unit 15)

^A Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

~ Areas calculations are approximate

Table 3.6 **TECs occurring within the offset areas**

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Yarran View Offset Area (ha)~	Total Offsets (ha)~+
Hunter Valley Footslopes Slaty Gum Woodland										
9: Slaty Box Woodland	VEC	-	11	141	17	2		209	52	421
Hunter Floodplain Red Gum Woodland										
3: River Oak / Redgum Riparian Forest	EEC	-		15						15
Box Gum Woodland and Derived Native Grassland										
6a(1) ^A : Yellow Box Woodland (Grassy)	EEC	CEEC	8	6		5	19	129		159
7a(1) ^A : White Box Woodland (Grassy)	EEC	CEEC	53	36	15	49	5	429	19	553
8a: Blakely's Red Gum Woodland (Grassy)	EEC	CEEC			3					3
DNG – 6(1) ^A : Yellow Box Woodland Derived Native Grassland	EEC	CEEC	6	8		2	49	20		79
DNG – 6(2) ^B : Yellow Box Woodland Derived Native Grassland	EEC	-	8				11	77		88
DNG – 7(1) ^A : White Box Woodland Derived Native Grassland	EEC	CEEC	68	32	19	152	34	168	133	538
DNG – 7(2) ^B : White Box Woodland Derived Native Grassland	EEC	-	63		22	7	17	119		166
DNG – 8(1) ^A : Blakely's Redgum Woodland Derived Native Grassland	EEC	CEEC						<1		<1
<i>Subtotal TSC Act Box Gum Woodland and Derived Native Grassland+</i>			206	81	59	217	135	942	152	1,586

Table 3.6 TECs occurring within the offset areas

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Yarran View Offset Area (ha)~	Total Offsets (ha)~+
<i>Subtotal EPBC Act Box Gum Woodland and Derived Native Grassland^A</i>			135	81	36	209	107	747	152	1,332
TOTAL TSC Act			217	236	76	219	135	1,151	204	2,022
TOTAL EPBC Act			135	81	36	209	107	747	152	1,332

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

⁺ In some cases totals may not equal the appropriate total number due to rounding

~ Areas calculations are approximate



3.7 Threatened Flora and Fauna Species

A suite of threatened flora and fauna species are known, or are considered to potentially occur, within the Study Area. **Table 3.7** summarises the occurrence of these threatened species within the offset areas. Threatened species recorded within the Onsite and Offset Areas are shown in **Figures 3.3 to 3.4**, respectively.

The majority of the threatened flora and fauna species known to occur within the Project Disturbance Boundary have been recorded within the offset areas. However as the offset areas are in close proximity to the Study Area, it is expected that the majority of threatened species known from the Study Area are likely to also occur within the offset areas, or have suitable habitat present.

Table 3.7 Threatened species occurrence within the offset areas

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
FLORA											
<i>Tylophora linearis</i>		V	E	Known	P	Known	P	P	-	P	P
<i>Ozothamnus tessellatus</i>		V	V	Known	P	P	P	-	-	Known	P
<i>Acacia pendula</i>	Acacia pendula population in the Hunter catchment	EP		Known	Known	-	-	-	-	Known	-
<i>Prostanthera cryptandroides subsp. cryptandroides</i>	Wollemi Mint-bush	V	V	P	-	P	P	-	-	P	P
<i>Prostanthera discolor</i>		V	V	P	-	P	P	-	-	P	P
<i>Commersonia rosea</i> (syn. <i>Androcalva rosea</i>)		E	E	P	-	P	-	-	-	P	-
<i>Eucalyptus camaldulensis</i>	Eucalyptus camaldulensis population in the Hunter catchment	EP		Known	-	-	-	-	-	-	-
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V		P	-	P	P	-	-	P	P
<i>Homoranthus darwinoides</i>		V	V	P	-	P	-	-	-	P	-
<i>Cymbidium canaliculatum</i>	Cymbidium canaliculatum population in the Hunter Catchment	EP		Known	P	Known	Known	Known	P	Known	Known
<i>Diuris tricolor</i>	Pine Donkey Orchid	V		Known	P	P	P	P	P	P	P
<i>Pomaderris queenslandica</i>	Scant Pomaderris	E		Known	-	P	P	-	-	P	P

Table 3.7 Threatened species occurrence within the offset areas

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
<i>Pomaderris sericea</i>	Silky Pomaderris	E	V	P	-	P	P	-	-	P	P
<i>Philothea ericifolia</i>			V	P	-	P	P	-	-	P	P
<i>Thesium australe</i>	Austral Toadflax	V	V	P	P	P	P	P	P	P	P
FAUNA											
Birds											
<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Known	Known	Known	P	Known	P
<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	P	P	P	P	P	P
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	P	P	P	P	P	P	P	P
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	P	P	P	P	P	P
<i>Lophoictinia isura</i>	Square-tailed Kite	V		P	P	P	P	P	P	P	P
<i>Apus pacificus</i>	Fork-tailed Swift		M	P	P	P	P	P	P	P	P
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	P	P	P	P	P	P	P
<i>Ardea ibis</i>	Cattle Egret		M	P	P	P	P	P	P	P	P
<i>Ardea modesta</i>	Eastern Great Egret		M	P	P	P	P	P	P	P	P
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Known	Known	Known	P	P	P	Known
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	P	P	P	P	-	P	P
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern	V		Known	Known	Known	Known	Known	P	Known	Known

Table 3.7 Threatened species occurrence within the offset areas

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
	subspecies)										
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	P	Known	Known	P	Known	Known
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	P	P	P	P	P	P	P
<i>Grantiella picta</i>	Painted Honeyeater	V		P	P	P	P	P	P	P	P
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	P	P	P	P	Known	P
<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	P	P	P	P	Known	P
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	P	P	P	P	P	-	P	P
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		P	P	P	P	Known	P	P	Known
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	P	P	P	P	Known	Known
<i>Petroica boodang</i>	Scarlet Robin	V		P	P	P	P	P	P	P	P
<i>Petroica phoenicea</i>	Flame Robin	V		P	P	P	P	P	-	P	P
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	P	Known	P	P	Known	P
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Known	P	P	P	Known	P
<i>Lathamus discolor</i>	Swift Parrot	E	E	P	P	P	P	P	P	P	P
<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Known	P	P	-	Known	P
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	P	P	P	P	P	-	P	P

Table 3.7 Threatened species occurrence within the offset areas

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
<i>Ninox connivens</i>	Barking Owl	V		Known*	P	Known	P	Known	P	P	Known
<i>Ninox strenua</i>	Powerful Owl	V		Known*	P	P	P	P	-	P	P
<i>Tyto novaehollandiae</i>	Masked Owl	V		P	P	P	P	P	-	P	P
Mammals											
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	P	P	P	P	-	P	P
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Known	Known	P	P	P	P
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	P	P	P	-	-	P	P
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		P	P	P	P	P	P	P	P
<i>Phascolarctos cinereus</i>	Koala	V	V	P	P	P	P	P	P	P	P
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	P	P	P	P	P	P	P	P
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Known	P	Known	Known	Known
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		P	P	P	P	Po	Po	P	Po
<i>Miniopterus australis</i>	Little Bentwing-bat	V		P	P	P	P	P	P	P	P
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Known	Known	Known	Known	Known
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known*	P	P	P	P	P	P	P
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Po	Po	Po	P	Po	P	Po	Po

Table 3.7 Threatened species occurrence within the offset areas

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Po	Po	Po	Po	Po	Po	Po	Po
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	P	Known	P	P	-	P	P
Reptiles											
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	P	P	P	P	-	-	P	P
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	P	P	P	P	P	P	P	P
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		P	P	P	P	P	-	P	P

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)

Occurrence: P = Potential; Po = Possibly present but not reliably identified, - = Unlikely

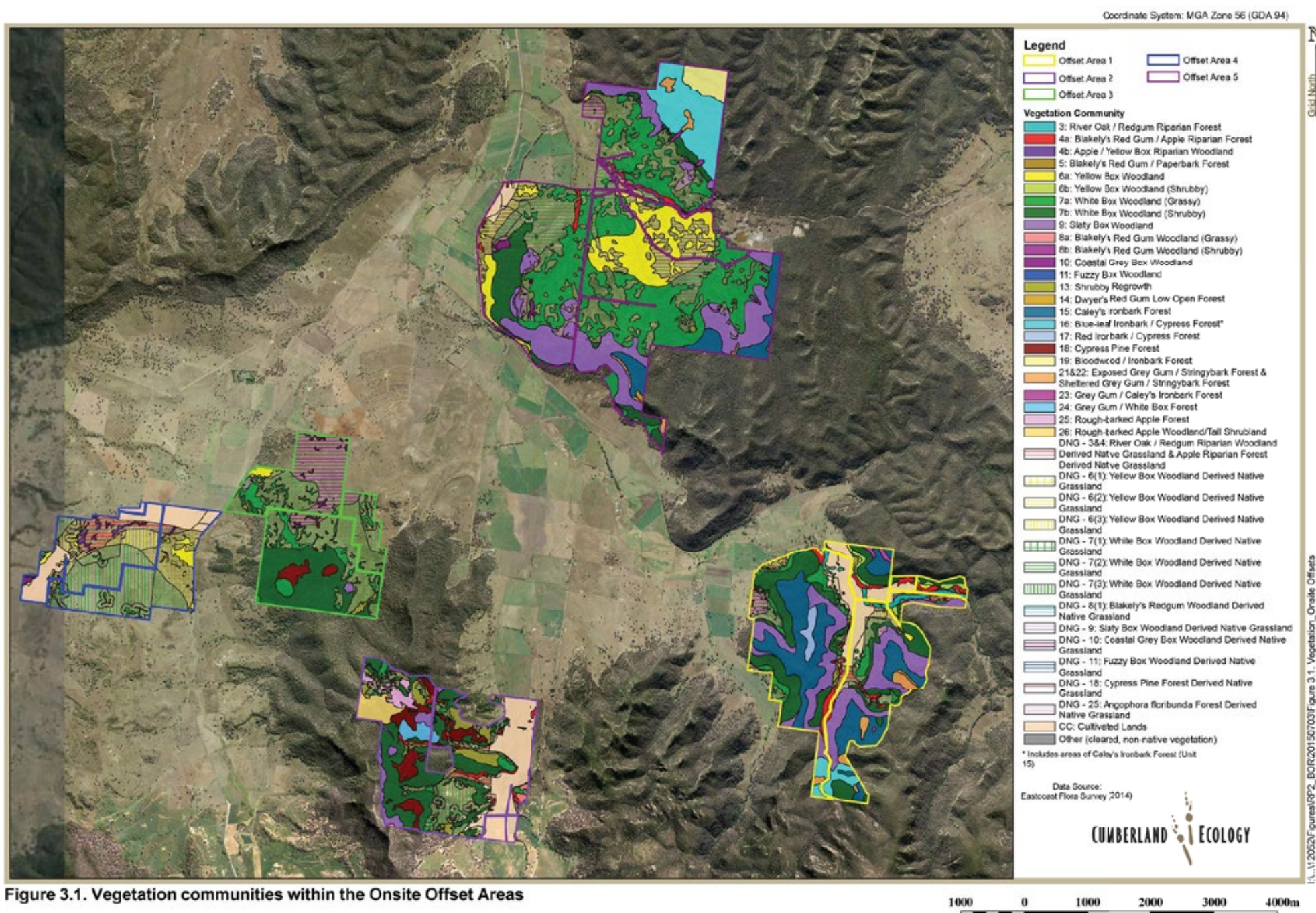


3.8 Strategic Values

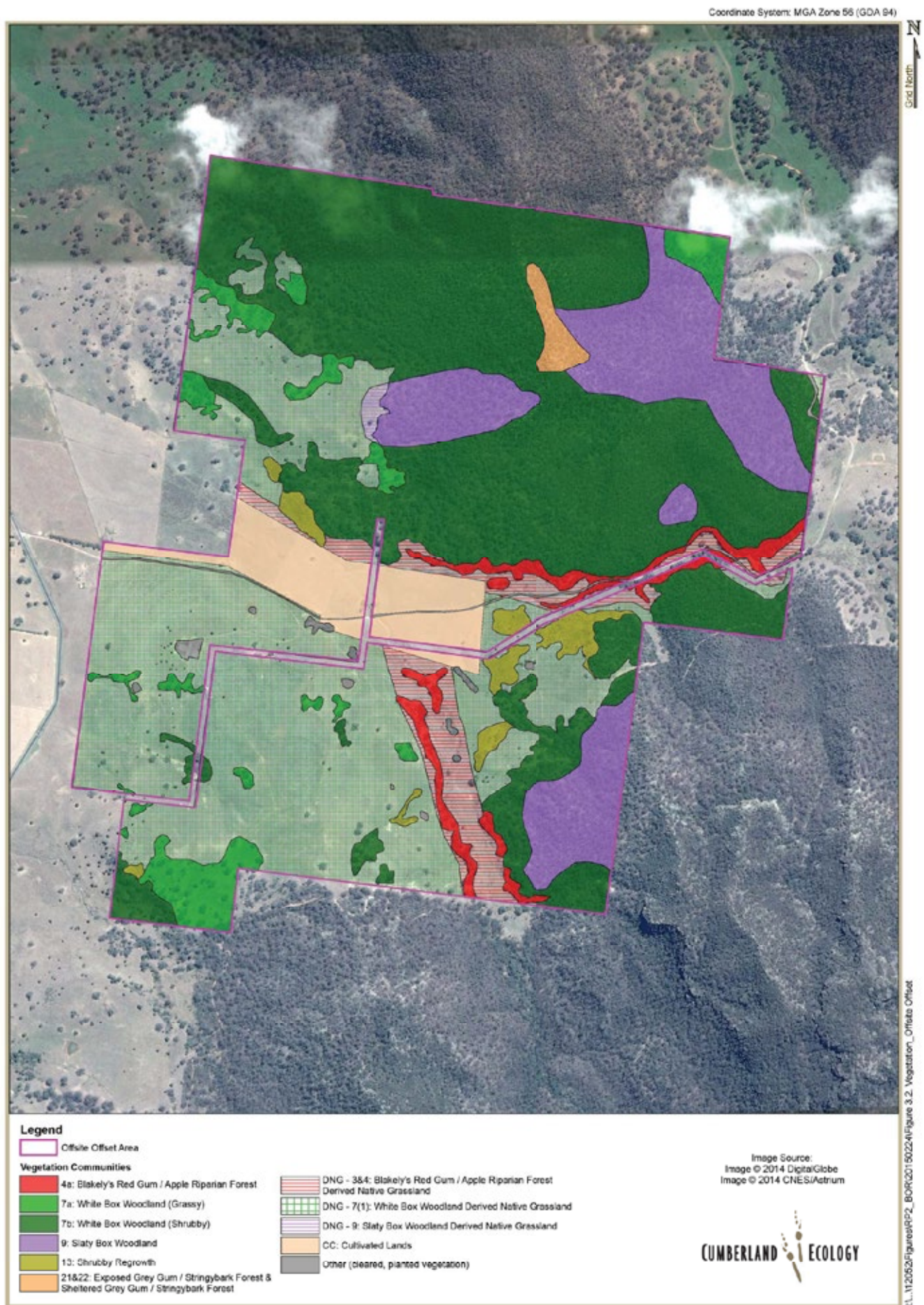
The offset areas were selected based on a number of considerations, as outlined in **Section 1.3.1**. The results from the assessment of these areas confirm that each contains a suite of strategic values that demonstrate their suitability as offsets for the Project. **Table 3.8** summarises the strategic values of each of the offset areas.

Table 3.8 Summary of strategic values of the offset areas

Strategic Values	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Are proximate to the location of the Project	✓	✓	✓	✓	✓	✓
Contain comparable, or “like for like” vegetation community types to the vegetation within the Project Disturbance Boundary	✓	✓	✓	✓	✓	✓
Contain areas of TECs, including Box Gum Woodland	✓	✓	✓	✓	✓	✓
Contain known habitat for threatened species predicted to be impacted by the Project	✓	✓	✓	✓	✓	✓
Contain potential habitat for threatened species predicted to be impacted by the Project	✓	✓	✓	✓	✓	✓
Portions of the properties have the potential to be improved to provide additional areas of TECs	✓	✓	✓	✓	✓	✓
Portions of the properties have the potential to be improved to provide additional areas of threatened species habitat	✓	✓	✓	✓	✓	✓
Portions of the properties have the potential to be improved to provide additional connectivity across previously cleared land	✓	✓	✓	✓	✓	✓
Are connected directly to existing conservation reserves	✓				✓	✓



I:\...1\2052\Figures\992_BOR\20150703\Figure 3.1_Vegetation_Onsite Offsets



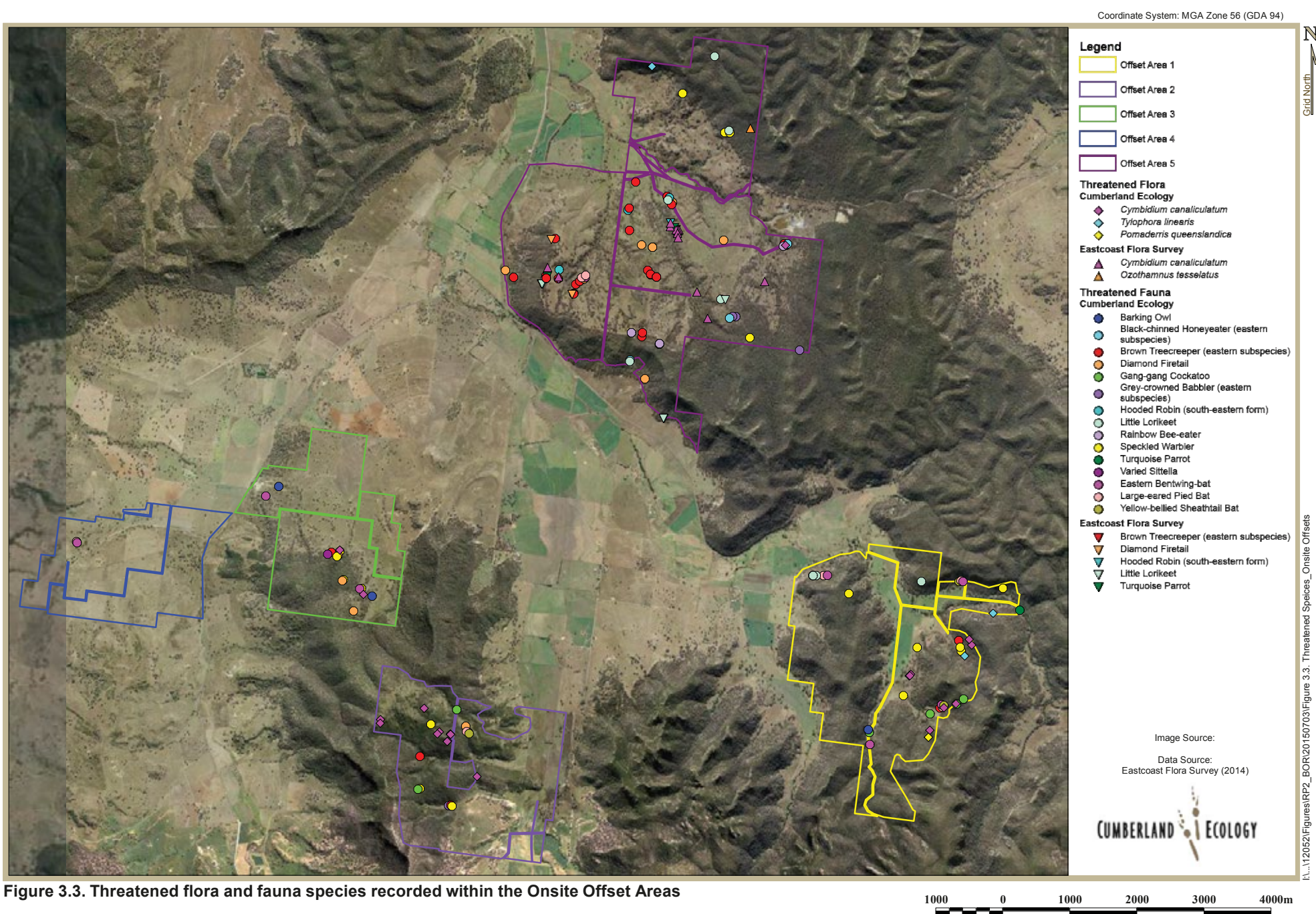


Figure 3.3. Threatened flora and fauna species recorded within the Onsite Offset Areas

Coordinate System: MGA Zone 56 (GDA 94)

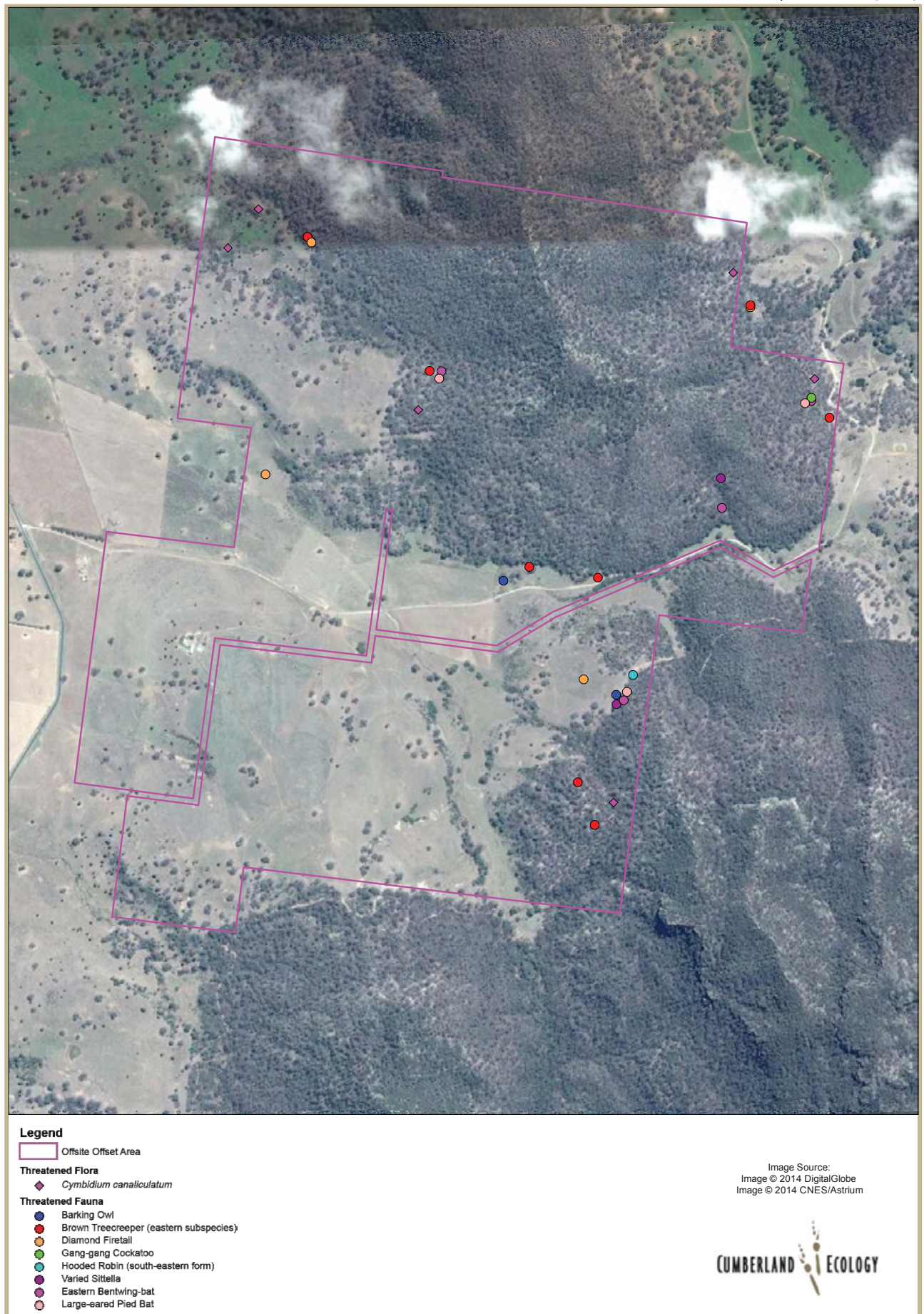


Figure 3.4. Threatened flora and fauna species recorded within the Offsite Offset Area

250 0 250 500 750 1000m



Chapter 4

Offset Strategies and Management

4.1 Offset Strategy

The BOS entails acquisition of offset properties for permanent conservation of flora and fauna, including species predicted to be impacted by the Project, and by provision of indirect offsets. The BOS targets Box Gum Woodland and Derived Native Grassland and other habitats for all threatened flora and fauna known to occur within the Project Boundary.

The current composition of the BOP includes:

1. **Onsite Offset Areas**, comprising:
 - a. Conservation and ongoing management of existing vegetated land within Offset Area 1, Offset Area 2, Offset Area 3, Offset Area 4 and Offset Area 5;
 - b. Restoration of vegetation communities and associated habitat within the aforementioned Onsite Offset Areas;
2. **Offsite Offset Area**, comprising:
 - a. Conservation and ongoing management of existing vegetated land within the Yarran View Offset Area; and
 - b. Restoration of vegetation communities and associated habitat within the Yarran View Offset Area.

The offset areas include various forms of forest, woodland and grassland, which constitute habitat for threatened flora and fauna. Importantly, these areas would provide upfront compensation of the Project's impacts on biodiversity values. The inclusion of these lands as biodiversity offsets would provide additional conservation areas within the locality of the Project. Based on current data, the offset areas are likely to contribute 3,791 ha of native vegetation through retention and restoration.

4.1.1 Direct Offsets

The strategies and desired outcomes vary for each of the offset areas and are summarised in **Table 4.1**. The direct offsets for the Project will have a significant net benefit to flora and fauna. The available data indicates that in the medium to long term, the Project will result in a net increase in woodland in and around the Study Area and locality.



Table 4.1 Key strategies for the offset areas

Offset Area	Strategy
Offset Area 1	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Retain areas of land for agricultural use.</p>
Offset Area 2	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Improve connectivity between existing woodland remnants.</p> <p>Retain areas of land for agricultural use.</p>
Offset Area 3	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Improve connectivity between existing woodland remnants.</p> <p>Build on to existing woodland remnants.</p> <p>Retain areas of land for agricultural use.</p>
Offset Area 4	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Improve connectivity across the valley floor between existing woodland remnants.</p> <p>Retain areas of land for agricultural use.</p>



Table 4.1 Key strategies for the offset areas

Offset Area	Strategy
Offset Area 5	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Monitor changes to flora and fauna values resulting from subsidence.</p> <p>Increase connectivity in the landscape, including the addition of habitat directly connected to Goulburn River National Park.</p> <p>Retain areas of land for agricultural use.</p>
Yarran View Offset Area	<p>Retain and improve areas of Box Gum Woodland.</p> <p>Retain vegetation communities known to be impacted by the Project.</p> <p>Restore areas of derived native grassland to Box Gum Woodland and other native woodland types.</p> <p>Retain and improve areas of known and potential threatened species habitat.</p> <p>Improve connectivity between existing woodland remnants.</p> <p>Build on to existing woodland remnants.</p> <p>Retain areas of land for agricultural use.</p>

4.2 Offset Security

KEPCO own all of the properties contained within the offset areas for the Project. At the time of writing, KEPCO are considering a number of mechanisms to permanently secure the offset properties for conservation and management. There are a number of options to permanently protect offset land for conservation and these include:

- Formal BioBanking Agreements;
- Voluntary conservation agreements, which are a joint agreement between landowners and the Minister for the Environment under the *National Parks and Wildlife Act 1974*;
- Conservation covenants under Section 88 of the *Conveyancing Act 1919*; this is a joint agreement between the landowner (i.e. KEPCO) and an authorised body; and
- Application to change zoning regulation that dictates land use.

The final outcome will depend on negotiations with relevant regulatory agencies.



4.3 Management

The management of the offset areas includes the conservation and ongoing management of existing vegetation. Details of the management procedures to be implemented within the each of the offset areas will be contained within the Project Biodiversity Management Plan (BMP). KEPCO have previously appointed a land manager for all KEPCO-owned land within the Study Area. When the offsets are formalised and a BMP is in place, it is anticipated that the land manager will oversee and coordinate activities for the purposes of biodiversity management.

4.3.1 Conservation and Ongoing Management of Existing Vegetation

Conservation and ongoing management of existing vegetation will occur within all the offset areas in order to maintain and improve their ecological value and facilitate regeneration of native vegetation and associated fauna habitat. This will include weed and feral animal management, phased reduction of livestock management and, where required, active replanting and reseedling of vegetation. The management of the flora and fauna values within the offset areas will also be monitored.

The objectives for the management of existing vegetation within the offsets are:

- Maintenance and improvement of the condition of existing forest and woodland;
- Maintenance and improvement of the condition of riparian vegetation and habitats;
- Maintenance and improvement of habitat for threatened flora and fauna;
- Improvement of derived native grassland to promote, natural succession towards woodland and or open forest;
- Revegetation, where required, of areas of low diversity native grassland by replanting trees and shrubs to promote a more rapid regeneration towards forest or woodland (further detail provided in **Section 4.3.2**); and
- Improvement of habitat connectivity within the offset areas in order to improve wildlife movement in the long term.

The offset properties contain extensive areas of existing woodland and open forest that will form nuclei for the ongoing regeneration of trees and shrubs into grassland areas. Such areas would provide immediate and ongoing habitats for native plants and animals. Existing forest and woodland areas are currently mature, functioning examples of natural ecosystems, but their condition is expected to improve with time as trees mature, tree hollows are generated and as regeneration of understorey takes place when livestock are progressively removed (McIntyre *et al.*, 2002).

Derived native grasslands within the offset areas are in variable condition. Many of the grasslands adjacent to remnant vegetation have a diversity of native grasses and non-grass understorey species. Grasslands occurring in actively used agricultural areas and riparian areas have fewer native species in the understorey. It is intended that grazing management,



combined with the management of weeds and feral animals would accelerate regeneration of derived native grasslands to forest and woodland areas. Such habitats are semi-natural and cannot currently be considered fully functional as they generally lack trees and shrubs.

In the medium to long term, trees and shrubs are expected to regenerate in many grassland areas if the condition of the land is improved through grazing and weed management (Lindenmayer *et al.*, 2010). It is expected that substantial regeneration will occur during the life of the Project and a mature, functional ecosystem will be established across much of these grassland areas within 50 years.

There are some portions of grassland within the offset areas that would require revegetation. These areas occur where remnant woodland and forest patches are largely absent (e.g. Offset Area 4).

Full details of the proposed management activities to be conducted within the offset areas will be provided as part of the BMP.

4.3.2 Revegetation

A number of the woodland communities relevant to the Project are listed because much of this vegetation has been cleared historically for agricultural practices. In order to recover such woodland, it is essential to recover land from farmlands. As there are limited opportunities for conservation of large intact patches of TECs, revegetation of these communities within modified landscapes is being undertaken.

Revegetation is proposed to occur within the portions of the offset areas containing grasslands associated with Box Gum Woodland, that do not meet the criteria to be listed under the TSC Act or EPBC Act (see vegetation mapping figures in **Appendix A** to **Appendix F**). Revegetation of these areas is proposed to establish extensive areas of woodland.

The draft National Recovery Plan for Box Gum Woodland and Derived Native Grassland and other manuals on restoration of grassy woodlands (e.g. McIntyre *et al* 2002, Rawlings *et al* 2010) support the notion that woodland is quite feasible to recover or regenerate from derived native grassland, with the correct management.

The objectives for revegetation within the offset areas are:

- Restore extensive areas of Box Gum Woodland;
- Restore extensive areas of habitat for the suite of threatened species impacted by the Project; and
- Establish linkages between patches of remnant vegetation.

It is not contended that the revegetated woodland will be a facsimile of the original woodland. However, broad areas of such grassland will be revegetated with trees and shrubs and as such, it is predicted that sufficient native trees and shrubs will be reintroduced to provide self-regenerating vegetation.



Restoration of forest and woodland to a structural complexity with diverse age classes comparable to the original community structure will take many decades, but natural regeneration can be achieved with supplemented revegetation to replace missing community layers. A major part of this is maintaining or increasing the number of large old canopy trees (in areas where they remain) which provide habitat resources including hollows, woody debris and reliable blossom production. Restoration of forest and woodland also involves protection of any remaining medium sized trees that are future large old canopy trees.

It is anticipated that initial revegetation work will be focussed on expanding existing patches of woodland. Trees and shrubs should be planted into such areas to form nuclei of regenerating woody habitats that would then be able to progressively grow back into woodland or open forest. Replanting of such areas will take place early in the life of the Project (within the first five years) and it is expected that substantial regeneration of woody plants will occur within the life of the Project.

The BMP is proposed to contain details on revegetation priorities and techniques, as well as details of reference sites and monitoring methodology. Methods for revegetation could include direct seeding and tubestock planting. Revegetation methods will be undertaken in conjunction with weed control and feral animal management, so as to minimise threats to seedlings/tubestock. A number of other factors, such as site preparation, monitoring and adaptive management are an important component of revegetation works.

4.4 Biodiversity Management Plan

In order to provide a comprehensive framework for the implementation of the proposed biodiversity impact mitigation and offset measures, a BMP will be developed for the Project. The BMP will ensure that the Project's conservation objectives are met and that impacts to biodiversity are adequately managed for the life of the Project. The BMP will incorporate all of the impact mitigation measures as described in the EIA that are proposed to be undertaken for the Project, and provide detailed specifications for their implementation.

The BMP will include the following:

- A description and plan of onsite conservation measures (long and short term);
- Measures to protect local biodiversity values;
- Provisions to address specific issues such as the occurrence of threatened species;
- Details of appropriate areas for rehabilitation and conservation;
- Details of revegetation priorities and techniques;
- Details of reference sites, monitoring methodology, and other contributions to conservation;
- Description of key performance indicators against which to measure progress; and



- Specification of appropriate review periods where progress is reviewed and the document updated as required.

The BMP is intended to be a working document that guides all facets of biodiversity management and biodiversity mitigation for the Project, and should include clear objectives and actions. The BMP will specify what management measures will be undertaken, how they will be undertaken, and should provide a timeline to ensure that all activities are conducted and reviewed according to the plan. The BMP will enable site environmental managers to enact the 'avoid and mitigate' principles during the operation of the Project.

The BMP will contain comprehensive details of the proposed management measures that will be implemented in the offset properties to ensure that there is an improvement in the biodiversity values, including phased reduction of livestock management, the management of weeds and feral animals, as well as shrub and tree planting and direct seeding of groundcover species in more modified areas. Different properties and different areas within a single offset will inevitably require varying levels and methods of management.

The baseline survey information should be used to identify site specific issues; formulate scope of works and indicator performance criteria; prepare a series of site specific management actions; and prepare a set of implementation timeframes and key milestones for the offset properties. These should be guided by best practice guidelines and should be consistent with the desired outcomes of the draft National Recovery Plan for Box Gum Woodland and Derived Native Grassland (DECCW (NSW), 2010) and incorporated as appropriate into the BMP.

The BMP will include, where appropriate, specifications for the following:

- Detailed design of mitigation measures such as fencing, rehabilitation and soil conservation;
- Pre-clearing surveys and fauna rescue or translocation where practical;
- Vegetation clearing protocols;
- Rehabilitation and restitution of adjoining habitat where possible;
- Control and ongoing management of environmental and noxious weeds;
- Control and ongoing management of feral animals;
- Rehabilitation methods and protocols; and
- Details of the ecological monitoring program.

The BMP will include clear objectives, key performance objectives and management actions of biodiversity values to be protected and of the proposed mitigation measures including, where appropriate:

- Minimising human disturbance to native flora and fauna;



- Limiting clearance or disturbance of native vegetation;
- Minimising impacts to, and where possible protecting, threatened species and communities;
- Minimising impacts to aquatic habitats and species; and
- Ongoing monitoring of impacts on flora and fauna, including within the Subsidence Study Area, and implementation of adaptive management plans.

The BMP will also contain further information on the staged rehabilitation of the Project Disturbance Boundary, the monitoring and management activities to take place within the Subsidence Study Area and will specify how the Project Boundary will be closed post mining and returned to other land uses. This should include post-mining land use, conceptual final landform design, and rehabilitation methodology.

The success of the BMP may be determined independently as follows:

- Independent audit at designated intervals by appropriately qualified person appointed by the Secretary in consultation with OEH/DoE; and
- The audit would assess progress against key performance criteria to be assessed at the designated intervals.

4.5 Monitoring

A monitoring program will be developed to monitor the ongoing status and health of flora and fauna that is to be retained within the Project Boundary and in the offset areas, including both vegetation monitoring and threatened species monitoring. This will provide feedback data to determine the level of success of the mitigation and amelioration measures. The proposed monitoring program includes the use of appropriate reference sites that are located away from mining activities to use as a baseline against which to compare the status of habitats in close proximity to mining.

The progress of offsets would also be subject to annual monitoring where achievement of measureable key performance targets would be determined. These would include but not be limited to:

- Monitoring surveys to verify that the relevant threatened species are using offsets and increasing in their use of offsets;
- Monitoring surveys to verify that TECs and other vegetation communities are being maintained and improved by reference to quantitative, standard biometric benchmark data;
- Monitoring of weeds to verify that significant weeds are declining or being maintained at sustainable levels; and



- Monitoring of feral animals to verify that significant feral pests (e.g. foxes, pigs and goats) are declining or being maintained at sustainable low levels.

This section discusses the proposed monitoring programs that will be developed for the Project. More detailed prescriptions for monitoring strategies and the development of reference sites will be incorporated into the BMP, including a framework for reporting on the results of the monitoring.

4.5.1 Vegetation Monitoring

The vegetation monitoring strategy would provide information to quantify the change in biodiversity over time. It is proposed that monitoring sites be established in areas of vegetation within the Project Disturbance Boundary and Subsidence Study Area and in designated reference sites (see **Section 4.5.3**). Monitoring will be used in adaptive management, in order to continually improve the outcomes of the land management strategy. Appropriate data management procedures will be implemented to ensure that all data is collected using appropriate techniques and suitably analysed to allow meaningful spatial and temporal comparisons to be made. More specific details of the vegetation monitoring strategy will be contained in the BMP.

4.5.2 Threatened Species Monitoring

Monitoring should also be undertaken on selected threatened species of flora and fauna, in order to determine whether populations are being adversely affected by the Project.

Threatened species monitoring will:

- Enable the identification of the impacts of the Project on threatened species;
- Identify changes in population numbers over time;
- Determine the success of impact mitigation and conservation measures; and
- Highlight areas for improvement if these measures are found to be inadequate.

Threatened species monitoring should involve conducting targeted threatened species surveys annually in areas of known habitat in order to record the abundance of selected species. This should include both flora and fauna species. The level of monitoring effort would be determined according to risk level and biology of the particular species in question (e.g. coordinating with breeding or movement times).

4.5.3 Reference Sites

The establishment of reference sites is recommended by the *Good Practice Guidance for Mining and Biodiversity* (ICMM, 2006) to enable impacts resulting from mining to be better understood and quantified. Reference areas serve as a benchmark against which changes in biodiversity over time can be compared (for example, through the use of the before-after/control-impact approach). This approach collects and compares data from sites before and after the impact has occurred, and also from control (un-impacted) and impacted sites.



Reference sites help to determine which changes are directly attributable to the mining operations and which are the results of unrelated outside factors. Reference sites can also be very useful in rehabilitation, as they allow a desired endpoint to be set for rehabilitation efforts, and progress towards this endpoint through time can be quantified.

Reference sites should be selected before mining commences and should be determined in consultation with relevant government agencies as part of the finalisation of the BMP. These sites should be established in areas within the Study Area that will not be subject to impacts from mining, or outside of but as close as possible to the Study Area. Locations suitable as reference sites should ideally contain the same ecological community that is being impacted, should be in a similar position in the landscape, should have similar topography and disturbance history, and should not be subject to impacts from the Project (ICMM, 2006). At each reference site, a range of data will be collected in order to allow comparisons to be made between impacted and non-impacted sites. This will provide an indication of the impacts occurring as a result of the Project. The full range of data to be collected at each reference site will be developed during the preparation of the BMP.



Chapter 5

Assessment of Adequacy

5.1 Introduction

The avoidance and mitigation measures described in the EIA would be insufficient on their own to ameliorate all anticipated ecological impacts of the Project. For this reason, offsetting is proposed to compensate for what would otherwise result in a net loss of biodiversity through the direct and indirect impacts of the Project.

In recent years, there have been a number of approaches to evaluate the type and quantum of offsets required for major projects. This assessment has utilised the following methods:

- Ratios: Calculation of the ratios of areas of vegetation within proposed offsets and expressing such areas as a ratio for the areas of vegetation proposed to be cleared. The intention is to demonstrate that offsets are several times the size of the proposed impact area so as to provide for a net gain in biodiversity;
- NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014c): The NSW Government has developed a set of principles for assessing impacts to biodiversity values and determining acceptable offsets. Within these principles, the losses and gains of a Project and its offsets can be assessed using established assessment tools, including FBA and BBAM; and
- DoE Offset Principles (SEWPaC, 2012): DoE has developed eight principles for determining the suitability of offsets for a Project. The *Offsets Assessment Guide*, which accompanies this policy, has been developed in order to give effect to the requirements of this policy, utilising a balance sheet approach to measure impacts and offsets.

These approaches are explained in more detail below.

The original Secretary's Environmental Assessment Requirements (SEARs) for the Project were issued by the NSW Department of Planning and Environment (DP&E) on 23 June 2014. These SEARs were prepared in conjunction with advice received from OEH and DoE. The provisions of the SEARs that are relevant to this biodiversity offsets report are reproduced below.



The EIS must address the following specific issues:

- *Biodiversity – including:*
 - *an assessment of the likely biodiversity impacts of the development, having regard to OEH's, the Department of Primary Industries' and the (Commonwealth) Department of Environment's requirements (see Attachment 2);*
 - *a comprehensive offset strategy to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term.*

Attachment 1 of the SEARs included a list of environmental planning instruments, policies, guidelines and plans that may be relevant to the Project. Included in this list was the then Draft NSW Biodiversity Offset Policy for Major Projects, the BBAM and DoE's *Environmental Offsets Policy*. The advice provided by OEH to DP&E for the development of the SEARs did not include a reference to the Draft NSW Biodiversity Offset Policy for Major Projects as the advice was issued on 18 February 2014, prior to the draft policy going on public exhibition in March 2014.

Since the original SEARs were issued the *NSW Biodiversity Offset Policy for Major Projects* commenced on 1 October 2014, with a 12-18 month transitional implementation period commencing at this time. Additionally, the BBAM was also updated with the methodology commencing on 1 October 2014 to align with the commencement of the *NSW Biodiversity Offset Policy for Major Projects*.

DP&E amended the SEARs on 11 November 2014 to reflect some minor amendments to the Project. The amended SEARs did not include a requirement to assess the Project in accordance with the *NSW Biodiversity Offset Policy for Major Projects*. As the EIA for the Project was largely prepared prior to the introduction of the policy, surveys and reporting methodology outlined within the policy could not be completely followed. As such, this assessment of the offsets for the Project has used the *NSW Biodiversity Offset Policy for Major Projects* as a tool for assessing the adequacy of the offsets for the Project. KEPCO propose to further assess the Project throughout the Government's assessment period in consultation with DP&E and OEH to align with the *NSW Biodiversity Offset Policy for Major Projects* and associated FBA, where possible.

5.2 Assessment Methods

5.2.1 Vegetation Removal and Offset Ratios

Offsets for major projects in NSW have been conventionally developed based upon a ratio method whereby for every hectare of habitat cleared, a multiple of habitat is provided as an offset. In some cases where other methods have been used to assess the adequacy of offsets, the ratios of land provided within an offset have retrospectively been calculated to compare between projects.



Offsets ratios also typically factor in future habitat improvement and so offsets consist of a mixture of existing habitat in good condition, and habitat in low to moderate condition that can be regenerated. This means that in future, if the offsets are acquired and fully regenerated, there will be a net increase in the total amounts of vegetation/habitat. Such increases are important because threatened communities and species are generally listed as such because their habitats have been over cleared in the past. Offset packages need to be designed to redress this.

For the purpose of establishing minimum area thresholds for the BOS, the following ratios have been adopted:

- 5:1 for components of TECs listed under both State and Commonwealth legislation;
- 4:1 for components of TECs only listed under State legislation; and
- 3:1 for non-listed native vegetation.

The ratios set for this assessment of the Project are targeted towards compensating the direct loss of vegetation and habitat as well as potential indirect impacts.

5.2.2 NSW Biodiversity Offsets Policy for Major Projects and Framework for Biodiversity Assessment

i. Offsets Policy

The NSW Government's *NSW Biodiversity Offsets Policy for Major Projects* commenced on 1 October 2014 and includes the following principles to assist in the assessment of impacts to biodiversity values and determining acceptable offsets:

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.
2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.
3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.
4. Offsets must be additional to other legal requirements.
5. Offsets must be enduring, enforceable and auditable.
6. Supplementary measures can be used *in lieu* of offsets.

The FBA has been developed in conjunction with the policy to provide a method for determining the quantum of impacts and assessing the adequacy of offsets. The FBA has



also been utilised for the Project to objectively assist in determining the quantum of offsets required. This is discussed in more detail below.

ii. *Framework for Biodiversity Assessment and BioBanking Assessment Methodology*

The FBA provides rules and software for calculating the number and type of credits that a development site will require in order to offset its impacts and thus improve or maintain biodiversity values. “Credits” are the currency used within FBA and they are not specifically area measurements. Rather, they are a measure of the current quality of habitat for threatened flora and fauna. FBA is used for the development site, whilst BBAM is used for offset sites.

The FBA method is focussed on trades of like for like habitats where higher credit scores are obtained for habitats in better ecological condition and where habitats are larger and better connected to other habitat areas. This is because the method is based upon the premise that larger, better connected habitats will afford more habitat for threatened species.

5.2.3 DoE Environmental Offsets Policy and Offset Assessment Guide

i. *Environmental Offsets Policy*

DoE's *Environmental Offsets Policy* includes the following principles to assist in the assessment of impacts to biodiversity values and determining acceptable offsets:

1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.
2. Suitable offsets must be built around direct offsets but may include other compensatory measures.
3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.
4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.
5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding.
6. Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.
7. Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.
8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.



The *Offsets Assessment Guide* has been developed in conjunction with the policy to provide a method for determining the quantum of impacts and assessing the adequacy of offsets. The *Offsets Assessment Guide* has been utilised for the Project to objectively assist in determining the quantum of offsets required. This is discussed in more detail below.

ii. *Offsets Assessment Guide*

The *Offsets Assessment Guide* is a tool that can be used to assess the adequacy of direct offsets and the cost of indirect offsets. The *Offsets Assessment Guide* was developed for DoE to assess the suitability of offset proposals (SEWPaC, 2012); however proponents are being requested to utilise the tool to assess the adequacy of their project offsets. The *Offsets Assessment Guide* provides a prescriptive method for measuring the loss of biodiversity values at a development site and the gain in biodiversity values at an offset site. This is done through the utilisation of a balance sheet approach.

The *Offsets Assessment Guide* is an Excel spreadsheet that is used to calculate the quantum of impact and value of the offset in order to improve or maintain biodiversity values. For communities and habitat for species, “adjusted hectares” are the currency used within the guide. They take into account variables such as area of impact and quality of the habitat. The same currency is utilised for the offsets, however additional variables, such as current and future quality, risk and confidence in achieving the desired outcome, are also utilised.

The *Offsets Assessment Guide* expresses the value of a proposed direct offsetting measure as a percentage of the development’s offsetting requirement. The biodiversity impacts of a development are considered to be adequately compensated for by DoE if the direct biodiversity offsets can be demonstrated via the calculator to meet at least 90% of the offsetting requirement. The remaining 10% of a development’s offsetting requirement can comprise indirect offsets, such as a financial contribution to research or education programs.

5.3 Impact Assessment

5.3.1 *Vegetation Removal and Offset Ratios*

The Project Disturbance Boundary contains approximately 753 ha of native vegetation, including several communities listed as TECS under the TSC Act and/or the EPBC Act that will be disturbed and which are required to be offset. Cultivation and cleared areas (roads, dams, railway etc.) totalling 407 ha will not require offsetting.

A summary of the minimum offsetting requirements for the Project based on the ratios outlined in **Section 5.2.1** is provided in **Table 5.1**. The minimum offset area required using the aforementioned ratios to compensate for the Project impacts is 2,611 ha. This includes 959 ha of Box Gum Woodland and Derived Native Grassland listed under the TSC Act and 676 ha of Box Gum Woodland and Derived Native Grassland listed under the EPBC Act.



Table 5.1 Offset requirement calculated using ratios

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha) ~	Ratio	Required Offset (ha) ~+
4: Apple Riparian Forest					
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	-	-	5	3:1	16
6: Yellow Box Woodland					
6a(1) ^A : <i>Yellow Box Woodland (Grassy)</i>	EEC	CEEC	8	5:1	41
6a(2) ^C : <i>Yellow Box Woodland (Grassy)</i>	-	-	<1	3	<1
7: White Box Woodland					
7a(1) ^A : <i>White Box Woodland (Grassy)</i>	EEC	CEEC	53	5:1	266
7a(2) ^C : <i>White Box Woodland (Grassy)</i>	-	-	1	3:1	4
7b: <i>White Box Woodland (Shrubby)</i>	-	-	71	3:1	212
9: Slaty Box Woodland	VEC	-	11	4:1	45
10: Coastal Grey Box Woodland	-	-	31	3:1	92
11: Fuzzy Box Woodland	-	-	5	3:1	15
13: Shrubby Regrowth	-	-	40	3:1	119
18: Cypress Pine Forest	-	-	4	3:1	11
DNG: Derived Native Grassland					
DNG – 3: <i>River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	-	-	11	3:1	33
DNG – 4: <i>Apple Riparian Forest Derived Native Grassland[#]</i>					
DNG – 6(1) ^A : <i>Yellow Box Woodland Derived Native Grassland</i>	EEC	CEEC	6	5:1	29
DNG – 6(2) ^B : <i>Yellow Box Woodland Derived Native Grassland</i>	EEC	-	8	4:1	31
DNG – 6(3) ^C : <i>Yellow Box Woodland Derived Native Grassland</i>	-	-	1	3:1	3
DNG – 7(1) ^A : <i>White Box Woodland Derived Native Grassland</i>	EEC	CEEC	68	5:1	340
DNG – 7(2) ^B : <i>White Box Woodland Derived Native Grassland</i>	EEC	-	63	4:1	252
DNG – 7(3) ^C : <i>White Box Woodland Derived Native Grassland</i>	-	-	43	3:1	128
DNG – 9: <i>Slaty Box Woodland Derived</i>	-	-	31	3:1	94



Table 5.1 Offset requirement calculated using ratios

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha) ~	Ratio	Required Offset (ha) ~+
<i>Native Grassland</i>					
<i>DNG – 10: Coastal Grey Box Woodland Derived Native Grassland</i>	-	-	241	3:1	723
<i>DNG – 11: Fuzzy Box Woodland Derived Native Grassland</i>	-	-	53	3:1	158
CC: Cultivated Lands	-	-	386	0	0
Other (cleared, planted vegetation)	-	-	21	0	0
TOTAL NATIVE VEGETATION⁺			753		2,611
TOTAL NON-NATIVE VEGETATION AND CLEARED			407		0
TOTAL AREA⁺			1160		2,611

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate



5.3.2 NSW Biodiversity Offsets Policy for Major Projects and Framework for Biodiversity Assessment

Surveys of the Project Disturbance Boundary were undertaken prior to the introduction of the FBA. As such, surveys followed the methodology provided within the BioBanking Operational Manual (DECC, 2009). Some variations were made to the way in which credits were calculated for the Project. These include:

- Inclusion of nearby plot data undertaken in grasslands at the same time as those undertaken within the Project Disturbance Boundary;
- Sharing of grassland plot data where condition was considered the same where there were insufficient plots;
- Duplication of plot data where there were insufficient plots;
- Inclusion of non-listed White Box Woodland (Grassy) (Unit 7a(3)) components into the same condition classes as listed White Box Woodland (Grassy) (Unit 7a(1)) as there were insufficient condition classes for the selected Plant Community Type (PCT); and
- Assumption of the presence of the Regent Honeyeater within the Project Disturbance Boundary based on a recent nearby record.

A summary of the ecosystem credits required for the Project is provided in **Table 5.2**. All native vegetation types within the Project Disturbance Boundary were assessed as being in moderate/good condition. When assessed using the FBA, the Project was estimated to require a total of 21,741 ecosystem credits. Of this, an estimated 6,276 ecosystem credits are required for Box Gum Woodland and Derived Native Grassland and 643 ecosystem credits are required for Hunter Valley Footslopes Slaty Gum Woodland.

A summary of the species credits required for the Project is provided in **Table 5.3**. The Project requires 13,031 species credits for the Regent Honeyeater, 12 species credits for the Brush-tailed Rock-wallaby, 1,300 species credits for the Eastern Bentwing-bat (breeding habitat) and 1,300 species credits for the Large-eared Pied Bat (breeding habitat).

Table 5.2 Ecosystem credits required for the Project

Vegetation Community	PCT Code	Area (ha)~	Credits Required	Credits/ha
4: Apple Riparian Forest				
4a: Blakely's Red Gum / Apple Riparian Forest	HU714	5	276	52
6: Yellow Box Woodland				
6a: Yellow Box Woodland (Grassy)	HU732	8	472	57
7: White Box Woodland				



Table 5.2 Ecosystem credits required for the Project

Vegetation Community	PCT Code	Area (ha)~	Credits Required	Credits/ha
7a: White Box Woodland (Grassy)	HU690	55	2,989	55
7b: White Box Woodland (Shrubby)	HU824	71	3,908	55
9: Slaty Box Woodland	HU869	11	643	58
10: Coastal Grey Box Woodland	HU690	31	1,785	58
11: Fuzzy Box Woodland	HU547	5	148	29
13: Shrubby Regrowth	HU824	40	1,869	47
18: Cypress Pine Forest	HU824	4	197	53
DNG: Derived Native Grassland				
DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland#	HU714	11	199	18
DNG – 4: Apple Riparian Forest Derived Native Grassland#				
DNG – 6(1) ^A : Yellow Box Woodland Derived Native Grassland	HU732	6	95	16
DNG – 6(2) ^B : Yellow Box Woodland Derived Native Grassland	HU732	8	140	18
DNG – 6(3) ^C : Yellow Box Woodland Derived Native Grassland	HU732	1	15	17
DNG – 7(1) ^A : White Box Woodland Derived Native Grassland	HU690	68	1,466	22
DNG – 7(2) ^B : White Box Woodland Derived Native Grassland	HU690	63	1,113	18
DNG – 7(3) ^C : White Box Woodland Derived Native Grassland	HU690	43	735	17
DNG – 9: Slaty Box Woodland Derived Native Grassland	HU869	31	613	20
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	HU690	241	4,165	17
DNG – 11: Fuzzy Box Woodland Derived Native Grassland	HU547	53	913	17
TOTAL⁺		753	21,741	29

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act



River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

* In some cases totals may not equal the appropriate total number due to rounding

~ Area calculations are approximate

Table 5.3 Species credits required for the Project

Common Name	Scientific Name	Project Disturbance Boundary (ha) ~	Credits Required	Credits/ha
Regent Honeyeater	<i>Anthochaera phrygia</i>	169	13,031	77
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	<1	12	26
Eastern Bentwing-bat	<i>Miniopterus schreibersii subsp. oceanensis</i>	100	1,300	13
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	100	1,300	13

~ Area calculations are approximate

5.3.3 DoE Environmental Offsets Policy and Offset Assessment Guide

Under the DoE *Environmental Offsets Policy*, an offset is required if residual impacts to MNES (i.e. impacts remaining after avoidance and mitigation measures) from a project are assessed to be significant by the *Significant Impact Guidelines*.

The following MNES have been assessed using the DoE *Offsets Assessment Guide* as the residual impacts of the Project are considered significant:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (woodland and grassland components assessed separately); and
- Regent Honeyeater (*Anthochaera phrygia*).

Each MNES identified was assessed using the *Offsets Assessment Guide* to determine the total quantum of impact in hectares based on area of impact and quality of the habitat impacted. **Table 5.4** below summarises the assessed impact to each MNES. The area of habitat calculated for the Regent Honeyeater is based on the presence of feed trees identified in the OEH (2014d) and DoE (2014a) profiles for the species and the recovery plan (Menkhorst *et al.*, 1999).



Table 5.4 Total quantum of impacts for each MNES assessed using the Offsets Assessment Guide

MNES	EPBC Act Status	Area Impacted (ha) ~	Quality	Total Quantum of Impact (Adjusted ha)
Significantly Impacted MNES				
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – woodland component	CEEC	61	7/10	43.01
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – grassland component	CEEC	74	5/10	36.86
Regent Honeyeater (<i>Anthochaera phrygia</i>)	E	169	6/10	101.54

EPBC Act Status: CEEC = Critically Endangered Ecological Community, E = Endangered

~ Area calculations are approximate

5.4 Offset Assessment

5.4.1 Application of Assessment Methods to Offset Area 5

The BOP for the Project includes six properties located within close proximity to the Project Disturbance Boundary, referred to as the Onsite Offset Areas. One of the Onsite Offsets Areas, namely Offset Area 5 is located above a portion of the Underground Extraction Area. As such, there is potential for impacts to the vegetation and habitat within portions of Offset Area 5, which have been taken into account in the assessment of the offset areas. The potential impacts and discount applied to Offset Area 5 are outlined below.

i. Assessment of Impacts

The extent of potential subsidence impacts resulting from mining of the Underground Extraction Area has been modelled and is represented by the Subsidence Study Area (see **Figure 1.1**). The EIA details the extent of impacts to vegetation and habitats within the Subsidence Study Area.

Approximately 70% (1,064 ha) of Offset Area 5 overlaps with the Subsidence Study Area. As such, there is potential for the flora and fauna values of this portion of the offset to be impacted by subsidence. The reduction in flora and fauna values may occur through impacts such as surface cracking, tree and rock fall and alteration to hydrological regimes. The subsidence impacts associated with Offset Area 5 are discussed below.

MSEC (2015) has estimated that there will be cracking but that the area of surface cracking will cover less than 1 % of the total subsidence area for the proposed longwalls. Surface cracking has the potential to impact flora and fauna values through erosion, tree fall and remediation works as follows:



- Erosion can result in the degradation of vegetation and riparian habitats that are that are intersected by the cracks; however these impacts will be managed within Offset Area 5 through the implementation of a BMP;
- Surface cracking also has the potential to result in increased tree fall (i.e. above normal rates): it is predicted that there will be isolated occurrences of such tree fall within Offset Area 5. Tree fall is not expected to be significant in terms of the proportion of existing trees impacted. and the vegetation and habitats present within Offset Area 5 will continue to be present; and
- The extent of disturbance for remediation works associated with surface cracking has been conservatively estimated at 10% of the Subsidence Study Area, largely comprising grassland, however appropriate management could reduce this impact to 5% (MSEC, 2015).

Cliff lines within the Study Area, including Offset Area 5, were identified by MSEC (2015) , and the design of the project has been developed to miss the major cliff lines. One small area of identified cliff lines occurs along the southern boundary of Offset Area 5. Cracking and rock fall may result in a loss of some existing caves and vegetation downslope of the cliff line. However, the extent of impacts is likely to be confined to a limited area and species occurring in such rocky landscapes are typically adapted to cope with and recolonise after such disturbances as rock falls. The loss of this vegetation through rock fall is not considered to be significant.

Modelled hydrological changes relevant to the vegetation and fauna habitat within Offset Area 5 include surface water and groundwater alterations that could lead to the degradation of riparian habitats and vegetation dependent on groundwater. Surface water alterations resulting from subsidence are not considered likely to significantly impact the vegetation within Offset Area 5 because it is predominantly comprised of dry land habitats rather than riparian habitats and groundwater dependent ecosystems. There are limited areas of vegetation that have been assessed within the EIA as groundwater dependent ecosystems (GDEs). Those that have been identified as potential GDEs are not considered to have a complete or high dependence on groundwater. Despite changes to groundwater within, and in proximity to, the Underground Extraction Area, other existing water sources that would be utilised by vegetation (including rainfall and surface water runoff) will continue to be available.

ii. Application of a Discount

To account for the limited potential impacts above the Subsidence Study Area within Offset Area 5, the total value/land area to be contributed to the BOP by this portion of the offset has been discounted by 10%. That is, 1,064 ha of land above the Subsidence Study Area and within Offset Area 5 has been assigned a value of "958 ha" within each of the assessments outlined below. The discount applied to Offset Area 5 is considered conservative given the minor anticipated extent of impacts to vegetation and habitat within the portion of the offset occurring within the Subsidence Study Area, as well as proposed management actions that will be implemented to address such issues.



This discount has also not taken into account the management actions that will be undertaken prior to the commencement of underground mining. Land within Offset Area 5 will be managed through the implementation of a BMP, which includes management of TECs and threatened species habitat. These management actions will commence at the beginning of the Project, thus providing opportunities to improve the flora and fauna values of the offset prior to impacts from underground mining. Underground mining development will commence in Year 7 of the Project, which includes initial works within Offset Area 5 at the interface with the Project Disturbance Boundary. These works are unlikely to result in subsidence related impacts. The eastern portions of Offset Area 5 will be subject to underground longwall mining for Years 9-13 of the Project, followed by the western portion for Years 16-25 of the Project. The period between commencement of management actions within Offset Area 5 and underground mining within this area will allow for activities such as destocking, drainage line stabilisation and natural regeneration to occur.

5.4.2 *Vegetation Removal and Offset Ratios*

For the purpose of establishing minimum size thresholds for the BOS, a ratio of 5:1 for components of TECs listed under both State and Commonwealth legislation, 4:1 for components of TECs listed under State legislation and 3:1 for non-listed native vegetation has been adopted. Ideally, offsets were on a 'like for like' basis in that they offset identical vegetation communities, however where this was not possible, other communities have been proposed as surrogates.

A summary of the vegetation removal ratios and how the offset areas exhibit the calculated requirement is provided in **Table 5.5**. A summary of the TECs and the offsetting requirements based on ratios is provided in **Table 5.6**.

Table 5.5 Summary of offsets based on offset requirement calculated by ratios

Vegetation Community	Project Disturbance Boundary (ha)~	Ratio Applied	Required Offset (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Offset Area Yarran View (ha)~	Total Offsets (ha)~ ⁺	Amount above Requirement (ha)~
3: River Oak / Redgum Riparian Forest		4:1	0	15				0		15	15
4: Apple Riparian Forest											
4a: Blakely's Red Gum / Apple Riparian Forest	5	3:1	16	26	14			12	10	62	46
4b: Apple/Yellow Box Riparian Forest		3:1	0				7	0		7	7
5: Blakely's Red Gum / Paperbark Forest		3:1	0					1		1	1
6: Yellow Box Woodland											
6a(1) ^A : Yellow Box Woodland (Grassy)	8	5:1	41	6		5	19	118		148	107
6b: Yellow Box Woodland (Shrubby)		3:1	0	8				0		8	8
7: White Box Woodland											
7a(1) ^A : White Box Woodland (Grassy)	53	5:1	266	36	15	49	5	392	19	516	250
7a(3) ^B : White Box Woodland (Grassy)	1	3:1	4	2	<1					2	-2
7b: White Box Woodland (Shrubby)	71	3:1	212	159	135	111		82	173	660	449
8: Blakely's Red Gum Woodland											
8a: Blakely's Red Gum Woodland (Grassy)		5:1	0		3					3	3
8b: Blakely's Red Gum Woodland (Shrubby)		3:1	0					3		3	3
9: Slaty Box Woodland	11	4:1	45	141	17	2		199	52	411	367

Table 5.5 Summary of offsets based on offset requirement calculated by ratios

Vegetation Community	Project Disturbance Boundary (ha)~	Ratio Applied	Required Offset (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Offset Area Yarran View (ha)~	Total Offsets (ha)~ ⁺	Amount above Requirement (ha)~
10: Coastal Grey Box Woodland	31	3:1	92	1		5	2	7		14	-77
11: Fuzzy Box Woodland	5	3:1	15			<1				<1	-15
13: Shrubby Regrowth	40	3:1	119	3	47	5		1	8	64	-55
14: Dwyer's Red Gum Low Open Forest		3:1	0	2				1		3	3
15: Caley's Ironbark Forest		3:1	0	167				52		219	219
16: Blue-leaf Ironbark / Cypress Forest*		3:1	0	21				95		116	116
17: Red Ironbark / Cypress Forest		3:1	0	11						11	11
18: Cypress Pine Forest	4	3:1	11		47	14				60	49
19: Bloodwood / Ironbark Forest		3:1	0					28		28	28
21: Exposed Grey Gum / Stringybark Forest		3:1	0	14	<1			11	3	28	28
22: Sheltered Grey Gum / Stringybark Forest^											
23: Grey Gum / Caley's Ironbark Forest^		3:1	0	4						4	4
24: Grey Gum / White Box Forest		3:1	0		13					13	13
25: Rough-barked Apple Forest		3:1	0		15					15	15
26: Rough-barked Apple Woodland/Tall Shrubland		3:1	0		23					23	23
DNG: Derived Native Grassland											

Table 5.5 Summary of offsets based on offset requirement calculated by ratios

Vegetation Community	Project Disturbance Boundary (ha)~	Ratio Applied	Required Offset (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Offset Area Yarran View (ha)~	Total Offsets (ha)~ ⁺	Amount above Requirement (ha)~
<i>DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	11	3:1	33	21	11		33	1	19	85	52
<i>DNG – 4: Blakely's Redgum / Apple Riparian Forest Derived Native Grassland[#]</i>											
<i>DNG – 6(1)^A: Yellow Box Woodland Derived Native Grassland</i>	6	5:1	29	8		2	49	20		78	49
<i>DNG – 6(2)^B: Yellow Box Woodland Derived Native Grassland</i>	8	4:1	31				11	71		82	51
<i>DNG – 6(3)^C: Yellow Box Woodland Derived Native Grassland</i>	1	3:1	3	2			25	0		27	24
<i>DNG – 7(1)^A: White Box Woodland Derived Native Grassland</i>	68	5:1	340	32	19	152	34	156	133	526	186
<i>DNG – 7(2)^B: White Box Woodland Derived Native Grassland</i>	63	4:1	252		22	7	17	109		156	-95
<i>DNG – 7(3)^C: White Box Woodland Derived Native Grassland</i>	43	3:1	128	0	34	11	109			154	27
<i>DNG – 8(1)^A: Blakely's Red Gum Woodland Derived Native Grassland</i>		5:1	0					<1		<1	<1
<i>DNG – 9: Slaty Box Woodland Derived Native</i>	31	3:1	94	3				20	1	25	-69

Table 5.5 Summary of offsets based on offset requirement calculated by ratios

Vegetation Community	Project Disturbance Boundary (ha)~	Ratio Applied	Required Offset (ha)~	Offset Area 1 (ha)~	Offset Area 2 (ha)~	Offset Area 3 (ha)~	Offset Area 4 (ha)~	Offset Area 5 (ha)~	Offset Area Yarran View (ha)~	Total Offsets (ha)~ ⁺	Amount above Requirement (ha)~
<i>Grassland</i>											
<i>DNG – 10: Coastal Grey Box Woodland Derived Native Grassland</i>	241	3:1	723	9		90	0	12		111	-612
<i>DNG – 11: Fuzzy Box Woodland Derived Native Grassland</i>	53	3:1	158			1		0		1	-158
<i>DNG – 18: Cypress Pine Forest Derived Native Grassland</i>		3:1	0		0			0		0	0
<i>DNG – 25: Rough-barked Apple Forest Derived Native Grassland</i>		3:1	0		5			0		5	5
TOTAL NATIVE VEGETATION⁺	753		2,611	688	420	455	311	1,391	418	3,684	1,073

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

*Includes areas of Caley's Ironbark Forest (Unit 15)

[^] Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate

Table 5.6 Summary of TECs within offsets based on offset requirement calculated by ratios

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha) [~]	Ratio Applied	Offset Requirement (ha) [~]	Total Offsets (ha) [~]	Offset Ratio
Hunter Valley Footslopes Slaty Gum Woodland							
9: Slaty Box Woodland	VEC		11	4:1	45	411	37:1
Hunter Floodplain Red Gum Woodland							
3: River Oak / Redgum Riparian Forest	EEC			4:1	0	15	n/a
Box Gum Woodland and Derived Native Grassland							
6a(1) ^A : Yellow Box Woodland (Grassy)	EEC	CEEC	8	5:1	41	148	
7a(1) ^A : White Box Woodland (Grassy)	EEC	CEEC	53	5:1	266	516	
8a: Blakely's Red Gum Woodland (Grassy)	EEC	CEEC		5:1	0	3	
DNG – 6(1) ^A : Yellow Box Woodland Derived Native Grassland	EEC	CEEC	6	5:1	29	78	
DNG – 6(2) ^B : Yellow Box Woodland Derived Native Grassland	EEC		8	4:1	31	82	
DNG – 7(1) ^A : White Box Woodland Derived Native Grassland	EEC	CEEC	68	5:1	340	526	
DNG – 7(2) ^B : White Box Woodland Derived Native Grassland	EEC		63	4:1	252	156	
DNG – 8(1) ^A : Blakely's Redgum Woodland Derived Native Grassland	EEC	CEEC		5:1	0	<1	
<i>Subtotal TSC Act Box Gum Woodland and Derived Native Grassland+</i>			206		959	1,509	7:1

Table 5.6 Summary of TECs within offsets based on offset requirement calculated by ratios

Vegetation Community	TSC Act Status	EPBC Act Status	Project Disturbance Boundary (ha) [~]	Ratio Applied	Offset Requirement (ha) [~]	Total Offsets (ha) [~]	Offset Ratio
<i>Subtotal EPBC Act Box Gum Woodland and Derived Native Grassland⁺</i>			135		676	1,271	9:1

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate



5.4.3 Framework for Biodiversity Assessment

Under the FBA, surveys of offsets and calculations of credit values should follow the most recent BBAM manual (OEH, 2014b). As surveys for the Project (both impact and offset surveys) commenced prior to the introduction of FBA and updated BBAM, surveys followed the methodology provided within the previous BioBanking Operational Manual (DECC, 2009). Some variations were made to the way in which credits were calculated for the Project. These include:

- Use of all plot data for Offset Area 1-5 across these offsets (i.e. plot data collected in Offset Area 1 was used for Offset Areas 1-5);
- Inclusion of nearby plot data undertaken in grasslands within the Study Area;
- Sharing of grassland plot data where condition was considered the same where there were insufficient plots;
- Duplication of plot data where there were insufficient plots;
- Inclusion of non-listed White Box Woodland (Grassy) (Unit 7a(3)) components into the same condition classes as listed White Box Woodland (Grassy) (Unit 7a(1)) as there were insufficient condition classes for the selected Plant Community Type (PCT);
- Inclusion of non-listed Yellow Box Woodland (Grassy) (Unit 6a(3)) components into the same condition classes as listed White Box Woodland (Grassy) (Unit 6a(1)) to ensure consistency with the above variation;
- Assumption of the presence (or likely future occurrence) of the Regent Honeyeater within the Project Disturbance Boundary and offset areas based on a recent nearby records and suitable habitat (see **Figure 1.5**);
- Assumption of the presence (or likely future occurrence) of the Brush-tailed Rock-wallaby within the south-eastern portion of Project Disturbance Boundary and Offset Areas 1 and 2 based on a recent nearby records and suitable habitat in proximity to the record (see **Figure 1.5**); and
- Calculations of species credits for only species known to be impacted within the Project Disturbance Boundary (excluding credits for *Acacia pendula* population in the Hunter catchment as it is not considered to be naturally occurring within the Study Area).

A summary of the ecosystem credits generated for the Project is provided in **Table 5.7**. All native vegetation types within the offset areas were assessed as being in moderate/good condition. When assessed using the FBA, the Project requires a total of 21,741 ecosystem credits. The offset areas provide a total of 43,006 ecosystem credits. The BOS provides a substantial amount of ecosystem credits beyond the total amount of ecosystem credits required for the Project.



Table 5.8 provides a summary of the ecosystem credits for TECs generated by the Project. The results of the assessment indicate that the BOS provides:

- 8,690 more ecosystem credits for TSC Act listed Box Gum Woodland and Derived Native Grassland than is required;
- 7,654 more ecosystem credits for EPBC Act listed Box Gum Woodland and Derived Native Grassland than is required; and
- 5,468 more ecosystem credits for Hunter Valley Footslopes Slaty Gum Woodland than is required; and

A summary of the species credits generated by the Project is provided in **Table 5.9**. It is estimated that the Project provides an excess of 150 species credits for the Regent Honeyeater, 2,025 species credits for the Brush-tailed Rock-wallaby, 6,264 species credits for the Eastern Bentwing-bat (breeding habitat) and 6,264 species credits for the Large-eared Pied Bat (breeding habitat).

Table 5.7 Total ecosystem credits generated by the Project

Vegetation Community	PCT Code	Disturbance Area		Offset Area 1		Offset Area 2		Offset Area 3		Offset Area 4		Offset Area 5		Yarran View Offset Area		TOTAL OFFSETS		Amount Above Requirement
		Area (ha)~	Credits Required	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	Area (ha)~	Credits Generated	
3: River Oak / Redgum Riparian Forest	HU599			15	181											15	181	181
4: Apple Riparian Forest																		
4a: Blakely's Red Gum / Apple Riparian Forest	HU714	5	276	26	408	14	104					12	179	10	117	62	808	532
4b: Apple/Yellow Box Riparian Forest	HU714									7	90					7	90	90
5: Blakely's Red Gum / Paperbark Forest												1	11			1	11	11
6: Yellow Box Woodland																		
6a(1) ^A : Yellow Box Woodland (Grassy)	HU732	8	472	6	83			5	60	19	304	118	1587			148	2,034	1,562
6b: Yellow Box Woodland (Shrubby)				8	117											8	117	117
7: White Box Woodland																		
7a(1) ^A : White Box Woodland (Grassy)	HU690	55	2,989	38	422	15	157	50	442	5	61	392	3922	19	258	518	5,262	2,273
7b: White Box Woodland (Shrubby)	HU824	71	3,908	159	2029	135	1658	111	1172			82	952	173	2415	660	8,226	4,318
8: Blakely's Red Gum Woodland																		
8a: Blakely's Red Gum Woodland (Grassy)	HU714					3	39									3	39	39
8b: Blakely's Red Gum Woodland (Shrubby)	HU714											3	37			3	37	37
9: Slaty Box Woodland	HU869	11	643	141	2183	17	259	2	30			199	2841	52	798	411	6,111	5,468
10: Coastal Grey Box Woodland	HU690	31	1,785	1	11			5	48	2	21	7	68			14	148	-1,637
11: Fuzzy Box Woodland	HU547	5	148					0	1							0	1	-147
13: Shrubby Regrowth	HU824	40	1,869	3	38	47	549	5	48			1	11	8	104	64	750	-1,119
14: Dwyer's Red Gum Low Open Forest	HU893			2	22							1	16			3	38	38
15: Caley's Ironbark Forest	HU891			167	2512							52	714			219	3,226	3,226
16: Blue-leaf Ironbark / Cypress Forest*	HU891			21	312							95	1303			116	1,615	1,615
17: Red Ironbark / Cypress Forest	HU886			11	174											11	174	174
18: Cypress Pine Forest	HU824	4	197			47	534	14	133							60	667	470
19: Bloodwood / Ironbark Forest	HU888											28	364			28	364	364
21: Exposed Grey Gum / Stringybark Forest	HU702			14	187	<1	6					11	129	3	44	28	366	366
22: Sheltered Grey Gum / Stringybark Forest^																		
23: Grey Gum / Caley's Ironbark Forest^	HU826			4	48											4	48	48
24: Grey Gum / White Box Forest	HU799					13	160									13	160	160
25: Rough-barked Apple Forest	HU910					15	211									15	211	211
26: Rough-barked Apple Woodland/Tall Shrubland	HU870					23	274									23	274	274
DNG: Derived Native Grassland																		
DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland ^a	HU714	11	199	21	206	11	102	2	19	33	372	1	10	19	186	87	895	696
DNG – 4: Blakely's Redgum / Apple Riparian Forest Derived Native Grassland ^b																		
DNG – 6(1) ^A : Yellow Box Woodland Derived Native Grassland	HU732	6	95	8	77					49	549	20	176			76	802	707
DNG – 6(2) ^B : Yellow Box Woodland Derived Native Grassland	HU732	8	140							11	120	71	604			82	724	584
DNG – 6(3) ^C : Yellow Box Woodland Derived Native Grassland	HU732	1	15	2	22					25	286					27	308	293
DNG – 7(1) ^A : White Box Woodland Derived Native Grassland	HU690	68	1,466	32	301	19	172	152	1111	34	370	156	1302	133	1322	526	4,578	3,112
DNG – 7(2) ^B : White Box Woodland Derived Native Grassland	HU690	63	1,113			22	225	7	62	17	207	109	1030			156	1,524	411
DNG – 7(3) ^C : White Box Woodland Derived Native Grassland	HU690	43	735	0	4	34	379	11	101	109	1390					154	1,874	1,139
DNG – 8(1) ^A : Blakely's Red Gum Woodland Derived Native Grassland	HU714											3				0	3	3
DNG – 9: Slaty Box Woodland Derived Native Grassland	HU869	31	613	3	35							20	194	1	12	25	241	-372
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	HU690	241	4,165	9	98			90	812	0	6	12	125			111	1,041	-3,124
DNG – 11: Fuzzy Box Woodland Derived Native Grassland	HU547	53	913					1	5							1	5	-908
DNG – 18: Cypress Pine Forest Derived Native Grassland	HU824					0	3									0	3	3
DNG – 25: Rough-barked Apple Forest Derived Native Grassland	HU910					5	51									5	51	51
TOTAL NATIVE VEGETATION^c		753	21,741	688	9470	420	4,883	455	4,044	311	3,776	1,391	15,577	418	5,256	3,684	43,006	21,265

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^c In some cases totals may not equal the appropriate total number due to rounding

^d Areas calculations are approximate

Table 5.8 Total ecosystem credits for TECs generated by the Project

Vegetation Community	PCT Code	TSC Act Status	EPBC Act Status	Project Disturbance Boundary		Offset Areas		Amount above Requirement
				Area (ha) ~	Credits Required	Area (ha) ~	Credits Generated	
Hunter Valley Footslopes Slaty Gum Woodland								
9: Slaty Box Woodland	HU869	VEC		11	643	411	6,111	5,468
Hunter Floodplain Red Gum Woodland								
3: River Oak / Redgum Riparian Forest	HU599	EEC				15	181	181
Box Gum Woodland and Derived Native Grassland								
6a(1)A: Yellow Box Woodland (Grassy)	HU732	EEC	CEEC	8	472	148	2,034	1,562
7a(1)A: White Box Woodland (Grassy)	HU690	EEC	CEEC	55	2,989	518	5,262	2,273
8a: Blakely's Red Gum Woodland (Grassy)	HU714	EEC	CEEC			3	39	39
DNG – 6(1)A: Yellow Box Woodland Derived Native Grassland	HU732	EEC	CEEC	6	95	76	802	707
DNG – 6(2)B: Yellow Box Woodland Derived Native Grassland	HU732	EEC		8	140	82	724	584
DNG – 7(1)A: White Box Woodland Derived Native Grassland	HU690	EEC	CEEC	68	1,466	526	4578	3,112
DNG – 7(2)B: White Box Woodland Derived Native Grassland	HU690	EEC		63	1,113	156	1,524	411
DNG – 8(1)A: Blakely's Red Gum Woodland Derived Native	HU714	EEC	CEEC			0	3	3

Table 5.8 Total ecosystem credits for TECs generated by the Project

Vegetation Community	PCT Code	TSC Act Status	EPBC Act Status	Project Disturbance Boundary		Offset Areas		Amount above Requirement
				Area (ha) ~	Credits Required	Area (ha) ~	Credits Generated	
Grassland								
<i>Subtotal TSC Act Box Gum Woodland and Derived Native Grassland^A</i>				207	6,275	1,509	14,965	8,690
<i>Subtotal EPBC Act Box Gum Woodland and Derived Native Grassland^A</i>				137	5,022	1,267	12,676	7,654

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

* In some cases totals may not equal the appropriate total number due to rounding

~ Area calculations are approximate

Table 5.9 Total species credits generated by the Project

Scientific Name	Common Name	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area	Total Offset Areas	Above Requirement
<i>Anthochaera phrygia</i>	Regent Honeyeater	13,031	3,244	1,549	1,214	229	5,486	1,459	13,181	150
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	12	1,921	116					2,037	2,025
<i>Miniopterus schreibersii</i> subsp. <i>oceanensis</i> (breeding habitat)	Eastern Bentwing-bat	1,300	4,076	665			1,920	822	7,483	6,183
<i>Chalinolobus dwyeri</i> (breeding habitat)	Large-eared Pied Bat	1,300	4,076	665			1,920	822	7,483	6,183



5.4.4 Offset Assessment Guide

The *Offsets Assessment Guide* has been utilised to allow an objective assessment of the suitability of the offset areas. The process has been useful in gaining an understanding of the required offset area to development area ratio. The results of the *Offsets Assessment Guide* for the offset areas are provided in **Table 5.10**. For Box Gum Woodland and Derived Native Grassland, when woodland and components are combined, the BOS provides greater than 100% of the offset requirement through retention and management of existing habitat. The BOS also provides greater than 100% of the offset requirement for Regent Honeyeater.

Table 5.10 Offsets Assessment Guide results for the Project in adjusted hectares

MNES	EPBC Act Status	Project Disturbance Boundary	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area	Total Offset Areas	Above Requirement
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – woodland component	CEEC	43.01	3.09	1.28	4.02	1.82	41.94	1.41	53.56	10.55
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – grassland component	CEEC	36.86	2.02	0.98	8.02	4.39	10.52	6.86	32.79	-4.07
Regent Honeyeater (<i>Anthochaera phrygia</i>)	E	101.54	38.31	18.30	14.34	5.10	101.24	17.24	194.53	92.99

EPBC Act Status: CEEC = Critically Endangered Ecological Community, E = Endangered



5.5 Adequacy of the Biodiversity Offset Strategy

The adequacy of the BOS has been assessed using a number of methods. These methods include assessment of the vegetation removal and offset ratios, assessment against the *NSW Biodiversity Offsets Policy for Major Projects* and assessment against DoE's *Environmental Offsets Policy*. The results of the assessments indicate that while there is some variation between each of the assessment methodologies utilised, the Project provides a substantial BOS which adequately offsets the residual direct ecological impacts of the Project.

5.5.1 *Vegetation Removal and Offset Ratios*

The BOS meets the targets established for the TECs directly impacted by the Project. The BOS provides the following offset ratios:

- 7:1 for TSC Act listed Box Gum Woodland and Derived Native Grassland;
- 9:1 for EPBC Act listed Box Gum Woodland and Derived Native Grassland; and
- 37:1 for TSC Act listed Hunter Valley Floodslopes Box Gum Woodland.

In addition, the offset areas provide an excess of 1,073 ha of native vegetation beyond the offset requirement calculated by ratios. The total area of native vegetation that will be supplied by the BOS in the long term will offset the predicted direct impacts of the Project. The proposed management of the offset areas will further complement the retention of remnant woodland and will also ensure that there is no net loss of habitat for the suite of species predicted to be impacted by the Project.

5.5.2 *NSW Biodiversity Offsets Policy for Major Projects*

The BOS for the Project aims to meet the principles for the provision of offsets under the *NSW Biodiversity Offsets Policy for Major Projects*. **Table 5.11** shows how each of these principles has been addressed by the BOS. The results of the assessment of the Project against the *NSW Biodiversity Offsets Policy for Major Projects* indicate that the BOS provides adequate offsets for the biodiversity predicted to be impacted by the Project.



Table 5.11 Assessment of the Project against the NSW Biodiversity Offsets Policy for Major Projects

Principle	Assessment
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.	Changes have been made to the design of the Project to minimise disturbance to established woodland areas, in particular reduction in areas of Box Gum Woodland and Derived Native Grassland and avoidance of a large population of <i>Tylophora linearis</i> . Details of the avoidance and mitigation measures for the Project are outlined within the EIA (Section 7.1).
2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.	Extensive surveys have been conducted within the Study Area and offset areas to provide a basis for determining the losses and gains from the Project. The FBA and BBAM calculators have been used as one method to assess these losses and gains. Based on the results of this assessment, the Project will provide 43,006 ecosystem credits to offset the loss of 21,741 ecosystem credits (including provision of 14,965 ecosystems credits for TSC Act listed Box Gum Woodland and Derived Native Grassland). The Project also provides sufficient species credits for the Regent Honeyeater, Brush-tailed Rock-wallaby, Eastern Bentwing-bat and Large Eared Pied Bat.
3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.	The BOS has been developed to target the communities and species impacted by the Project. The BOS provides extensive areas of TEC vegetation. Where there is a shortfall of offsets for vegetation communities, additional areas of communities of higher conservation value have been included (e.g. additional Box Gum Woodland provided to compensate for loss of Coastal Grey Box Woodland and Fuzzy Box Woodland as there is limited availability of these communities). The offset areas also provide extensive areas of known and potential habitat for the suite of threatened species known to be impacted.



Table 5.11 Assessment of the Project against the NSW Biodiversity Offsets Policy for Major Projects

Principle	Assessment
4. Offsets must be additional to other legal requirements.	The proposed offsets are supplementary in that they are proposed exclusively for the Project and are not already funded or being managed for biodiversity value for another development proposal.
5. Offsets must be enduring, enforceable and auditable.	The proposed offset areas will be secured by an appropriate land zoning or other alternative means. A BMP will be prepared to manage the offset areas and will include provisions for ongoing monitoring and maintenance. When the offsets are formalised and a BMP is in place, it is anticipated that the Farm Manager appointed to manage KEPCO-owned land within the Study Area will oversee and coordinate activities for the purposes of biodiversity management.
6. Supplementary measures can be used in lieu of offsets.	The BOS is underpinned by the provision of substantial direct offsets.

5.5.3 DoE Environmental Offsets Policy

The BOS for the Project aims to meet the principles for the provision of offsets under the *DoE Environmental Offsets Policy*. **Table 5.12** shows how each of these principles has been addressed by the BOS. The results of the assessment of the Project against the *DoE Environmental Offsets Policy* indicate that the BOS provides adequate offset for the MNES predicted to be significantly impacted by the Project.

Table 5.12 Assessment of the Project against the EPBC Act Environmental Offsets Policy

Principle	Assessment
1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.	The BOS has been assessed via a number of methods including the Offsets Assessment Guide. Results of these assessments indicate that the BOS will improve the viability of the relevant MNES.



Table 5.12 Assessment of the Project against the EPBC Act Environmental Offsets Policy

Principle	Assessment
2. Suitable offsets must be built around direct offsets but may include other compensatory measures.	<p>The BOS primarily consists of direct offsets, however some supplementary measures are also proposed. All indirect offsets will be targeted towards the biodiversity values relevant to the Project.</p> <p>The results of the Offsets Assessment Guide indicate that the direct offsets fulfil the offsetting requirements for the species considered to be significantly impacted by the Project.</p>
3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.	The Offsets Assessment Guide, as well as the proposed ratios for the Project have taken into account the level of protection afforded to each MNES.
4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.	The Offsets Assessment Guide has taken into account the size and quality of the impact and offsets. The results of the assessment indicate that the BOS provides above the requirement for the relevant MNES through direct offsets.
5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding.	The Offsets Assessment Guide takes into account the risks associated with the offsets not succeeding. The risks of the offset not succeeding have also been minimised by the provision of additional areas of direct offsets (above the 100% requirement) and the advance provision of offsets. Additionally, the risks associated with inclusion of the portion of Offset Area 5 occurring above the Subsidence Study Area have been taken into account during calculations.
6. Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.	The proposed offsets are supplementary in that they are proposed exclusively for the Project and are not already funded or being managed for biodiversity value for another development proposal.



Table 5.12 Assessment of the Project against the EPBC Act Environmental Offsets Policy

Principle	Assessment
7. Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.	The proposed offsets are considered to be efficient and effective, as measurable conservation gains will be achieved with reasonable investment of time and money. They are timely as they are being provided in advance of the disturbance (with the exception of any restoration works which would occur progressively) and are proposed to be long lasting. They are transparent, in that measurable conservation gains will be achieved and monitoring of results will be conducted. They are scientifically robust, and are known to produce conservation outcomes. They are reasonable, and utilise well known approaches for biodiversity conservation.
8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	A comprehensive BMP will be prepared for monitoring and auditing the performance of the offset lands. When the offsets are formalised and a BMP is in place, it is anticipated that the Farm Manager appointed to manage the KEPCO-owned land within the Study Area will oversee and coordinate activities for the purposes of biodiversity management.
9. In assessing the suitability of an offset, government decision-making will be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty.	Not relevant to this assessment. The Offsets Assessment Guide takes into account the risks and uncertainties associated with the establishment and management of offsets. The risks of the offset not succeeding have also been minimised by the provision of additional areas of direct offsets (above the 100% requirement) and the advance provision of offsets. Additionally, the risks associated with inclusion of the portion of Offset Area 5 occurring above the Subsidence Study Area have been taken into account during calculations.
10. In assessing the suitability of an offset, government decision-making will be conducted in a consistent and transparent manner.	Not relevant to this assessment.



Chapter 6

Conclusion

A substantial BOS has been proposed to offset the predicted residual impacts of the Project. Assessment of the BOS using a number of methods has indicated that the offsets proposed for the Project will adequately offset these impacts.

The BOS includes the six separate areas located within the vicinity of the Project. A portion of one of these areas, namely Offset Area 5, occurs within the Subsidence Study Area for the Project. The risks associated with subsidence effects to this portion of land, including surface cracking, tree and rock fall (or similar damage) and alteration to hydrological regimes, have been considered in the assessment of this offset area. To account for these risks, the total value/land area to be contributed to the BOP by this portion of the offset has been discounted by 10%, which is considered conservative given anticipated extent of impacts as well as proposed management actions.

The BOS will protect approximately 3,684 ha of native vegetation. This includes a total of approximately 1,509 ha of TSC Act listed Box Gum Woodland and Derived Native Grassland, 1,271 ha of EPBC Act listed Box Gum Woodland and Derived Native Grassland, and 411 ha of Hunter Valley Foothills Slaty Gum Woodland. The BOS includes significant areas of known and potential habitat for the suite of species known from the Project Disturbance Boundary. The offset areas will also provide a significant area of conservation land within the locality of the Project.

The long term objective of the BOS is to provide for a net benefit to flora and fauna within the locality and region, substantially increasing the proportions of native woodland in conservation tenure. When the avoidance, mitigation and BOS is considered, no significant impacts are predicted to occur to threatened communities and species as a result of the Project, and the Project will provide a major ecological benefit in the medium to long term.



References

- Botanic Gardens Trust (2015). "PlantNET." Retrieved 2015, from http://www.rbgsyd.nsw.gov.au/search_plant_net.
- Braun-Blanquet, J. (1932). *Plant Sociology*. McGraw-Hill, New York.
- Brooker, M. and Kleinig, D. (1990). *Field guide to eucalypts of south eastern Australia, Volume 2*. Inkata, Melbourne.
- Cumberland Ecology (2015). *Bylong Coal Project. Ecological Impact Assessment*. Cumberland Ecology Pty Ltd, Carlingford Court.
- DEC (2006). *The Vertebrate Fauna of North-western Wollemi National Park*. Unpublished report funded by the Central Branch Parks and Wildlife Division Biodiversity Survey Priorities Program by NSW Department of Environment and Conservation, Information and Assessment Section, Metropolitan Branch, Environment Protection and Regulation Division.
- DECC (2009). *BioBanking Assessment Methodology and Credit Calculator Operational Manual*. Department of Environment and Climate Change, Hurstville, NSW.
- DECCW (NSW) (2010). *Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. NSW DECCW, Sydney.
- DoE (2014a). *Anthochaera phrygia in Species Profile and Threats Database*. Department of the Environment, Canberra.
- DoE (2014b). *EPBC Protected Matters Search Tool*. Department of the Environment, Canberra.
- Eastcoast Flora Survey (2014). *Assessment and mapping of vegetation in the Bylong Valley: Authorisations 287 & 342*. Eastcoast Flora Survey, Kotara Fair.
- Harden, G. J. (1990-1993). *Flora of NSW Volumes 1-4*. New South Wales University Press, Kensington.
- ICMM (2006). *Good Practice Guidance for Mining and Biodiversity*. International Council on Mining and Metals.
- Jacobs, S. W. L., Whalley, R. D. B. and Wheeler, D. J. B. (2008). *Grasses of New South Wales. Fourth Edition*. University of New England.
- Kovac, M. and Lawrie, J. W. (1991). *Soil Landscapes of the Singleton 1:250 000 Sheet*. Soil Conservation Service NSW, Sydney.
- Lindenmayer, D., Bennett, A. and Hobbs, R. (2010). *Temperate Woodland Conservation and Management*. CSIRO Publishing, Collingwood.
- McIntyre, S., McIvor, J. G. and Heard, K. M. (2002). *Managing and Conserving Grassy Woodlands*. CSIRO Publishing, Collingwood.
- Menkhorst, P., Schedvin, N. and Geering, D. (1999). *Regent Honeyeater (Xanthomyza phrygia) Recovery Plan 1999-2003*. Department of Natural Resource and Environment, East Melbourne, VIC.
- MSEC (2015). *Subsidence Ground Movement Predictions and Subsidence Impact Assessments for all Natural Features and Surface Infrastructure in support of the Environmental Impact Statement*. Mine Subsidence Engineering Consultants.
- OEH (2014a). "Atlas of NSW Wildlife." 2014, from http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS/_AtlasSearch.aspx.
- OEH (2014b). *BioBanking Assessment Methodology 2014*. Office of Environment and Heritage, Sydney.
- OEH (2014c). *NSW Biodiversity Offsets Policy for Major Projects*. Office of Environment and Heritage for the NSW Government, Sydney.
- OEH (2014d). *Regent Honeyeater - profile*. NSW Office of Environment and Heritage, Hurstville.



- Richardson, F. J., Richardson, R. G. and Shepherd, R. C. H., Eds. (2006). *Weeds of the South-east: An identification guide for Australia*. R.G. and F.J. Richardson, Victoria.
- SEWPaC (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. October 2012. Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Wells Environmental Services (2011). *Mt Penny Coal Project - Preliminary Environmental Assessment*. Wells Environmental Services, East Maitland.



Appendix A

Profile: Offset Area 1



A.1 Introduction

Name: Offset Area 1

Area: 762 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 11, 12, 37, 38, 39, 40, 41, 52, 65, 68, 70, 71, 72, 76 and 86 DP 755420

Zoning: RU1- Primary Production

Location: Upper Bylong, less than one kilometre east of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

Offset Area 1 comprises valley floors, foothills, upper slopes and hill top areas. The valley floor extends north/south through the offset as well as to the east in the northern portion of the offset. The lower lying portions of the offset occur at approximately 300 m Australian Height Datum (AHD) and have largely been cleared for agriculture. Bylong River also occurs in the northern portion of the offset, meandering from east to west. Numerous topographic highs occur within the offset, with the highest point occurring in the central eastern portion at 530 m AHD, and sandstone cliffs are present. Intact native vegetation extends from the foothills up to the hill top areas. These areas comprise structurally diverse vegetation including formations along gullies, slopes, ridgelines and plateaus. The eastern and southern boundaries of Offset Area 1 adjoin Wollemi National Park. The location of Offset Area 1 is shown in **Figure A.1**.

A.2 Vegetation Communities

The vegetation within Offset Area 1 comprises both intact and fragmented woodland and areas of agricultural land. The vegetation within this area is largely a reflection of topography, geology and land use history. **Table A.1** lists the vegetation communities occurring within Offset Area 1, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure A.2**.



Table A.1 Vegetation communities within Offset Area 1

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha)~
3: River Oak / Redgum Riparian Forest	EEC	-	15
4: Apple Riparian Woodland			
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	-	-	26
6: Yellow Box Woodland			
6a(1) ^A : <i>Yellow Box Woodland (Grassy)</i>	EEC	CEEC	6
6b: <i>Yellow Box Woodland (Shrubby)</i>	-	-	8
7: White Box Woodland			
7a(1) ^A : <i>White Box Woodland (Grassy)</i>	EEC	CEEC	36
7a(3) ^C : <i>White Box Woodland (Grassy)</i>	-	-	2
7b: <i>White Box Woodland (Shrubby)</i>	-	-	159
9: Slaty Box Woodland	VEC	-	141
10: Coastal Grey Box Woodland	-	-	1
13: Shrubby Regrowth	-	-	3
14: Dwyer's Red Gum Low Open Forest	-	-	2
15: Caley's Ironbark Forest	-	-	167
16: Blue-leaf Ironbark / Cypress Forest*	-	-	21
17: Red Ironbark / Cypress Forest	-	-	11
21: Exposed Grey Gum / Stringybark Forest^A	-	-	14
22: Sheltered Grey Gum / Stringybark Forest^A			
23: Grey Gum / Caley's Ironbark Forest	-	-	4
DNG: Derived Native Grassland			
DNG – 3: <i>River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	-	-	21
DNG – 4: <i>Apple Riparian Forest Derived Native Grassland[#]</i>			
DNG – 6(1) ^A : <i>Yellow Box Woodland Derived Native Grassland</i>	EEC	CEEC	8
DNG – 6(3) ^C : <i>Yellow Box Woodland Derived Native Grassland</i>	-	-	2
DNG – 7(1) ^A : <i>White Box Woodland Derived Native Grassland</i>	EEC	CEEC	32
DNG – 7(3) ^C : <i>White Box Woodland Derived Native Grassland</i>	-	-	<1
DNG – 9: <i>Slaty Box Woodland Derived Native Grassland</i>	-	-	3
DNG – 10: <i>Coastal Grey Box Woodland Derived Native Grassland</i>	-	-	9
CC: Cultivated Lands	-	-	73



Table A.1 Vegetation communities within Offset Area 1

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha) [~]
Other (cleared, planted vegetation)	-	-	1
Total Native Vegetation ⁺			688
Total Non-native Vegetation and Cleared ⁺			74
TOTAL AREA⁺			762

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

^{*} Includes areas of Caley's Ironbark Forest (Unit 15)

[^] Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate

A.2.1 River Oak / Redgum Riparian Forest (Unit 3)

TSC Act Status: Hunter Floodplain Red Gum Woodland (EEC)

EPBC Act Status: Not listed

This community occurs at a number of locations along Bylong River, as well as along Cousins Creek. The canopy is dominated by *Casuarina cunninghamiana* subsp. *cunninghamiana* (River Oak), with variable occurrences of *Eucalyptus blakelyi* (Blakely's Red Gum). Species occurring in the shrub layer include *Bursaria spinosa* (Blackthorn), *Trema tomentosa* (Native Peach) and *Melicactus dentatus* (Tree Violet). Species occurring in the ground layer include *Microlaena stipoides* (Weeping Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Einadia trigonos* (Fishweed), *Urtica incisa* (Stinging Nettle) and *Sigesbeckia orientalis* subsp. *orientalis* (Indian Weed). Exotic species are common within the ground layer and include *Bidens pilosa* (Cobblers Pegs), *Sonchus asper* (Prickly Sowthistle), *Modiola caroliniana* (Red-flowered Mallow) and *Solanum nigrum* (Black-berry Nightshade). This community is shown in **Photograph A.1**.



Photograph A.1 Offset Area 1: River Oak / Redgum Riparian Forest

A.2.2 Blakely's Red Gum / Apple Riparian Forest (Unit 4a)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at a number of locations within Offset Area 1 along Bylong River and associated drainage lines. The canopy is dominated by *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus blakelyi* (Blakely's Red Gum). *Acacia implexa* (Hickory Wattle) is present within the small tree layer. Common shrubs in this community include *Bursaria spinosa* (Blackthorn) and *Melicytus dentatus* (Tree Violet). This community has a grassy ground layer and includes *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass) and *Microlaena stipoides* (Weeping Grass). Other species occurring in the ground layer include *Carex inversa* (Knob Sedge), *Commelina cyanea* (Native Wandering Jew), *Gahnia aspera* (Rough Saw-sedge), *Einadia trigonos* (Fishweed), *Dichondra* sp. A (Kidney Weed), *Sida corrugata* (Corrugated Sida), *Rumex brownii* (Swamp Dock) and *Acaena echinata*. Exotic species are common within the ground layer and include *Hypochaeris radicata* (Catsear), *Modiola caroliniana* (Red-flowered Mallow), *Paronychia brasiliiana* (Chilean Whitlow Wort), *Petrorhagia dubia*, *Verbascum virgatum* (Twiggy Mullein) and *Verbena bonariensis* (Purpletop). This community is shown in **Photograph A.2**.



Photograph A.2 Offset Area 1: Blakely's Red Gum / Apple Riparian Forest

A.2.3 Yellow Box Woodland Grassy (Unit 6a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community is located at a number of locations within Offset Area 1, predominantly in association with the valley floor. The canopy of this community is dominated by *Eucalyptus melliodora* (Yellow Box), which also occurs within the small tree layer. The shrub layer is sparse and includes *Spartothamnella juncea* (Bead Bush), *Bursaria spinosa* (Blackthorn), *Swainsona galegifolia* (Smooth Darling-pea) and *Acacia implexa* (Hickory Wattle). The ground layer is dominated by native grasses including *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa decipiens* var. *decipiens*, *Microlaena stipoides* (Weeping Grass) and *Aristida vagans* (Threeawn Speargrass). Other species in the ground layer include *Einadia trigonos* (Fishweed), *Sida corrugata* (Corrugated Sida), *Boerhavia dominii* (Tartvine), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Atriplex semibaccata* (Creeping Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Lomandra filiformis* (Wattle Mat-rush), *Carex inversa* (Knob Sedge) and *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush). The climbers *Glycine tabacina* and



Convolvulus erubescens (Blushing Bindweed) also occur within this community. Exotic species are common within the ground layer and include *Hypochaeris radicata* (Catsear), *Paronychia brasiliiana* (Chilean Whitlow Wort), *Petrorhagia dubia*, *Side spinosa* and *Bidens pilosa* (Cobblers Pegs). This community is shown in **Photograph A.3**.



Photograph A.3 Offset Area 1: Yellow Box Woodland (Grassy)

A.2.4 Yellow Box Woodland Shrubby (Unit 6b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community is located on the lower edge of the footslopes within the north eastern portion of Offset Area 1. This community was not sampled during surveys of Offset Area 1. This community is closely related to Yellow Box Woodland (Grassy), with a canopy dominated by *Eucalyptus melliodora* (Yellow Box). The shrub layer within this community is well-developed, with greater than 30% projected foliage cover.



A.2.5 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs at a number of locations within Offset Area 1, typically on the lower footslopes. The canopy is dominated by *Eucalyptus albens* (White Box). This species is also present in the small tree layer along with occasional occurrences of *Acacia implexa* (Hickory Wattle), *Brachychiton populneus* subsp. *populneus* (Kurrajong), *Myoporum montanum* (Western Boobialla) and *Eucalyptus melliodora* (Yellow Box). Shrub cover is sparse and includes *Cassinia quinquefaria*, *Senna artemisioides* subsp. *zygophylla*, *Acacia decora* (Western Silver Wattle), *Acacia ixiophylla* (Sticky Leaved Wattle), *Spartothamnella juncea* (Bead Bush) and *Myoporum montanum* (Western Boobialla). This community is shown in **Photograph A.4**.



Photograph A.4 Offset Area 5: White Box Woodland (Grassy)

A.2.6 White Box Woodland (Shrubby) (Unit 7b)

TSC Act Status: Not listed

EPBC Act Status: Not listed



This community occurs extensively within Offset Area 1. The canopy is dominated by *Eucalyptus albens* (White), which also occurs in the small tree layer. This community has a well-developed shrub layer and includes *Bursaria spinosa* (Blackthorn), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Acacia implexa* (Hickory Wattle), *Senna artemisioides* subsp. *zygophylla* and *Leucopogon ericoides* (Pink Beard-heath). Species occurring in the ground layer include *Calotis lappulacea* (Yellow Burr-daisy), *Dichondra repens* (Kidney Weed), *Einadia polygonoides*, *Solanum cinereum* (Narrawa Burr), *Aristida ramosa* (Purple Wiregrass) and *Chloris ventricosa* (Tall Chloris). The climber *Glycine tabacina* also occurs within this community. Portions of this community occurring in close proximity to agricultural land have a higher abundance of exotic species such as *Cerastium glomeratum* (Mouse-ear Chickweed), *Medicago polymorpha* (Burr Medic) and *Anagallis arvensis* (Scarlet Pimpernel). This community is shown in **Photograph A.5**.



Photograph A.5 Offset Area 5: White Box Woodland (Shrubby)

A.2.7 Slaty Box Woodland

TSC Act Status: Hunter Valley Footslopes Slaty Gum Woodland (VEC)

EPBC Act Status: Not listed

This community occurs extensively within Offset Area 1 on footslopes. The canopy is dominated by *Eucalyptus dawsonii* (Slaty Gum) with *Brachychiton populneus* subsp. *populneus* (Kurrajong) occurring in the small tree layer. Common species in the shrub layer



include *Olearia elliptica* (Sticky Daisy-bush), *Acacia ixiophylla* (Sticky Leaved Wattle), *Dodonaea viscosa* (Sticky Hop-bush), *Choretrum* sp. Coks Gap and *Bursaria spinosa* (Blackthorn). The ground layer is sparse and includes *Einadia hastata* (Berry Saltbush), *Enchylaena tomentosa* (Ruby Saltbush), *Sida corrugata* (Corrugated Sida), *Sida cunninghamii* (Ridged Sida) and *Austrostipa scabra* (Speargrass). The climber *Marsdenia viridiflora* subsp. *viridiflora* (Native Pear) also occurs within this community. This community is shown in **Photograph A.6**.



Photograph A.6 Offset Area 1: Slaty Box Woodland

A.2.8 Coastal Grey Box Woodland

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered woodland remnants within one area on the north western portion of Offset Area 1. This community was not sampled during surveys of Offset Area 1. Within the Study Area this community is dominated by *Eucalyptus moluccana* (Grey Box) (Eastcoast Flora Survey, 2014). The community supports a range of grasses, herbs and forbs, in addition to a scattered shrub layer of *Maireana microphylla* (Small-leaf Bluebush) (Eastcoast Flora Survey, 2014).



A.2.9 Shrubby Regrowth

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at scattered locations in the central portion of Offset Area 1. This community was not sampled during surveys of Offset Area 1. Within the Study Area this community occurs in areas that have previously been cleared and not support dense shrub stands of species such as *Acacia ixiophylla* (Sticky Leaved Wattle), *Dodonaea viscosa* var. *cuneata* (Wedge-leaf Hop-bush) and *Bursaria spinosa* (Blackthorn) (Eastcoast Flora Survey, 2014).

A.2.10 Dwyer's Red Gum Low Open Forest

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs along a ridgeline in the central western portion of Offset Area 1. The low canopy is dominated by *Eucalyptus dwyeri* (Dwyer's Red Gum), with *Acacia doratoxylon* (Currawang) and *Callitris endlicheri* (Black Cypress Pine). The shrub layer includes *Leptospermum parvifolium*, *Phebalium squamulosum* subsp. *gracile* (Scaly Phebalium), *Cassinia cunninghamii* (Cunninghams Everlasting), *Prostanthera ovalifolia* (Oval-leaf Mintbush) and *Isopogon dawsonii* (Nepean Conebush). The ground layer is sparse and includes *Cleistochloa rigida*, *Lepidosperma laterale*, *Lomandra confertifolia* (Mat-rush), *Lomandra filiformis* (Wattle Mat-rush) and *Phyllanthus hirtellus* (Thyme Spurge). This community is shown in **Photograph A.7**.



Photograph A.7 Offset Area 1: Dwyer's Red Gum Low Open Forest

A.2.11 Caley's Ironbark Forest (Unit 15)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs extensively within Offset Area 1 at higher elevations. This community is dominated by *Eucalyptus caleyi* subsp. *caleyi*, with *Callitris endlicheri* (Black Cypress Pine), *Acacia doratoxylon* (Currawang) and *Eucalyptus punctata* (Grey Gum) also occurring. *Eucalyptus caleyi* subsp. *caleyi* is also common within the small tree layer. A diversity of shrubs occurs in this community including *Olearia elliptica* (Sticky Daisy-bush), *Cassinia quinquefaria*, *Cassinia cunninghamii* (Cunninghams Everlasting), *Astroloma humifusum* (Native Cranberry), *Persoonia linearis* (Narrow-leaved Geebung) and *Spartothamnella juncea* (Bead Bush). Species occurring in the ground layer include *Pomax umbellata*, *Solanum brownii* (Violet Nightshade), *Goodenia stephensonii*, *Microlaena stipoides* (Weeping Grass), *Cleistochloa rigida*, *Lomandra glauca* (Pale Mat-rush) and *Lepidosperma gunnii*. The climber *Marsdenia viridiflora* subsp. *viridiflora* (Native Pear) also occurs within this community. This community is shown in **Photograph A.8**.



Photograph A.8 Offset Area 1: Caley's Ironbark Forest

A.2.12 Caley's Ironbark Forest & Blue-leaf Ironbark / Cypress Forest (Unit 15&16)

TSC Act Status: Not listed

EPBC Act Status: Not listed

is dominated in the canopy by *Eucalyptus nubila* (Blue-leaved Ironbark) and *Callitris endlicheri* (Black Cypress Pine), with the shrubs *Persoonia linearis* (Narrow-leaved Geebung), *Acacia crassa* subsp. *crassa*, *Acrotriche rigida* and *Dodonaea viscosa* var. *cuneata* (Wedge-leaf Hop-bush) commonly occurring (Eastcoast Flora Survey, 2014). The sparse ground layer usually includes *Cleistochloa rigida*, *Lepidosperma gunnii* and *Phyllanthus hirtellus* (Thyme Spurge) (Eastcoast Flora Survey, 2014).

A.2.13 Red Ironbark / Cypress Forest

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs along a ridgeline in the central western portion of Offset Area 1. This community is dominated by *Eucalyptus fibrosa* (Red Ironbark) and *Callitris endlicheri* (Black



Cypress Pine), with both species also occurring in the small tree layer. Shrubs are common within this community and include *Dodonaea viscosa* (Sticky Hop-bush), *Cassinia cunninghamii* (Cunninghams Everlasting), *Hovea apiculata* and *Cassinia quinquefaria*. Species occurring in the ground layer include *Phyllanthus hirtellus* (Thyme Spurge), *Pomax umbellata*, *Cleistochloa rigida*, *Lepidosperma gunnii*, *Dianella revoluta* (Blueberry Lily) and *Lomandra glauca* (Pale Mat-rush). This community is shown in **Photograph A.9**.



Photograph A.9 Offset Area 1: Red Ironbark / Cypress Forest

A.2.14 Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest (Unit 21&22)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at scattered locations in the south eastern portion of Offset Area 1. This community is dominated by *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Eucalyptus punctata* (Grey Gum). The small tree layer includes *Callitris endlicheri* (Black Cypress Pine), *Eucalyptus caleyi* subsp. *caleyi* and *Acacia doratoxylon* (Currawang). A diversity of shrubs occurs in the community and includes *Cassinia cunninghamii* (Cunninghams Everlasting), *Leucopogon muticus* (Blunt Beard-heath), *Podolobium ilicifolium* (Prickly Shaggy Pea) and *Styphelia triflora* (Pink Five-Corners). The ground layer is sparse and includes *Poranthera ericifolia*, *Rytidosperma fulvum* (Wallaby Grass), *Dianella revoluta*



(Blueberry Lily), *Lepidosperma gunnii*, *Lomandra confertifolia* (Mat-rush) and *Lomandra glauca* (Pale Mat-rush). This community is shown in **Photograph A.10**.



Photograph A.10 Offset Area 1: Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest

A.2.15 Grey Gum / Caley's Ironbark Forest

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at two locations within the northern portion of Offset Area 1. This community is dominated by *Eucalyptus caleyi* subsp. *caleyi* and *Eucalyptus punctata* (Grey Gum). The small tree layer includes *Acacia doratoxylon* (Currawang). A diversity of shrubs occurs in the community and includes *Leucopogon muticus* (Blunt Beard-heath), *Dodonaea viscosa* (Sticky Hop-bush), *Melichrus urceolatus* (Urn-heath), *Olearia elliptica* (Sticky Daisy-bush) *Astroloma humifusum* (Native Cranberry) and *Choretrum* sp. Coxs Gap. Species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Goodenia stephensonii*, *Persoonia linearis* (Narrow-leaved Geebung), *Phyllanthus hirtellus* (Thyme Spurge), *Cleistochloa rigida*, *Rytidosperma fulvum* (Wallaby Grass) and *Lepidosperma gunnii*. This community is shown in **Photograph A.11**.



Photograph A.11 **Offset Area 1: Grey Gum / Caley's Ironbark Forest**

A.2.16 Derived Native Grassland

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit DNG – 6(1) and 7(1))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG – 6(1) and 7(1))

All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within Offset Area 1 and is the result of clearing of the original woodland communities. Derived native grasslands within Offset Area 1 have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands vary within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa decipiens* var. *decipiens* and *Aristida ramosa* (Purple Wiregrass). Non-grass species also occurring in the ground layer at varying frequencies include *Sida corrugata* (Corrugated Sida), *Boerhavia dominii* (Tarvine), *Dysphania pumilio*, *Calotis lappulacea* (Yellow Burr-daisy), *Cyperus gracilis* (Slender Flat-sedge), *Erodium crinitum* (Blue Storksbill) and *Einadia trigonos* (Fishweed). Exotic species occur within most patches of this community, and include



Urochloa panicoides (Urochloa Grass), *Bidens subalternans* (Greater Beggar's Ticks) and *Malva parviflora* (Small-flowered Mallow). An example of this community is shown in **Photograph A.12**.



Photograph A.12 **Offset Area 1: Derived Native Grassland**

A.3 **Flora**

Over 200 flora species have been recorded within Offset Area 1. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae, Fabaceae (Faboideae), Myrtaceae and Chenopodiaceae. Non-grass herbaceous groundcovers have the highest diversity, followed by shrubs and grasses. Approximately 20% of the flora species occurring within Offset Area 1 are exotic species. Exotic species occurred across the Offset Area 1, particularly where previous clearing for agricultural purposes has been undertaken.

The following threatened flora species were recorded within Offset Area 5:

- *Cymbidium canaliculatum* (*Cymbidium canaliculatum* population in the Hunter Catchment) (TSC Act: Endangered Population; EPBC Act: not listed);
- *Tylophora linearis* (TSC Act: Vulnerable; EPBC Act: Endangered); and
- *Pomaderris queenslandica* (TSC Act: Endangered; EPBC Act: not listed).



Cymbidium canaliculatum was recorded within White Box Woodland (Grassy), White Box Woodland (Shrubby), Slaty Box Woodland and Caley's Ironbark Forest. *Tylophora linearis* was recorded within Slaty Box Woodland and White Box Woodland (Shrubby). *Pomaderris queenslandica* was recorded within White Box Woodland (Shrubby). The occurrence of these species within Offset Area 1 is shown in **Figure A.3**.

A.4 Fauna

A.4.1 Fauna Habitat

There are extensive areas of connected forest, woodland and grassland within Offset Area 1 that provides moderate to good quality habitat for a wide variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity varies across the offset, with areas grassy and shrubby understorey vegetation. The canopy species present within the offset are dominated by Box species (*Eucalyptus albens*, *Eucalyptus melliodora*, *Eucalyptus dawsonii*) with Ironbark species (*Eucalyptus caleyi* subsp. *caleyi*, *Eucalyptus fibrosa*), also occurring. A range of other canopy trees occur within this offset area. The habitat features available are numerous and provide potential foraging, shelter and breeding opportunities for a variety of threatened fauna species. These habitats occur at a range of altitudes; areas of gently undulating topography, along drainage lines, cliff lines and valley floors.

Key habitat features within Offset Area 1 include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter, coarse woody debris and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna;
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores; and
- Cliff lines and associated features such as caves and rocky outcrops suitable for fauna species dependent on these habitats, such as microbats.

Connectivity within the offset is maintained by existing patches of woodland connected to extensive areas outside the site. The offset area is directly connected to Wollemi National Park.

A.4.2 Fauna Species

The habitat features available within Offset Area 1 provides habitat for a suite of native species. Nearly 100 vertebrate fauna species have been recorded, including 62 birds, 31



mammals and five reptiles. The majority of species are native, with seven exotic species recorded, including Foxes (*Vulpes vulpes*), Dingoes/Domestic Dogs (*Canis lupus*) and feral Pigs (*Sus scrofa*).

The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Offset Area 1:

- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Little Lorikeet (*Glossopsitta pusilla*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Turquoise Parrot (*Neophema pulchella*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Barking Owl (*Ninox connivens*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (TSC Act: Vulnerable; EPBC Act Status: Vulnerable); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded within Offset Area 1 are shown on **Figure A.4**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. Two threatened microbats, Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Eastern Cave Bat (*Vespadelus troughtoni*), are assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by Offset Area 1 for threatened fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table A.2**. The habitats provided by Offset Area 1 are currently in moderate to good condition.

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Known	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses and grassland areas. Breeding/nesting habitat present in the form of woodland adjacent to watercourses.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Potential	Foraging and breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Potential	Known	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated forests and woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	Potential	Potential	It is expected that this species would forage in stands of Allocasuarinas within woodland and forest vegetation. Nesting habitat is present within the offset area in the form of large hollows.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Known	Foraging habitat within the offset area includes Yellow Box Woodland, White Box Woodland, Slaty Box Woodland and Exposed/Sheltered Grey Gum / Stringybark Forest, favouring areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Water resources available in form of dams, drainage lines and creeks. Breeding/nesting habitat present in the form of shrubby understorey vegetation and other nests.

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key nectar producing trees, including <i>Eucalyptus albens</i> (White Box), <i>E. melliodora</i> (Yellow Box), <i>E. blakelyi</i> (Blakely's Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple), <i>E. punctata</i> (Grey Gum) and <i>E. caleyi</i> . Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated and Ironbark vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
								present in the form of eucalypts.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Potential	Foraging habitat present in the form of woodland. Breeding/nesting habitat in proximity to watercourses.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Potential	Potential foraging habitat occurs in the form of vegetated gullies, and breeding habitat occurs in the form of eucalypt-dominated forest and woodland.
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Potential	Foraging habitat present in open forest and woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt open forest and woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Potential	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs in the form of eucalypt-dominated

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
								forests and woodlands with an open understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Potential	The offset area contains suitable foraging and breeding habitat for the species in both summer and winter. Suitable summer habitat occurs in the form of rocky eucalypt-dominated hills, and winter habitat occurs as woodland vegetation in open valleys. Suitable breeding habitat in the form of woodland and forest occurs throughout.
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Breeding/nesting habitat present in the form of shrubs, sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Known	Abundant foraging habitat present in the form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in <i>Eucalyptus albens</i> (White Box). No breeding/nesting habitat present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Known	Foraging habitat present at the edges of eucalypt woodland adjoining clearings. Breeding/nesting habitat present in the form of tree hollows, logs and posts.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Potential	Foraging habitat for this species occurs in eucalypt-dominated vegetation across the offset area, particularly in densely vegetated gullies and areas with a shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Known	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items being present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
								and forest vegetation in proximity to drainage lines.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items being present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items being present within forest and woodland vegetation. Nesting habitat is present within the offset area in the form of large hollow-bearing trees within remnant woodland and forest vegetation.
Mammals								

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Potential	Suitable habitat in the form of forest and woodland vegetation. Potential den sites present in the form of boulder piles, rocks, hollow-bearing trees and fallen logs.
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Known	Extensive areas of foraging habitat across the offset area in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Potential	Areas of suitable habitat for the species occur in proximity to tall cliff lines and boulder piles. Suitable foraging and shelter habitat in the form of open forest occurs in proximity to cliff lines.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Potential	Potential habitat in Box-dominated open forest and woodland. Nesting habitat in the form of hollow-bearing trees
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Foraging habitat in the form of eucalypt-dominated open forest and woodland. Feed trees in the form of <i>Eucalyptus punctata</i> (Grey Gum) and <i>E. albens</i>

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
								(White Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat occurs within the offset area in the form of eucalypt-dominated forest and woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Areas of suitable roost habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Potential	Extensive areas of foraging habitat across the offset area occurs in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
								proximity to cliff lines.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known	Potential	Potential	Extensive areas of foraging habitat across the offset area in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Possible	Extensive areas of foraging habitat across the offset area occurs in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.

Table A.2 Assessment of habitat values provided by Offset Area 1 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 1	Habitat Features Present
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Known	Suitable forage and shelter habitat occurs within woodland and shrubby woodland communities within the offset area.
Reptiles								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Potential	Areas of suitable habitat for the species occur in proximity to cliff lines and boulder piles. Suitable summer habitat occurs in hollow bearing trees adjacent to cliff lines, while winter habitat exists on cliffs.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding habitat for the species occurs within the grasslands and grassy woodland communities of the offset area.
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Potential	Suitable shelter habitat occurs in the form of tree hollows and fallen logs, and the presence of suitable prey species provide foraging resources.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)

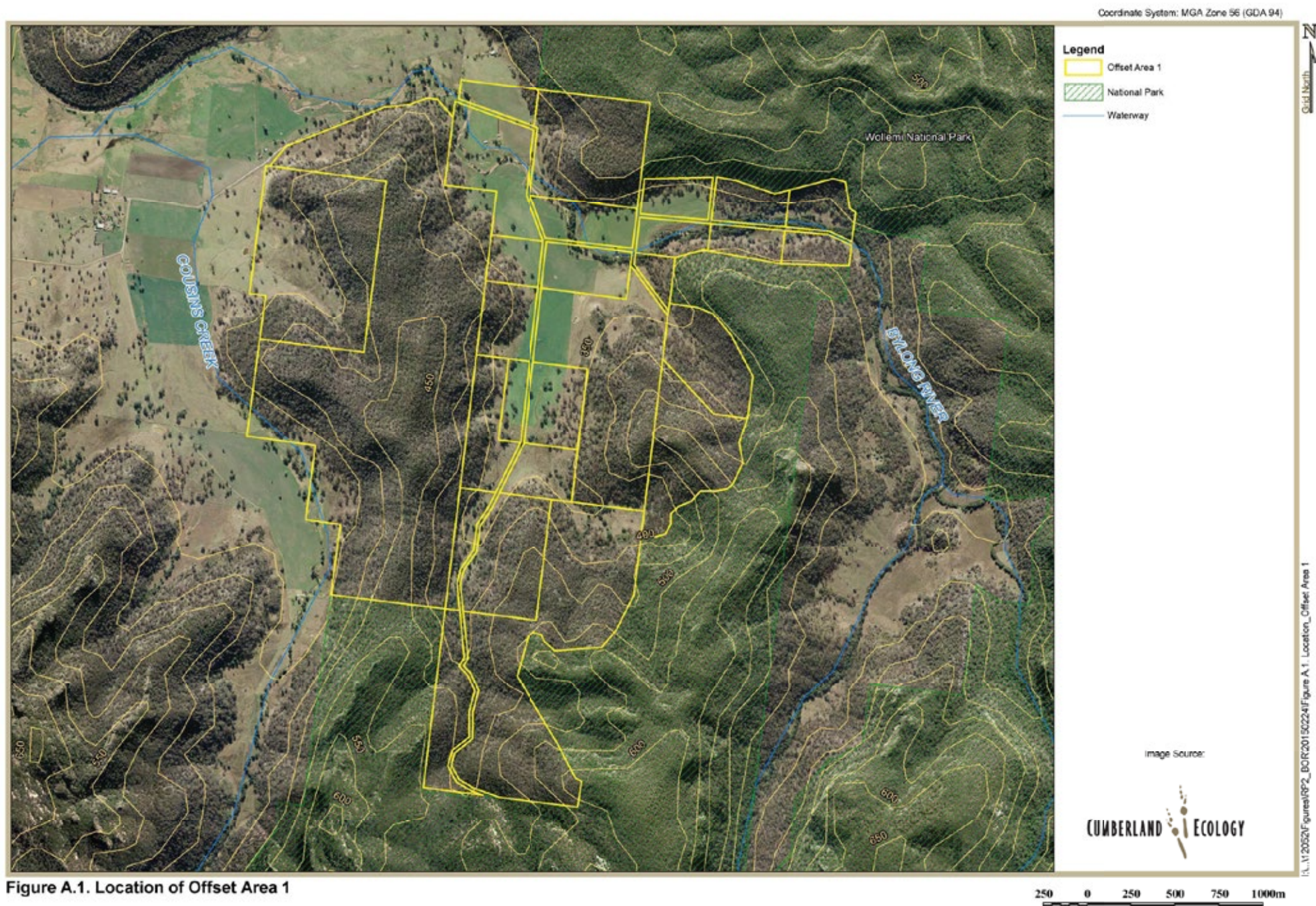
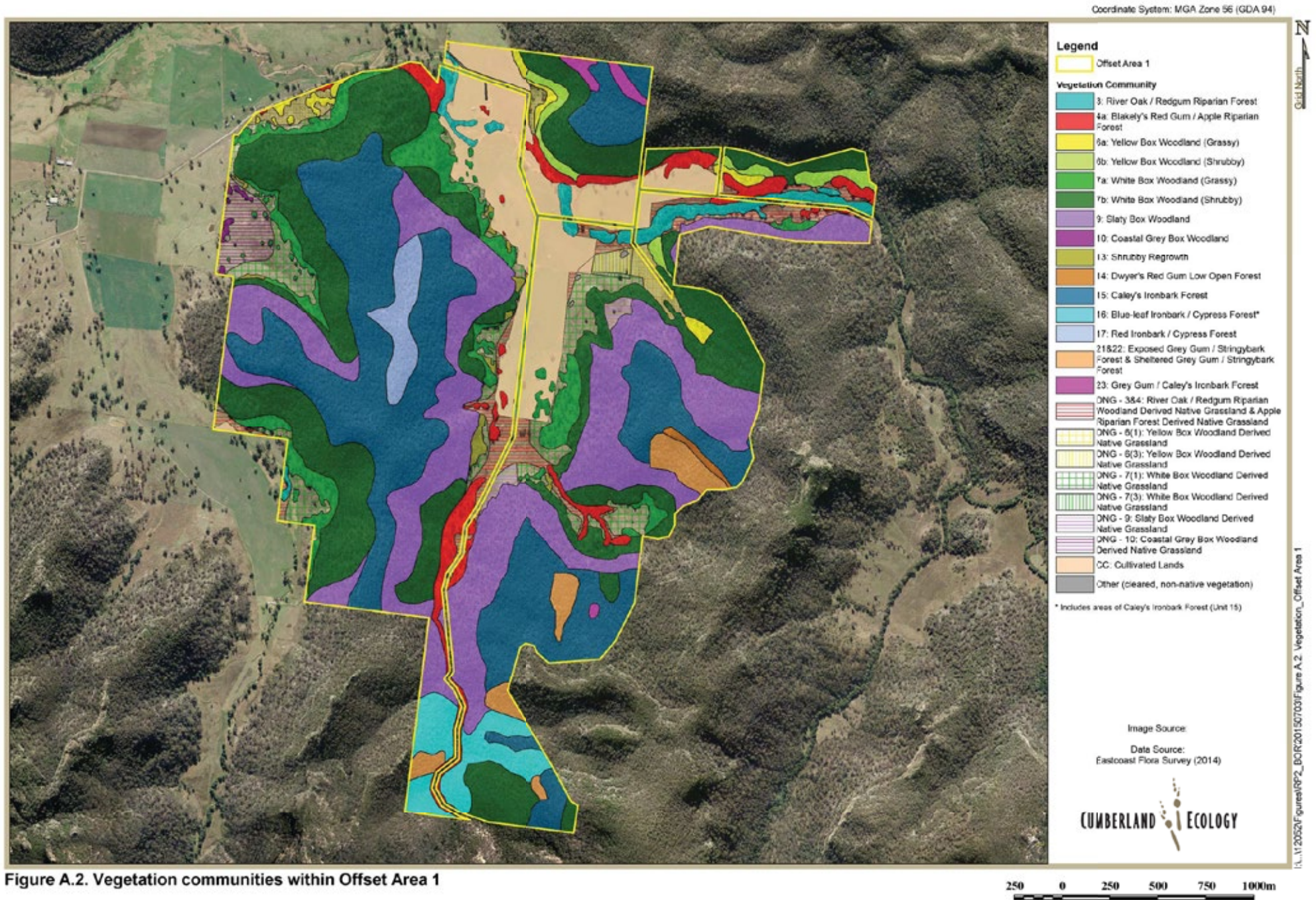


Figure A.1. Location of Offset Area 1



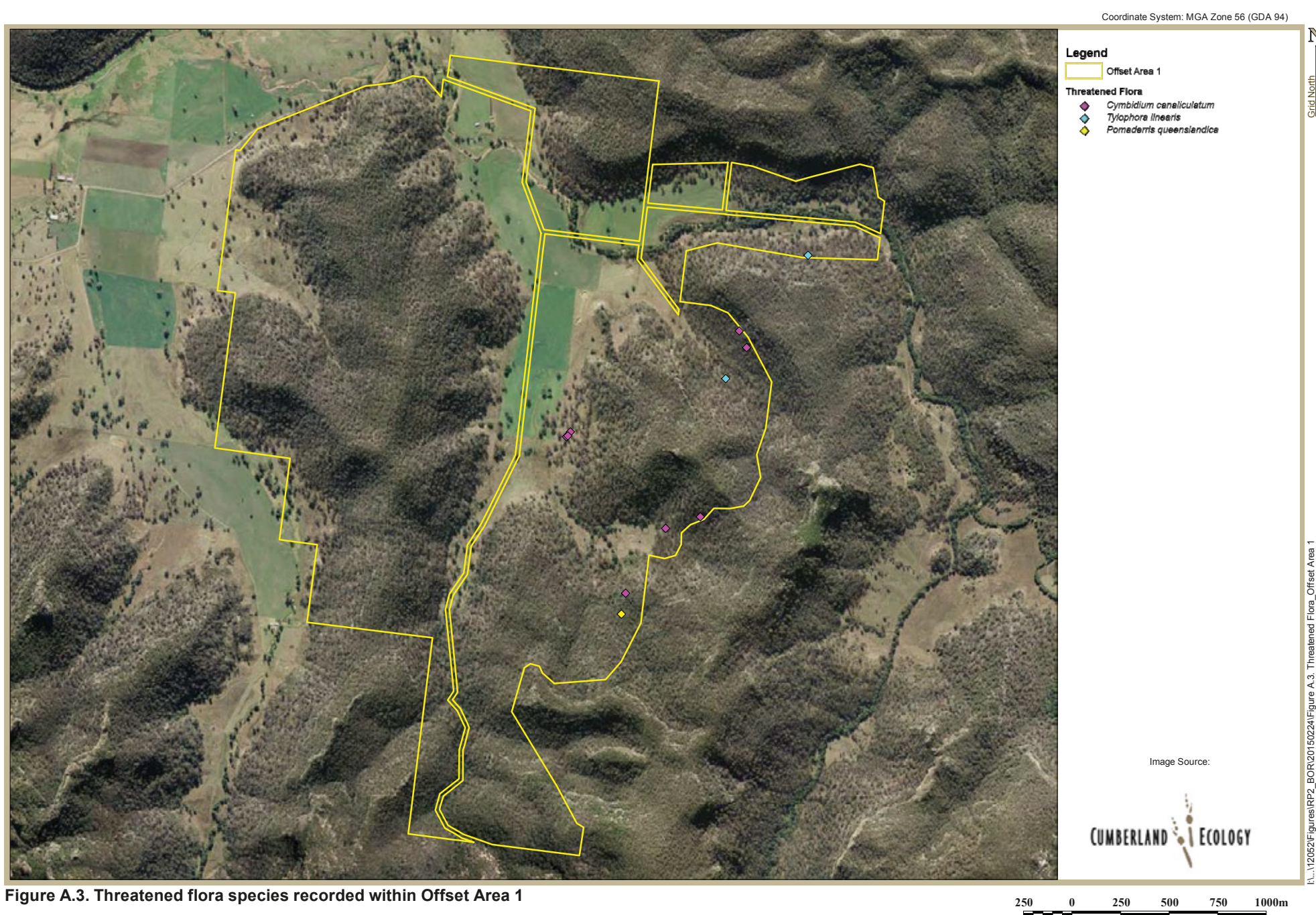


Figure A.3. Threatened flora species recorded within Offset Area 1

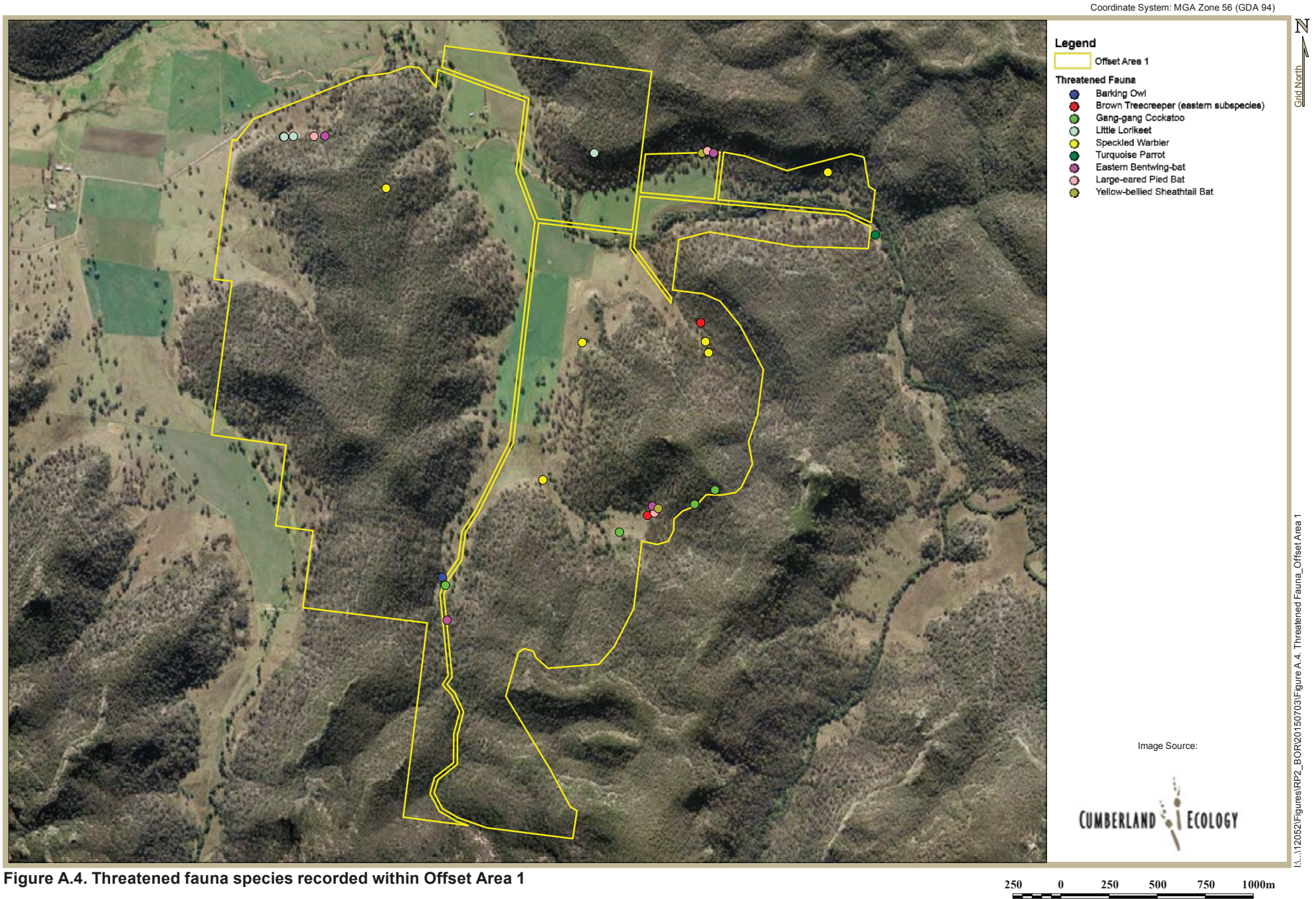


Figure A.4. Threatened fauna species recorded within Offset Area 1



Appendix B

Profile: Offset Area 2



B.1 Introduction

Name: Offset Area 2

Area: 526 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 94 (part) DP 45337; Lot 96 DP 45338; Lot 1 DP 498907; Lot 1 (part) and 2 DP 618119; Lot 9, 57 (part) and 87 DP 755438

Zoning: RU1- Primary Production

Location: Upper Bylong, adjoining the southern boundary of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

Offset Area 2 comprises valley floors, foothills, upper slopes and hill top areas. The valley floor extends north/south through the eastern portion of the offset with smaller valleys extending west. The lowest lying portions of the offset occur at approximately 310 m Australian Height Datum (AHD) and have largely been cleared for agriculture. A cleared plateau at approximately 350 m AHD occurs in the southern portion of the offset. Numerous topographic highs occur within the offset, with the highest point occurring in the south eastern corner at 580 AHD, and sandstone cliffs are present. Intact native vegetation extends from the foothills up to the hill top areas. These areas comprise structurally diverse vegetation including formations along gullies, slopes, ridgelines and plateaus. The location of Offset Area 2 is shown in **Figure B.1**.

B.2 Vegetation Communities

The vegetation within Offset Area 2 comprises both intact and fragmented woodland and areas of agricultural land. The vegetation within this area is largely a reflection of topography, geology and land use history. **Table B.1** lists the vegetation communities occurring within Offset Area 2, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure B.2**.



Table B.1 Vegetation communities within Offset Area 2

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha) [~]
4: Apple Riparian Woodland			
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	-	-	14
7: White Box Woodland			
7a(1) ^A : <i>White Box Woodland (Grassy)</i>	EEC	CEEC	15
7a(3) ^C : <i>White Box Woodland (Grassy)</i>	-	-	<1
7b: <i>White Box Woodland (Shrubby)</i>	-	-	135
9: Slaty Box Woodland	VEC	-	17
8: Blakely's Red Gum Woodland			
8a: <i>Blakely's Red Gum Woodland (Grassy)</i>	EEC	CEEC	3
13: Shrubby Regrowth	-	-	47
18: Cypress Pine Forest	-	-	47
20: Exposed Grey Gum / Stringybark Forest^A	-	-	<1
21: Sheltered Grey Gum / Stringybark Forest^A			
24: Grey Gum / White Box Forest	-	-	13
25: Rough-barked Apple Forest	-	-	15
26: Rough-barked Apple Woodland/Tall Shrubland	-	-	23
DNG: Derived Native Grassland			
DNG – 3: <i>River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>			11
DNG – 4: <i>Apple Riparian Forest Derived Native Grassland[#]</i>			
DNG – 7(1) ^A : <i>White Box Woodland Derived Native Grassland</i>	EEC	CEEC	19
DNG – 7(2) ^B : <i>White Box Woodland Derived Native Grassland</i>	EEC	-	22
DNG – 7(3) ^C : <i>White Box Woodland Derived Native Grassland</i>	-	-	34
DNG – 18: <i>Cypress Pine Forest Derived Native Grassland</i>	-	-	<1
DNG – 25: <i>Rough-barked Apple Forest Derived Native Grassland</i>	-	-	5
CC: Cultivated Lands	-	-	105
Other (cleared, planted vegetation)	-	-	<1
<i>Total Native Vegetation⁺</i>			420
<i>Total Non-native Vegetation and Cleared⁺</i>			105
TOTAL AREA⁺			526



TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

[^] Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

^{*} In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate

B.2.1 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs as scatters patches in some of the lower lying areas of Offset Area 2, with an additional patch occurring at a higher elevation in the north western portion. The canopy is dominated by *Eucalyptus albens* (White Box). This species is also present within the small tree layer along with *Brachychiton populneus* subsp. *populneus* (Kurrajong). The shrub layer is sparse and includes regenerating *Eucalyptus albens* (White Box) with *Cassinia quinquefaria* and *Dodonaea viscosa* (Sticky Hop-bush). This community has a grassy understorey. Native grasses occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Microlaena stipoides* (Weeping Grass) and *Paspalidium gracile* (Slender Panic). Other natives occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Desmodium brachypodum* (Large Tick-trefoil), *Solanum campanulatum*, *Sida corrugata* (Corrugated Sida), *Sida cunninghamii* (Ridged Sida) and *Einadia trigonos* (Fishweed). The climber *Glycine tabacina* also occurs within this community. Exotic species occurring in this community include *Opuntia stricta* (Common Prickly Pear), *Bidens pilosa* (Cobblers Pegs), *Bidens subalternans* (Greater Beggar's Ticks) and *Sida spinosa*. This community is shown in **Photograph B.1**.



Photograph B.1 Offset Area 2: White Box Woodland (Grassy)

B.2.2 White Box Woodland (Shrubby) (Unit 7b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs extensively within the southern and central portions of Offset Area 2. The canopy is dominated by *Eucalyptus albens* (White Box), with *Eucalyptus blakelyi* (Blakely's Red Gum) occurring at some locations. The canopy species occur in the small tree layer along with *Callitris endlicheri* (Black Cypress Pine) and *Allocasuarina verticillata* (Drooping Sheoak). Species occurring in the shrub layer include *Olearia elliptica* (Sticky Daisy-bush), *Senna artemisioides* subsp. *x artemisioides* (Silver Cassia), *Acacia implexa* (Hickory Wattle), *Acacia ixiophylla* (Sticky Leaved Wattle) and *Bursaria spinosa* (Blackthorn). Species in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Dichondra* sp. A (Kidney Weed), *Sida corrugata* (Corrugated Sida), *Cymbopogon refractus* (Barbed Wire Grass), *Cynodon dactylon* (Couch), *Lepidosperma gunnii* and *Carex inversa* (Knob Sedge). This community is shown in **Photograph B.2**.



Photograph B.2 Offset Area 2: White Box Woodland (Shrubby)

B.2.3 Slaty Box Woodland (Unit 9)

TSC Act Status: Hunter Valley Footslopes Slaty Gum Woodland (VEC)

EPBC Act Status: Not listed

This community occurs at scattered locations within the eastern portion of Offset Area 2. The canopy is dominated by *Eucalyptus dawsonii* (Slaty Gum), with *Eucalyptus albens* (White Box) occurring less frequently. The small tree layer includes *Callitris endlicheri* (Black Cypress Pine) and *Allocasuarina luehmannii* (Bulloak), with the latter dominating at some locations. The shrub layer includes *Olearia elliptica* (Sticky Daisy-bush), *Acacia ixiophylla* (Sticky Leaved Wattle), *Dodonaea viscosa* (Sticky Hop-bush) and *Cassinia quinquefaria*. The ground layer is sparse with abundant leaf litter. Species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Gahnia aspera* (Rough Saw-sedge), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Aristida ramosa* (Purple Wiregrass), *Microlaena stipoides* (Weeping Grass) and *Cleistochloa rigida*. The climber *Parsonsia straminea* (Common Silkpod) also occurs within this community. This community is shown in **Photograph B.3**.



Photograph B.3 Offset Area 2: Slaty Box Woodland

B.2.4 Cypress Pine Forest (Unit 18)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at a number of locations within Offset Area 2. The canopy is dominated by *Callitris endlicheri* (Black Cypress Pine), which also dominates the small tree layer. Species occurring in the shrub layer include *Astroloma humifusum* (Native Cranberry), *Bursaria spinosa* (Blackthorn), *Cassinia quinquefaria*, *Olearia elliptica* (Sticky Daisy-bush), *Melicytus dentatus* (Tree Violet) and *Acacia implexa* (Hickory Wattle). The ground layer is variable in composition and cover. Species occurring in the ground layer include *Microlaena stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Gahnia aspera* (Rough Saw-sedge) and *Lomandra confertifolia* (Mat-rush). The climbers *Convolvulus erubescens* (Blushing Bindweed) and *Glycine clandestina* also occur within this community. This community is shown in **Photograph B.4**.



Photograph B.4 Offset Area 2: Cypress Pine Forest

B.2.5 Grey Gum / White Box Forest (Unit 24)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at one location within the north western portion of Offset Area 2. This community is dominated by *Eucalyptus albens* (White Box) and *Eucalyptus punctata* (Grey Gum). Other species occurring in the canopy include *Callitris endlicheri* (Black Cypress Pine) and *Eucalyptus caleyi* subsp. *caleyi*. Species occurring in the small tree layer include *Brachychiton populneus* subsp. *populneus* (Kurrajong), *Allocasuarina luehmannii* (Bullock) and *Acacia doratoxylon* (Currawang). Shrubs occurring in this community include *Cassinia quinquefaria*, *Olearia elliptica* (Sticky Daisy-bush), *Astroloma humifusum* (Native Cranberry) and *Macrozamia reducta*. The ground layer is diverse including a suite of grass and non-grass species. Commonly occurring species in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Dichondra* sp. A (Kidney Weed), *Vittadinia cuneata* (Fuzzweed), *Desmodium brachypodum* (Large Tick-trefoil), *Gahnia aspera* (Rough Saw-sedge), *Lomandra glauca* (Pale Mat-rush), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Lepidosperma gunnii*, *Cleistochloa rigida*, *Microlaena stipoides* (Weeping Grass) and *Rytidosperma fulvum* (Wallaby Grass). The climbers *Glycine microphylla* (Small-leaf Glycine) and *Marsdenia viridiflora* subsp. *viridiflora* (Native Pear) also



occur within this community. The exotic *Opuntia stricta* (Common Prickly Pear) occurs at numerous locations within this community. This community is shown in **Photograph B.5**.



Photograph B.5 Offset Area 2: Grey Gum / White Box Forest

B.2.6 Rough-barked Apple Forest (Unit 25)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community is located in the north western portion of Offset Area 2. This community is characterised by the dominance of *Angophora floribunda* (Rough-barked Apple) in the canopy. This species also appears in the small tree layer with *Callitris endlicheri* (Black Cypress Pine). The shrub layer includes *Cassinia quinquefaria*, *Swainsona galegifolia* (Smooth Darling-pea), *Acacia implexa* (Hickory Wattle) and *Bursaria spinosa* (Blackthorn). This community has a diverse range of species within the ground layer. Grasses include *Themeda triandra* (Kangaroo Grass), *Aristida ramosa* (Purple Wiregrass), *Microlaena stipoides* (Weeping Grass) and *Poa labillardierei* var. *labillardierei* (Tussock). Non-grass species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Desmodium brachypodum* (Large Tick-trefoil), *Ajuga australis* (Austral Bugle), *Dichondra repens* (Kidney Weed), *Geranium solanderi* (Native Geranium), *Oxalis perennans*, *Rumex brownii* (Swamp Dock), *Asperula conferta* (Common Woodruff), *Carex inversa* (Knob Sedge), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush) and



Dianella prunina. The climbers *Glycine tabacina* and *Glycine clandestina* also within this community. Exotic species are present within the ground layer of this community and include *Bidens pilosa* (Cobblers Pegs), *Hypericum perforatum* (St. Johns Wort) and *Opuntia stricta* (Common Prickly Pear). This community is shown in **Photograph B.6**.



Photograph B.6 Offset Area 2: Rough-barked Apple Forest

B.2.7 Rough-barked Apple Woodland/Tall Shrubland (Unit 26)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community is located in the north western portion of Offset Area 2. This community has a well-developed small tree and shrub layer with emergent trees of *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus albens* (White Box). Species occurring in the small tree layer include *Callitris endlicheri* (Black Cypress Pine), *Allocasuarina verticillata* (Drooping Sheoak) and *Acacia doratoxylon* (Currawang). Shrubs occurring in this community include *Bursaria spinosa* (Blackthorn), *Cassinia* sp., *Olearia elliptica* (Sticky Daisy-bush) and *Astroloma humifusum* (Native Cranberry). Species occurring in the ground layer include *Gahnia aspera* (Rough Saw-sedge), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Themeda triandra* (Kangaroo Grass), *Rytidosperma* sp., *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern). *Dichondra repens* (Kidney Weed)



and *Desmodium varians* (Slender Tick-trefoil). This community is shown in Photograph B.7.



Photograph B.7 Offset Area 2: Rough-barked Apple Woodland/Tall Shrubland

B.2.8 Derived Native Grassland (Unit DNG)

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit DNG –7(1) and 7(2))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG –7(1))

All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within Offset Area 2 and is the result of clearing of the original woodland communities. Derived native grasslands within Offset Area 2 have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands vary within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Aristida ramosa* (Purple Wiregrass) and *Bothriochloa decipiens* var. *decipiens*. Non-grass species also occurring in the ground layer at varying frequencies include *Sida corrugata* (Corrugated Sida), *Calotis lappulacea* (Yellow Burr-daisy), *Geranium*



solanderi (Native Geranium), *Einadia nutans* (Climbing Saltbush), *Oxalis perennans*, *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern) and *Einadia trigonos* (Fishweed). Exotic species occur within most patches of this community, and include *Hypericum perforatum* (St. Johns Wort), *Modiola caroliniana* (Red-flowered Mallow), *Trifolium repens* (White Clover) and *Bidens subalternans* (Greater Beggar's Ticks). An example of this community is shown in **Photograph B.8**.



Photograph B.8 Offset Area 2: Derived Native Grassland

B.3 Flora

Nearly 200 flora species have been recorded within Offset Area 2. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae, Chenopodiaceae and Fabaceae (Faboideae). Non-grass herbaceous groundcovers have the highest diversity, followed by grasses and shrubs. Approximately 14% of the flora species occurring within Offset Area 2 are exotic species. Exotic species occurred across the Offset Area 2, particularly where previous clearing for agricultural purposes has been undertaken.

One threatened flora species, *Cymbidium canaliculatum* (Tiger Orchid) has been recorded at numerous locations within Offset Area 2. This species forms an Endangered Population in the Hunter catchment listed under the TSC Act. The species occurs in Slaty Box Woodland, White Box Woodland (Shrubby), Grey Gum / White Box Forest, Rough-barked Apple Woodland and Rough-barked Apple Woodland / Tall Shrubland. Extensive areas of suitable



habitat for this species occur throughout Offset Area 2. The occurrence of this species within Offset Area 2 is shown in **Figure B.3**.

B.4 Fauna

B.4.1 Fauna Habitat

There are extensive areas of connected forest, woodland and grassland within Offset Area 2 that provides moderate to good quality habitat for a wide variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity varies across the offset, with areas grassy and shrubby understorey vegetation. The canopy species present within the offset are dominated by Box species (*Eucalyptus albens*, *Eucalyptus dawsonii*) with *Eucalyptus punctata* and *Angophora floribunda* also occurring. A range of other canopy trees occur within this offset area. The habitat features available are numerous and provide potential foraging, shelter and breeding opportunities for a variety of threatened fauna species. These habitats occur at a range of altitudes; areas of gently undulating topography, along drainage lines, cliff lines and valley floors.

Key habitat features within Offset Area 2 include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter, coarse woody debris and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna;
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores; and
- Cliff lines and associated features such as caves and rocky outcrops suitable for fauna species dependent on these habitats, such as microbats.

Connectivity within the offset is maintained by existing patches of woodland connected to extensive areas outside the site. The offset area is indirectly connected to Wollemi National Park.

B.4.2 Fauna Species

The habitat features available within Offset Area 2 provides habitat for a suite of native species. Over 60 vertebrate fauna species have been recorded, including 48 birds, 17 mammals and two reptiles. The majority of species are native, with only two exotic species recorded, namely the Common Starling (*Sturnus vulgaris*) and Rabbits (*Oryctolagus cuniculus*).



The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Offset Area 2:

- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Diamond Firetail (*Stagonopleura guttata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (TSC Act: Vulnerable; EPBC Act Status: Vulnerable); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded within Offset Area 2 are shown on **Figure B.4**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. One threatened microbat, Eastern Cave Bat (*Vespadelus troughtoni*), is assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by Offset Area 2 for threatened fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table B.2**. The habitats provided by Offset Area 2 are currently in moderate to good condition.

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Known	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Possible	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses and grassland areas. Breeding/nesting habitat present in the form of woodland adjacent to watercourses.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Potential	Foraging and breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Potential	Potential	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated forests and woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	Potential	Potential	It is expected that this species would forage in stands of Allocasuarinas within woodland and forest vegetation. Nesting habitat is present within the offset area in the form of large hollows.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Known	Foraging habitat within the offset area includes Yellow Box Woodland, White Box Woodland and Slaty Box Woodland, favouring areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland. Water resources available in form of dams, drainage lines and creeks. Breeding/nesting habitat present in the form of shrubby understorey vegetation and other nests.
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								nectar producing trees, including <i>Eucalyptus albens</i> (White Box), <i>E. melliodora</i> (Yellow Box), <i>E. blakelyi</i> (Blakely's Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple) and <i>E. punctata</i> (Grey Gum). Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated and Ironbark vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	Known	Extensive foraging habitat present in the form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat present in the form of eucalypts.

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Known	Foraging habitat present in the form of woodland. Breeding/nesting habitat in proximity to watercourses.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Potential	Potential foraging habitat occurs in the form of vegetated gullies, and breeding habitat occurs in the form of eucalypt-dominated forest and woodland.
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Potential	Foraging habitat present in open forest and woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt open forest and woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Known	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs in the form of eucalypt-dominated forests and woodlands with an open

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Potential	The offset area contains suitable foraging and breeding habitat for the species in both summer and winter. Suitable summer habitat occurs in the form of rocky eucalypt-dominated hills, and winter habitat occurs as woodland vegetation in open valleys. Suitable breeding habitat in the form of woodland and forest occurs throughout.
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland. Breeding/nesting habitat present in the form of shrubs, sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Known	Abundant foraging habitat present in the form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in <i>Eucalyptus albens</i> (White Box). No breeding/nesting habitat present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Known	Foraging habitat present at the edges of eucalypt woodland adjoining clearings. Breeding/nesting habitat present in the form of tree hollows, logs and posts.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Potential	Foraging habitat for this species occurs in eucalypt-dominated vegetation across the offset area, particularly in densely vegetated gullies and areas with a shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								vegetation in proximity to drainage lines.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items present within forest and woodland vegetation. Nesting habitat is present within the offset area in the form of large hollow-bearing trees within remnant woodland and forest vegetation.
Mammals								
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Potential	Suitable habitat in the form of forest and woodland vegetation. Potential den sites present in the form of boulder piles, rocks,

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								hollow-bearing trees and fallen logs.
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Potential	Extensive areas of foraging habitat across the offset area in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Potential	Areas of suitable habitat for the species occur in proximity to tall cliff lines and boulder piles. Suitable foraging and shelter habitat in the form of open forest occurs in proximity to cliff lines.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Potential	Potential habitat in Box-dominated open forest and woodland. Nesting habitat in the form of hollow-bearing trees
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Foraging habitat in the form of eucalypt-dominated open forest and woodland. Feed trees in the form of <i>Eucalyptus punctata</i> (Grey Gum) and <i>E. albens</i> (White Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								occurs within the offset area in the form of eucalypt-dominated forest and woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Areas of suitable roost habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Potential	Extensive areas of foraging habitat across the offset area occurs in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

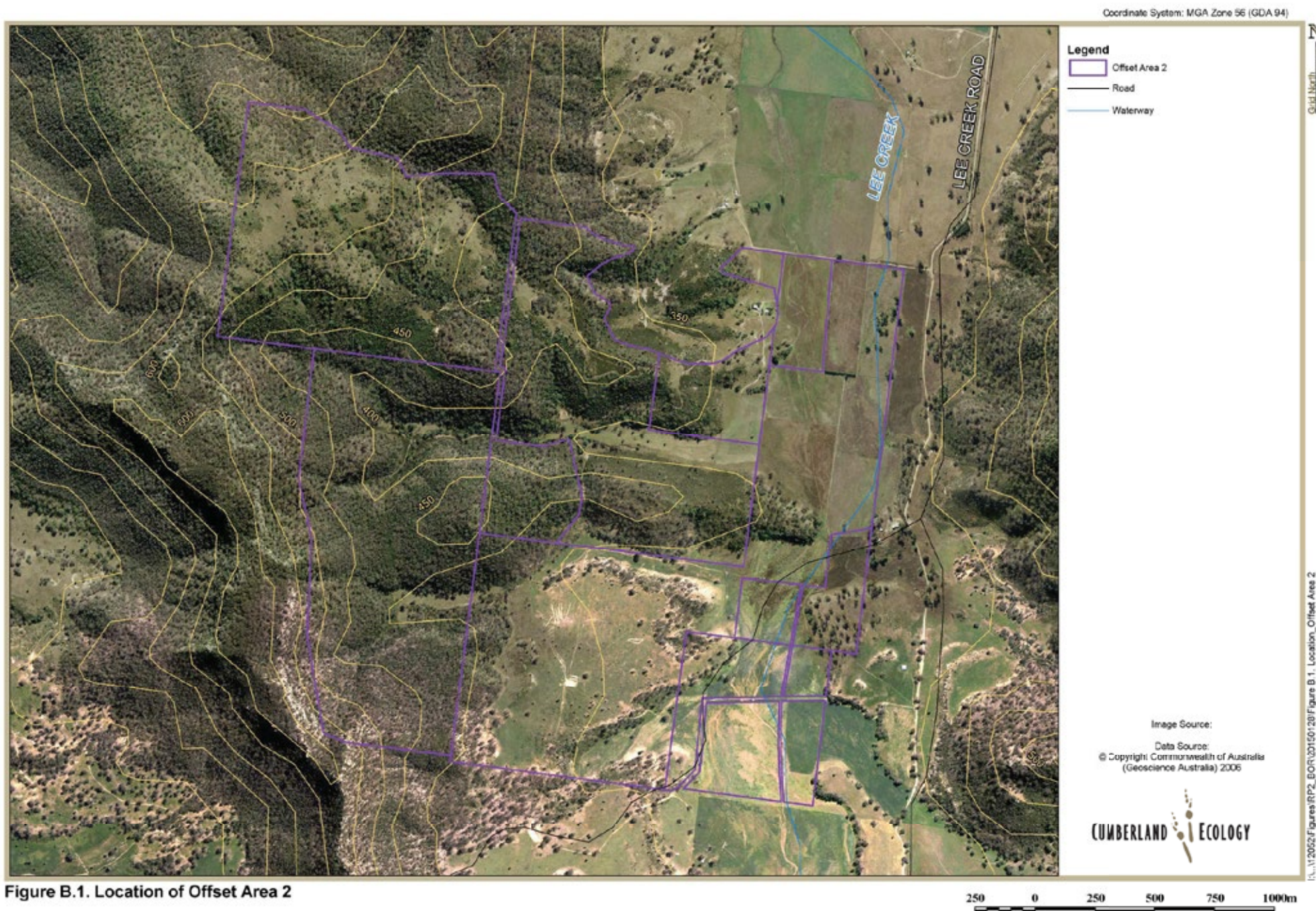
Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
								boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known	Potential	Potential	Extensive areas of foraging habitat across the offset area in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Potential	Extensive areas of foraging habitat across the offset area occurs in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus trougtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Potential	Suitable forage and shelter habitat occurs within woodland and shrubby woodland communities within the offset area.

Table B.2 Assessment of habitat values provided by Offset Area 2 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 2	Habitat Features Present
Reptiles								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Potential	Areas of suitable habitat for the species occur in proximity to cliff lines and boulder piles. Suitable summer habitat occurs in hollow bearing trees adjacent to cliff lines, while winter habitat exists on cliffs.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding habitat for the species occurs within the grasslands and grassy woodland communities of the offset area.
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Potential	Suitable shelter habitat occurs in the form of tree hollows and fallen logs, and the presence of suitable prey species provide foraging resources.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)



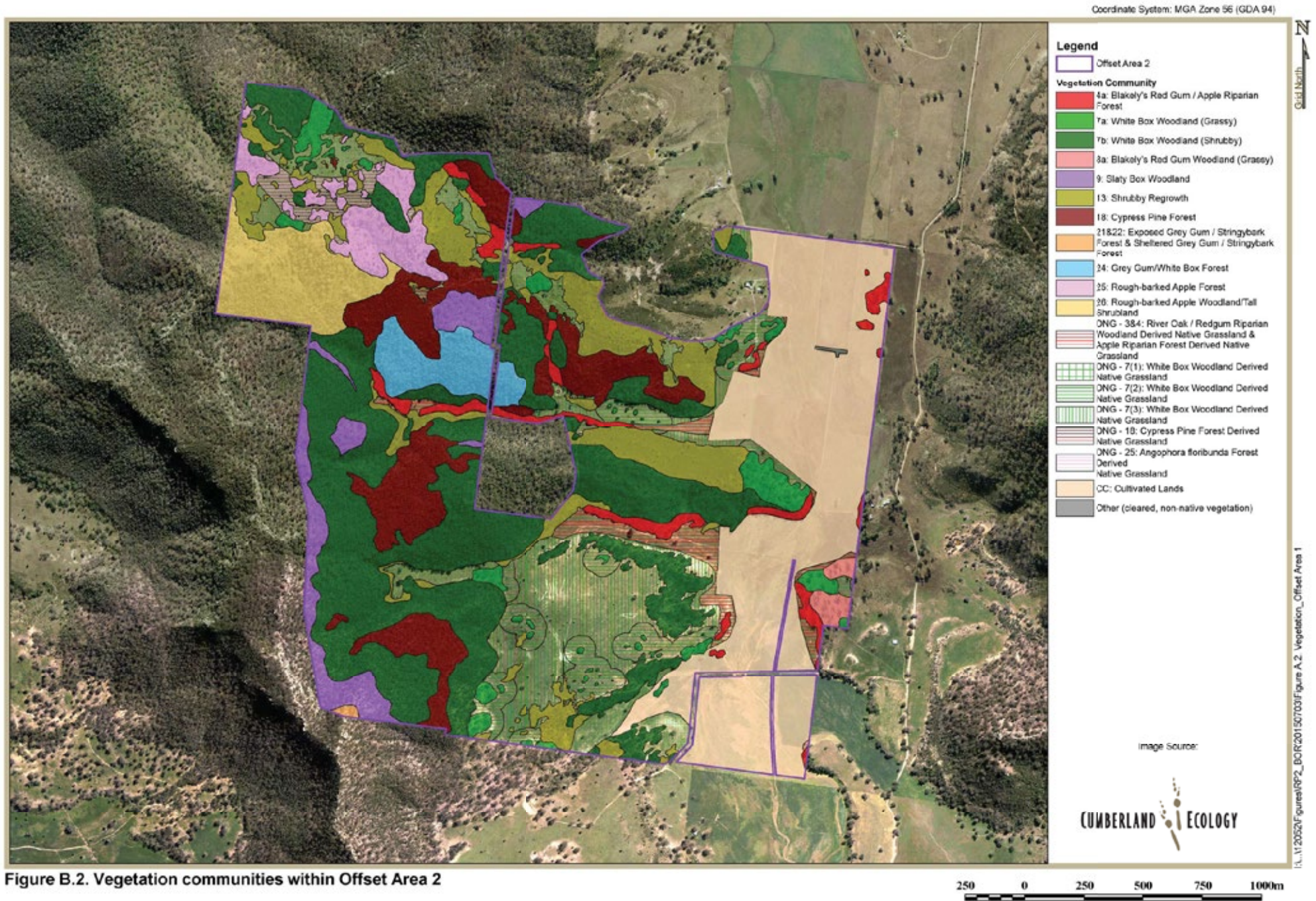


Figure B.2. Vegetation communities within Offset Area 2

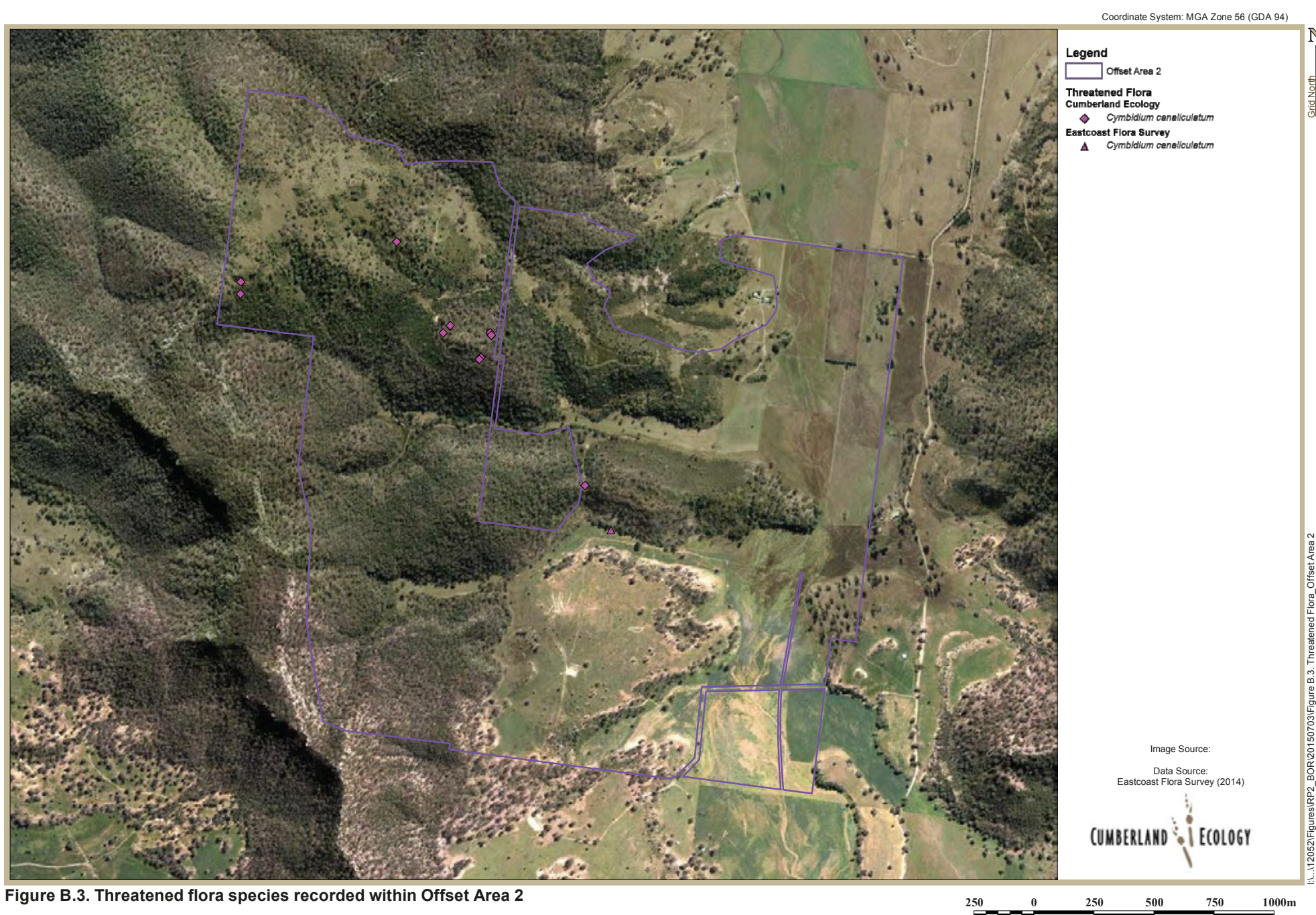


Figure B.3. Threatened flora species recorded within Offset Area 2

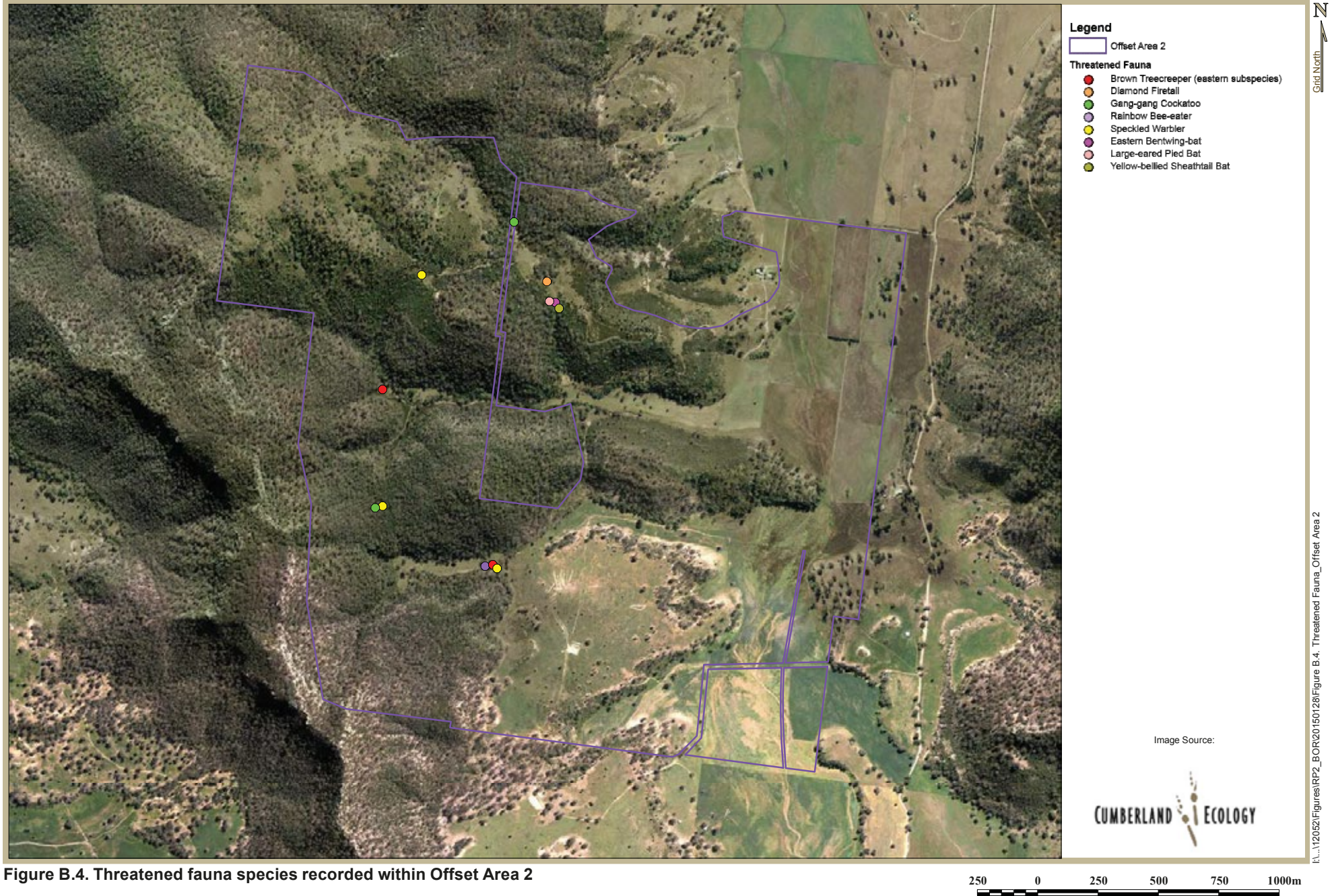


Figure B.4. Threatened fauna species recorded within Offset Area 2

K:\112062\Figures\RP2_BOR\20150128\Figure B.4. Threatened Fauna_Offset Area 2



Appendix C

Profile: Offset Area 3



C.1 Introduction

Name: Offset Area 3

Area: 458 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 52, 53, 54, 61, 62, 63, 85, 87 and 111 DP 755417; Lot 1 DP 1100343

Zoning: RU1- Primary Production

Location: Bylong, <1 km west of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

Offset Area 3 comprises valley floors, foothills, upper slopes and hill top areas. The valley floor extends across the northern and central portions of the offset with a smaller valley extending south in the eastern portion. The lowest lying portions of the offset occur at approximately 280 m Australian Height Datum (AHD) and have largely been cleared for agriculture. Two topographic highs occur within the southern portion of the offset at 530 m AHD. Intact native vegetation extends from the foothills up to the hill top areas. These areas comprise structurally diverse vegetation including formations along gullies and slopes. An elevated plateau with a degraded access track has been cleared within the southern portion of the offset. The location of Offset Area 3 is shown in **Figure C.1**.

C.2 Vegetation Communities

The vegetation within Offset Area 3 comprises both intact and fragmented woodland and extensive areas of agricultural land. The vegetation within this area is largely a reflection of topography, geology and land use history. **Table C.1** lists the vegetation communities occurring within Offset Area 3, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure C.2**.



Table C.1 Vegetation communities within Offset Area 3

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha)~
6: Yellow Box Woodland			
6a: Yellow Box Woodland (Grassy)	EEC	CEEC	5
7: White Box Woodland			
7a: White Box Woodland (Grassy)	EEC	CEEC	49
7b: White Box Woodland (Shrubby)	-	-	111
9: Slaty Box Woodland	VEC	-	2
10: Coastal Grey Box Woodland	-	-	5
11: Fuzzy Box Woodland	-	-	0
13: Shrubby Regrowth	-	-	5
18: Cypress Pine Forest	-	-	14
DNG: Derived Native Grassland			
DNG – 6(1)*: Yellow Box Woodland Derived Native Grassland	EEC	CEEC	2
DNG – 7(1)*: White Box Woodland Derived Native Grassland	EEC	-	152
DNG – 7(2)^: White Box Woodland Derived Native Grassland	EEC	-	7
DNG – 7(3)#: White Box Woodland Derived Native Grassland	-	-	11
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	-	-	90
DNG – 11: Fuzzy Box Woodland Derived Native Grassland	-	-	1
Other (cleared, planted vegetation)			2
<i>Total Native Vegetation⁺</i>			455
<i>Total Non-native Vegetation and Cleared⁺</i>			2
TOTAL AREA			458

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

* DNG sub-unit (1) represents grassland subunits listed under both the TSC Act and EPBC Act

^DNG sub-unit (2) represents grassland subunits listed only under the TSC Act

#DNG sub-unit (3) represents grassland subunits not listed under the TSC Act or EPBC Act

⁺ In some cases totals may not equal the appropriate total number due to rounding

~ Area calculations are approximate



C.2.1 Yellow Box Woodland (Grassy) (Unit 6a)

TSC Act Status: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs as a woodland patch within the northern western portion of Offset Area 3. The canopy is dominated by *Eucalyptus melliodora* (Yellow Box) with occasional occurrence of *Eucalyptus albens* (White Box). *Brachychiton populneus* subsp. *populneus* (Kurrajong) occurs in the small tree layer. This community has a very sparse shrub layer, with *Maireana microphylla* (Small-leaf Bluebush) occurring in this layer. The grassy understorey is dominated by *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Austrostipa scabra* (Speargrass), *Bothriochloa decipiens* var. *decipiens*. Other natives in the ground layer include *Atriplex semibaccata* (Creeping Saltbush), *Einadia hastata* (Berry Saltbush), *Dichondra repens* (Kidney Weed), *Ajuga australis* (Austral Bugle), *Sida corrugata* (Corrugated Sida), *Einadia trigonos* (Fishweed) and *Cyperus gracilis* (Slender Flat-sedge). The climbers *Glycine tabacina* and *Glycine clandestina* also occur within this community. Exotic species in the ground layer include *Bidens pilosa* (Cobblers Pegs), *Sida rhombifolia* (Paddy's Lucerne), *Portulaca oleracea* (Pigweed) and *Bidens subalternans* (Greater Beggar's Ticks). This community is shown in **Photograph C.1**.



Photograph C.1 Offset Area 3: Yellow Box Woodland (Grassy)



C.2.2 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs at numerous locations within Offset Area 3, predominately along the foothills, as well as on an elevated hillside and elevated plateau. The canopy is dominated by *Eucalyptus albens* (White Box), with some occurrences of *Angophora floribunda* (Rough-barked Apple). Species in the small tree layer include *Callitris endlicheri* (Black Cypress Pine), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Eucalyptus albens* (White Box). A sparse shrub layer is present within this community and includes regenerating *Eucalyptus albens* (White Box) and *Callitris endlicheri* (Black Cypress Pine) as well as *Acacia implexa* (Hickory Wattle), *Cassinia arcuata* (Sifton Bush), *Swainsona galegifolia* (Smooth Darling-pea), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush). This community has a predominantly grassy understorey. Commonly occurring native grasses include *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Aristida vagans* (Threeawn Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass) and *Chloris ventricosa* (Tall Chloris). Other native species occurring in the ground layer include *Desmodium brachypodium* (Large Tick-trefoil), *Dichondra repens* (Kidney Weed), *Sida corrugata* (Corrugated Sida), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Einadia polygonoides* and *Einadia trigonos* (Fishweed). The climber *Glycine tabacina* also occurs within this community. Common exotic species occurring in this community include *Opuntia stricta* var. *stricta* (Common Prickly Pear), *Sida spinosa* and *Anagallis arvensis* (Scarlet Pimpernel). This community is shown in **Photograph C.2**.



Photograph C.2 Offset Area 3: White Box Woodland (Grassy)

C.2.3 White Box Woodland (Shrubby) (Unit 7b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs extensively in the southern portion of Offset Area 3 along slopes, with a minor occurrence in the western portion along a ridge. The canopy is dominated by *Eucalyptus albens* (White Box), with some occurrences of *Angophora floribunda* (Rough-barked Apple) in some drainage line areas. Species occurring in the small tree layer include regenerating canopy species as well as *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Acacia implexa* (Hickory Wattle). This community has a well-developed shrub layer. Species occurring in the shrub layer include *Acacia ixiophylla* (Sticky Leaved Wattle), *Acacia implexa* (Hickory Wattle), *Bursaria spinosa* subsp. *spinosa* (Blackthorn), *Solanum brownii* (Violet Nightshade), *Cassinia arcuata* (Sifton Bush) and *Cassinia quinquefaria*. This community has a diverse ground layer including *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Desmodium brachypodum* (Large Tick-trefoil), *Einadia hastata* (Berry Saltbush), *Dichondra repens* (Kidney Weed), *Sida corrugata* (Corrugated Sida), *Cyperus gracilis* (Slender Flat-sedge) and *Desmodium varians* (Slender Tick-trefoil). Exotic species occurring in this community include *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush),



Opuntia stricta var. *stricta* (Common Prickly Pear), *Bidens subalternans* (Greater Beggar's Ticks). This community is shown in **Photograph C.3**.



Photograph C.3 Offset Area 3: White Box Woodland (Shrubby)

C.2.4 Slaty Box Woodland (Unit 9)

TSC Act Status: Hunter Valley Footslopes Slaty Gum Woodland (VEC)

EPBC Act Status: Not listed

This community occurs on one hill slope in the south eastern portion of Offset Area 3. The canopy is dominated by *Eucalyptus dawsonii* (Slaty Gum), with *Eucalyptus albens* (White Box) also occurring. Species in the small tree layer include *Callitris endlicheri* (Black Cypress Pine) and *Brachychiton populneus* subsp. *populneus* (Kurrajong). Shrubs occur sparsely within this community and include *Acacia implexa* (Hickory Wattle), *Acacia ixiophylla* (Sticky Leaved Wattle) and *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush). The ground layer is dominated by leaf litter. Native species occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush) and *Einadia trigonos* (Fishweed). The exotic *Opuntia stricta* var. *stricta* (Common Prickly Pear) also occurs in this community. This community is shown in **Photograph C.4**.



Photograph C.4 Offset Area 3: Slaty Box Woodland

C.2.5 Coastal Grey Box Woodland (Unit 10)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered woodland patches in the central and northern portions of Offset Area 3, in low lying areas. The canopy is dominated by *Eucalyptus moluccana* (Grey Box). A small tree and shrub layer is largely absent from this community. The understorey is dominated by grasses, including *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa decipiens* var. *decipiens*. Other native species in the ground layer include *Salsola australis*, *Maireana enchylaenoides* (Wingless Bluebush), *Atriplex semibaccata* (Creeping Saltbush), *Einadia hastata* (Berry Saltbush), *Einadia trigonos* (Fishweed) and *Carex inversa* (Knob Sedge). Exotic species occurring in this community include *Urochloa panicoides* (Urochloa Grass), *Malva parviflora* (Small-flowered Mallow), *Bidens subalternans* (Greater Beggar's Ticks), *Lepidium africanum*, *Lepidium bonariense*, *Modiola caroliniana* (Red-flowered Mallow) and *Opuntia stricta* var. *stricta* (Common Prickly Pear). This community is shown in **Photograph C.5**.



Photograph C.5 Offset Area 3: Coastal Grey Box Woodland

C.2.6 Fuzzy Box Woodland (Unit 11)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as a small remnant patch along the western boundary of Offset Area 3. The canopy is dominated by *Eucalyptus conica* (Fuzzy Box), with *Brachychiton populneus* subsp. *populneus* (Kurrajong) occurring in the small tree layer. Shrubs are absent within this community. This community has a grassy understorey of *Austrostipa verticillata* (Slender Bamboo Grass), *Aristida ramosa* (Purple Wiregrass) and *Chloris ventricosa* (Tall Chloris). Other native species in the ground layer include *Boerhavia dominii* (Tarvine), *Tribulus micrococcus* (Yellow Vine), *Einadia hastata* (Berry Saltbush), *Enchylaena tomentosa* (Ruby Saltbush), *Chamaesyce drummondii* (Caustic Weed), *Geranium solanderi* (Native Geranium), *Sida corrugata* (Corrugated Sida) and *Cyperus gracilis* (Slender Flat-sedge). Exotic species occurring in this community include *Urochloa panicoides* (Urochloa Grass), *Bidens subalternans* (Greater Beggar's Ticks), *Plantago lanceolata* (Lamb's Tongues) and *Portulaca oleracea* (Pigweed). This community is shown in **Photograph C.6**.



Photograph C.6 Offset Area 3: Fuzzy Box Woodland

C.2.7 Shrubby Regrowth (Unit 13)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered patches adjacent to White Box Woodland (Shrubby) and it is expected that the regrowth vegetation is derived from this woodland type. This community is characterised by thickets of *Bursaria spinosa* (Blackthorn). Emergent trees and small trees include *Eucalyptus albens* (White Box), *Callitris endlicheri* (Black Cypress Pine), *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus* subsp. *populneus* (Kurrajong). A diversity of species occur in the ground layer including *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Desmodium brachypodum* (Large Tick-trefoil), *Boerhavia dominii* (Tarvine), *Calotis lappulacea* (Yellow Burr-daisy), *Geranium solanderi* (Native Geranium), *Ajuga australis* (Austral Bugle), *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Austrostipa scabra* (Speargrass). Exotic species occur at low abundances within this community and include *Bidens subalternans* (Greater Beggar's Ticks) and *Urochloa panicoides* (Urochloa Grass). This community is shown in **Photograph C.7**.



Photograph C.7 Offset Area 3: Shrubby Regrowth

C.2.8 Cypress Pine Forest (Unit 18)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs on two ridgeline and slope areas in the southern portion of Offset Area 3 with small scattered occurrences on the foothills within the central portion. The canopy is dominated by *Callitris endlicheri* (Black Cypress Pine), with *Eucalyptus albens* (White Box) occurring less frequently. Both canopy species occur in the small tree layer, along with *Acacia ixiophylla* (Sticky Leaved Wattle). The shrub layer includes *Bursaria spinosa* (Blackthorn), *Hakea tephrosperma* (Hooked Needlewood) and *Acacia ixiophylla* (Sticky Leaved Wattle). Grasses occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Austrostipa scabra* (Speargrass) and *Chloris ventricosa* (Tall Chloris). Other native species in the ground layer *Einadia hastata* (Berry Saltbush), *Einadia nutans* subsp. *linifolia*, *Einadia trigonos* (Fishweed), *Hypericum gramineum* (Small St John's Wort), *Dichondra repens* (Kidney Weed), *Desmodium brachypodium* (Large Tick-trefoil), *Desmodium varians* (Slender Tick-trefoil) and *Solanum prinophyllum* (Forest Nightshade). This community is shown in **Photograph C.8**.



Photograph C.8 Offset Area 3: Cypress Pine Forest

C.2.9 Derived Native Grassland (Unit DNG)

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit DNG – 6(1), 7(1) and 7(2))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG – 6(1) and 7(1))

All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within Offset Area 3 and is the result of clearing of the original woodland communities. Derived native grasslands within Offset Area 3 have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands varies within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Bothriochloa decipiens* var. *decipiens*, *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Sporobolus creber* (Slender Rat's Tail Grass) and *Digitaria brownii* (Cotton Panic Grass). Non-grass species also occurring in the ground layer at varying frequencies include *Sida corrugata* (Corrugated Sida), *Glycine tabacina*, *Oxalis perennans*, *Rumex brownii* (Swamp Dock), *Geranium solanderi* (Native Geranium), *Einadia nutans* (Climbing Saltbush) and *Wahlenbergia communis* (Tufted Bluebell). Exotic species



occur within most patches of this community, and include *Urochloa panicoides* (Urochloa Grass) and *Medicago sativa* (Lucerne). An example of this community is shown in **Photograph C.9**.



Photograph C.9 Offset Area 3: Derived Native Grassland

C.3 Flora

Nearly 200 flora species have been recorded within Offset Area 3. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae, Chenopodiaceae and Fabaceae (Faboideae). Non-grass herbaceous groundcovers have the highest diversity, followed by grasses and shrubs. Approximately 23% of the flora species occurring within Offset Area 1 are exotic species. Exotic species occurred across the Offset Area 1, particularly where previous clearing for agricultural purposes has been undertaken.

One threatened flora species, *Cymbidium canaliculatum* (Tiger Orchid) has been recorded at a few locations within Offset Area 3. This species forms an Endangered Population in the Hunter catchment listed under the TSC Act. The species occurs in Slaty Box Woodland, and Cypress Pine Forest. Extensive areas of suitable habitat for this species occur throughout Offset Area 3. The occurrence of this species within Offset Area 2 is shown in **Figure C.3**.



C.4 Fauna

C.4.1 Fauna Habitat

There are extensive areas of connected forest, woodland and grassland within Offset Area 3 that provides moderate to good quality habitat for a wide variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity varies across the offset, with areas grassy and shrubby understorey vegetation. The canopy species present within the offset are dominated by Box species (*Eucalyptus albens*, *Eucalyptus moluccana*, *Eucalyptus melliodora*, *Eucalyptus conica*, *Eucalyptus dawsonii*). There are also areas dominated by *Callitris endlicheri*. The habitat features available are numerous and provide potential foraging, shelter and breeding opportunities for a variety of threatened fauna species. These habitats occur at a range of altitudes; areas of gently undulating topography, along drainage lines, ridgetops and valley floors.

Key habitat features within Offset Area 3 include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter, coarse woody debris and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna; and
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores.

Connectivity within the offset is maintained by existing patches of woodland connected to extensive areas outside the site.

C.4.2 Fauna Species

The habitat features available within Offset Area 3 provides habitat for a suite of native species. Over 70 vertebrate fauna species have been recorded, including 56 birds and 16 mammals. The majority of species are native, with only three exotic species recorded, namely Foxes (*Vulpes vulpes*), Rabbits (*Oryctolagus cuniculus*) and feral Pigs (*Sus scrofa*).

The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Offset Area 3:

- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);



- Barking Owl (*Ninox connivens*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Diamond Firetail (*Stagonopleura guttata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Varied Sittella (*Daphoenositta chrysoptera*) (TSC Act: Vulnerable; EPBC Act: not listed); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded within Offset Area 2 are shown on **Figure C.4**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. Three threatened microbats, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Eastern Cave Bat (*Vespadelus troughtoni*), are assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by Offset Area 3 for threatened fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table C.2**. The habitats provided by Offset Area 3 are currently in moderate to good condition.

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Known	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses, in dams and grassland areas. Breeding/nesting habitat present in the form of woodland adjacent to watercourses and dams.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Potential	Foraging and breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Known	Potential	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated forests and woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	Potential	Potential	It is expected that this species would forage in stands of Allocasuarinas within woodland and forest vegetation. Nesting habitat is present within the offset area in the form of large hollows.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Known	Foraging habitat within the offset area includes Yellow Box Woodland, White Box Woodland and Slaty Box Woodland. It is expected that this species would favour areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland. Water resources available in form of dams, drainage lines and creeks. Breeding/nesting habitat present in the form of shrubby understorey vegetation and other nests.

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key nectar producing trees, including <i>Eucalyptus albens</i> (White Box), <i>E. melliodora</i> (Yellow Box) and <i>Angophora floribunda</i> (Rough-barked Apple). Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat present in the form of eucalypts.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Potential	Foraging habitat present in the form of

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								woodland. Breeding/nesting habitat in proximity to watercourses.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Potential	Potential foraging habitat occurs in the form of vegetated gullies, and breeding habitat occurs in the form of eucalypt-dominated woodland.
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Known	Foraging habitat present in woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Potential	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs in the form of eucalypt-dominated woodlands with an open understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Potential	The offset area contains suitable foraging

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								and breeding habitat for the species in both summer and winter. Suitable summer habitat occurs in the form of rocky eucalypt-dominated hills, and winter habitat occurs as woodland vegetation in open valleys. Suitable breeding habitat in the form of woodland and forest occurs throughout.
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Breeding/nesting habitat present in the form of shrubs, sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Potential	Abundant foraging habitat present in the form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in Eucalyptus albens (White Box). No breeding/nesting habitat

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Potential	Foraging habitat present at the edges of eucalypt woodland adjoining clearings. Breeding/nesting habitat present in the form of tree hollows, logs and posts.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Potential	Foraging habitat for this species occurs in eucalypt-dominated vegetation across the offset area, particularly in densely vegetated gullies and areas with a shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Known	Suitable foraging and breeding habitat occurs within the offset area with suitable habitat for prey items present within woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area with suitable habitat for prey items being present within

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occur within the offset area, with suitable habitat for prey items being present within woodland vegetation. Nesting habitat is present within the offset area in the form of large hollow-bearing trees within remnant woodland and forest vegetation.
Mammals								
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Potential	Suitable habitat in the form of forest and woodland vegetation. Potential den sites present in the form of rocks, hollow-bearing trees and fallen logs.
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Potential	Extensive areas of foraging habitat across the offset area in the form of forest and woodland. Breeding/roosting habitat

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Unlikely	Suitable foraging habitat within offset area, no suitable shelter habitat in the form of cliffs.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Potential	Potential habitat in Box-dominated woodland. Nesting habitat in the form of hollow-bearing trees
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Foraging habitat in the form of eucalypt-dominated open forest and woodland. Feed trees in the form of <i>Eucalyptus albens</i> (White Box) and <i>E. conica</i> (Fuzzy Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat occurs within the offset area in the form of eucalypt-dominated forest and woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Potential	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. Limited

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								suitable roosting habitat.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Possible	Extensive areas of foraging habitat across the offset area occurs in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. Limited suitable roosting habitat.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. Limited suitable roosting habitat.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known*	Potential	Potential	Extensive areas of foraging habitat across the offset area in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Possible	Extensive areas of foraging habitat across the offset area occurs in the form of

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. Limited suitable roosting habitat.
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Potential	Suitable forage and shelter habitat occurs within woodland and shrubby woodland communities within the offset area.
Reptiles								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Unlikely	Limited suitable summer habitat occurs in hollow bearing trees adjacent to cliff lines.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding habitat for the species occurs within the grasslands and grassy woodland communities of the offset area.
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Potential	Suitable shelter habitat occurs in the form of tree hollows and fallen logs, and the

Table C.2 Assessment of habitat values provided by Offset Area 3 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 3	Habitat Features Present
								presence of suitable prey species provide foraging resources.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

**Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)*

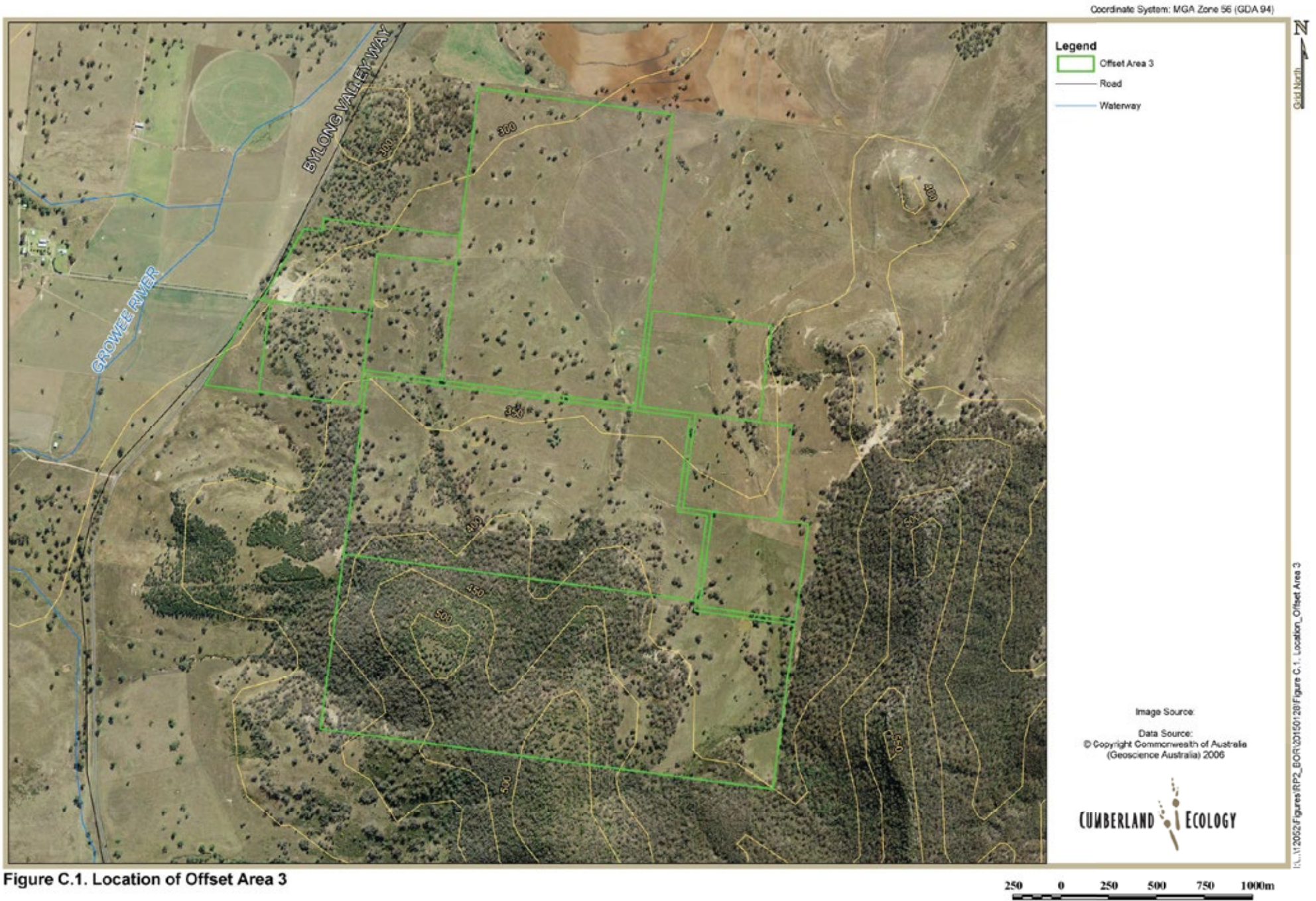
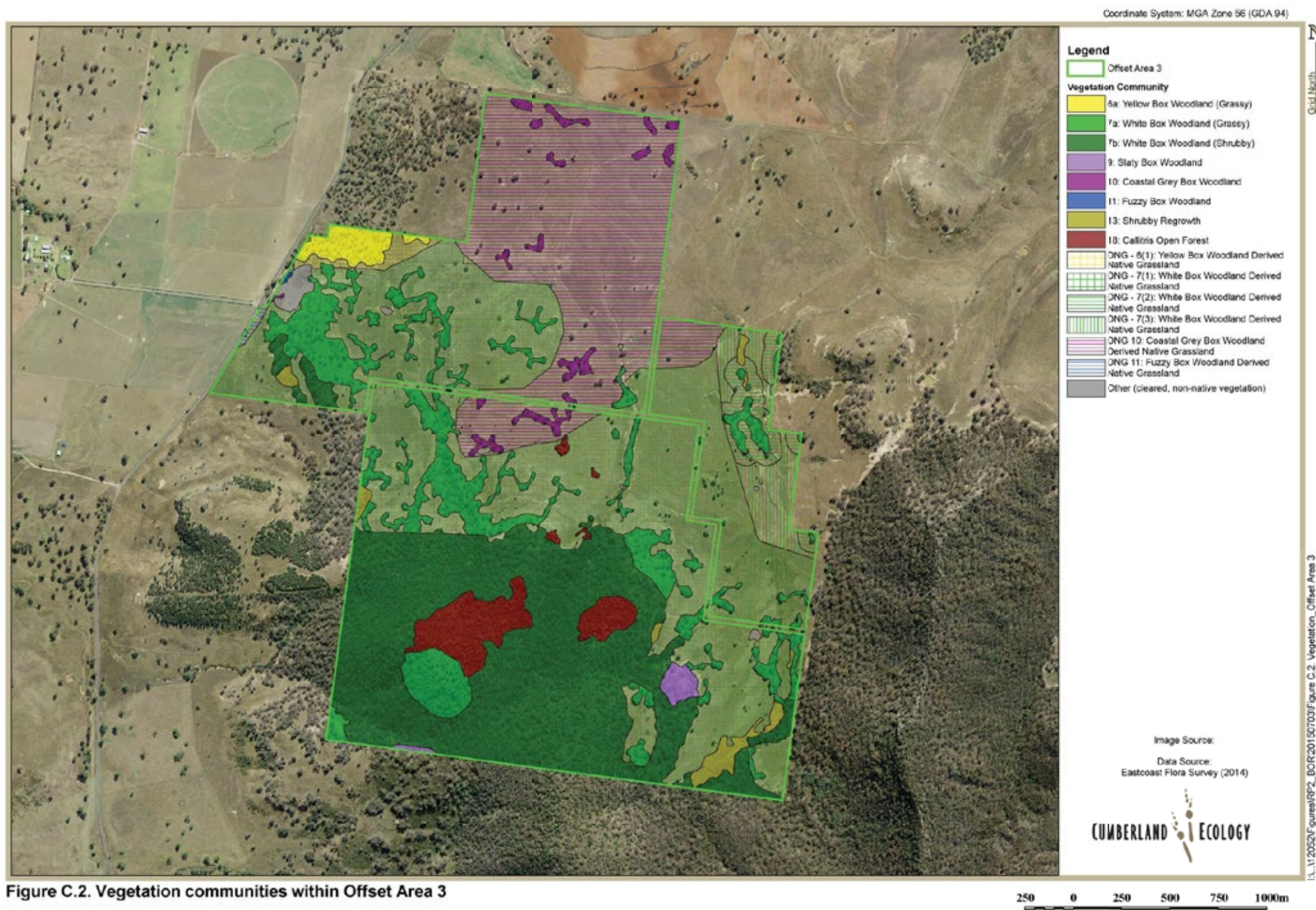


Figure C.1. Location of Offset Area 3



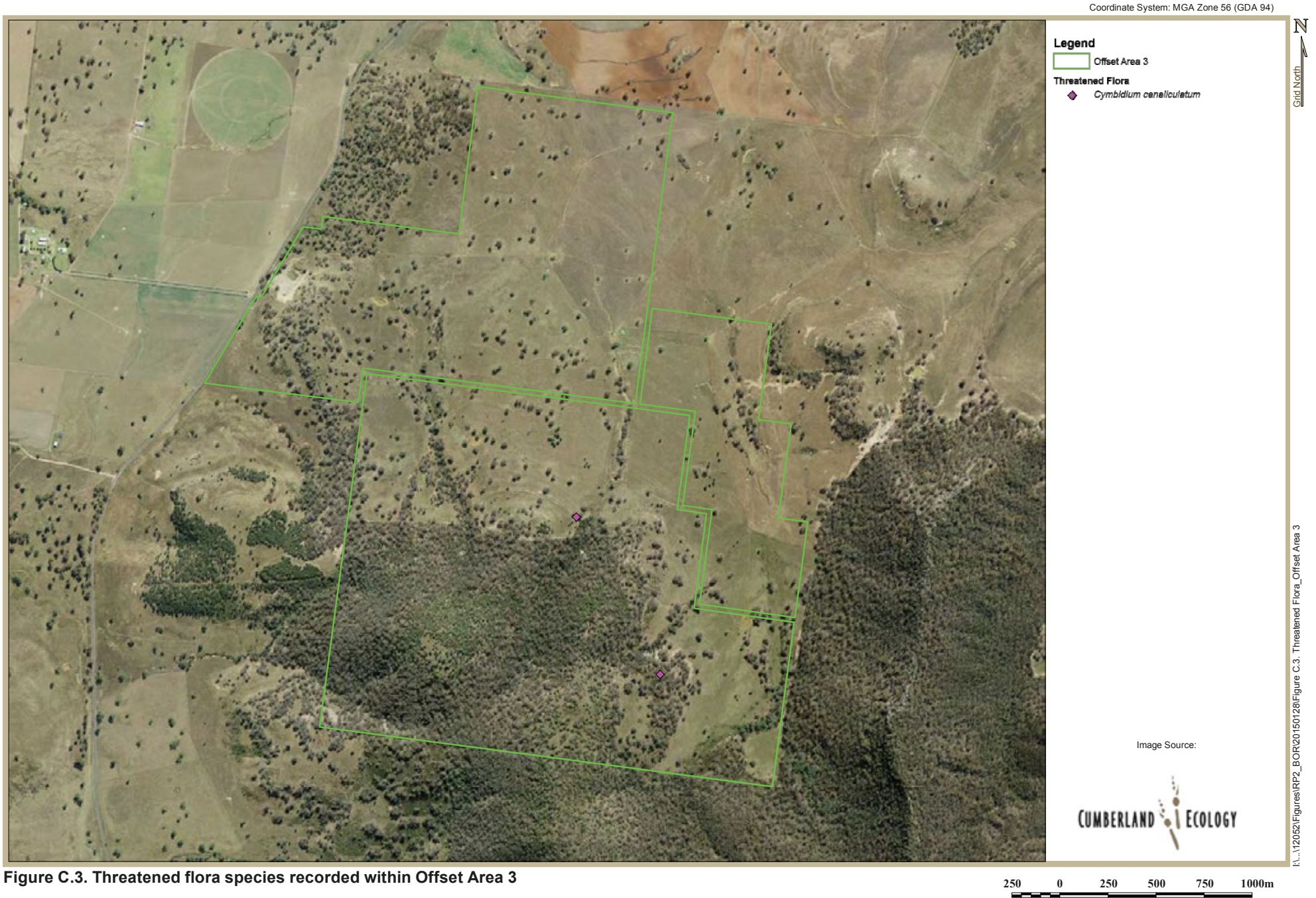


Figure C.3. Threatened flora species recorded within Offset Area 3

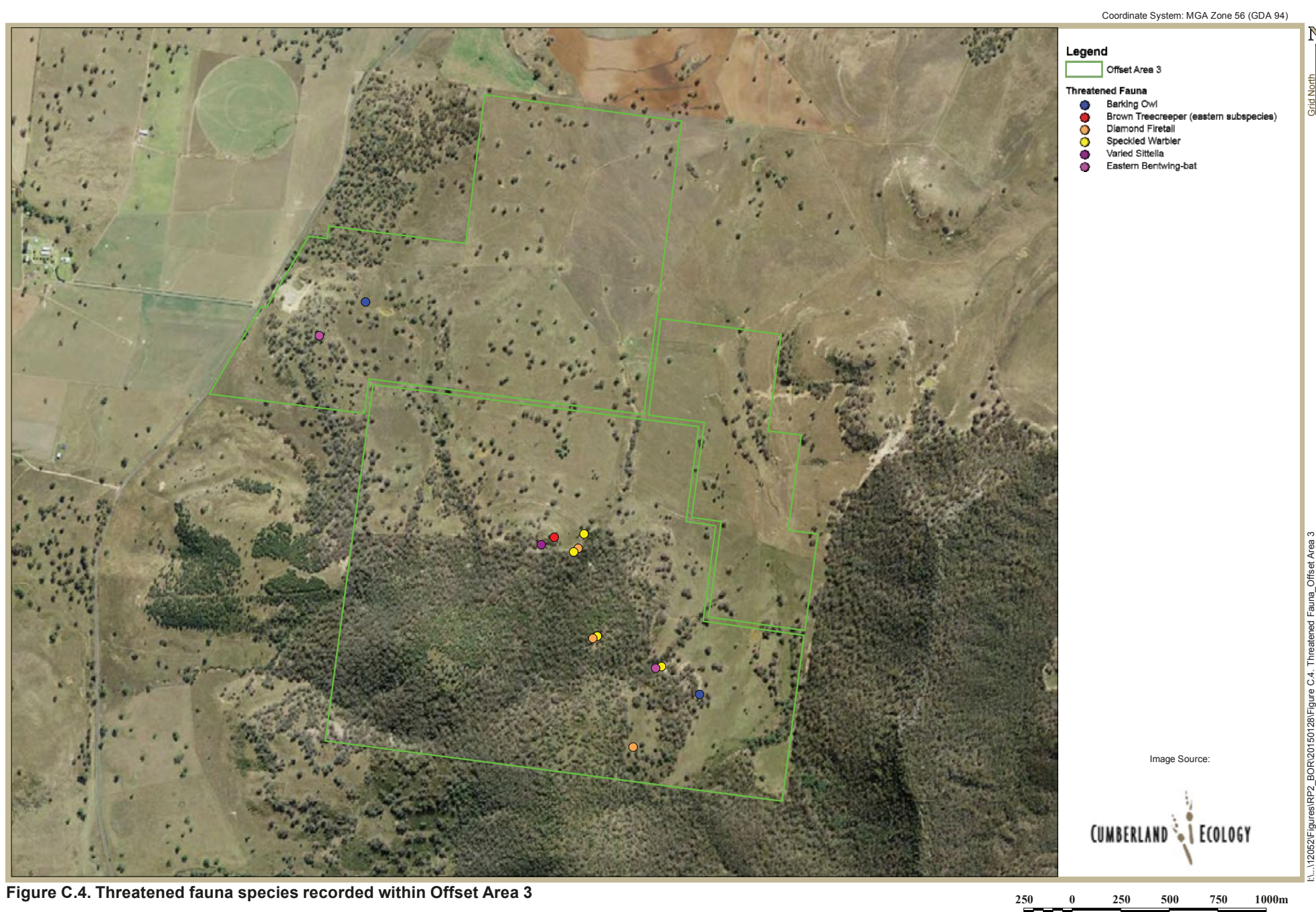


Figure C.4. Threatened fauna species recorded within Offset Area 3



Appendix D

Profile: Offset Area 4



D.1 Introduction

Name: Offset Area 4

Area: 380 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 1 DP 199850; Lot 1 DP 420435; Lot 8, 13, 14, 15, 21, 27, 28, 29, 45, 69, 70 and 71 DP 755419; Lot 1 DP 1088401

Zoning: RU1- Primary Production

Location: Bylong, 3 km west of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

Offset Area 4 comprises valley floors with some elevated areas. The valley floor extends across much of the offset with elevated areas occurring along the southern boundary. The lowest lying portions of the offset occur at approximately 290 m Australian Height Datum (AHD) and the highest points occur at 370 m AHD. The majority of the offset has been cleared for agriculture, however there are fragments of woodland are scattered across the offset. Growee River occurs in the eastern portion of the offset, meandering from south to north. The location of Offset Area 4 is shown in **Figure D.1**.

D.2 Vegetation Communities

The vegetation within Offset Area 4 comprises fragmented woodland and extensive areas of agricultural land. The vegetation within this area is largely a reflection of topography and land use history. **Table D.1** lists the vegetation communities occurring within Offset Area 4, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure D.2**.



Table D.1 Vegetation communities within Offset Area 4

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha)~
4: Apple Riparian Woodland			
4b: Apple/Yellow Box Riparian Forest	-	-	7
6: Yellow Box Woodland			
6a: Yellow Box Woodland (Grassy)	EEC	CEEC	19
7: White Box Woodland			
7a: White Box Woodland (Grassy)	EEC	CEEC	5
10: Coastal Grey Box Woodland	-	-	2
DNG: Derived Native Grassland			
DNG – 4: Apple Riparian Forest Derived Native Grassland	-	-	33
DNG – 6(1)*: Yellow Box Woodland Derived Native Grassland	EEC	CEEC	49
DNG – 6(2)^: Yellow Box Woodland Derived Native Grassland	EEC	-	11
DNG – 6(3)#: Yellow Box Woodland Derived Native Grassland	-	-	25
DNG – 7(1)*: White Box Woodland Derived Native Grassland	EEC	CEEC	34
DNG – 7(2)^: White Box Woodland Derived Native Grassland	EEC	-	17
DNG – 7(3)#: White Box Woodland Derived Native Grassland	-	-	109
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	-	-	<1
CC: Cultivated Lands			69
Other (cleared, planted vegetation)			<1
<i>Total Native Vegetation⁺</i>			311
<i>Total Non-native Vegetation and Cleared⁺</i>			69
TOTAL AREA⁺			380

TSC Act / EPBC Act Status: EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

* DNG sub-unit (1) represents grassland subunits listed under both the TSC Act and EPBC Act

^DNG sub-unit (2) represents grassland subunits listed only under the TSC Act

#DNG sub-unit (3) represents grassland subunits not listed under the TSC Act or EPBC Act

⁺ In some cases totals may not equal the appropriate total number due to rounding

~ Area calculations are approximate



D.2.1 Apple / Yellow Box Riparian Forest (Unit 4b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered woodland patches within the northern portions of Offset Area 4. The canopy is dominated by *Angophora floribunda* (Rough-barked Apple) with *Eucalyptus melliodora* (Yellow Box) occurring less frequently. Small trees and shrubs are largely absent in this community, however the exotic *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush) and *Rosa rubiginosa* (Sweet Briar) occur in low abundances. This community has a grassy understorey dominated by *Austrostipa verticillata* (Slender Bamboo Grass) with *Microlaena stipoides* (Weeping Grass) also occurring. The exotic grasses *Pennisetum clandestinum* (Kikuyu Grass) and *Bromus molliformis* (Soft Brome) are also common. Other natives occurring in the ground layer include *Sida corrugata* (Corrugated Sida), *Dichondra repens* (Kidney Weed), *Atriplex semibaccata* (Creeping Saltbush) and *Einadia hastata* (Berry Saltbush). Exotic species occurring in the ground layer include *Malva parviflora* (Small-flowered Mallow), *Rapistrum rugosum* (Turnip Weed), *Modiola caroliniana* (Red-flowered Mallow), *Lepidium bonariense* and *Carthamus lanatus* (Saffron Thistle). This community is shown in **Photograph D.1**.



Photograph D.1 Offset Area 4: Apple / Yellow Box Riparian Forest



D.2.2 Yellow Box Woodland (Grassy) (Unit 6a)

TSC Act Status: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs as scattered woodland patches within the eastern and western portions of Offset Area 4. The canopy is dominated by *Eucalyptus melliodora* (Yellow Box), with *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) occurring less frequently. *Brachychiton populneus* subsp. *populneus* (Kurrajong) occurs in the small tree layer. This community has a grassy understorey, with common native grasses including *Austrostipa verticillata* (Slender Bamboo Grass), *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* (Speargrass) and *Chloris ventricosa* (Tall Chloris). Other natives occurring in the ground layer include *Einadia trigonos* (Fishweed), *Sida corrugata* (Corrugated Sida), *Eremophila debilis* (Winter Apple) and regenerating *Brachychiton populneus* subsp. *populneus* (Kurrajong). The climber *Glycine tabacina* also occurs within this community. Patches of this community have been heavily grazed, resulting in low abundances of non-grass understorey species. Exotic species occurring in this community include *Modiola caroliniana* (Red-flowered Mallow), *Brassica* sp., *Marrubium vulgare* (White Horehound), *Lepidium bonariense* and *Senecio madagascariensis* (Fireweed). This community is shown in **Photograph D.2**.



Photograph D.2 Offset Area 4: Yellow Box Woodland (Grassy)



D.2.3 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs as scattered woodland patches within the central and southern portions of Offset Area 4. The canopy is dominated by *Eucalyptus albens* (White Box). Small trees and shrubs are largely absent in this community. This community has a grassy understorey, with common native grasses including *Austrostipa verticillata* (Slender Bamboo Grass), *Austrostipa scabra* (Speargrass) and *Chloris ventricosa* (Tall Chloris). Other natives occurring in the ground layer include *Einadia trigonos* (Fishweed), *Dichondra repens* (Kidney Weed), *Eremophila debilis* (Winter Apple), *Salsola australis* and *Lomandra filiformis* (Wattle Mat-rush). The climber *Glycine tabacina* also occurs within this community. Patches of this community have been heavily grazed, resulting in low abundances of non-grass understorey species. Exotic species occurring in this community include *Malva parviflora* (Small-flowered Mallow), *Modiola caroliniana* (Red-flowered Mallow), *Bromus* sp., *Pennisetum clandestinum* (Kikuyu Grass) and *Rapistrum rugosum* (Turnip Weed). This community is shown in **Photograph D.3**.



Photograph D.3 Offset Area 4: White Box Woodland (Grassy)



D.2.4 Coastal Grey Box Woodland (Unit 10)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as on the western boundary of Offset Area 4. The canopy is dominated by *Eucalyptus moluccana* (Grey Box) with *Brachychiton populneus* subsp. *populneus* (Kurrajong) occurring in the small tree layer. Shrubs are largely absent from this community. This community has a grassy understorey, with common native grasses including *Austrostipa verticillata* (Slender Bamboo Grass), *Austrostipa scabra* (Speargrass) and *Aristida* sp. Other natives occurring in the ground layer include *Einadia trigonos* (Fishweed), *Lomandra filiformis* subsp. *coriacea* and *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush). Exotic species occurring in this community include *Lepidium bonariense*, *Centaurea* sp., *Senecio madagascariensis* (Fireweed), *Sida rhombifolia* (Paddy's Lucerne) and *Marrubium vulgare* (White Horehound). This community is shown in **Photograph D.4**.



Photograph D.4 Offset Area 4: Coastal Grey Box Woodland

D.2.5 Derived Native Grassland (Unit DNG)

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit DNG – 6(1), 6(2), 7(1) and 7(2))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG – 6(1) and 7(1))



All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within Offset Area 4 and is the result of clearing of the original woodland communities. Derived native grasslands within Offset Area 4 have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands varies within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Bothriochloa decipiens* var. *decipiens*, *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Sporobolus creber* (Slender Rat's Tail Grass) and *Digitaria brownii* (Cotton Panic Grass). Non-grass species also occurring in the ground layer at varying frequencies include *Wahlenbergia communis* (Tufted Bluebell), *Sida corrugata* (Corrugated Sida), *Dysphania pumilio*, *Glycine tabacina*, *Calotis lappulacea* (Yellow Burr-daisy), *Geranium solanderi* (Native Geranium), *Boerhavia dominii* (Tarvine) and *Tribulus micrococcus* (Yellow Vine). Exotic species occur within most patches of this community, and include *Urochloa panicoides* (Urochloa Grass), *Hypericum perforatum* (St. Johns Wort), *Malva parviflora* (Small-flowered Mallow) and *Schkuhria pinnata* var. *abrotanoides*. An example of this community is shown in **Photograph D.5**.



Photograph D.5 Offset Area 4: Derived Native Grassland



D.3 Flora

Over 110 flora species have been recorded within Offset Area 4. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae and Chenopodiaceae. Non-grass herbaceous groundcovers have the highest diversity, followed by grasses. Approximately 37% of the flora species occurring within Offset Area 2 are exotic species. Exotic species occurred across the Offset Area 4, particularly where previous clearing for agricultural purposes has been undertaken. No threatened flora species have been recorded within Offset Area 4.

D.4 Fauna

D.4.1 Fauna Habitat

There are some areas of connected woodland and grassland within Offset Area 4 that provides low to moderate quality habitat for a variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity is largely similar across the offset with a predominantly grassy understorey. The canopy species present within the offset are dominated by Box species (*Eucalyptus albens*, *Eucalyptus melliodora*, *Eucalyptus moluccana*). The habitat features available are limited, however the habitat present provides potential foraging, shelter and breeding opportunities for a number of threatened fauna species. These habitats largely occur in valley floor areas.

Key habitat features within Offset Area 4 include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground vegetation, leaf litter and coarse woody debris suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna; and
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores.

Connectivity within the offset is limited, with fragment remnant woodland patches scattered throughout.

D.4.2 Fauna Species

The habitat features available within Offset Area 4 provides some habitat for native species. Over 30 vertebrate fauna species have been recorded, including one frog, 20 birds, 10 mammals and one reptile. The majority of species are native, with only cattle (*Bos taurus*) recorded during limited surveys.



The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Offset Area 4:

- Large-eared Pied Bat (*Chalinolobus dwyeri*) (TSC Act: Vulnerable; EPBC Act Status: Vulnerable); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded within Offset Area 2 are shown on **Figure D.3**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. Two threatened microbats, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) and Eastern Cave Bat (*Vespadelus troughtoni*), are assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by Offset Area 4 for threatened fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table D.2**. The habitats provided by Offset Area 4 are currently in low to moderate condition.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Potential	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses, in dams and grassland areas. Limited breeding/nesting habitat present in the form of woodland adjacent to watercourses and dams.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Potential	Foraging and limited breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Potential	Potential	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	Potential	Unlikely	No suitable foraging habitat in the form of Allocasuarinas occurs within the offset area. Though large hollow bearing trees occur, it is unlikely that these would be utilised due to their lack of proximity to suitable forage resources.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Potential	Foraging habitat within the offset area includes White Box Woodland and Yellow Box Woodland, favouring areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Water resources available in form of dams and creeks. Breeding/nesting habitat limited due to a lack of shrubby understory vegetation.
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key nectar producing trees, <i>Eucalyptus albens</i>

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
								(White Box), <i>E. melliodora</i> (Yellow Box) <i>E. blakelyi</i> (Blakely's Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple). Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	Potential	Foraging habitat present in the form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat present in the form of eucalypts.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Potential	Foraging habitat present in the form of woodland. Breeding/nesting habitat in proximity to watercourses.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Unlikely	Limited foraging and nesting habitat present, with no densely vegetated gullies occurring on the offset area.
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Potential	Foraging habitat present woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Potential	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Unlikely	Limited suitable foraging and breeding habitat occurs in the form of eucalypt-dominated woodlands with an open understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Unlikely	Limited suitable foraging and breeding habitat for the species in and winter and no summer habitat present.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Limited breeding/nesting habitat present in the form of sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Potential	Foraging habitat present in the form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts.
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in <i>Eucalyptus albens</i> (White Box). No breeding/nesting habitat present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Unlikely	Limited foraging habitat present at the edges of eucalypt woodland adjoining clearings.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Unlikely	Limited foraging habitat for this species occurs within the offset area as a result of the lack of vegetated gullies or dense

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
								shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Potential	Some suitable foraging and breeding habitat occurs within the offset area with suitable habitat for prey items present within woodland vegetation. Limited nesting habitat is present within the offset area.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Unlikely	Limited suitable foraging and breeding habitat occurs within the offset area in the form of intact woodland and hollow-bearing trees.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Unlikely	Limited suitable foraging and breeding habitat occurs within the offset area in the form of intact woodland and hollow-bearing trees.
Mammalia								
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Unlikely	Limited suitable habitat available, open grassy woodland not typically suitable for the species, lacks rocks and large areas of hollow logs.

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V		Known	Known	Potential	Areas of foraging habitat within the offset area in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Unlikely	No suitable habitat available, no cliff lines in close proximity to offset area.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Potential	Potential habitat in Box-dominated open forest and woodland. Nesting habitat in the form of hollow-bearing trees.
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Some foraging habitat in the form of eucalypt-dominated woodland. Feed trees in the form of <i>Eucalyptus albens</i> (White Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat occurs within the offset area in the form of eucalypt-dominated woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Suitable foraging habitat occurs within offset area in the form of woodland

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
								located in proximity to cliff lines. No suitable roosting habitat in the form of cliffs.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Possible	Areas of foraging habitat within the offset area occurs in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. No suitable shelter habitat in the form of cliffs.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. No suitable shelter habitat in the form of cliffs.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known*	Potential	Potential	Areas of foraging habitat within the offset area in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Potential	Areas of foraging habitat within the offset area in the form of woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Suitable foraging habitat occurs within offset area in the form of woodland located in proximity to cliff lines. No suitable shelter habitat in the form of cliffs.
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Unlikely	Habitat for the species is considered unsuitable within this area due to its isolation from areas of vegetation with a dense shrub layer.
Reptilia								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Unlikely	Limited suitable summer habitat in the form of hollow bearing trees exist, however these occur in a highly fragmented landscape.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding

Table D.2 Assessment of habitat values provided by Offset Area 4 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 4	Habitat Features Present
		Lizard						habitat for the species occurs within the grasslands and grassy woodland communities of the offset area
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Unlikely	Limited suitable habitat is available within this offset area, with limited hollow logs and rock crevices available.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)

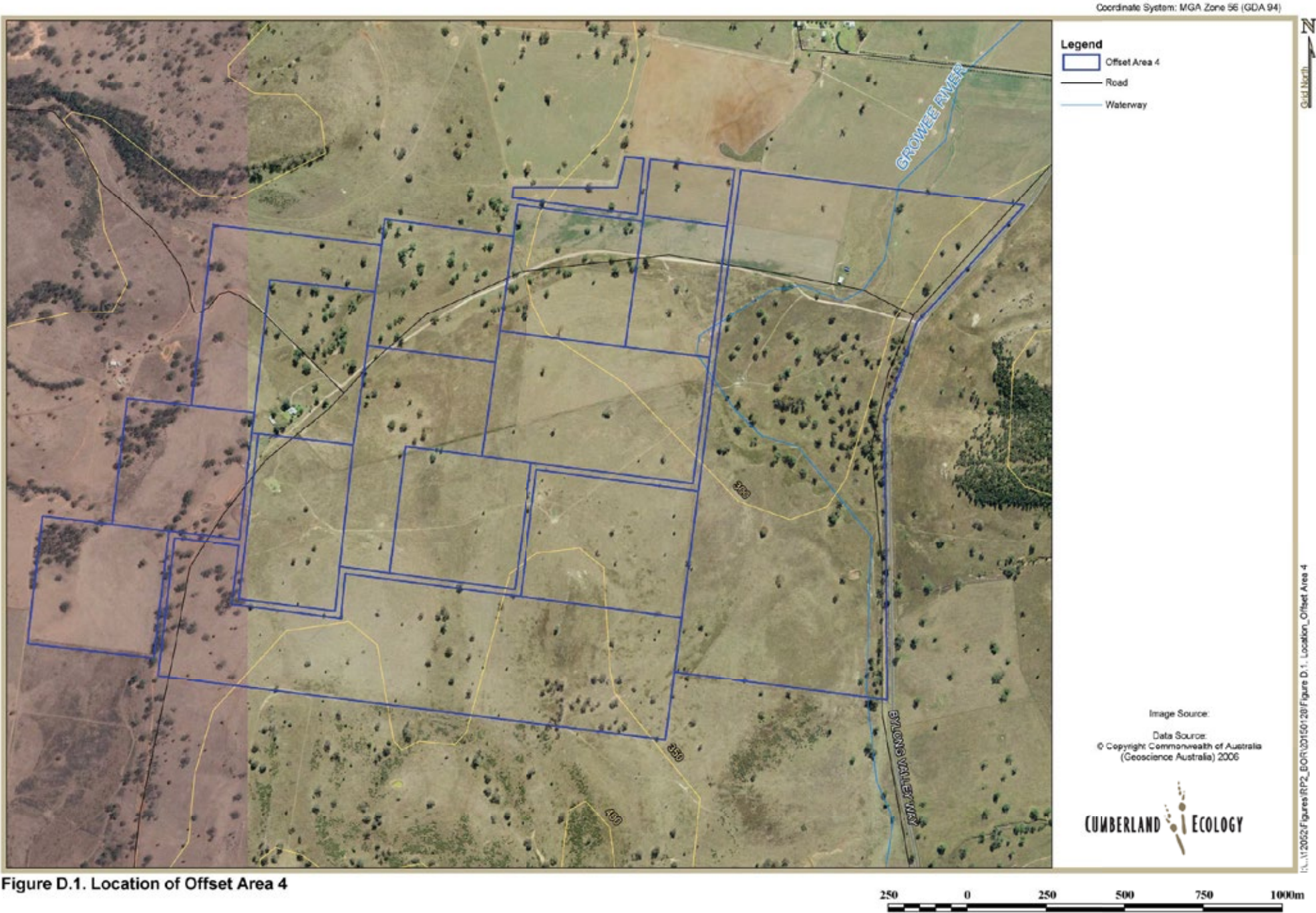


Figure D.1. Location of Offset Area 4

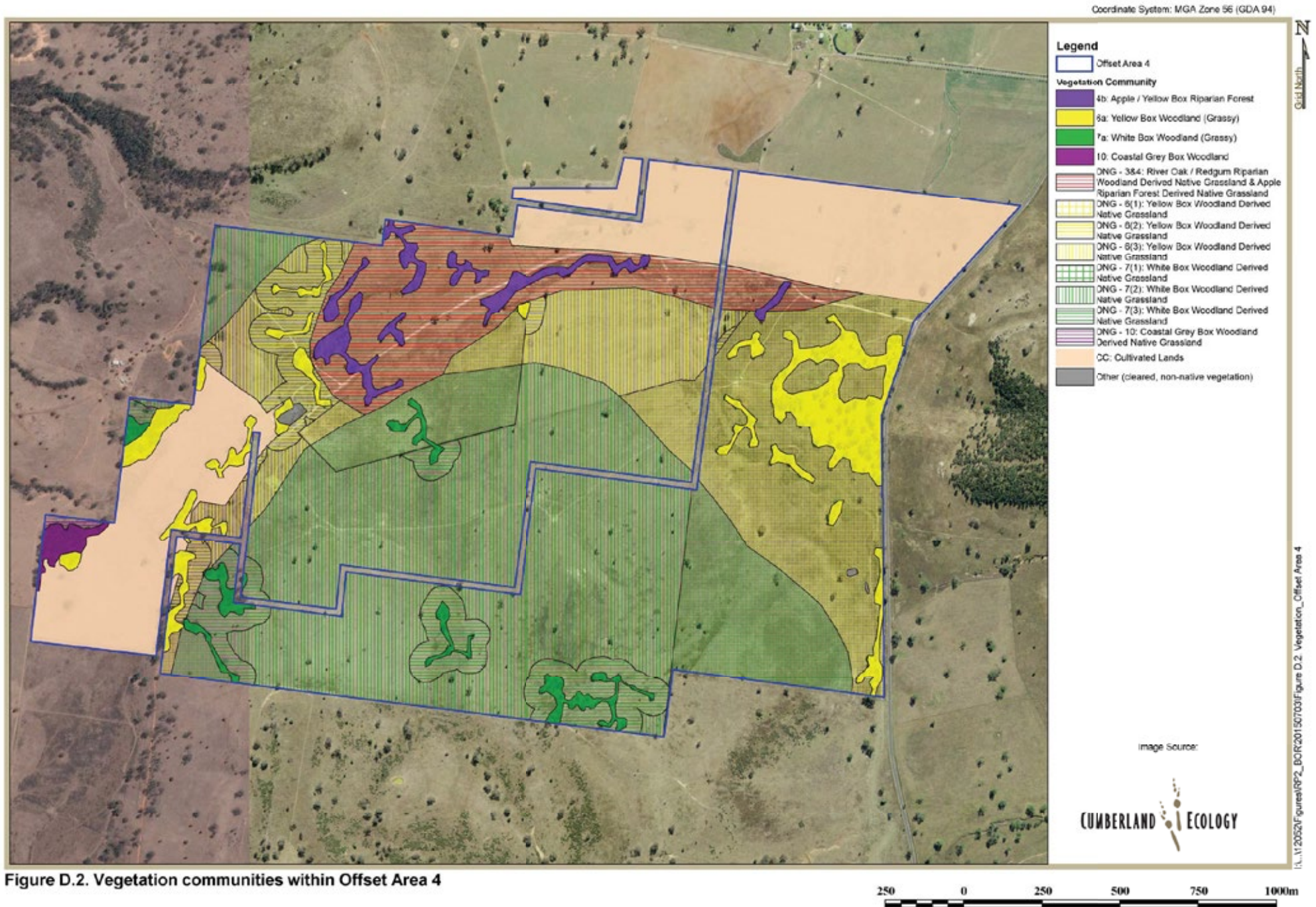


Figure D.2. Vegetation communities within Offset Area 4

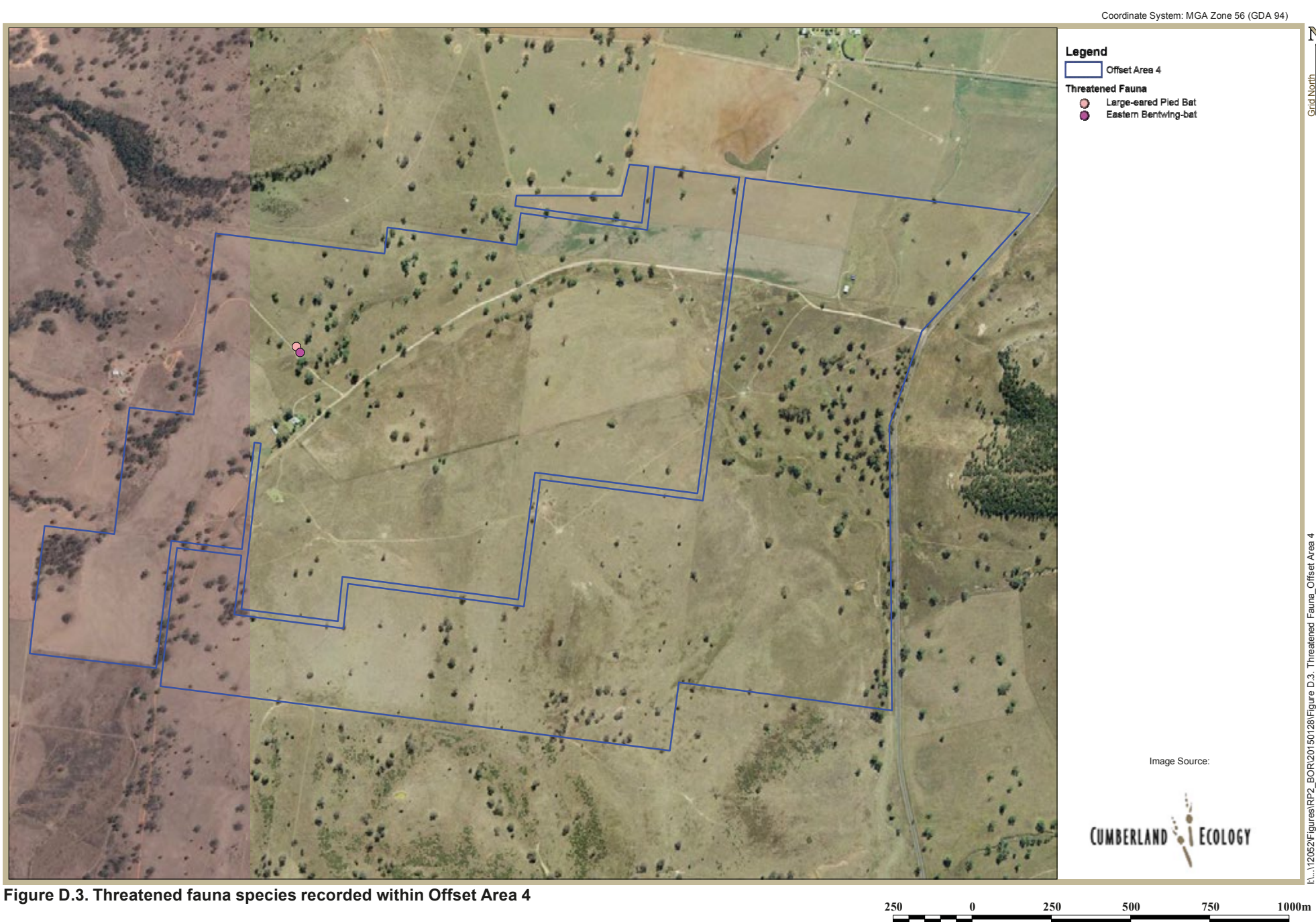


Figure D.3. Threatened fauna species recorded within Offset Area 4



Appendix E

Profile: Offset Area 5



E.1 Introduction

Name: Offset Area 5

Area: 1,512 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 2 (part) DP 222796; Lot 1 DP 512928; Lot 3, 4, 5, 6, 7, 21, 23, 24, 25, 46 and 47 DP 755420; Lot 86, 187 and 188 DP 755421; Lot 1 (part) DP 1094509; Lot 1 (part) DP 1146893

Zoning: RU1- Primary Production

Location: Bylong/Upper Bylong, adjoining the northern boundary of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

Offset Area 5 comprises valley floors, foothills, upper slopes and hill top areas. The valley floor extends east/west through the offset, widening in the west. The lower lying portions of the offset occur at approximately 260 m Australian Height Datum (AHD) and have largely been cleared for agriculture. Dry Creek occurs in the northern portion of the offset, with a number of drainage lines flowing into this watercourse. Numerous topographic highs occur within the offset, with the highest point occurring in the southern eastern portion at 490 m AHD, and sandstone cliffs are present. Intact native vegetation extends from the foothills up to the hill top areas. These areas comprise structurally diverse vegetation including formations along gullies, slopes, ridgelines and plateaus. The northern boundary of Offset Area 5 adjoins Goulburn River National Park. The location of Offset Area 5 is shown in **Figure E.1**.

E.2 Vegetation Communities

The vegetation within Offset Area 5 comprises both intact and fragmented woodland and areas of agricultural land. The vegetation within this area is largely a reflection of topography, geology and land use history. **Table E.1** lists the vegetation communities occurring within Offset Area 5, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure E.2**.



Table E.1 Vegetation communities within Offset Area 5

Vegetation Community	TSC Act	EPBC Act	Area Outside SSA (ha)	Area Within SSA (ha)	Total Area (ha) [~]
4: Apple Riparian Forest					
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	-	-	1	12	13
5: Blakely's Red Gum / Paperbark Forest	-	-		1	1
6: Yellow Box Woodland					
6a(1) ^A : <i>Yellow Box Woodland (Grassy)</i>	EEC	CEEC	20	109	129
6a(3) ^C : <i>Yellow Box Woodland (Grassy)</i>	-	-	<1		<1
7: White Box Woodland					
7a (1) ^A : <i>White Box Woodland (Grassy)</i>	EEC	CEEC	57	372	429
7b: <i>White Box Woodland (Shrubby)</i>	-	-	66	18	84
8: Blakely's Red Gum Woodland					
8b: <i>Blakely's Red Gum Woodland (Shrubby)</i>	-	-		4	4
9: Slaty Box Woodland	VEC	-	109	99	209
10: Coastal Grey Box Woodland	-	-	6	<0	7
13: Shrubby Regrowth	-	-		1	1
14: Dwyer's Red Gum Low Open Forest	-	-	1		1
15: Caley's Ironbark Forest	-	-	6	51	57
16: Blue-leaf Ironbark / Cypress Forest*			26	76	103
19: Bloodwood / Ironbark Forest	-	-	13	17	29
21: Exposed Grey Gum / Stringybark Forest[^]	-	-	6	5	11
22: Sheltered Grey Gum / Stringybark Forest[^]					
DNG – 3: <i>River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	-	-	<1	1	1
DNG – 4: <i>Apple Riparian Forest Derived Native Grassland[#]</i>					
DNG – 6(1) ^A : <i>Yellow Box Woodland Derived Native Grassland</i>	EEC	CEEC	15	5	20
DNG – 6(2) ^B : <i>Yellow Box Woodland Derived Native Grassland</i>	EEC	-	17	60	77
DNG – 7(1) ^A : <i>White Box Woodland Derived Native Grassland</i>	EEC	CEEC	46	122	168
DNG – 7(2) ^B : <i>White Box Woodland Derived Native Grassland</i>	EEC	-	23	96	119
DNG – 8(1) ^A : <i>Blakely's Red Gum Woodland</i>	EEC	CEEC		<1	<1



Table E.1 Vegetation communities within Offset Area 5

Vegetation Community	TSC Act	EPBC Act	Area Outside SSA (ha)	Area Within SSA (ha)	Total Area (ha) [~]
<i>Derived Native Grassland</i>					
<i>DNG – 9: Slaty Box Woodland Derived Native Grassland</i>	-	-	9	13	22
<i>DNG – 10: Coastal Grey Box Woodland Derived Native Grassland</i>	-	-	12		12
CC: Cultivated Lands	-	-	13		13
Other (cleared, planted vegetation)	-	-	<1	2	2
<i>Total Native Vegetation⁺</i>			435	1,062	1,497
<i>Total Non-native Vegetation and Cleared⁺</i>			13	2	15
TOTAL AREA⁺			448	1,064	1,512

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

SSA = Subsidence Study Area

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^B Sub-unit (2) represents Box Gum Woodland and Derived Native Grassland listed only under the TSC Act

^C Sub-unit (3) represents Box Gum Woodland and Derived Native Grassland not listed only under the TSC Act and/or EPBC Act

*Includes areas of Caley's Ironbark Forest (Unit 15)

[^] Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate

E.2.1 Blakely's Red Gum / Apple Riparian Forest (Unit 4a)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs along two drainage lines within the central portion of Offset Area 5. The canopy is dominated by *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus blakelyi* (Blakely's Red Gum), with occasional occurrences of *Eucalyptus melliodora* (Yellow Box). A small tree layer and shrub layer are largely absent and exotic species are common in the ground layer. Native species occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Chloris ventricosa* (Tall



Chloris), *Geranium solanderi* (Native Geranium), *Einadia nutans* (Climbing Saltbush) and *Carex inversa* (Knob Sedge). Exotic species occurring in this community include *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush), *Medicago polymorpha* (Burr Medic), *Trifolium repens* (White Clover), *Modiola caroliniana* (Red-flowered Mallow), *Bidens pilosa* (Cobblers Pegs), *Malva parviflora* (Small-flowered Mallow) and *Medicago minima* (Woolly Burr Medic). This community is shown in **Photograph E.1**.



Photograph E.1 Offset Area 5: Blakely's Red Gum / Apple Riparian Forest

E.2.2 Blakely's Red Gum / Paperbark Forest (Unit 5)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at two locations within the south eastern portion of Offset Area 5. The canopy is dominated by *Eucalyptus blakelyi* (Blakely's Red Gum), with occasional occurrences of *Eucalyptus albens* (White Box). Species occurring in the shrub layer include *Swainsona galegifolia* (Smooth Darling-pea), *Acacia linearifolia* (Narrow-leaved Wattle), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Cassinia arcuata* (Sifton Bush) and *Melaleuca thymifolia* (Thyme Honey-myrtle). The ground layer is dominated by a range of non-grass herbaceous species. Native species occurring in the ground layer include *Brunoniella australis* (Blue Trumpet), *Wahlenbergia gracilis* (Sprawling Bluebell), *Scleria mackaviensis*, *Austrostipa scabra* (Speargrass), *Solenogyne bellioides*, *Dichondra repens* (Kidney Weed) and *Dianella revoluta* (Blueberry Lily). This community is shown in **Photograph E.2**.



Photograph E.2 Offset Area 5: Blakely's Red Gum / Paperbark Forest

E.2.3 Yellow Box Woodland Grassy (Unit 6a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs extensively in the central portion of Offset Area 5, with some additional areas in the eastern portion. The canopy is dominated by *Eucalyptus melliodora* (Yellow Box), with occasional occurrences of *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus albens* (White Box). *Eucalyptus melliodora* (Yellow Box) also occurs in the small tree layer. Shrubs occurring in this community include *Cryptandra amara* var. *longiflora* (Bitter Cryptandra), *Acacia ixiophylla* (Sticky Leaved Wattle) and *Acacia decora* (Western Silver Wattle), as well as regenerating canopy species. The ground layer is dominated by a diversity of grasses including *Aristida ramosa* (Purple Wiregrass), *Sporobolus creber* (Slender Rat's Tail Grass), *Bothriochloa decipiens* var. *decipiens*, *Rytidosperma richardsonii* (Straw Wallaby-grass) and *Chloris ventricosa* (Tall Chloris). Other species in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Calotis lappulacea* (Yellow Burr-daisy), *Geranium solanderi* (Native Geranium), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Erodium crinitum* (Blue Storksbill) and *Oxalis exilis*. Exotic species occur frequently within this community and include *Medicago minima* (Woolly Burr Medic), *Anagallis arvensis* (Scarlet Pimpernel), *Bidens pilosa* (Cobblers Pegs) and *Centaurea calcitrapa* (Star Thistle). This community is shown in **Photograph E.3**.



Photograph E.3 Offset Area 5: Yellow Box Woodland (Grassy)

E.2.4 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs extensively in the central portion of Offset Area 5. This community is dominated by *Eucalyptus albens* (White Box), with occasional occurrences of *Eucalyptus moluccana* (Grey Box) at some locations. The shrub layer within this community is sparse and include regenerating canopy species, *Acacia implexa* (Hickory Wattle), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Swainsona galegifolia* (Smooth Darling-pea) and *Acacia ixiophylla* (Sticky Leaved Wattle). The ground layer is dominated by a diversity of grasses including *Aristida ramosa* (Purple Wiregrass), *Bothriochloa macra* (Red Grass), *Bothriochloa decipiens* var. *decipiens*, *Dichanthium sericeum* (Queensland Bluegrass), *Chloris ventricosa* (Tall Chloris) and *Austrostipa scabra* (Speargrass). Other species in the ground layer include *Cymbonotus lawsonianus* (Bears-ear), *Sida corrugata* (Corrugated Sida), *Oxalis perennans*, *Eremophila debilis* (Winter Apple). The climbers *Glycine microphylla* (Small-leaf Glycine) and *Glycine tabacina* also occur within this community. Exotic species occurring in this community include *Anagallis arvensis* (Scarlet Pimpernel), *Hypericum perforatum* (St. Johns Wort) and *Medicago minima* (Woolly Burr Medic). This community is shown in **Photograph E.4**.



Photograph E.4 Offset Area 5: White Box Woodland (Grassy)

E.2.5 White Box Woodland (Shrubby) (Unit 7b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at a number of locations within Offset Area 5, predominantly in the western portion. The canopy is dominated by *Eucalyptus albens* (White), which also occurs in the small tree layer. This community has a well-developed shrub layer and includes *Bursaria spinosa* (Blackthorn), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Acacia implexa* (Hickory Wattle), *Senna artemisioides* subsp. *zygophylla* and *Leucopogon ericoides* (Pink Beard-heath). Species occurring in the ground layer include *Calotis lappulacea* (Yellow Burr-daisy), *Dichondra repens* (Kidney Weed), *Einadia polygonoides*, *Solanum cinereum* (Narrawa Burr), *Aristida ramosa* (Purple Wiregrass) and *Chloris ventricosa* (Tall Chloris). The climber *Glycine tabacina* also occurs within this community. Portions of this community occurring in close proximity to agricultural land have a higher abundance of exotic species such as *Cerastium glomeratum* (Mouse-ear Chickweed), *Medicago polymorpha* (Burr Medic) and *Anagallis arvensis* (Scarlet Pimpernel). This community is shown in **Photograph E.5**.



Photograph E.5 Offset Area 5: White Box Woodland (Shrubby)

E.2.6 Blakely's Red Gum Woodland (Shrubby) (Unit 8b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs along two drainage lines within the northern portion of Offset Area 5. The canopy is dominated by *Eucalyptus blakelyi* (Blakely's Red Gum). The small tree layer includes *Acacia linearifolia* (Narrow-leaved Wattle) and *Eucalyptus blakelyi* (Blakely's Red Gum). Species occurring in the shrub layer include *Acacia implexa* (Hickory Wattle), *Olearia elliptica* (Sticky Daisy-bush), *Astroloma humifusum* (Native Cranberry), *Leucopogon ericoides* (Pink Beard-heath), *Swainsona galegifolia* (Smooth Darling-pea) and regenerating *Eucalyptus blakelyi* (Blakely's Red Gum). Species occurring in the ground layer include *Aristida vagans* (Threeawn Speargrass), *Aristida ramosa* (Purple Wiregrass), *Bothriochloa decipiens* var. *decipiens*, *Chloris ventricosa* (Tall Chloris) and *Cymbopogon refractus* (Barbed Wire Grass), *Lepidosperma urophorum*, *Brunoniella australis* (Blue Trumpet), *Dichondra repens* (Kidney Weed), *Desmodium varians* (Slender Tick-trefoil) and *Haloragis heterophylla* (Rough Raspwort). The climber *Glycine tabacina* also occurs within this community. Exotic species occurring in the ground layer include *Anagallis arvensis* (Scarlet Pimpernel), *Opuntia stricta* var. *stricta* (Common Prickly Pear) and *Medicago minima* (Woolly Burr Medic). This community is shown in **Photograph E.6**.



Photograph E.6 Offset Area 5: Blakely's Red Gum Woodland (Shrubby)

E.2.7 Slaty Box Woodland (Unit 9)

TSC Act Status: Hunter Valley Footslopes Slaty Gum Woodland (VEC)

EPBC Act Status: Not listed

This community occurs at a number of locations within Offset Area 5 in the southern, eastern and northern portions. The canopy is dominated by *Eucalyptus dawsonii* (Slaty Gum), with *Callitris endlicheri* (Black Cypress Pine) occurring in lower abundance. Other species occurring in the canopy include *Eucalyptus albens* (White Box) and *Eucalyptus punctata* (Grey Gum). Canopy trees also occur in the small tree layer along with *Acacia linearifolia* (Narrow-leaved Wattle). The shrub layer is variable within this community with areas of sparse and dense shrub cover. Species occurring in the shrub layer include *Bursaria spinosa* (Blackthorn), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Phebalium squamulosum* subsp. *gracile* (Scaly Phebalium), *Persoonia linearis* (Narrow-leaved Geebung) and *Acacia implexa* (Hickory Wattle). Species occurring in the ground layer include *Brunoniella australis* (Blue Trumpet), *Dichondra repens* (Kidney Weed), *Ajuga australis* (Austral Bugle), *Veronica plebeia* (Trailing Speedwell), *Austrostipa scabra* (Speargrass), *Aristida ramosa* (Purple Wiregrass) and *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush). The climber *Clematis aristata* (Old Man's Beard) also occurs in this community. This community is shown in **Photograph E.7**.



Photograph E.7 Offset Area 5: Slaty Box Woodland

E.2.8 Coastal Grey Box Woodland (Unit 10)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered patches in the western portion of Offset Area 5. The canopy is dominated by *Eucalyptus moluccana* (Grey Box), with *Eucalyptus albens* (White Box) occurring at some locations. The shrub layer is sparse and includes *Acacia ixiophylla* (Sticky Leaved Wattle), *Maireana microphylla* (Small-leaf Bluebush), *Acacia linearifolia* (Narrow-leaved Wattle) and *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush). The ground layer is dominated by grasses, including *Austrostipa scabra* (Speargrass), *Chloris ventricosa* (Tall Chloris), *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass) and *Bothriochloa decipiens* var. *decipiens*. Other species in the ground layer include *Dichondra repens* (Kidney Weed), *Vittadinia cuneata* (Fuzzweed), *Geranium solanderi* (Native Geranium), *Sida corrugata* (Corrugated Sida), *Oxalis perennans* and *Asperula conferta* (Common Woodruff). The climbers *Glycine tabacina* and *Glycine clandestina* also occur within this community. Exotic species occurring in this community include *Centaurea calcitrapa* (Star Thistle), *Anagallis arvensis* (Scarlet Pimpernel), *Sonchus oleraceus* (Common Sowthistle) and *Medicago minima* (Woolly Burr Medic). This community is shown in **Photograph E.8**.



Photograph E.8 Offset Area 5: Coastal Grey Box Woodland

E.2.9 Shrubby Regrowth (Unit 13)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as small patches at one location in the south eastern portion of Offset Area 5. This community is characterised by the presents of a dense shrub layer with emergent trees. Shrubs occurring in this community include *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), regenerating *Eucalyptus albens* (White Box), *Acacia decora* (Western Silver Wattle) and *Daviesia ulicifolia* (Gorse Bitter Pea). Emergent trees include *Eucalyptus albens* (White Box) and *Acacia implexa* (Hickory Wattle). Species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Senecio quadridentatus* (Cotton Fireweed), *Dichondra repens* (Kidney Weed), *Desmodium varians* (Slender Tick-trefoil), *Stackhousia viminea* (Slender Stackhousia), *Solanum cinereum* (Narrawa Burr), *Aristida ramosa* (Purple Wiregrass) and *Aristida vagans* (Threeawn Speargrass). The climber *Glycine tabacina* also occurs within this community. Exotic species occurring in the ground layer include *Hypericum perforatum* (St. Johns Wort), *Senecio madagascariensis* (Fireweed), *Anagallis arvensis* (Scarlet Pimpernel) and *Medicago minima* (Woolly Burr Medic). This community is shown in **Photograph E.9**.



Photograph E.9 Offset Area 5: Shrubby Regrowth

E.2.10 Dwyer's Red Gum Low Open Forest (Unit 14)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs in one small patch within Offset Area 5 along a ridgeline. This community was not sampled during surveys of Offset Area 5. Within the Study Area this community is characterised by a low and widely spaced canopy of *Eucalyptus dwyeri* (Dwyer's Red Gum), *Callitris endlicheri* (Black Cypress Pine) and *Acacia doratoxylon* (Currawang) (Eastcoast Flora Survey, 2014). Typical shrub species present include *Leptospermum parvifolium*, *Philotheca salsolifolia*, *Leucopogon muticus* (Blunt Beard-heath) and *Calytrix tetragona* (Common Fringe-myrtle), with *Cleistochloa rigida* and *Lomandra confertifolia* (Mat-rush) dominating the ground layer (Eastcoast Flora Survey, 2014).

E.2.11 Caley's Ironbark Forest (Unit 15)

TSC Act Status: Not listed

EPBC Act Status: Not listed



This community has scattered occurrences along the south eastern boundaries of Offset Area 5. The canopy is dominated by *Eucalyptus caleyi* subsp. *caleyi* with *Callitris endlicheri* (Black Cypress Pine) also occurring frequently. Both species also occur within the small tree layer. A diversity of shrubs occur in this community including *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Leptomeria acida* (Native Currant), *Cassinia quinquefaria*, *Melichrus erubescens* (Ruby Urn Heath), *Hovea lanceolata* and *Cassinia arcuata* (Sifton Bush). Species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Lagenophora stipitata* (Blue Bottle-daisy), *Solenogyne bellioides*, *Dichondra repens* (Kidney Weed), *Goodenia hederacea* (Forest Goodenia), *Austrostipa scabra* (Speargrass) and *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush). The climbers *Glycine tabacina* and *Glycine microphylla* (Small-leaf Glycine) also occur within this community. This community has few occurrence of exotic species which likely a result of its occurrence away from agricultural areas. This community is shown in **Photograph E.10**.



Photograph E.10 **Offset Area 5: Caley's Ironbark Forest**

E.2.12 Caley's Ironbark Forest & Blue-leaf Ironbark / Cypress Forest (Unit 15 & 16)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as one large patch in the north eastern corner of Offset Area 5. The canopy is dominated by *Eucalyptus caleyi* subsp. *caleyi*, *Eucalyptus nubila* (Blue-leaved Ironbark) and *Callitris endlicheri* (Black Cypress Pine). Other species occurring in the



canopy include *Acacia doratoxylon* (Currawang), *Eucalyptus dwyeri* (Dwyer's Red Gum) and *Eucalyptus punctata* (Grey Gum). A diversity of shrubs occur in this community including *Persoonia linearis* (Narrow-leaved Geebung), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Macrozamia reducta*, *Hibbertia circumdans*, *Acacia doratoxylon* (Currawang), *Cassinia arcuata* (Sifton Bush) and *Boronia anethifolia*. Species occurring in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Goodenia hederacea* (Forest Goodenia), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Lepidosperma concavum* and *Lepidosperma laterale*. This community has few occurrence of exotic species which likely a result of its occurrence away from agricultural areas. This community is shown in **Photograph E.11**.



Photograph E.11 Offset Area 5: Caley's Ironbark Forest / Blue-leaf Ironbark & Cypress Forest

E.2.13 Bloodwood / Ironbark Forest (Unit 19)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as one large patch in the north eastern corner of Offset Area 5. The canopy is dominated by *Corymbia trachyphloia* subsp. *amphistomatica* and *Eucalyptus nubila* (Blue-leaved Ironbark), with occasional occurrences of *Callitris endlicheri* (Black Cypress Pine) and *Eucalyptus dwyeri* (Dwyer's Red Gum). The canopy species also occur within the small tree layer along with *Allocasuarina gymnanthera*. The shrub layer includes *Gompholobium aspalathoides*, *Hibbertia circumdans*, *Dodonaea viscosa* subsp. *cuneata*



(Wedge-leaf Hop-bush), *Leucopogon muticus* (Blunt Beard-heath) and *Acacia buxifolia* subsp. *buxifolia* (Box-leaf Wattle). The ground layer is sparse and includes *Lepidosperma laterale*, *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Dianella revoluta* (Blueberry Lily) and *Lomandra glauca* (Pale Mat-rush). This community has few occurrence of exotic species which likely a result of its occurrence away from agricultural areas. This community is shown in **Photograph E.12**.



Photograph E.12 **Offset Area 5: Bloodwood/Ironbark Forest**

E.2.14 Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest (Unit 21 & 22)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs at a few scattered locations in the southern and northern portions of Offset Area 5 at higher elevations. The canopy within this community is variable and includes *Eucalyptus punctata* (Grey Gum), *Eucalyptus nubila* (Blue-leaved Ironbark), *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Acacia doratoxylon* (Currawang). Species occurring in the small tree layer include *Eucalyptus caleyi* subsp. *caleyi* with *Callitris endlicheri* (Black Cypress Pine). Shrubs occurring in this community include *Macrozamia reducta*, *Leucopogon ericoides* (Pink Beard-heath), *Persoonia linearis* (Narrow-leaved Geebung), *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Hibbertia circumdans*



and *Bursaria spinosa* (Blackthorn). The ground layer is sparse and includes *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Goodenia hederacea* (Forest Goodenia), *Poranthera microphylla*, *Goodenia stephensonii* and *Microlaena stipoides* (Weeping Grass). The climbers *Clematis aristata* (Old Man's Beard) and *Glycine microphylla* (Small-leaf Glycine) also occur within this community. This community has few occurrence of exotic species which likely a result of its occurrence away from agricultural areas. This community is shown in **Photograph E.13**.



Photograph E.13 Offset Area 5: Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest

E.2.15 Derived Native Grassland

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit DNG – 6(1), 6(2), 7(1), 7(2) and 8(1))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG – 6(1) and 7(1))

All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within Offset Area 5 and is the result of clearing of the original woodland communities. Derived native grasslands within



Offset Area 5 have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands varies within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa decipiens* var. *decipiens* and *Digitaria brownii* (Cotton Panic Grass). Non-grass species also occurring in the ground layer at varying frequencies include *Sida corrugata* (Corrugated Sida), *Calotis lappulacea* (Yellow Burr-daisy), *Dysphania pumilio*, *Carex inversa* (Knob Sedge), *Wahlenbergia communis* (Tufted Bluebell), *Boerhavia dominii* (Tarvine), *Einadia hastata* (Berry Saltbush), *Oxalis perennans* and *Glycine tabacina*. Exotic species occur within most patches of this community, and include *Urochloa panicoides* (Urochloa Grass), *Hypericum perforatum* (St. Johns Wort) and *Tagetes minuta* (Stinking Roger). An example of this community is shown in **Photograph E.14**.



Photograph E.14 **Offset Area 5: Derived Native Grassland**

E.3 Flora

Over 250 flora species have been recorded within Offset Area 5. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae, Fabaceae (Faboideae) and Myrtaceae families. Non-grass herbaceous groundcovers have the highest diversity, followed by shrubs. Approximately 27% of the flora species occurring within Offset Area 5 are exotic species. Exotic species occurred across the Offset Area 5, particularly where previous clearing for agricultural purposes has been undertaken.



The following threatened flora species were recorded within Offset Area 5:

- *Acacia pendula* (*Acacia pendula* population in the Hunter catchment) (TSC Act: Endangered Population; EPBC Act: not listed);
- *Cymbidium canaliculatum* (*Cymbidium canaliculatum* population in the Hunter Catchment) (TSC Act: Endangered Population; EPBC Act: not listed);
- *Ozothamnus tessellatus* (TSC Act: Vulnerable; EPBC Act: Vulnerable); and
- *Tylophora linearis* (TSC Act: Vulnerable; EPBC Act: Endangered).

Acacia pendula was recorded within White Box Woodland (Grassy), however these individuals are not considered as naturally occurring within the Study Area. *Cymbidium canaliculatum* was recorded within White Box Woodland (Grassy) and Yellow Box Woodland. *Tylophora linearis* was recorded in Slaty Box Woodland. *Ozothamnus tessellatus* was recorded in Caley's Ironbark Forest & Blue-leaf Ironbark /Cypress Forest. The occurrence of these species within Offset Area 5 is shown in **Figure E.3**.

E.4 Fauna

E.4.1 Fauna Habitat

There are extensive areas of connected forest, woodland and grassland within Offset Area 5 that provides moderate to good quality habitat for a wide variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity varies across the offset, with areas grassy and shrubby understorey vegetation. The canopy species present within the offset are dominated by Box species (*Eucalyptus albens*, *Eucalyptus melliodora*, *Eucalyptus dawsonii*, *Eucalyptus moluccana*) with Ironbark species (*Eucalyptus caleyi* subsp. *caleyi*, *Eucalyptus nubila*) also occurring. A range of other canopy trees occur within this offset area. The habitat features available are numerous and provide potential foraging, shelter and breeding opportunities for a variety of threatened fauna species. These habitats occur at a range of altitudes; areas of gently undulating topography, along drainage lines, cliff lines and valley floors.

Key habitat features within Offset Area 5 include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter, coarse woody debris and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna;



- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores; and
- Cliff lines and associated features such as caves and rocky outcrops suitable for fauna species dependent on these habitats, such as microbats.

Connectivity within the offset is maintained by existing patches of woodland connected to extensive areas outside the site. The offset area is directly connected to Goulburn River National Park to the north and indirectly connected to Wollemi National Park to the east.

E.4.2 Fauna Species

The habitat features available within Offset Area 5 provides habitat for a suite of native species. Over 110 vertebrate fauna species have been recorded, including 85 birds, 28 mammals and one reptile. The majority of species are native, with eight exotic species recorded, including the Common Starling (*Sturnus vulgaris*), Dingoes/Domestic Dogs (*Canis lupus*), Cats (*Felis catus*) and Fallow Deer (*Dama dama*).

The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Offset Area 5:

- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Diamond Firetail (*Stagonopleura guttata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Rainbow Bee-eater (*Merops ornatus*) (TSC Act: not listed; EPBC Act: Migratory);
- Hooded Robin (*Melanodryas cucullata cucullata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Little Lorikeet (*Glossopsitta pusilla*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Turquoise Parrot (*Neophema pulchella*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (TSC Act: Vulnerable; EPBC Act Status: Vulnerable); and



- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded within Offset Area 5 are shown on **Figure E.4**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. Two threatened microbats, Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Eastern Cave Bat (*Vespadelus troughtoni*), are assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by Offset Area 5 for threatened fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table E.2**. The habitats provided by Offset Area 5 are currently in moderate to good condition.

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Known	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Possible	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses and grassland areas. Breeding/nesting habitat present in the form of woodland adjacent to watercourses.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Potential	Foraging and breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Potential	Potential	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated forests and woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Known	Potential	Potential	It is expected that this species would forage in stands of Allocasuarinas within woodland and forest vegetation. Nesting habitat is present within the offset area in the form of large hollows.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Known	Foraging habitat within the offset area includes Yellow Box Woodland, White Box Woodland, Slaty Box Woodland and Exposed/Sheltered Grey Gum / Stringybark Forest. It is expected that this species would forage across these vegetation communities and other woodland and forest communities, favouring areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland. Water resources available in form of dams, drainage lines and creeks.

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								Breeding/nesting habitat present in the form of shrubby understorey vegetation and other nests.
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key nectar producing trees, including <i>Eucalyptus albens</i> (White Box), <i>E. melliodora</i> (Yellow Box), <i>E. blakelyi</i> (Blakely's Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple), <i>E. punctata</i> (Grey Gum) and <i>E. caleyi</i> . Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated and Ironbark vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis</i>	Black-chinned	V		Known	Known	Known	Extensive foraging habitat present in the

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
	<i>gularis</i>	Honeyeater (eastern subspecies)						form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat present in the form of eucalypts.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Known	Foraging habitat present in the form of woodland. Breeding/nesting habitat in proximity to watercourses.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Potential	Potential foraging habitat occurs in the form of vegetated gullies, and breeding habitat occurs in the form of eucalypt-dominated forest and woodland.
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Potential	Foraging habitat present in open forest and woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt open forest and woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Known	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs in the form of eucalypt-dominated forests and woodlands with an open understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Potential	The offset area contains suitable foraging and breeding habitat for the species in both summer and winter. Suitable summer habitat occurs in the form of rocky eucalypt-dominated hills, and winter habitat occurs as woodland vegetation in open valleys. Suitable breeding habitat in the form of woodland and forest occurs throughout.
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland. Breeding/nesting habitat present in the form of shrubs, sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Known	Abundant foraging habitat present in the

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in <i>Eucalyptus albens</i> (White Box). No breeding/nesting habitat present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Known	Foraging habitat present at the edges of eucalypt woodland adjoining clearings. Breeding/nesting habitat present in the form of tree hollows, logs and posts.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Potential	Foraging habitat for this species occurs in eucalypt-dominated vegetation across the offset area, particularly in densely vegetated gullies and areas with a shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items including the

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								Common Ringtail Possum and Sugar Glider being present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items present within forest and woodland vegetation. Nesting habitat is present within the offset area in the form of large hollow-bearing trees within remnant woodland and forest vegetation.

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
Mammals								
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Potential	Suitable habitat in the form of forest and woodland vegetation. Potential den sites present in the form of boulder piles, rocks, hollow-bearing trees and fallen logs.
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Potential	Extensive areas of foraging habitat across the offset area in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Potential	Areas of suitable habitat for the species occur in proximity to tall cliff lines and boulder piles. Suitable foraging and shelter habitat in the form of open forest occurs in proximity to cliff lines.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Potential	Potential habitat in Box-dominated open forest and woodland. Nesting habitat in the form of hollow-bearing trees
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Foraging habitat in the form of eucalypt-dominated open forest and woodland. Feed trees in the form of <i>Eucalyptus</i>

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								<i>punctata</i> (Grey Gum) and <i>E. albens</i> (White Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat occurs within the offset area in the form of eucalypt-dominated forest and woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Areas of suitable roost habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Potential	Extensive areas of foraging habitat across the offset area occurs in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known	Potential	Potential	Extensive areas of foraging habitat across the offset area in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Potential	Extensive areas of foraging habitat across the offset area occurs in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus troungtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in

Table E.2 Assessment of habitat values provided by Offset Area 5 for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Offset Area 5	Habitat Features Present
								proximity to cliff lines.
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Potential	Suitable forage and shelter habitat occurs within woodland and shrubby woodland communities within the offset area.
Reptiles								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Potential	Areas of suitable habitat for the species occur in proximity to cliff lines and boulder piles. Suitable summer habitat occurs in hollow bearing trees adjacent to cliff lines, while winter habitat exists on cliffs.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding habitat for the species occurs within the grasslands and grassy woodland communities of the offset area.
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Potential	Suitable shelter habitat occurs in the form of tree hollows and fallen logs, and the presence of suitable prey species provide foraging resources.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)

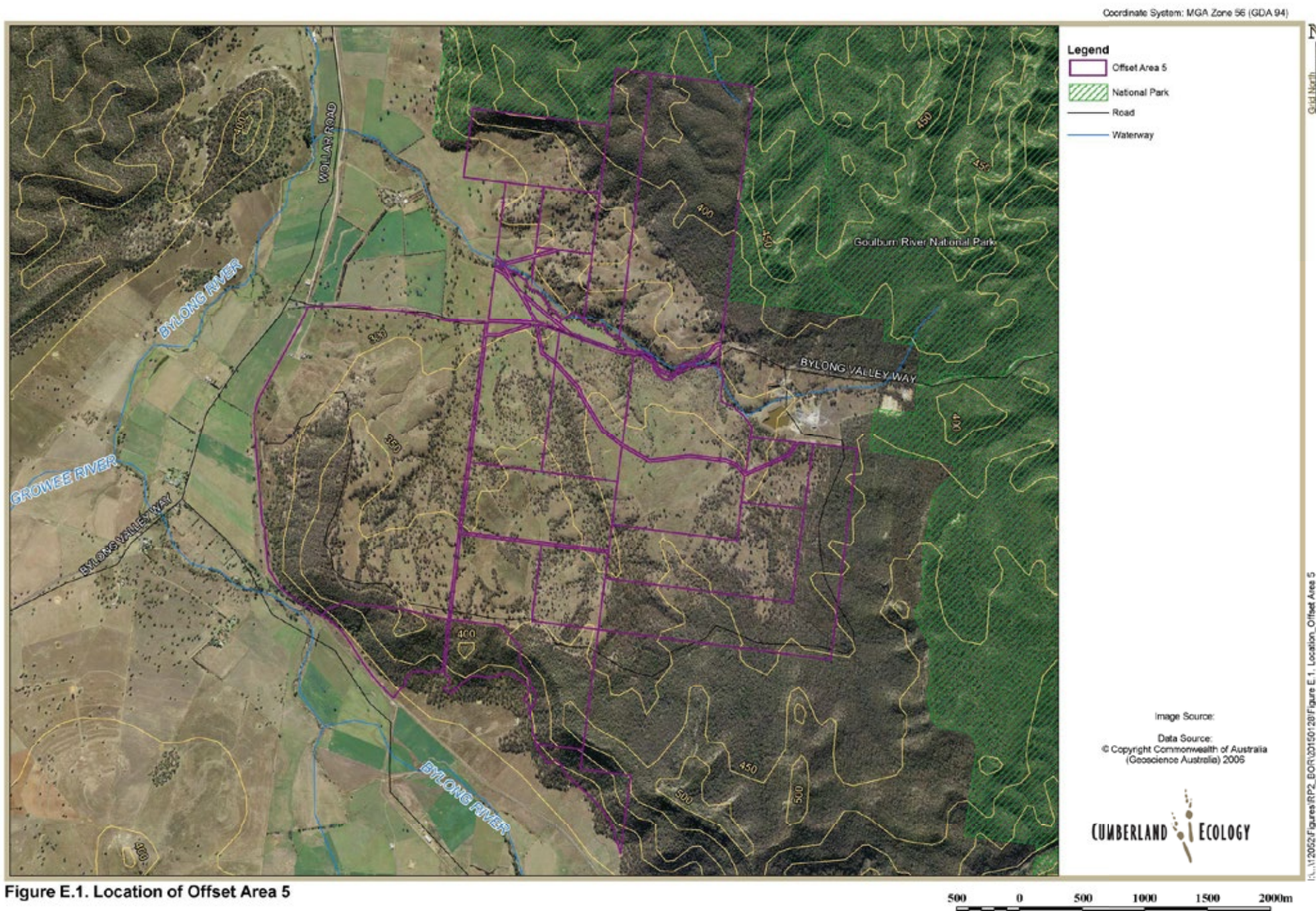


Figure E.1. Location of Offset Area 5

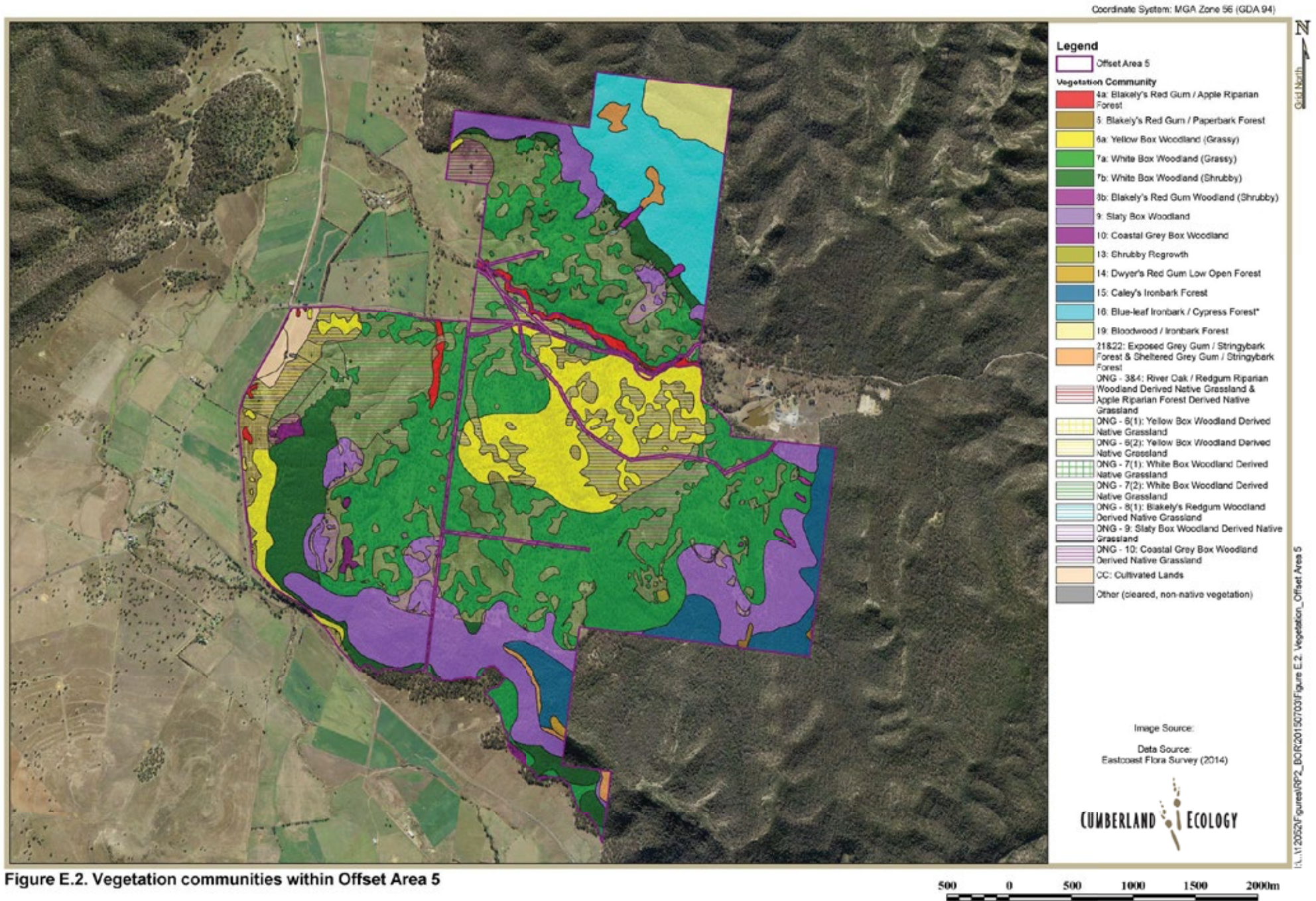


Figure E.2. Vegetation communities within Offset Area 5

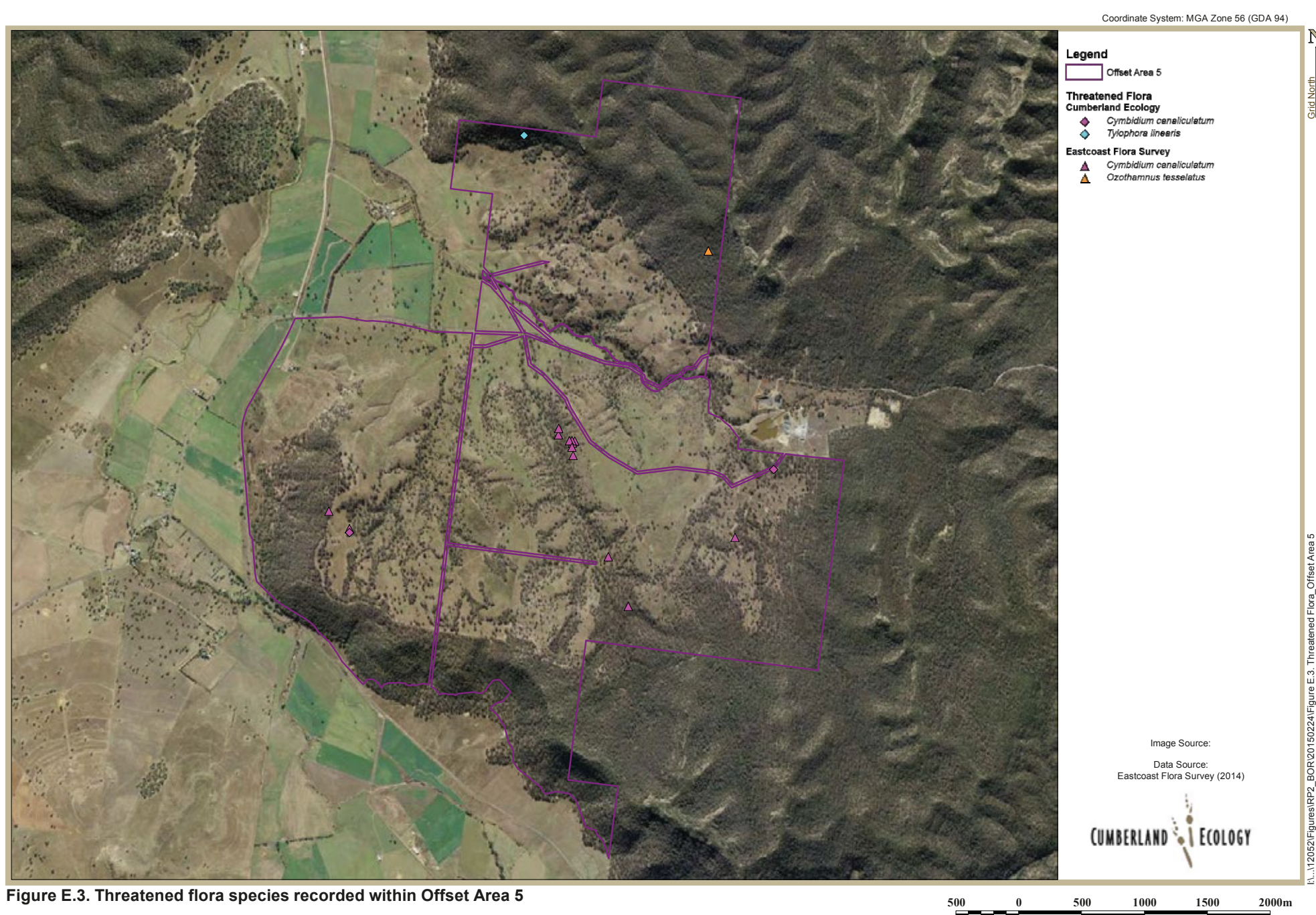
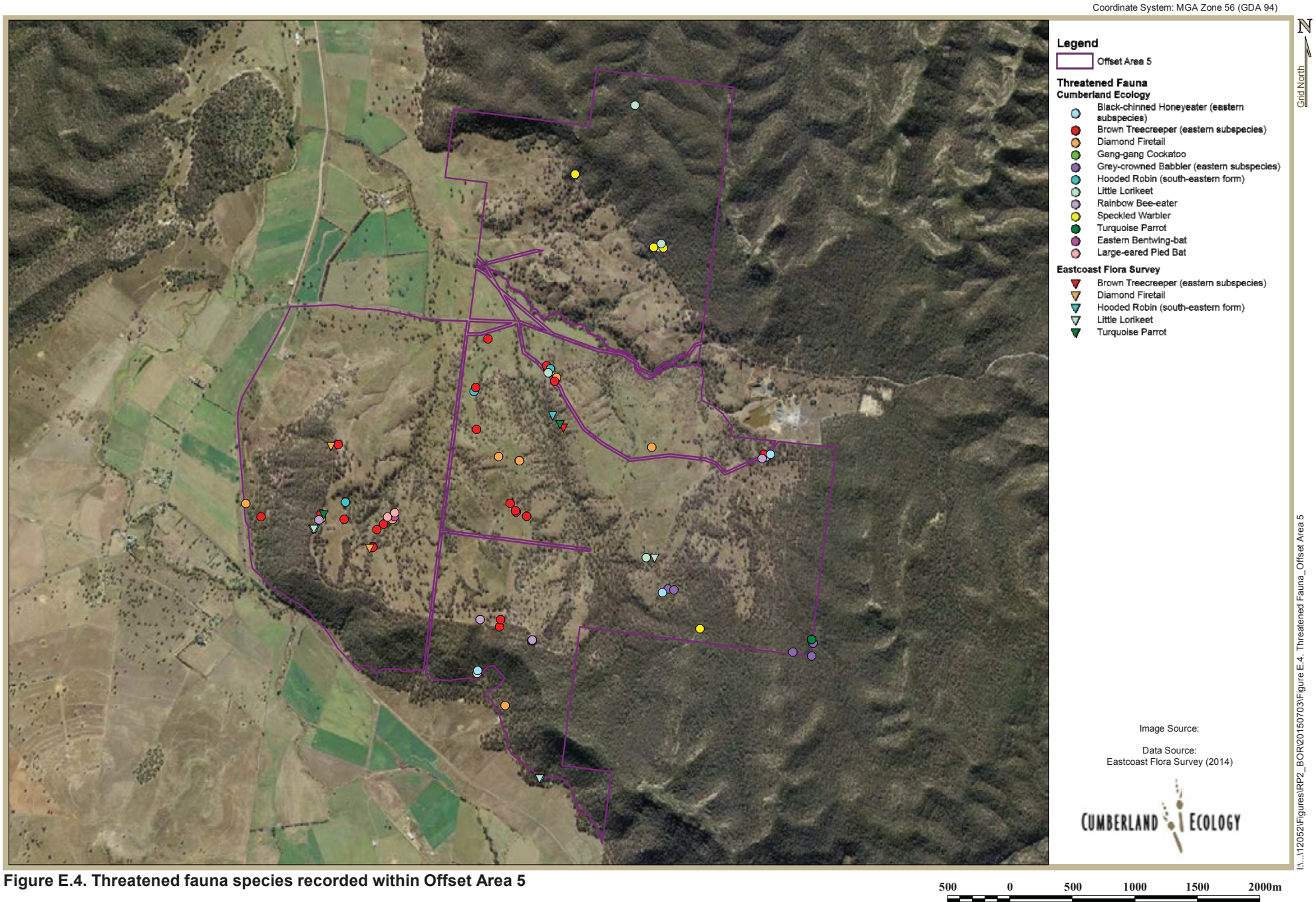


Figure E.3. Threatened flora species recorded within Offset Area 5





Appendix F

Profile: Yarran View Offset Area



F.1 Introduction

Name: Yarran View Offset Area

Area: 443 ha

Land Owner: KEPCO Bylong Australia Pty Ltd

Lot/DP: Lot 64, 65, 66, 67, 68, 86, 96, 120 and 121 DP 755432; Lot 63, 63, 69, 70 DP 755438

Zoning: RU1- Primary Production

Location: Lee Creek, 9 km south of the Project Disturbance Boundary

LGA: Mid-western Regional

Local Land Services Area: Hunter

Bioregion: Sydney Basin

Subregion: Kerrabee

The Yarran View Offset comprises valley floors, foothills, upper slopes and hill top areas. The narrow valley flora extends across the central portion of the offset. The lowest lying portions of the offset occur at approximately 380 m Australian Height Datum (AHD) and have largely been cleared for agriculture. Two topographic highs occur within the north eastern portion of the offset occur at 640 m AHD. The offset also rises to 520 m AHD in the south eastern portion. Intact native vegetation extends from a number of the foothills up to the hill top areas. These areas comprise structurally diverse vegetation including formations along gullies and slopes. Some scattered patches of vegetation also occur on the undulating topography of the lower slopes. The location of Yarran View Offset Area is shown in **Figure F.1**.

F.2 Vegetation Communities

The vegetation within the Yarran View Offset Area comprises both intact and fragmented woodland and areas of agricultural land. The vegetation within this area is largely a reflection of topography, geology and land use history. **Table F.1** lists the vegetation communities occurring within the Yarran View Offset Area, their TSC Act and EPBC Act status and their total area. Descriptions of the native vegetation communities occurring within the offset are provided below and their distribution is shown in **Figure F.2**.



Table F.1 Vegetation communities within the Yarran View Offset Area

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha)~
4: Apple Riparian Woodland			
4a: <i>Blakely's Red Gum / Apple Riparian Forest</i>	-	-	10
7: White Box Woodland			
7a(1) ^A : <i>White Box Woodland (Grassy)</i>	EEC	CEEC	19
7b: <i>White Box Woodland (Shrubby)</i>	-	-	173
9: Slaty Box Woodland	VEC	-	52
13: Shrubby Regrowth	-	-	8
20: Exposed Grey Gum / Stringybark Forest^A	-	-	3
21: Sheltered Grey Gum / Stringybark Forest^A			
DNG: Derived Native Grassland			
DNG – 3: <i>River Oak / Redgum Riparian Woodland Derived Native Grassland[#]</i>	-	-	19
DNG – 4: <i>Apple Riparian Forest Derived Native Grassland[#]</i>			
DNG – 7(1) ^A : <i>White Box Woodland Derived Native Grassland</i>	EEC	CEEC	133
DNG – 9: <i>Slaty Box Woodland Derived Native Grassland</i>	-	-	1
CC: Cultivated Lands	-	-	22
Other (cleared, planted vegetation)	-	-	3
<i>Total Native Vegetation⁺</i>			418
<i>Total Non-native Vegetation and Cleared⁺</i>			25
TOTAL AREA⁺			443

TSC Act / EPBC Act Status: VEC = Vulnerable Ecological Community, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

^A Sub-unit (1) represents Box Gum Woodland and Derived Native Grassland listed under both the TSC Act and EPBC Act

^A Exposed Grey Gum / Stringybark Forest (Unit 21) and Sheltered Grey Gum / Stringybark Forest (Unit 22) are mapped concurrently

[#] River Oak / Redgum Riparian Woodland Derived Native Grassland (Unit DNG – 3) and Blakely's Redgum / Apple Riparian Forest Derived Native Grassland (Unit DNG – 4) are mapped concurrently

⁺ In some cases totals may not equal the appropriate total number due to rounding

[~] Area calculations are approximate



F.2.1 Blakely's Red Gum / Apple Riparian Forest (Unit 4a)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community is located along two drainage lines within the Yarran View Offset Area. The canopy is dominated by *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus blakelyi* (Blakely's Red Gum), with occasional occurrences of *Eucalyptus albens* (White Box). The small tree layer includes *Brachychiton populneus* subsp. *populneus* (Kurrajong). Regenerating canopy species occur in the shrub layer along with *Bursaria spinosa* (Blackthorn) and *Acacia implexa* (Hickory Wattle). Species occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Echinopogon caespitosus* (Bushy Hedgehog-grass), *Microlaena stipoides* (Weeping Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Gahnia aspera* (Rough Saw-sedge), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Asplenium flabellifolium* (Necklace Fern), *Sigesbeckia orientalis* subsp. *orientalis* (Indian Weed) and *Solanum parvifolium* subsp. *parvifolium*. Exotic species occurring in this community include *Petrorhagia dubia*, *Conyza bonariensis* (Flaxleaf Fleabane) and *Marrubium vulgare* (White Horehound). This community is shown in **Photograph F.1**.



Photograph F.1 Yarran View Offset Area: Blakely's Red Gum / Apple Riparian Forest

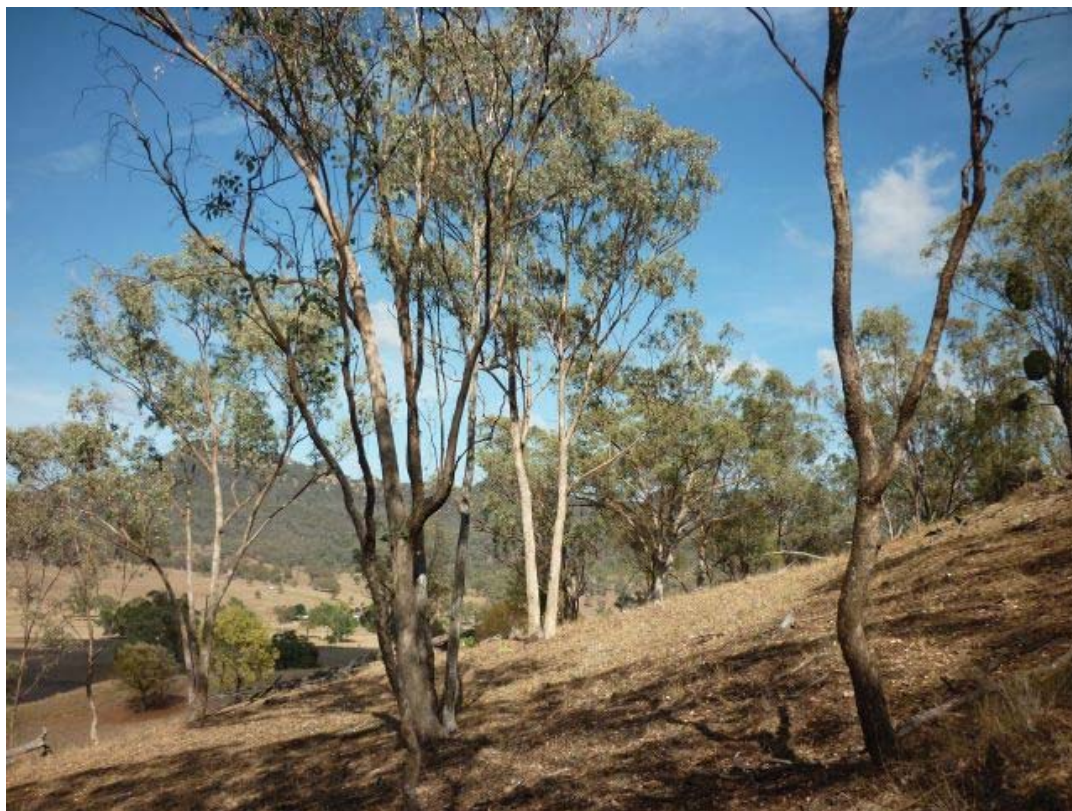


F.2.2 White Box Woodland (Grassy) (Unit 7a)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

This community occurs as scattered patches at a number of locations within the Yarran View Offset Area. The canopy is dominated by *Eucalyptus albens* (White Box), with occasional occurrences of *Eucalyptus dawsonii* (Slaty Gum). Species occurring in the small tree layer include *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus* subsp. *populneus* (Kurrajong). The shrub layer is sparse and includes *Olearia elliptica* (Sticky Daisy-bush), *Acacia doratoxylon* (Currawang), *Acacia implexa* (Hickory Wattle) and *Bursaria spinosa* (Blackthorn). The ground layer is dominated by grasses, including *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Chloris ventricosa* (Tall Chloris), *Aristida personata* (Purple Wiregrass) and *Rytidosperma setaceum* (Smallflower Wallaby Grass). Other species occurring in the ground layer include *Atriplex semibaccata* (Creeping Saltbush), *Einadia hastata* (Berry Saltbush), *Dichondra repens* (Kidney Weed), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Cyperus gracilis* (Slender Flat-sedge) and *Gahnia aspera* (Rough Saw-sedge). The climbers *Glycine clandestina* and *Eustrephus latifolius* (Wombat Berry) also occur within this community. Exotic species occurring in this community include *Marrubium vulgare* (White Horehound), *Bidens subalternans* (Greater Beggar's Ticks), *Hypericum perforatum* (St. Johns Wort) and *Lolium perenne* (Perennial Ryegrass). This community is shown in **Photograph F.2**.



Photograph F.2 Yarran View Offset Area: White Box Woodland (Grassy)



F.2.3 White Box Woodland (Shrubby) (Unit 7b)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs extensively across the Yarran View Offset Area with some small patches in cleared areas. The canopy is dominated by *Eucalyptus albens* (White Box), with occasional occurrences of *Eucalyptus dawsonii* (Slaty Gum). Species occurring in the small tree layer include *Callitris endlicheri* (Black Cypress Pine), *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus* subsp. *populneus* (Kurrajong). This community has a well-developed shrub layer and includes *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush), *Bursaria spinosa* (Blackthorn), *Cassinia* sp., *Acacia ixiophylla* (Sticky Leaved Wattle) and *Cryptandra spinescens*. A diversity of native species occurs in the ground layer. Grasses recording in this community include *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass) and *Entolasia stricta* (Wiry Panic). Other native species in the ground layer include *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Dichondra repens* (Kidney Weed), *Sida corrugata* (Corrugated Sida), *Gahnia aspera* (Rough Saw-sedge) and *Dianella revoluta* var. *revoluta*. The climber *Glycine clandestina* also occurs within this community. Exotic species occurring in this community include *Bidens subalternans* (Greater Beggar's Ticks), *Lamium amplexicaule* (Henbit) and *Opuntia stricta* var. *stricta* (Common Prickly Pear). This community is shown in **Photograph F.3**.



Photograph F.3 Yarran View Offset Area: White Box Woodland (Shrubby)



F.2.4 Slaty Box Woodland (Unit 9)

TSC Act Status: Hunter Valley Footslopes Slaty Gum Woodland (VEC)

EPBC Act Status: Not listed

This community occurs on a number of hillsides within the central and eastern portions of the Yarran View Offset Area. The canopy is dominated by *Eucalyptus dawsonii* (Slaty Gum), with occasional occurrences of *Eucalyptus albens* (White Box). The small tree layer is dominated by *Callitris endlicheri* (Black Cypress Pine) and *Eucalyptus dawsonii* (Slaty Gum), with some occurrences of *Eucalyptus caleyi* subsp. *caleyi*. Commonly occurring shrubs within this community include *Acacia ixiophylla* (Sticky Leaved Wattle), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Acacia implexa* (Hickory Wattle) and *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hop-bush). The ground layer is sparse with an abundance of leaf litter. Species occurring in the ground layer include *Austrostipa scabra* (Speargrass), *Cleistochloa rigida*, *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Lepidosperma gunnii* and *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush). This community is shown in **Photograph F.4**.



Photograph F.4 Yarran View Offset Area: Slaty Box Woodland



F.2.5 Shrubby Regrowth (Unit 13)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as scattered patches within the central portion of the Yarran View Offset Area. This community is characterised by a dense thicket of *Bursaria spinosa* (Blackthorn). Emergent trees include *Eucalyptus albens* (White Box) and *Acacia implexa* (Hickory Wattle). It is considered that this community is derived from White Box Woodland (Shrubby). Species occurring in the ground layer include *Aristida ramosa* (Purple Wiregrass), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Einadia hastata* (Berry Saltbush), *Dichondra repens* (Kidney Weed), *Oxalis perennans* and *Scleria mackaviensis*. Exotic species occurring in this community include *Bidens pilosa* (Cobblers Pegs), *Solanum nigrum* (Black-berry Nightshade) and *Lolium perenne* (Perennial Ryegrass). This community is shown in **Photograph F.5**.



Photograph F.5 Yarran View Offset Area: Shrubby Regrowth



F.2.6 Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest (Unit 21 & 22)

TSC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs as a small patch along a rocky ridgeline in the northern portion of the Yarran View Offset Area. The canopy is dominated by *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Eucalyptus punctata* (Grey Gum), with occurrences of *Eucalyptus dawsonii* (Slaty Gum), *Eucalyptus dwyeri* (Dwyer's Red Gum) and *Eucalyptus nubila* (Blue-leaved Ironbark). *Callitris endlicheri* (Black Cypress Pine) and *Acacia linearifolia* (Narrow-leaved Wattle) are common in the small tree layer. Shrubs occurring in this community include *Cassinia cunninghamii* (Cunninghams Everlasting), *Acacia uncinata* (Round-leaved Wattle), *Olearia elliptica* (Sticky Daisy-bush) and *Cryptandra spinescens*. Species occurring in the ground layer include *Einadia hastata* (Berry Saltbush), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Phyllanthus gunnii* (Scrubby Spurge), *Xanthorrhoea johnsonii* (Johnson's Grass Tree), *Dianella revoluta* var. *revoluta*, *Lomandra confertifolia* subsp. *rubiginosa*, *Rytidosperma* sp. and *Cleistochloa rigida*. This community is shown in Photograph F.6.



Photograph F.6 Yarran View Offset Area: Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest



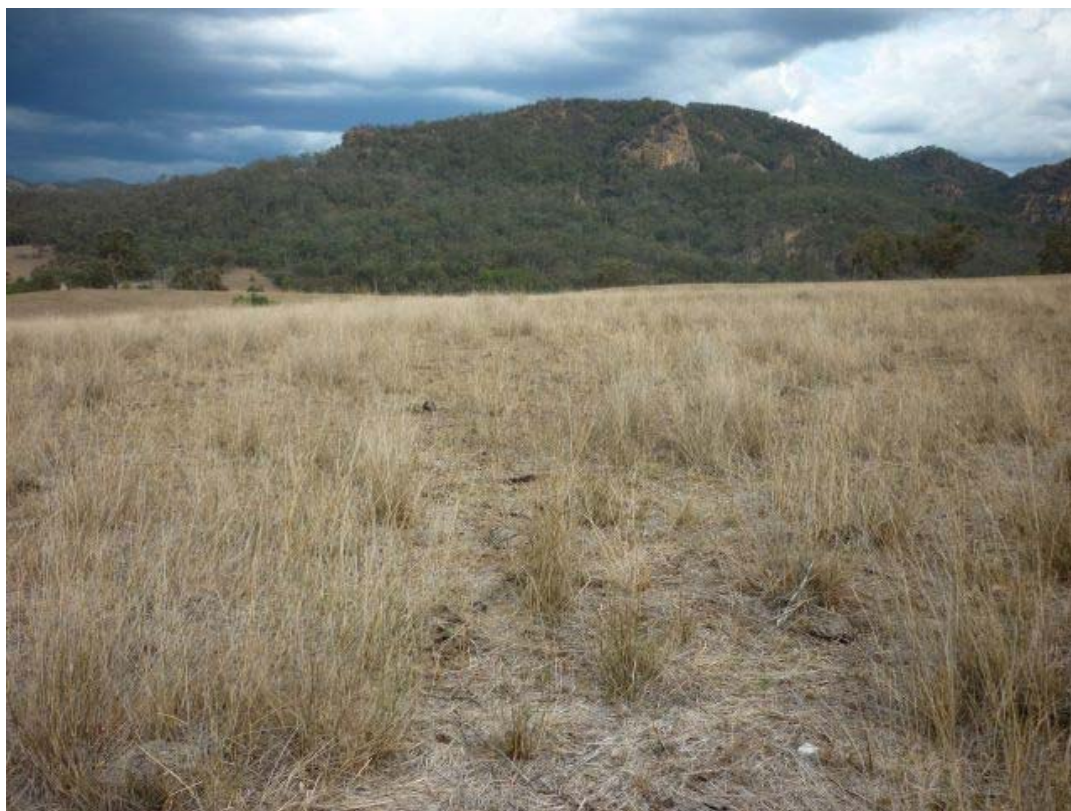
F.2.7 Derived Native Grassland (Unit DNG)

TSC Act: White Box - Yellow Box - Blakely's Red Gum Woodland (EEC) (Unit 7(1))

EPBC Act: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC) (Unit DNG –7(1))

All remaining Derived Native Grassland units are not listed under either the TSC Act or EPBC Act.

This vegetation community occurs at a number of locations within the Yarran View Offset Area and is the result of clearing of the original woodland communities. Derived native grasslands within the Yarran View Offset Area have been attributed to the predicted pre-settlement distribution of woody vegetation. Condition of the grasslands varies within the offset as a result of previous and current land management practices. Broadly, this community is dominated by native grasses including *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* (Speargrass). Non-grass species also occurring in the ground layer at varying frequencies include *Einadia hastata* (Berry Saltbush), *Dichondra repens* (Kidney Weed), *Boerhavia dominii* (Tarvine) and *Solanum cinereum* (Narrawa Burr). Exotic species occur within most patches of this community, and include *Lolium perenne* (Perennial Ryegrass), *Hypericum perforatum* (St. Johns Wort), *Arctotheca calendula* (Capeweed) and *Carthamus lanatus* (Saffron Thistle). An example of this community is shown in **Photograph F.7**.



Photograph F.7 Yarran View Offset Area: Derived Native Grassland



F.3 Flora

Approximately 150 flora species have been recorded within the Yarran View Offset Area. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae and Chenopodiaceae families. Non-grass herbaceous groundcovers have the highest diversity, followed by shrubs. Approximately 17% of the flora species occurring within the Yarran View Offset Area are exotic species. Exotic species predominantly occurred in areas where previous clearing for agricultural purposes has been undertaken.

One threatened flora species, *Cymbidium canaliculatum* (Tiger Orchid) has been recorded at numerous locations within the Yarran View Offset Area. This species forms an Endangered Population in the Hunter catchment listed under the TSC Act. The species occurs in Slaty Box Woodland, White Box Woodland (Shrubby) and White Box Woodland (Grassy). Extensive areas of suitable habitat for this species occurs throughout the Yarran View Offset Area. The occurrence of this species within the Yarran View Offset Area is shown in Figure F.3.

F.4 Fauna

F.4.1 Fauna Habitat

There are extensive areas of connected forest, woodland and grassland within the Yarran View Offset Area that provides moderate to good quality habitat for a wide variety of species, including threatened species that are predicted to be impacted by the Project. Structural diversity varies across the offset, with areas grassy and shrubby understorey vegetation. The canopy species present within the offset are dominated by *Eucalyptus albens* and *Eucalyptus dawsonii*. A range of other canopy trees occur within this offset area. The habitat features available are numerous and provide potential foraging, shelter and breeding opportunities for a variety of threatened fauna species. These habitats occur at a range of altitudes; areas of gently undulating topography, along drainage lines, cliff lines and valley floors.

Key habitat features within the Yarran View Offset Area include:

- Riparian environments (including farm dams, ephemeral drainage lines) suitable for fauna species dependent on these habitats;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter, coarse woody debris and rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna;
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores; and



- Cliff lines and associated features such as caves and rocky outcrops suitable for fauna species dependent on these habitats, such as microbats.

Connectivity within the offset is maintained by existing patches of woodland connected to extensive areas outside the site. The offset area is directly connected to Wollemi National Park to the south east.

F.4.2 Fauna Species

The habitat features available within the Yarran View Offset Area provides habitat for a suite of native species. Over 90 vertebrate fauna species have been recorded, including 72 birds, 20 mammals and three reptiles. The majority of species are native, with only three exotic species recorded, namely Foxes (*Vulpes vulpes*), Rabbits (*Oryctolagus cuniculus*) and feral Pigs (*Sus scrofa*).

The habitats available within the offset area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened fauna species have been recorded during surveys of the Yarran View Offset Area:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Diamond Firetail (*Stagonopleura guttata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Varied Sittella (*Daphoenositta chrysoptera*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Hooded Robin (*Melanodryas cucullata cucullata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Barking Owl (*Ninox connivens*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (TSC Act: Vulnerable; EPBC Act Status: Vulnerable); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

The locations of threatened fauna species recorded the Yarran View Offset Area are shown on **Figure F.4**. There is also the potential for other threatened fauna species known from the locality to occur within the offset area, including threatened microbats, birds and mammals. Two threatened microbats, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Eastern Cave Bat (*Vespadelus troughtoni*), are assessed as possibly present, but not reliably identified from ultrasonic detection data. An assessment of the habitat values provided by the Yarran View Offset Area for threatened



fauna assessed as occurring or potentially occurring within the Study Area is provided in **Table F.2**. The habitats provided by the Yarran View Offset Area are currently in moderate to good condition.

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
Birds								
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V		Known	Known	Potential	Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Potential	Potential	Potential	Some foraging habitat present along watercourses and grassland areas, when water is present. Breeding/nesting habitat present in the form of woodland adjacent to watercourses.
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Known	Known	Potential	Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Potential	Potential	Possible	Foraging and breeding/nesting habitat within woodland areas, particularly in proximity to watercourses.
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift		M	Potential	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Known*	Potential	Potential	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Ardeidae	<i>Ardea ibis</i>	Cattle Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret		M	Potential	Potential	Potential	Limited foraging habitat in proximity to water, particularly dams. No breeding/nesting habitat present.
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Known	Known	Known	Suitable foraging habitat occurs across the offset area in the form of eucalypt-dominated forests and woodlands. Suitable breeding habitat occurs in the form of large hollow bearing trees.

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
Cacatuidae	<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V		Known	Potential	Potential	It is expected that this species would forage in stands of Allocasuarinas within woodland and forest vegetation. Nesting habitat is present within the offset area in the form of large hollows.
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Known	Known	Known	Foraging habitat within the offset area includes White Box Woodland, Slaty Box Woodland and Exposed/Sheltered Grey Gum / Stringybark Forest. It is expected that this species would forage across these vegetation communities and other woodland and forest communities, favouring areas dominated by rough-barked species and where fallen logs are present. Nesting habitat is present within the offset area in the form of hollow-bearing trees.
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V		Known	Known	Known	Foraging habitat present, particularly in areas of Box Gum Woodland and Shrubby Regrowth. Water resources available in form of dams, drainage lines and creeks. Breeding/nesting habitat present in the

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								form of shrubby understorey vegetation and other nests.
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Known	Potential	Potential	Foraging habitat occurs in the form of key nectar producing trees, including <i>Eucalyptus albens</i> (White Box), <i>E. blakelyi</i> (Blakely's Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple), <i>E. punctata</i> (Grey Gum). Numerous other nectar producing trees occur within the offset area, as well as mistletoes. The offset area falls outside the known breeding range of the species.
Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	V		Potential	Potential	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees and mistletoe, particularly in Box-dominated vegetation. Breeding/nesting habitat present in the form of drooping eucalypts and mistletoe branches.
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		Known	Known	Potential	Extensive foraging habitat present in the form of blossom and nectar-producing trees in eucalypt-dominated woodland and forest. Breeding/nesting habitat present in

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								the form of eucalypts.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater		M	Known	Known	Potential	Foraging habitat present in the form of woodland. Breeding/nesting habitat in proximity to watercourses.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Potential	Potential	Potential	Potential foraging habitat occurs in the form of vegetated gullies, and breeding habitat occurs in the form of eucalypt-dominated forest and woodland
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Potential	Potential	Known	Foraging habitat present in open forest and woodland vegetation, particularly in areas of rough-barked species and mature smooth-barked gums with dead branches. Breeding/nesting habitat present in the form of eucalypt open forest and woodland.
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Known	Known	Known	Foraging habitat present in the form of open woodland near clearings. Breeding/nesting habitat present in the form of woodland vegetation.
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occurs in the form of Eucalypt dominated

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								forests and woodlands with an open understory containing logs and fallen timber.
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		Potential	Potential	Potential	The offset area contains suitable foraging and breeding habitat for the species in both summer and winter. Suitable summer habitat occurs in the form of rocky eucalypt-dominated hills, and winter habitat occurs as woodland vegetation in open valleys. Suitable breeding habitat in the form of woodland and forest occurs throughout.
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		Known	Known	Potential	Foraging habitat present, particularly in areas of Box Gum Woodland. Breeding/nesting habitat present in the form of shrubs, sapling eucalypts and low branches of large eucalypts.
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Known	Known	Potential	Abundant foraging habitat present in the form of blossom and nectar-producing trees. Breeding/nesting habitat present in the form of tree hollows of a suitable size, particularly smooth-barked eucalypts

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	E	Potential	Potential	Potential	Foraging habitat present in the form of blossom and nectar-producing trees, particularly in <i>Eucalyptus albens</i> (White Box). No breeding/nesting habitat present, as breeding occurs in Tasmania.
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Known	Known	Potential	Foraging habitat present at the edges of eucalypt woodland adjoining clearings. Breeding/nesting habitat present in the form of tree hollows, logs and posts.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Potential	Potential	Potential	Foraging habitat for this species occurs in eucalypt-dominated vegetation across the offset area, particularly in densely vegetated gullies and areas with a shrubby understory.
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		Known*	Potential	Known	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat containing prey items, including the Common Brushtail Possum, being present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Known*	Potential	Potential	Suitable foraging and breeding habitat occurs within the offset area, with suitable habitat for prey items being present within forest and woodland vegetation. Nesting habitat is present within the offset area occurring in the form of large hollow-bearing trees within remnant woodland and forest vegetation in proximity to drainage lines.
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		Potential	Potential	Potential	Suitable foraging and breeding habitat occur within the woodland and forest communities of the offset area. Prey items occurring within the offset area include terrestrial rodents and arboreal mammals, such as the Common Brushtail Possum. Nesting habitat is present within the offset area in the form of large hollow-bearing trees within remnant woodland and forest vegetation.

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
Mammals								
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Known*	Potential	Potential	Some areas of suitable habitat in the form of forest and woodland vegetation. Potential den sites present in the form of boulder piles, rocks, hollow-bearing trees and fallen logs.
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Known	Known	Potential	Extensive areas of foraging habitat across the offset area in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Known	Potential	Potential	Areas of suitable habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging and shelter habitat in the form of open forest occurs in proximity to cliff lines.
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Potential	Potential	Possible	Potential habitat in Box-dominated woodland. Nesting habitat is present in the form of hollow-bearing trees.
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	Potential	Potential	Foraging habitat in the form of Eucalypt-dominated forest and woodland. Feed

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								trees in the form of <i>Eucalyptus punctata</i> (Grey Gum) and <i>E. albens</i> (White Box). Potential for transient individuals.
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Potential	Potential	Potential	Suitable occasional foraging habitat occurs within the offset area in the form of eucalypt-dominated forest and woodland. No breeding camps were observed during surveys.
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Known	Known	Known	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to areas of cliff lines.
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Potential	Potential	Possible	Extensive areas of foraging habitat across the offset area occurs in the form of forest and woodland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Potential	Potential	Potential	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in

Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

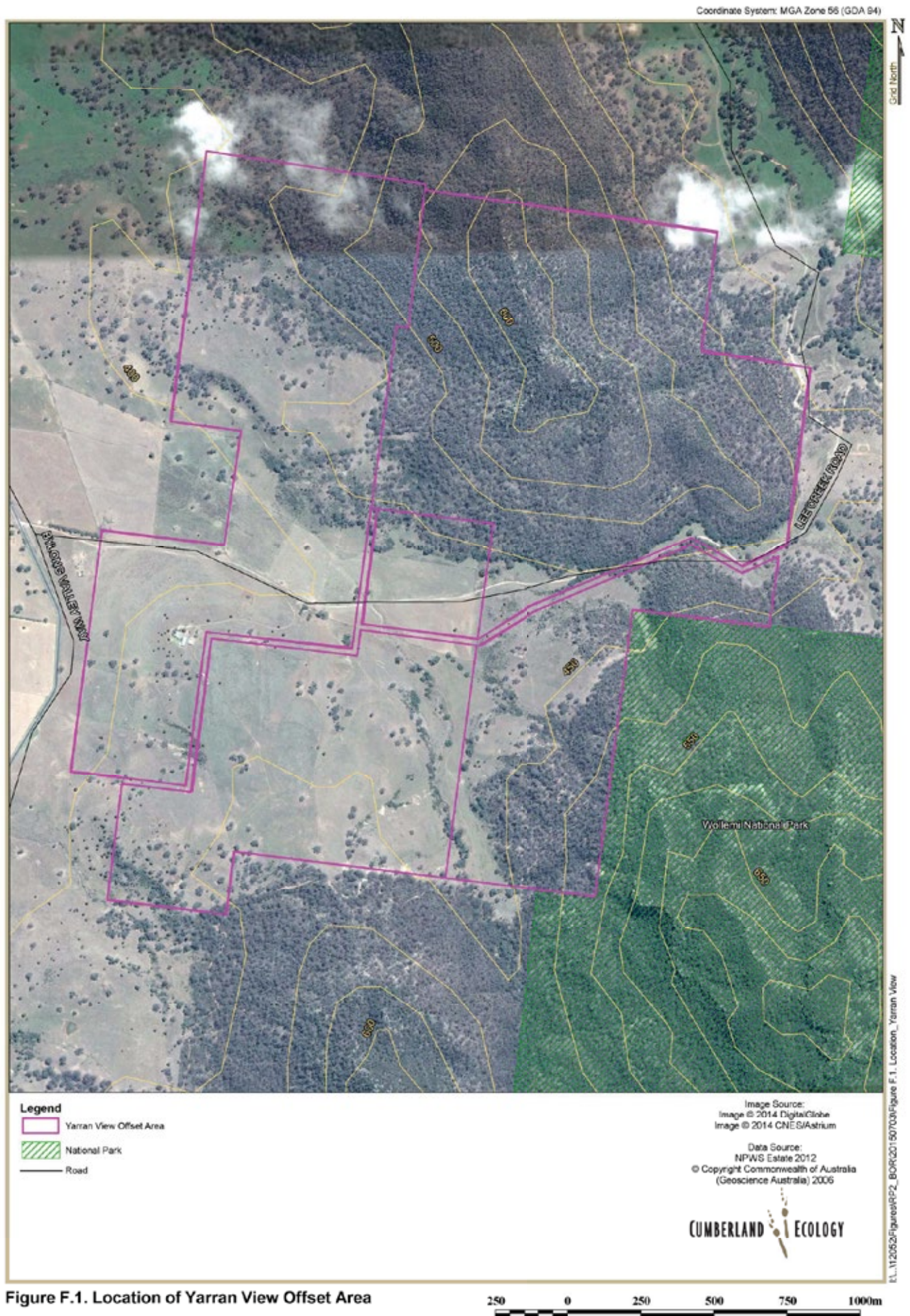
Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Known	Known	Known	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of forest and woodland occurs in proximity to cliff lines.
Vespertilionidae	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Known*	Potential	Potential	Extensive areas of foraging habitat across the offset area in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Possible	Possible	Possible	Extensive areas of foraging habitat across the offset area occurs in the form of woodland and forest. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes).
Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Possible	Possible	Possible	Areas of suitable roosting habitat for the species occur in proximity to cliff lines and boulder piles. Suitable foraging habitat in the form of open forest occurs in proximity

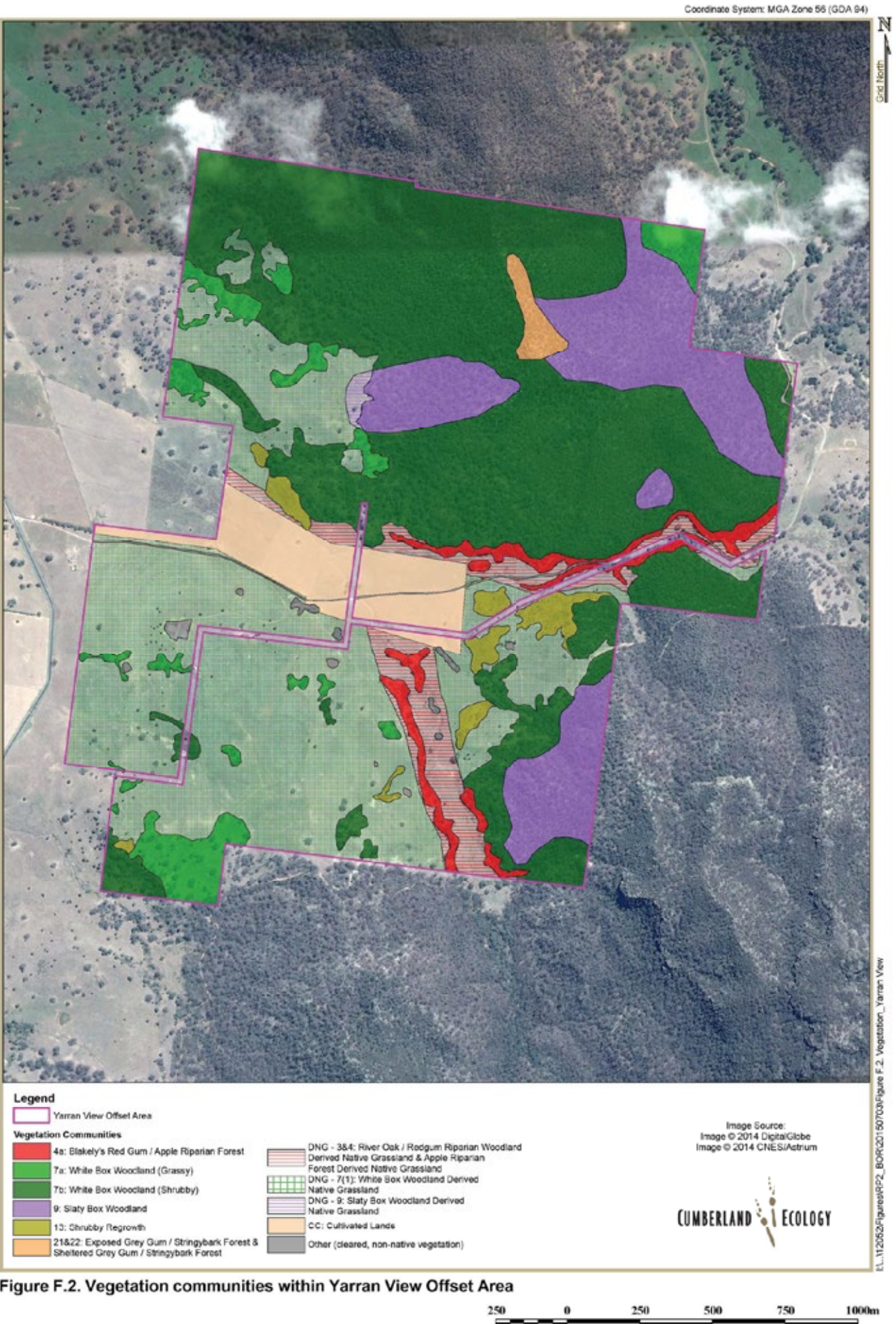
Table F.2 Assessment of habitat values provided by the Yarran View Offset Area for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Presence within Study Area	Presence within Project Disturbance Boundary	Presence within Yarran View Offset Area	Habitat Features Present
								to cliff lines.
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known	Potential	Potential	Suitable forage and shelter habitat occurs within woodland and shrubby woodland communities within the offset area.
Reptiles								
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Potential	Potential	Potential	Areas of suitable habitat for the species occur in proximity to cliff lines and boulder piles. Suitable summer habitat occurs in hollow bearing trees adjacent to cliff lines, while winter habitat exists on cliffs.
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	Potential	Potential	Potential	Suitable forage, shelter and breeding habitat for the species occurs within the grasslands and grassy woodland communities of the offset area.
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V		Potential	Potential	Potential	Suitable shelter habitat occurs in the form of tree hollows and fallen logs, and the presence of suitable prey species provide foraging resources.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

*Data obtained from the Atlas of NSW Wildlife (OEH, 2014a)





Coordinate System: MGA Zone 56 (GDA 94)

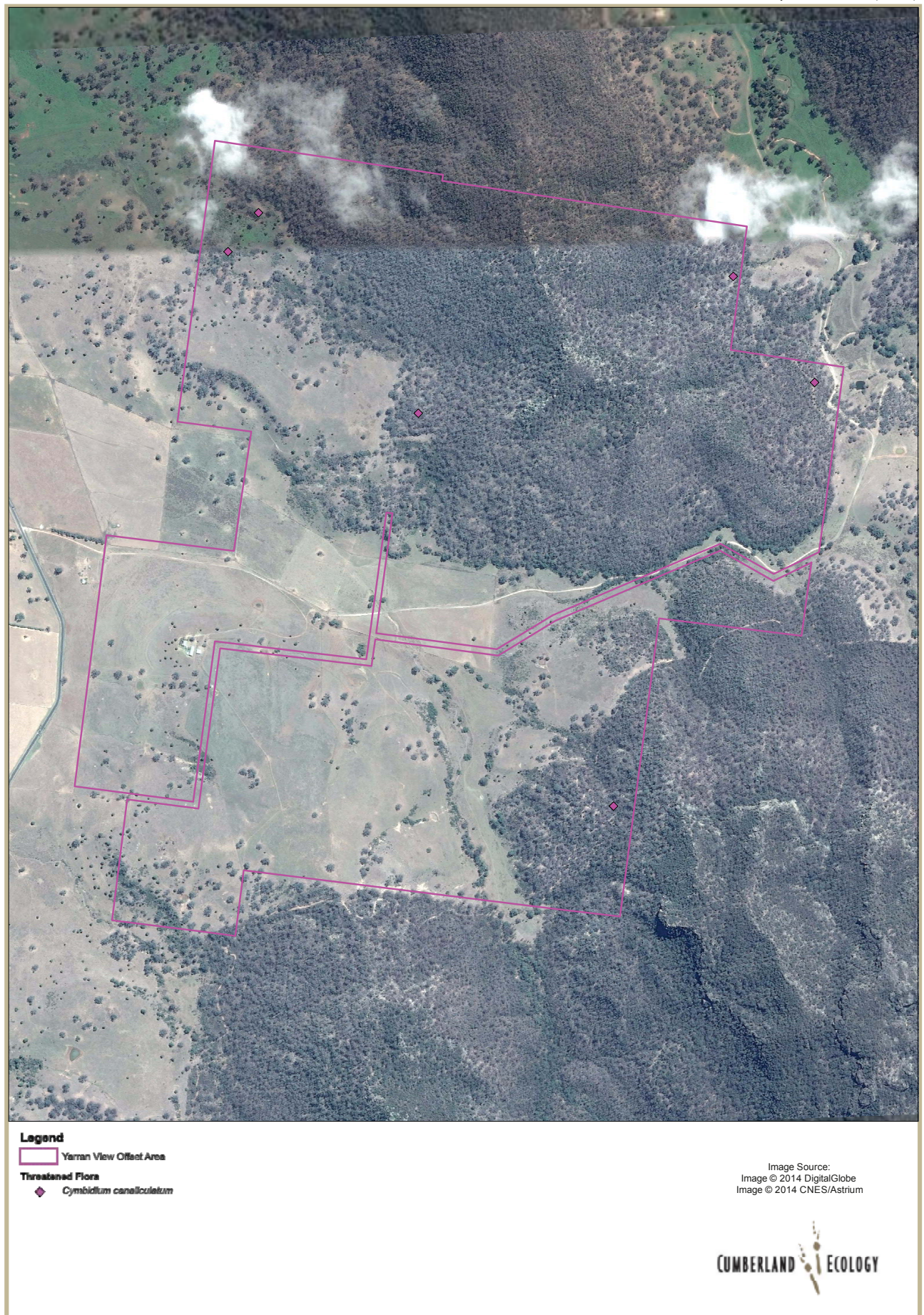


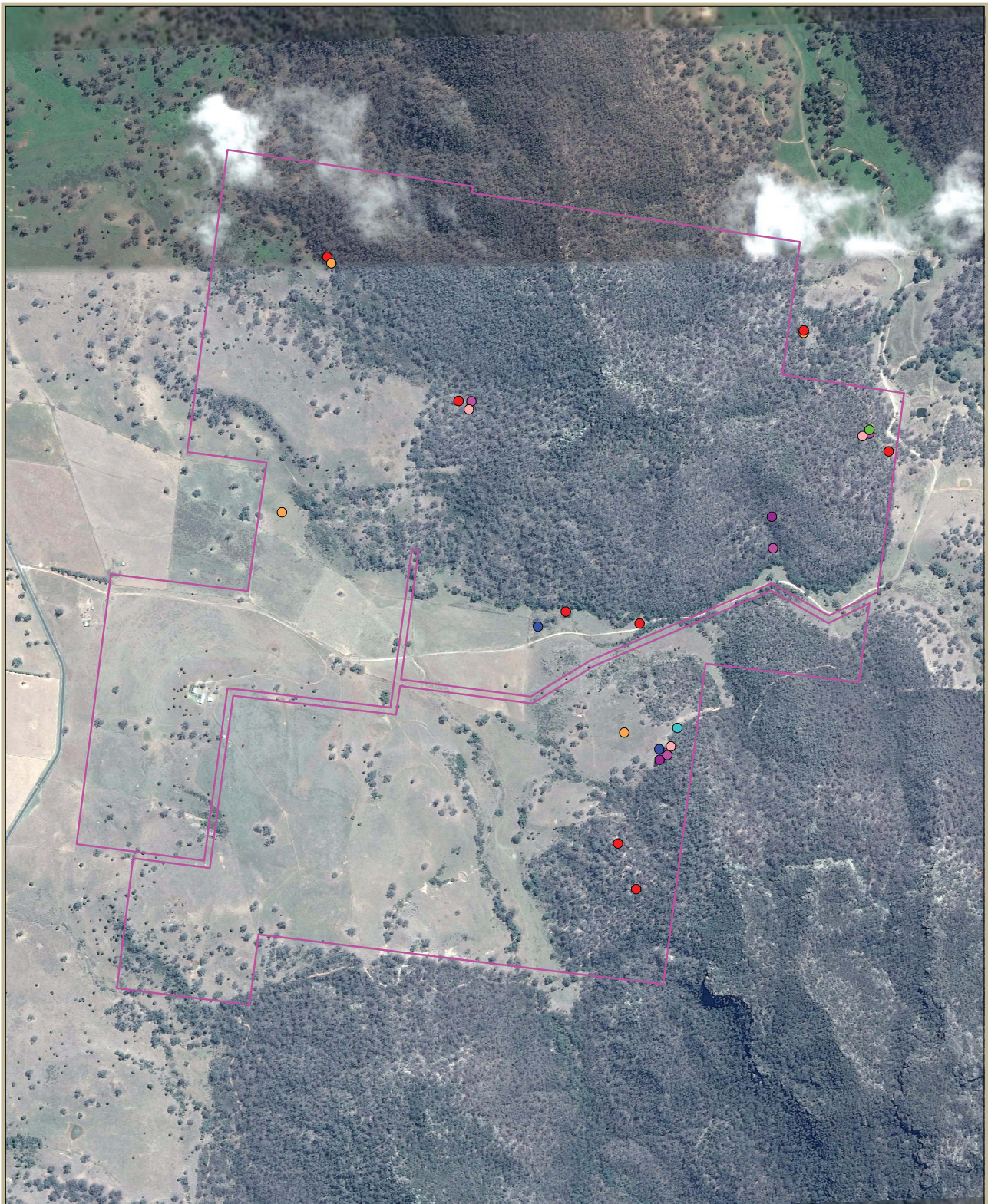
Figure F.3. Threatened flora species recorded within Yarran View Offset Area

250 0 250 500 750 1000m

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Coordinate System: MGA Zone 56 (GDA 94)

Grid North



Legend

Yarran View Offset Area

Threatened Fauna

- Barking Owl
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Gang-gang Cockatoo
- Hooded Robin (south-eastern form)
- Varied Stihella
- Eastern Berrwing-bat
- Large-eared Pied Bat

Image Source:
Image © 2014 DigitalGlobe
Image © 2014 CNES/Astrium



I:\12052\Figures\RP2_BOR\20150210\Figure F.4, Threatened Fauna_Yarran View

Figure F.4. Threatened fauna species recorded within Yarran View Offset Area





Appendix G

Flora Species List

Table G.1 Flora species recorded in the offset areas during surveys

Family	*	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Trees												
Casuarinaceae		<i>Casuarina cunninghamiana subsp. cunninghamiana</i>	River Oak			X	X					
Cupressaceae		<i>Callitris endlicheri</i>	Black Cypress Pine			X	X	X	X		X	
Fabaceae (Mimosoideae)		<i>Acacia doratoxylon</i>	Currawang			X	X				X	
Myrtaceae		<i>Angophora floribunda</i>	Rough-barked Apple			X	X	X	X	X	X	X
Myrtaceae		<i>Corymbia trachyphloia subsp. amphistomatica</i>				X	X				X	
Myrtaceae		<i>Eucalyptus agglomerata</i>	Blue-leaved Stringybark				X					X
Myrtaceae		<i>Eucalyptus albens</i>	White Box			X	X	X	X	X	X	X
Myrtaceae		<i>Eucalyptus blakelyi</i>	Blakely's Red Gum			X	X	X	X	X	X	X
Myrtaceae		<i>Eucalyptus caleyi subsp. caleyi</i>				X	X	X			X	
Myrtaceae		<i>Eucalyptus caleyi x Box sp.</i>				X					X	
Myrtaceae		<i>Eucalyptus conica</i>	Fuzzy Box			X			X			
Myrtaceae		<i>Eucalyptus dawsonii</i>	Slaty Gum			X	X	X	X		X	X
Myrtaceae		<i>Eucalyptus dwyeri</i>	Dwyer's Red Gum			X					X	X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Myrtaceae	<i>Eucalyptus fibrosa</i>	Red Ironbark				X					
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box			X	X		X	X	X	
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box			X			X	X	X	
Myrtaceae	<i>Eucalyptus nubila</i>	Blue-leaved Ironbark			X					X	X
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum			X	X	X			X	X
Small Trees											
Anacardiaceae	* <i>Schinus areira</i>	Pepper Tree			X						X
Casuarinaceae	<i>Allocasuarina gymnanthera</i>				X					X	
Casuarinaceae	<i>Allocasuarina luehmannii</i>	Bulloak					X				
Casuarinaceae	<i>Allocasuarina verticillata</i>	Drooping Sheoak					X				
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine			X	X	X	X		X	X
Fabaceae (Mimosoideae)	<i>Acacia doratoxylon</i>	Currawang			X	X	X			X	
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle			X	X		X		X	X
Fabaceae (Mimosoideae)	<i>Acacia ixiophylla</i>	Sticky Leaved Wattle						X			
Fabaceae (Mimosoideae)	<i>Acacia linearifolia</i>	Narrow-leaved Wattle			X					X	X
Malvaceae	<i>Brachychiton populneus</i> <i>subsp. populneus</i>	Kurrajong			X	X	X	X	X		X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig					X				
Myoporaceae	<i>Myoporum montanum</i>	Western Boobialla			X	X					
Myoporaceae	<i>Myoporum platycarpum</i>	Sugarwood			X	X					
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple			X		X			X	
Myrtaceae	<i>Corymbia trachyphloia</i> <i>subsp. amphistomatica</i>				X					X	
Myrtaceae	<i>Eucalyptus agglomerata</i>	Blue-leaved Stringybark				X					
Myrtaceae	<i>Eucalyptus albens</i>	White Box			X	X	X	X		X	
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum			X		X			X	
Myrtaceae	<i>Eucalyptus caleyi</i> subsp. <i>caleyi</i>				X	X				X	X
Myrtaceae	<i>Eucalyptus dawsonii</i>	Slaty Gum			X		X			X	X
Myrtaceae	<i>Eucalyptus dwyeri</i>	Dwyer's Red Gum				X					
Myrtaceae	<i>Eucalyptus fibrosa</i>	Red Ironbark				X					
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box			X	X				X	
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box			X					X	
Myrtaceae	<i>Eucalyptus nubila</i>	Blue-leaved Ironbark			X					X	
Oleaceae	* <i>Ligustrum lucidum</i>	Large-leaved Privet			X						
Salicaceae	* <i>Salix</i> sp.				X						

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Sapindaceae	<i>Atalaya sp.</i>							X			
Shrubs											
Anacardiaceae	* <i>Schinus areira</i>	Pepper Tree									X
Apiaceae	<i>Platysace ericoides</i>				X					X	
Apocynaceae	* <i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush			X	X	X	X	X	X	
Asteraceae	<i>Cassinia arcuata</i>	Sifton Bush			X		X	X		X	X
Asteraceae	<i>Cassinia cunninghamii</i>	Cunninghams Everlasting				X	X	X			X
Asteraceae	<i>Cassinia quinquefaria</i>				X	X	X	X		X	
Asteraceae	<i>Cassinia sp.</i>						X	X			X
Asteraceae	<i>Olearia elliptica</i>	Sticky Daisy-bush			X	X	X			X	X
Asteraceae	<i>Olearia elliptica subsp. elliptica</i>	Sticky Daisy Bush						X			X
Cactaceae	* <i>Opuntia stricta</i>	Common Prickly Pear			X	X	X	X		X	
Capparaceae	<i>Capparis mitchellii</i>	Wild Orange			X						
Casuarinaceae	<i>Allocasuarina gymnanthera</i>				X					X	
Casuarinaceae	<i>Allocasuarina luehmannii</i>	Bulloak				X					
Chenopodiaceae	<i>Chenopodium sp.</i>						X				

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaf Bluebush			X	X	X	X	X	X	X
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine			X		X	X		X	X
Dilleniaceae	<i>Hibbertia circumdans</i>				X					X	
Ericaceae (Styphelioideae)	<i>Acrotriche rigida</i>				X		X			X	X
Ericaceae (Styphelioideae)	<i>Astroloma humifusum</i>	Native Cranberry			X	X	X			X	
Ericaceae (Styphelioideae)	<i>Leucopogon ?appressus</i>										X
Ericaceae (Styphelioideae)	<i>Leucopogon ericoides</i>	Pink Beard-heath			X		X			X	
Ericaceae (Styphelioideae)	<i>Leucopogon muticus</i>	Blunt Beard-heath			X	X				X	X
Ericaceae (Styphelioideae)	<i>Melichrus erubescens</i>	Ruby Urn Heath			X	X	X			X	X
Ericaceae (Styphelioideae)	<i>Melichrus urceolatus</i>	Urn-heath				X					
Ericaceae (Styphelioideae)	<i>Monotoca scoparia</i>				X					X	
Ericaceae (Styphelioideae)	<i>Styphelia triflora</i>	Pink Five-Corners			X	X				X	
Fabaceae (Caesalpinioideae)	<i>Senna artemisioides subsp. X artemisioides</i>	Silver Cassia					X				
Fabaceae (Caesalpinioideae)	<i>Senna artemisioides subsp. zygophylla</i>				X	X	X			X	
Fabaceae (Faboideae)	<i>Daviesia genistifolia</i>	Broom Bitter Pea			X						
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea			X					X	
Fabaceae (Faboideae)	<i>Gompholobium aspalathoides</i>				X					X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Fabaceae (Faboideae)	<i>Hovea apiculata</i>					X	X				
Fabaceae (Faboideae)	<i>Hovea lanceolata</i>				X					X	X
Fabaceae (Faboideae)	<i>Indigofera adesmiifolia</i>	Tick Indigo				X					
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian indigo					X				
Fabaceae (Faboideae)	<i>Podolobium ilicifolium</i>	Prickly Shaggy Pea				X					X
Fabaceae (Faboideae)	<i>Swainsona galegifolia</i>	Smooth Darling-pea			X	X	X	X		X	
Fabaceae (Mimosoideae)	<i>Acacia buxifolia</i> subsp. <i>buxifolia</i>	Box-leaf Wattle			X	X				X	
Fabaceae (Mimosoideae)	<i>Acacia decora</i>	Western Silver Wattle			X	X	X	X	X	X	
Fabaceae (Mimosoideae)	<i>Acacia doratoxylon</i>	Currawang			X	X				X	X
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle			X	X	X	X	X	X	X
Fabaceae (Mimosoideae)	<i>Acacia ixiophylla</i>	Sticky Leaved Wattle			X	X	X	X		X	X
Fabaceae (Mimosoideae)	<i>Acacia linearifolia</i>	Narrow-leaved Wattle			X					X	
Fabaceae (Mimosoideae)	<i>Acacia piligera</i>				X						
Fabaceae (Mimosoideae)	<i>Acacia sertiformis</i>	Sunshine Wattle			X	X				X	X
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>					X					
Fabaceae (Mimosoideae)	<i>Acacia uncinata</i>	Round-leaved Wattle									X
Goodeniaceae	<i>Dampiera adpressa</i>	Purple Beauty-bush			X					X	
Goodeniaceae	<i>Goodenia ovata</i>	Hop Goodenia			X	X					

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Lamiaceae	<i>Prostanthera ovalifolia</i>	Oval-leaf Mintbush				X					
Lamiaceae	<i>Spartothamnella juncea</i>	Bead Bush				X					
Malvaceae	<i>Abutilon oxycarpum</i>	Straggly Lantern-bush			X						
Malvaceae	<i>Brachychiton populneus</i> <i>subsp. populneus</i>	Kurrajong			X	X				X	X
Myoporaceae	<i>Myoporum montanum</i>	Western Boobialla			X	X					
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple			X					X	X
Myrtaceae	<i>Calytrix tetragona</i>	Common Fringe-myrtle				X					
Myrtaceae	<i>Eucalyptus albens</i>	White Box			X	X	X	X		X	X
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum			X	X				X	
Myrtaceae	<i>Eucalyptus caleyi</i> subsp. <i>caleyi</i>				X	X				X	X
Myrtaceae	<i>Eucalyptus dawsonii</i>	Slaty Gum					X				
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box			X	X				X	
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box			X					X	
Myrtaceae	<i>Eucalyptus nubila</i>	Blue-leaved Ironbark			X					X	
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum				X					
Myrtaceae	<i>Harmogia densifolia</i>				X					X	
Myrtaceae	<i>Leptospermum parvifolium</i>				X	X				X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Myrtaceae	<i>Leptospermum sp.</i>				X					X	
Myrtaceae	<i>Melaleuca thymifolia</i>	Thyme Honey-myrtle			X					X	
Myrtaceae	<i>Micromyrtus sessilis</i>				X					X	
Oleaceae	* <i>Ligustrum lucidum</i>	Large-leaved Privet			X						
Oleaceae	* <i>Ligustrum sinense</i>	Small-leaved Privet			X						
Oleaceae	<i>Notelaea microcarpa</i>	Native Olive			X						
Oleaceae	<i>Notelaea microcarpa var. microcarpa</i>	Velvet Mock Olive									X
Oleaceae	* <i>Olea europaea subsp. cuspidata</i>	African Olive			X						
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush			X						
Phyllanthaceae	<i>Phyllanthus occidentalis</i>						X				X
Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn			X	X	X	X	X	X	X
Pittosporaceae	<i>Bursaria spinosa subsp. spinosa</i>	Blackthorn						X			X
Proteaceae	<i>Grevillea sp. aff. patulifolia/sericea</i>				X					X	
Proteaceae	<i>Grevillea triternata</i>				X					X	X
Proteaceae	<i>Hakea tephrosperma</i>	Hooked Needlewood						X			
Proteaceae	<i>Isopogon dawsonii</i>	Nepean Conebush				X					

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung			X	X	X			X	X
Rhamnaceae	<i>Cryptandra amara</i> var. <i>longiflora</i>	Bitter Cryptandra			X					X	
Rhamnaceae	<i>Cryptandra spinescens</i>						X				X
Rosaceae	* <i>Rosa rubiginosa</i>	Sweet Briar			X				X		X
Rosaceae	<i>Rubus parvifolius</i>	Native Raspberry			X						
Rubiaceae	<i>Psyrax odorata</i>	Shiny-leaved Canthium					X				
Rutaceae	<i>Boronia anethifolia</i>				X	X				X	X
Rutaceae	<i>Correa reflexa</i>	Common Correa				X					
Rutaceae	<i>Phebalium squamulosum</i>										X
Rutaceae	<i>Phebalium squamulosum</i> subsp. <i>gracile</i>	Scaly Phebalium			X	X				X	
Rutaceae	<i>Philotheca salsolifolia</i>					X					
Santalaceae	<i>Choretrum</i> sp.							X			
Santalaceae	<i>Choretrum</i> sp. <i>Coxs Gap</i>					X					
Santalaceae	<i>Exocarpos strictus</i>	Pale-fruit Ballart									X
Santalaceae	<i>Leptomeria acida</i>	Native Currant			X					X	
Sapindaceae	<i>Alectryon oleifolius</i>	Western Rosewood			X	X					
Sapindaceae	<i>Dodonaea sinuolata</i> subsp. <i>sinuolata</i>				X			X			

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Sapindaceae	<i>Dodonaea sp.</i>										X
Sapindaceae	<i>Dodonaea triangularis</i>					X					X
Sapindaceae	<i>Dodonaea viscosa</i>	Sticky Hop-bush			X	X	X			X	
Sapindaceae	<i>Dodonaea viscosa subsp. cuneata</i>	Wedge-leaf Hop-bush			X	X	X	X		X	X
Solanaceae	* <i>Lycium ferocissimum</i>	African Boxthorn			X						
Solanaceae	<i>Solanum brownii</i>	Violet Nightshade			X	X	X	X			X
Solanaceae	<i>Solanum parvifolium subsp. parvifolium</i>				X			X		X	X
Thymelaeaceae	<i>Pimelea latifolia</i>							X			X
Ulmaceae	<i>Trema tomentosa</i>	Native Peach				X					
Violaceae	<i>Melicytus dentatus</i>	Tree Violet			X	X	X				
Zamiaceae	<i>Macrozamia reducta</i>				X	X	X	X		X	X
Ferns and Allies											
Adiantaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair			X						
Adiantaceae	<i>Cheilanthes distans</i>	Bristly Cloak Fern			X		X	X		X	X
Adiantaceae	<i>Cheilanthes sieberi subsp. sieberi</i>	Poison Rock Fern			X	X	X	X	X	X	X
Aspleniaceae	<i>Asplenium flabellifolium</i>	Necklace Fern			X					X	X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Lindsaeaceae	<i>Lindsaea linearis</i>	Screw Fern			X						
Ophioglossaceae	<i>Ophioglossum lusitanicum</i>	Adders Tongue			X						
Selaginellaceae	<i>Selaginella uliginosa</i>	Swamp Selaginella						X			
Herbs (Dicots)											
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet			X	X	X	X		X	X
Acanthaceae	<i>Brunoniella pumilio</i>	Dwarf Brunoniella									X
Acanthaceae	<i>Brunoniella sp.</i>						X				
Acanthaceae	<i>Rostellularia adscendens</i>				X					X	
Aizoaceae	<i>Tetragonia tetragonioides</i>	New Zealand Spinach			X						
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed			X						
Amaranthaceae	* <i>Alternanthera nana</i>	Hairy Joyweed				X					
Amaranthaceae	* <i>Alternanthera pungens</i>	Khaki Weed			X						
Amaranthaceae	* <i>Amaranthus retroflexus</i>	Redroot Amaranth			X						
Amaranthaceae	* <i>Gomphrena celosioides</i>	Gomphrena Weed			X			X			
Amaranthaceae	<i>Ptilotus nobilis subsp. semilanatus</i>					X					
Amaranthaceae	<i>Ptilotus polystachyus var. polystachyus</i>	Long Tails			X						

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Anacardiaceae	* <i>Schinus areira</i>	Pepper Tree					X				
Apiaceae	* <i>Cyclospermum leptophyllum</i>	Slender Celery			X					X	
Apiaceae	<i>Daucus glochidiatus</i>	Native Carrot			X	X	X		X		
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort			X					X	
Apiaceae	<i>Hydrocotyle peduncularis</i>					X	X				
Apiaceae	<i>Hydrocotyle sp.</i>										X
Apiaceae	<i>Hydrocotyle tripartita</i>	Pennywort			X					X	
Asteraceae	* <i>Arctotheca calendula</i>	Capeweed			X						X
Asteraceae	* <i>Bidens pilosa</i>	Cobblers Pegs			X	X	X	X	X	X	X
Asteraceae	* <i>Bidens subalternans</i>	Greater Beggar's Ticks			X	X	X	X	X		X
Asteraceae	<i>Brachyscome ?sieberi</i>				X						
Asteraceae	<i>Brachyscome dentata</i>				X						
Asteraceae	<i>Brachyscome sp.</i>							X			
Asteraceae	<i>Calotis cuneifolia</i>	Purple Burr-daisy					X	X			
Asteraceae	<i>Calotis hispidula</i>	Bogan Flea			X					X	
Asteraceae	<i>Calotis lappulacea</i>	Yellow Burr-daisy			X	X	X	X	X	X	X
Asteraceae	* <i>Carthamus lanatus</i>	Saffron Thistle			X		X	X	X	X	X
Asteraceae	<i>Cassinia quinquefaria</i>					X	X	X			

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Asteraceae	* <i>Centaurea calcitrapa</i>	Star Thistle			X	X			X	X	X
Asteraceae	* <i>Centaurea melitensis</i>	Maltese Cockspur						X			
Asteraceae	* <i>Centaurea sp.</i>								X		
Asteraceae	<i>Chrysocephalum apiculatum</i>	Common Everlasting			X	X		X	X	X	
Asteraceae	* <i>Cichorium intybus</i>	Chicory							X		
Asteraceae	* <i>Cirsium vulgare</i>	Spear Thistle			X	X			X	X	
Asteraceae	* <i>Conyza bonariensis</i>	Flaxleaf Fleabane			X			X		X	X
Asteraceae	* <i>Conyza sumatrensis</i>	Tall Fleabane				X		X			
Asteraceae	<i>Cotula australis</i>	Common Cotula			X			X		X	
Asteraceae	<i>Cymbonotus lawsonianus</i>	Bears-ear			X	X	X	X	X	X	X
Asteraceae	* <i>Facelis retusa</i>	Annual Trampweed			X					X	
Asteraceae	* <i>Gamochaeta americana</i>	Cudweed						X			
Asteraceae	* <i>Gamochaeta sp.</i>				X			X		X	
Asteraceae	<i>Glossocardia bidens</i>	Cobbler's Tack			X	X	X				
Asteraceae	* <i>Hypochaeris glabra</i>	Smooth Catsear			X						
Asteraceae	* <i>Hypochaeris microcephala</i>	White Flatweed			X						
Asteraceae	* <i>Hypochaeris radicata</i>	Catsear			X	X				X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Asteraceae	* <i>Lactuca saligna</i>	Willow-leaved Lettuce					X				
Asteraceae	* <i>Lactuca serriola</i>	Prickly Lettuce			X				X	X	
Asteraceae	<i>Lagenophora stipitata</i>	Blue Bottle-daisy			X					X	
Asteraceae	<i>Minuria leptophylla</i>				X					X	
Asteraceae	<i>Olearia elliptica</i> subsp. <i>elliptica</i>	Sticky Daisy Bush									X
Asteraceae	* <i>Schkuhria pinnata</i> var. <i>abrotanoides</i>				X	X		X	X	X	
Asteraceae	<i>Senecio ?hispidulus</i>							X			
Asteraceae	* <i>Senecio madagascariensis</i>	Fireweed			X	X		X	X	X	
Asteraceae	<i>Senecio prenanthoides</i>				X					X	
Asteraceae	<i>Senecio quadridentatus</i>	Cotton Fireweed			X		X			X	
Asteraceae	<i>Sigesbeckia australiensis</i>							X			
Asteraceae	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian Weed			X	X	X	X		X	X
Asteraceae	* <i>Silybum marianum</i>	Variegated Thistle			X	X			X	X	
Asteraceae	<i>Solenogyne bellioides</i>				X		X	X		X	
Asteraceae	* <i>Soliva sessilis</i>	Bindyi			X						
Asteraceae	* <i>Sonchus asper</i>	Prickly Sowthistle			X	X				X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Asteraceae	* <i>Sonchus oleraceus</i>	Common Sowthistle			X		X		X	X	
Asteraceae	* <i>Sonchus sp.</i>								X		
Asteraceae	* <i>Tagetes minuta</i>	Stinking Roger			X	X	X	X		X	X
Asteraceae	* <i>Taraxacum officinale</i>	Dandelion			X	X	X	X		X	
Asteraceae	<i>Vittadinia cuneata</i>	Fuzzweed			X	X	X	X	X	X	X
Asteraceae	<i>Vittadinia cuneata</i> var. <i>cuneata</i>							X			
Asteraceae	<i>Vittadinia muelleri</i>				X	X	X	X			
Asteraceae	<i>Vittadinia sulcata</i>				X		X	X			X
Asteraceae	* <i>Xanthium spinosum</i>	Bathurst Burr			X						
Boraginaceae	* <i>Echium plantagineum</i>	Paterson's Curse			X	X				X	
Boraginaceae	* <i>Heliotropium amplexicaule</i>	Blue Heliotrope				X					
Brassicaceae	* <i>Brassica sp.</i>								X		
Brassicaceae	* <i>Capsella bursa-pastoris</i>	Shepherd's Purse			X					X	
Brassicaceae	* <i>Hirschfeldia incana</i>	Hairy Brassica			X	X					
Brassicaceae	* <i>Lepidium africanum</i>				X	X	X	X			
Brassicaceae	* <i>Lepidium bonariense</i>				X	X		X	X	X	
Brassicaceae	* <i>Lepidium sp.</i>				X			X		X	
Brassicaceae	* <i>Raphanus raphanistrum</i>	Wild Radish			X						

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Brassicaceae	* <i>Rapistrum rugosum</i>	Turnip Weed			X				X	X	X
Brassicaceae	* <i>Sisymbrium officinale</i>	Hedge Mustard			X					X	
Cactaceae	* <i>Opuntia aurantiaca</i>	Tiger Pear			X	X		X		X	
Cactaceae	* <i>Opuntia sp.</i>				X		X	X		X	X
Cactaceae	* <i>Opuntia stricta var. stricta</i>	Common Prickly Pear			X	X		X		X	X
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell			X	X	X	X	X	X	X
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell			X					X	
Campanulaceae	<i>Wahlenbergia luteola</i>				X	X	X				
Caryophyllaceae	* <i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort			X					X	
Caryophyllaceae	* <i>Cerastium glomeratum</i>	Mouse-ear Chickweed			X				X	X	
Caryophyllaceae	* <i>Paronychia brasiliensis</i>	Chilean Whitlow Wort			X	X	X		X	X	
Caryophyllaceae	* <i>Petrorhagia dubia</i>					X		X			X
Caryophyllaceae	* <i>Petrorhagia nanteuillii</i>							X	X		
Caryophyllaceae	* <i>Petrorhagia sp.</i>				X					X	X
Caryophyllaceae	* <i>Silene gallica var. gallica</i>				X					X	
Caryophyllaceae	* <i>Stellaria media</i>	Common Chickweed			X						
Caryophyllaceae	<i>Stellaria pungens</i>	Prickly Starwort				X					
Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush			X	X	X	X	X	X	X
Chenopodiaceae	* <i>Chenopodium album</i>	Fat Hen			X	X	X		X		X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Chenopodiaceae	<i>Dysphania pumilio</i>				X	X	X	X	X	X	X
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush			X	X	X	X	X	X	X
Chenopodiaceae	<i>Einadia nutans</i>	Climbing Saltbush			X	X	X	X	X	X	X
Chenopodiaceae	<i>Einadia nutans subsp. linifolia</i>					X		X			
Chenopodiaceae	<i>Einadia nutans subsp. nutans</i>	Climbing Saltbush			X	X	X	X			X
Chenopodiaceae	<i>Einadia polygonoides</i>				X	X	X	X	X	X	X
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed			X	X	X	X	X	X	X
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush			X	X	X	X	X		
Chenopodiaceae	<i>Maireana enchylaenoides</i>	Wingless Bluebush			X			X	X	X	
Chenopodiaceae	<i>Salsola australis</i>				X	X		X	X		
Chenopodiaceae	<i>Sclerolaena muricata</i>	Black Rolypoly			X	X		X	X		X
Chenopodiaceae	<i>Sclerolaena muricata var. semiglabra</i>	Black Rolypoly			X						
Chenopodiaceae	<i>Sclerolaena sp.</i>								X		
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort			X		X	X			X
Clusiaceae	* <i>Hypericum perforatum</i>	St. Johns Wort			X		X	X		X	X
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed			X	X	X	X	X	X	X
Convolvulaceae	<i>Dichondra sp. A</i>	Kidney Weed			X	X	X	X			X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Convolvulaceae	<i>Evolvulus alsinoides</i> var. <i>decumbens</i>				X						
Crassulaceae	<i>Crassula sieberiana</i>	Australian Stonecrop			X	X	X				
Dilleniaceae	<i>Hibbertia linearis</i>				X						
Euphorbiaceae	<i>Chamaesyce drummondii</i>	Caustic Weed			X	X	X	X		X	
Fabaceae (Faboideae)	<i>Desmodium brachypodum</i>	Large Tick-trefoil			X	X	X	X		X	X
Fabaceae (Faboideae)	<i>Desmodium varians</i>	Slender Tick-trefoil			X	X	X	X		X	X
Fabaceae (Faboideae)	<i>Lotus australis</i>	Australian Trefoil			X					X	
Fabaceae (Faboideae)	* <i>Medicago lupulina</i>	Black Medic			X					X	
Fabaceae (Faboideae)	* <i>Medicago minima</i>	Woolly Burr Medic			X			X	X	X	
Fabaceae (Faboideae)	* <i>Medicago polymorpha</i>	Burr Medic			X	X			X	X	
Fabaceae (Faboideae)	* <i>Medicago sativa</i>	Lucerne			X	X		X	X		
Fabaceae (Faboideae)	* <i>Medicago</i> sp.							X			
Fabaceae (Faboideae)	<i>Pultenaea</i> sp.							X			
Fabaceae (Faboideae)	<i>Templetonia stenophylla</i>	Leafy Templetonia			X						
Fabaceae (Faboideae)	* <i>Trifolium repens</i>	White Clover			X	X	X	X	X	X	
Fabaceae (Faboideae)	* <i>Trifolium</i> sp.				X					X	
Fabaceae (Faboideae)	* <i>Vicia</i> sp.				X					X	
Fabaceae (Faboideae)	<i>Zornia dyctiocarpa</i> var.	Zornia			X	X				X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
	<i>dyctiocarpa</i>										
Fabaceae (Mimosoideae)	<i>Acacia decora</i>	Western Silver Wattle			X					X	
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle						X			
Fabaceae (Mimosoideae)	<i>Acacia ixiophylla</i>	Sticky Leaved Wattle						X			X
Fabaceae (Mimosoideae)	<i>Acacia sertiformis</i>	Sunshine Wattle									X
Gentianaceae	* <i>Centaurium tenuiflorum</i>							X			
Geraniaceae	* <i>Erodium cicutarium</i>	Common Storksbill			X					X	
Geraniaceae	<i>Erodium crinitum</i>	Blue Storksbill			X	X	X	X	X	X	
Geraniaceae	<i>Erodium sp.</i>							X			
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium			X	X	X	X	X	X	X
Geraniaceae	<i>Geranium solanderi var. solanderi</i>	Austral Cranesbill						X			
Goodeniaceae	<i>Goodenia bellidifolia</i>				X	X		X	X		
Goodeniaceae	<i>Goodenia hederacea</i>	Forest Goodenia			X		X		X	X	X
Goodeniaceae	<i>Goodenia pinnatifida</i>					X					
Goodeniaceae	<i>Goodenia rotundifolia</i>										X
Goodeniaceae	<i>Goodenia sp.</i>				X						
Goodeniaceae	<i>Goodenia stephensonii</i>				X	X				X	
Haloragaceae	<i>Gonocarpus elatus</i>				X					X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Haloragaceae	<i>Haloragis heterophylla</i>	Rough Raspwort			X			X		X	
Hypoxidaceae	<i>Hypoxis hygrometrica</i>	Golden Weather-grass			X					X	
Iridaceae	* <i>Romulea rosea</i> var. <i>australis</i>	Onion Grass			X					X	
Lamiaceae	<i>Ajuga australis</i>	Austral Bugle			X	X	X	X		X	X
Lamiaceae	* <i>Lamium amplexicaule</i>	Henbit			X			X		X	X
Lamiaceae	* <i>Marrubium vulgare</i>	White Horehound			X	X	X	X	X	X	X
Lamiaceae	<i>Mentha satuireioides</i>	Native Pennyroyal			X	X	X	X	X	X	
Lamiaceae	* <i>Salvia reflexa</i>	Mintweed			X						
Lamiaceae	* <i>Salvia verbenaca</i>	Vervain			X	X			X	X	
Lamiaceae	<i>Scutellaria humilis</i>	Dwarf Skullcap				X	X				
Lamiaceae	* <i>Stachys arvensis</i>	Stagger Weed			X					X	
Linaceae	<i>Linum marginale</i>	Native Flax					X				
Malvaceae	<i>Brachychiton populneus</i> subsp. <i>populneus</i>	Kurrajong			X		X	X	X	X	X
Malvaceae	<i>Hibiscus sturtii</i> var. <i>sturtii</i>	Hill Hibiscus			X					X	
Malvaceae	* <i>Malva parviflora</i>	Small-flowered Mallow			X	X	X	X	X	X	
Malvaceae	* <i>Malva</i> sp.				X					X	
Malvaceae	* <i>Malvastrum americanum</i>	Spiked Malvastrum			X						

Table G.1 Flora species recorded in the offset areas during surveys

Family	*	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Malvaceae	*	<i>Modiola caroliniana</i>	Red-flowered Mallow			X	X	X	X	X	X	X
Malvaceae	*	<i>Sida acuta</i>	Spinyhead Sida			X						
Malvaceae		<i>Sida corrugata</i>	Corrugated Sida			X	X	X	X	X	X	X
Malvaceae		<i>Sida cunninghamii</i>	Ridged Sida			X	X	X	X	X	X	
Malvaceae	*	<i>Sida rhombifolia</i>	Paddy's Lucerne			X	X	X	X	X	X	
Malvaceae	*	<i>Sida spinosa</i>				X	X	X	X		X	
Malvaceae		<i>Sida trichopoda</i>	Hairy Sida					X	X			X
Meliaceae		<i>Melia azedarach</i>	White Cedar			X						
Myrsinaceae	*	<i>Anagallis arvensis</i>	Scarlet Pimpernel			X	X	X	X		X	X
Myrtaceae		<i>Angophora floribunda</i>	Rough-barked Apple			X		X	X			X
Myrtaceae		<i>Corymbia trachyphloia</i> <i>subsp. amphistomatica</i>				X					X	
Myrtaceae		<i>Eucalyptus albens</i>	White Box			X			X		X	
Myrtaceae		<i>Eucalyptus blakelyi</i>	Blakely's Red Gum			X					X	
Myrtaceae		<i>Eucalyptus caleyi</i> subsp. <i>caleyi</i>				X					X	
Myrtaceae		<i>Eucalyptus melliodora</i>	Yellow Box			X					X	
Nyctaginaceae		<i>Boerhavia dominii</i>	Tarvine			X	X	X	X	X	X	X
Nyctaginaceae		<i>Boerhavia</i> sp.								X		

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Oleaceae	* <i>Ligustrum lucidum</i>	Large-leaved Privet			X						
Oleaceae	* <i>Ligustrum sinense</i>	Small-leaved Privet			X						
Oxalidaceae	<i>Oxalis chnoodes</i>				X						
Oxalidaceae	<i>Oxalis exilis</i>				X			X		X	X
Oxalidaceae	<i>Oxalis perennans</i>				X	X	X	X	X	X	X
Phyllanthaceae	<i>Phyllanthus gunnii</i>	Scrubby Spurge									X
Phyllanthaceae	<i>Phyllanthus hirtellus</i>	Thyme Spurge				X	X				X
Phyllanthaceae	<i>Phyllanthus sp.</i>							X			
Phyllanthaceae	<i>Phyllanthus virgatus</i>	Wiry Spurge			X		X	X			
Phyllanthaceae	<i>Poranthera ericifolia</i>					X					
Phyllanthaceae	<i>Poranthera microphylla</i>				X					X	
Phytolaccaceae	* <i>Phytolacca octandra</i>	Inkweed					X				
Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn			X	X		X		X	X
Plantaginaceae	<i>Plantago debilis</i>				X	X	X	X		X	X
Plantaginaceae	* <i>Plantago lanceolata</i>	Lamb's Tongues			X			X		X	
Plantaginaceae	<i>Veronica plebeia</i>	Trailing Speedwell			X		X			X	
Polygonaceae	<i>Polygala japonica</i>	Dwarf Milkwort			X						
Polygonaceae	* <i>Polygonum aviculare</i>	Wireweed			X			X	X		
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock			X	X	X	X	X	X	X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Polygonaceae	* <i>Rumex conglomeratus</i>	Clustered Dock			X						
Polygonaceae	* <i>Rumex crispus</i>	Curled Dock			X					X	
Polygonaceae	* <i>Rumex sp.</i>				X					X	
Portulacaceae	<i>Calandrinia eremaea</i>	Small Purslane			X						
Portulacaceae	* <i>Portulaca oleracea</i>	Pigweed			X		X	X		X	
Proteaceae	<i>Hakea tephrosperma</i>	Hooked Needlewood						X			
Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung			X	X				X	
Rosaceae	<i>Acaena echinata</i>				X	X	X		X	X	
Rosaceae	<i>Acaena novae-zelandiae</i>	Bidgee-widgee			X					X	
Rosaceae	<i>Acaena ovina</i>					X	X				
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff			X	X	X	X	X	X	
Rubiaceae	<i>Galium gaudichaudii</i>	Rough Bedstraw									X
Rubiaceae	<i>Galium leptogonium</i>					X		X			
Rubiaceae	<i>Galium propinquum</i>	Maori Bedstraw			X					X	
Rubiaceae	<i>Opercularia diphylla</i>										X
Rubiaceae	<i>Opercularia hispida</i>	Hairy Stinkweed					X				
Rubiaceae	<i>Pomax umbellata</i>					X		X			
Sapindaceae	<i>Dodonaea viscosa subsp. cuneata</i>	Wedge-leaf Hop-bush			X		X	X		X	X

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Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Scrophulariaceae	<i>Eremophila debilis</i>	Winter Apple			X	X		X	X	X	
Scrophulariaceae	<i>Gratiola pedunculata</i>				X						
Scrophulariaceae	* <i>Verbascum virgatum</i>	Twiggy Mullein			X	X		X			
Solanaceae	* <i>Datura stramonium</i>	Common Thornapple			X	X				X	
Solanaceae	* <i>Physalis peruviana</i>	Cape Gooseberry			X						
Solanaceae	* <i>Solanum americanum</i>	Glossy Nightshade			X		X				
Solanaceae	<i>Solanum brownii</i>	Violet Nightshade			X	X	X	X	X	X	
Solanaceae	<i>Solanum campanulatum</i>				X		X	X			
Solanaceae	* <i>Solanum chenopodioides</i>	Whitetip Nightshade			X						
Solanaceae	<i>Solanum cinereum</i>	Narrawa Burr			X			X		X	X
Solanaceae	* <i>Solanum nigrum</i>	Black-berry Nightshade			X	X		X		X	X
Solanaceae	<i>Solanum parvifolium</i> <i>subsp. parvifolium</i>						X	X			X
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade			X	X	X	X		X	X
Solanaceae	* <i>Solanum sp.</i>				X					X	
Solanaceae	<i>Solanum sp.</i>								X		
Stackhousiaceae	<i>Stackhousia monogyna</i>	Creamy Candles			X	X		X		X	
Stackhousiaceae	<i>Stackhousia viminea</i>	Slender Stackhousia			X					X	
Thymelaeaceae	<i>Pimelea curviflora</i>					X	X	X			X

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Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Thymelaeaceae	<i>Pimelea curviflora</i> var. <i>divergens</i>				X						
Thymelaeaceae	<i>Pimelea curviflora</i> var. <i>sericea</i>				X		X	X	X	X	
Thymelaeaceae	<i>Pimelea latifolia</i> subsp. <i>elliptifolia</i>				X						
Thymelaeaceae	<i>Pimelea</i> sp.							X			
Urticaceae	<i>Urtica incisa</i>	Stinging Nettle			X	X					
Verbenaceae	* <i>Verbena bonariensis</i>	Purpletop			X	X		X	X	X	
Verbenaceae	* <i>Verbena officinalis</i>	Common Verbena			X					X	
Xanthorrhoeaceae	<i>Xanthorrhoea johnsonii</i>	Johnson's Grass Tree					X				X
Zamiaceae	<i>Macrozamia reducta</i>						X				X
Zygophyllaceae	<i>Tribulus micrococcus</i>	Yellow Vine			X	X	X	X	X		
Herbs (Monocots - Grasses)											
Poaceae	* <i>Aira caryophyllea</i>	Silvery Hairgrass				X					
Poaceae	<i>Aristida calycina</i>				X					X	
Poaceae	<i>Aristida personata</i>	Purple Wiregrass						X			X
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass			X	X	X	X	X	X	X

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Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Poaceae	<i>Aristida sp.</i>				X		X		X	X	
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass			X	X	X	X		X	X
Poaceae	<i>Austrostipa aristiglumis</i>	Plains Grass			X				X		
Poaceae	<i>Austrostipa pubescens</i>				X			X			
Poaceae	<i>Austrostipa scabra</i>	Speargrass			X	X	X	X	X	X	X
Poaceae	<i>Austrostipa scabra subsp. falcata</i>						X				
Poaceae	<i>Austrostipa scabra subsp. scabra</i>	Speargrass			X						
Poaceae	<i>Austrostipa sp.</i>						X	X			
Poaceae	<i>Austrostipa verticillata</i>	Slender Bamboo Grass			X	X	X	X	X	X	X
Poaceae	<i>Bothriochloa decipiens var. decipiens</i>				X	X	X	X	X	X	
Poaceae	<i>Bothriochloa macra</i>	Red Grass			X			X		X	
Poaceae	<i>Bothriochloa sp.</i>				X			X	X	X	X
Poaceae	* <i>Bromus brevis</i>								X		
Poaceae	* <i>Bromus catharticus</i>	Prairie Grass			X	X			X		
Poaceae	* <i>Bromus hordeaceus</i>	Soft Brome				X		X			
Poaceae	* <i>Bromus molliformis</i>	Soft Brome			X				X	X	X
Poaceae	* <i>Bromus sp.</i>				X				X		

Table G.1 Flora species recorded in the offset areas during surveys

Family	*	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Poaceae		<i>Chloris divaricata</i> var. <i>divaricata</i>	Slender Chloris			X					X	
Poaceae	*	<i>Chloris gayana</i>	Rhodes Grass			X						
Poaceae		<i>Chloris truncata</i>	Windmill Grass			X		X	X	X		
Poaceae		<i>Chloris ventricosa</i>	Tall Chloris			X	X	X	X	X	X	X
Poaceae		<i>Cleistochloa rigida</i>				X	X	X			X	X
Poaceae		<i>Cleistochloa</i> sp.							X			X
Poaceae		<i>Cymbopogon refractus</i>	Barbed Wire Grass			X	X	X	X	X	X	
Poaceae		<i>Cynodon dactylon</i>	Couch			X	X	X	X			
Poaceae		<i>Dactyloctenium radulans</i>	Button Grass			X						
Poaceae		<i>Dichanthium sericeum</i>	Queensland Bluegrass			X		X	X	X	X	
Poaceae		<i>Dichelachne micrantha</i>	Shorthair Plumegrass			X						
Poaceae		<i>Digitaria brownii</i>	Cotton Panic Grass			X	X	X	X	X	X	
Poaceae		<i>Digitaria coenicola</i>	Finger Panic Grass			X						
Poaceae		<i>Digitaria diffusa</i>	Open Summer-grass			X	X	X				
Poaceae		<i>Digitaria parviflora</i>	Small-flowered Finger Grass					X				
Poaceae		<i>Digitaria</i> sp.						X	X			
Poaceae		<i>Echinochloa colona</i>	Awnless Barnyard Grass			X						
Poaceae	*	<i>Echinochloa esculenta</i>	Japanese Millet			X						

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Poaceae	* <i>Echinochloa sp.</i>								X		
Poaceae	<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass									X
Poaceae	* <i>Eleusine tristachya</i>	Goose Grass			X				X		
Poaceae	<i>Elymus scaber</i>					X		X			
Poaceae	<i>Enneapogon gracilis</i>	Slender Bottle-washers			X		X	X		X	
Poaceae	<i>Enteropogon acicularis</i>				X		X	X			
Poaceae	<i>Entolasia marginata</i>	Bordered Panic				X					
Poaceae	<i>Entolasia stricta</i>	Wiry Panic					X	X			X
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass			X			X	X	X	
Poaceae	* <i>Eragrostis cilianensis</i>	Stinkgrass			X				X		
Poaceae	* <i>Eragrostis curvula</i>	African Lovegrass			X						
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass			X	X	X	X	X	X	
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass			X	X	X	X			
Poaceae	* <i>Hordeum sp.</i>				X					X	
Poaceae	* <i>Lolium perenne</i>	Perennial Ryegrass			X	X	X	X	X		X
Poaceae	* <i>Lolium sp.</i>				X				X	X	
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass			X	X	X	X	X	X	X
Poaceae	<i>Opismenus aemulus</i>	Australian Basket Grass				X					

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Poaceae	<i>Panicum effusum</i>	Hairy Panic			X	X	X			X	
Poaceae	<i>Panicum simile</i>	Two-colour Panic				X					
Poaceae	<i>Panicum sp.</i>				X					X	
Poaceae	<i>Paspalidium aversum</i>				X						
Poaceae	<i>Paspalidium criniforme</i>				X						
Poaceae	<i>Paspalidium distans</i>				X						
Poaceae	<i>Paspalidium gracile</i>	Slender Panic			X	X	X			X	
Poaceae	<i>Paspalidium jubiflorum</i>	Warrego Grass			X	X		X	X		
Poaceae	<i>Paspalidium sp.</i>					X		X			
Poaceae	* <i>Paspalum dilatatum</i>	Paspalum			X					X	
Poaceae	* <i>Pennisetum clandestinum</i>	Kikuyu Grass			X	X		X	X	X	
Poaceae	<i>Phragmites australis</i>	Common Reed			X						
Poaceae	<i>Poa affinis</i>						X				
Poaceae	<i>Poa labillardierei</i> var. <i>labillardierei</i>	Tussock			X	X	X				
Poaceae	<i>Poa sp.</i>						X	X			
Poaceae	* <i>Poaceae sp. (Unknown Genus/Species)</i>										X
Poaceae	<i>Rytidosperma fulvum</i>	Wallaby Grass			X	X	X			X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Poaceae	<i>Rytidosperma indutum</i>				X						
Poaceae	<i>Rytidosperma monticola</i>				X						
Poaceae	<i>Rytidosperma racemosum</i>				X	X					
Poaceae	<i>Rytidosperma racemosum</i> <i>var. racemosum</i>				X	X					
Poaceae	<i>Rytidosperma richardsonii</i>	Straw Wallaby-grass			X					X	
Poaceae	<i>Rytidosperma setaceum</i>	Smallflower Wallaby Grass			X				X		X
Poaceae	<i>Rytidosperma sp.</i>				X		X	X		X	X
Poaceae	<i>Rytidosperma sp. 2</i>										X
Poaceae	<i>Rytidosperma tenuius</i>				X						
Poaceae	* <i>Setaria parviflora</i>				X					X	
Poaceae	<i>Sporobolus caroli</i>	Fairy Grass			X						
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass			X			X	X	X	
Poaceae	<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass			X						
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass			X	X	X	X	X		
Poaceae	<i>Tragus australianus</i>	Small Burrgrass			X	X					
Poaceae	* <i>Urochloa panicoides</i>	Urochloa Grass			X			X	X	X	X
Poaceae	<i>Urochloa piligera</i>	Hairy Armgrass			X	X	X	X			
Poaceae	* <i>Vulpia bromoides</i>	Squirrel Tail Fescue					X				

Table G.1 Flora species recorded in the offset areas during surveys

Family	*	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Herbs (Monocots - Other)												
Anthericaceae		<i>Arthropodium sp.</i>				X		X	X		X	
Anthericaceae		<i>Arthropodium sp. B</i>						X				
Anthericaceae		<i>Caesia parviflora</i>	Pale Grass-lily				X					
Anthericaceae		<i>Dichopogon fimbriatus</i>	Nodding Chocolate Lily						X			
Anthericaceae		<i>Dichopogon sp.</i>					X					
Anthericaceae		<i>Laxmannia gracilis</i>	Slender Wire Lily				X					
Anthericaceae		<i>Tricoryne elatior</i>	Yellow Autumn-lily			X					X	
Commelinaceae		<i>Commelina cyanea</i>	Native Wandering Jew			X	X			X	X	X
Cyperaceae		<i>Carex inversa</i>	Knob Sedge			X	X	X	X	X	X	
Cyperaceae	*	<i>Cyperus brevifolius</i>	Mullumbimby Couch			X						
Cyperaceae		<i>Cyperus fulvus</i>	Sticky Sedge			X		X				
Cyperaceae		<i>Cyperus gracilis</i>	Slender Flat-sedge			X	X	X	X	X	X	X
Cyperaceae		<i>Cyperus sp.</i>				X					X	
Cyperaceae		<i>Fimbristylis dichotoma</i>	Common Fringe-sedge			X				X	X	
Cyperaceae		<i>Gahnia aspera</i>	Rough Saw-sedge			X	X	X	X		X	X
Cyperaceae		<i>Gahnia sp.</i>						X	X			
Cyperaceae		<i>Lepidosperma concavum</i>				X					X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Cyperaceae	<i>Lepidosperma gunnii</i>					X	X				X
Cyperaceae	<i>Lepidosperma laterale</i>				X	X				X	X
Cyperaceae	<i>Lepidosperma sp.</i>					X					
Cyperaceae	<i>Lepidosperma urophorum</i>				X					X	
Cyperaceae	<i>Scleria mackaviensis</i>				X					X	X
Iridaceae	* <i>Romulea rosea</i> var. <i>australis</i>	Onion Grass			X						
Iridaceae	* <i>Romulea sp.</i>				X					X	
Juncaceae	<i>Juncus subsecundus</i>				X					X	
Juncaceae	<i>Juncus usitatus</i>				X			X		X	
Lomandraceae	<i>Lomandra confertifolia</i>	Mat-rush				X	X	X			
Lomandraceae	<i>Lomandra confertifolia</i> subsp. <i>pallida</i>				X					X	
Lomandraceae	<i>Lomandra confertifolia</i> subsp. <i>rubiginosa</i>				X		X			X	X
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush				X	X				
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>				X			X	X	X	
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush			X			X	X	X	X

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Lomandraceae	<i>Lomandra glauca</i>	Pale Mat-rush			X	X	X			X	X
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush					X				X
Lomandraceae	<i>Lomandra multiflora</i> <i>subsp. multiflora</i>	Many-flowered Mat-rush			X	X	X	X		X	X
Lomandraceae	<i>Lomandra sp.</i>							X			
Orchidaceae	<i>Acianthus fornicatus</i>	Pixie Caps			X					X	
Orchidaceae	<i>Caladenia catenata</i>	White Caladenia			X					X	
Orchidaceae	<i>Calochilus sp.</i>				X						
Orchidaceae	<i>Cyanicula caerulea</i>	Blue Caladenia			X					X	
Orchidaceae	<i>Cymbidium canaliculatum</i>	Tiger Orchid	EP	-		X	X				X
Orchidaceae	<i>Glossodia ?major</i>				X						
Orchidaceae	<i>Orchidaceae sp.</i> (Unknown Genus/Species)				X						
Orchidaceae	<i>Pterostylis sp.</i>				X					X	
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily			X					X	
Phormiaceae	<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax Lily			X					X	
Phormiaceae	<i>Dianella longifolia</i>				X	X	X			X	
Phormiaceae	<i>Dianella prunina</i>					X	X				

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Phormiaceae	<i>Dianella revoluta</i>	Blueberry Lily			X	X	X	X		X	
Phormiaceae	<i>Dianella revoluta</i> var. <i>revoluta</i>						X				X
Phormiaceae	<i>Dianella tasmanica</i>	Tasman Flax-lily					X				
Phormiaceae	<i>Stypandra glauca</i>	Nodding Blue Lily			X					X	X
Herbs (Vines and Climbers)											
Apocynaceae	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear			X	X	X	X			X
Apocynaceae	<i>Parsonsia lanceolata</i>	Rough Silkpod			X						
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod			X		X			X	
Apocynaceae	<i>Tylophora linearis</i>		V	E	X	X					
Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Wonga Vine			X		X				
Convolvulaceae	<i>Convolvulus erubescens</i>	Blushing Bindweed			X	X	X	X	X	X	
Convolvulaceae	<i>Cuscuta australis</i>	Australian Dodder			X					X	
Fabaceae (Faboideae)	<i>Cullen tenax</i>	Tough Scurf-pea			X			X			
Fabaceae (Faboideae)	<i>Glycine canescens</i>	Silky Glycine			X		X				
Fabaceae (Faboideae)	<i>Glycine clandestina</i>				X		X	X	X	X	X
Fabaceae (Faboideae)	<i>Glycine microphylla</i>	Small-leaf Glycine			X	X	X			X	

Table G.1 Flora species recorded in the offset areas during surveys

Family	* Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Fabaceae (Faboideae)	<i>Glycine tabacina</i>				X	X	X	X	X	X	X
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	Purple Coral Pea			X	X				X	
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry			X	X	X				X
Menispermaceae	<i>Stephania japonica</i>	Snake Vine				X					
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Apple Berry			X					X	
Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard			X		X			X	
Ranunculaceae	<i>Clematis glycinoides</i> var. <i>glycinoides</i>	Headache Vine			X	X	X				
Mistletoes											
Loranthaceae	<i>Amyema ?miquelii</i>										X
Loranthaceae	<i>Amyema ?quandang</i> var. <i>quandang</i>										X
Loranthaceae	<i>Amyema miquelii</i>					X	X	X			
Loranthaceae	<i>Amyema</i> sp.								X		

* denotes exotic species

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, EP = Endangered Population



Appendix H

Fauna Species List

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Amphibians													
Hylidae	<i>Litoria caerulea</i>		Green Tree Frog			X							
Hylidae	<i>Litoria latopalmata</i>		Broad-palmed Frog			X							
Hylidae	<i>Litoria peronii</i>		Peron's Tree Frog			X	X				X		
Myobatrachidae	<i>Crinia signifera</i>		Common Eastern Froglet			X							
Myobatrachidae	<i>Limnodynastes tasmaniensis</i>		Spotted Grass Frog			X							
Myobatrachidae	<i>Uperoleia laevisgata</i>		Smooth Toadlet			X							
Birds													
Acanthizidae	<i>Acanthiza chrysorrhoa</i>		Yellow-rumped Thornbill			X	X			X			X
Acanthizidae	<i>Acanthiza lineata</i>		Striated Thornbill				X	X					X
Acanthizidae	<i>Acanthiza nana</i>		Yellow Thornbill			X	X	X	X	X		X	X
Acanthizidae	<i>Acanthiza pusilla</i>		Brown Thornbill			X	X	X	X	X		X	X
Acanthizidae	<i>Acanthiza reguloides</i>		Buff-rumped Thornbill			X	X					X	X
Acanthizidae	<i>Aphelocephala leucopsis</i>		Southern Whiteface			X							
Acanthizidae	<i>Chthonicola sagittata</i>		Speckled Warbler	V		X	X	X	X	X		X	
Acanthizidae	<i>Gerygone albogularis</i>		White-throated Gerygone			X	X	X	X	X			X

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Acanthizidae	<i>Origma solitaria</i>		Rockwarbler			X	X	X					X
Acanthizidae	<i>Sericornis frontalis</i>		White-browed Scrubwren			X	X	X				X	
Acanthizidae	<i>Smicromis brevirostris</i>		Weebill			X	X	X				X	
Accipitridae	<i>Accipiter cirrocephalus</i>		Collared Sparrowhawk				X	X					
Accipitridae	<i>Accipiter fasciatus</i>		Brown Goshawk			X	X					X	
Accipitridae	<i>Aquila audax</i>		Wedge-tailed Eagle			X	X			X		X	X
Accipitridae	<i>Circus assimilis</i>		Spotted Harrier	V		X							
Accipitridae	<i>Elanus axillaris</i>		Black-shouldered Kite			X							
Accipitridae	<i>Hieraaetus morphnoides</i>		Little Eagle	V		X							
Aegothelidae	<i>Aegotheles cristatus</i>		Australian Owlet-nightjar			X	X			X	X	X	X
Alaudidae	<i>Mirafra javanica</i>		Horsfield's Bushlark			X							
Alcedinidae	<i>Dacelo novaeguineae</i>		Laughing Kookaburra			X	X	X	X	X	X	X	X
Alcedinidae	<i>Todiramphus macleayii</i>		Forest Kingfisher				X			X			
Alcedinidae	<i>Todiramphus sanctus</i>		Sacred Kingfisher			X	X			X		X	X
Anatidae	<i>Anas gracilis</i>		Grey Teal			X							
Anatidae	<i>Anas superciliosa</i>		Pacific Black Duck			X	X	X				X	
Anatidae	<i>Chenonetta jubata</i>		Australian Wood Duck			X	X	X	X			X	
Apodidae	<i>Aerodramus terraereginae</i>		Australian Swiftlet			X	X					X	

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Ardeidae	<i>Ardea pacifica</i>		White-necked Heron			X							
Ardeidae	<i>Egretta novaehollandiae</i>		White-faced Heron			X	X					X	
Artamidae	<i>Artamus cinereus</i>		Black-faced Woodswallow			X	X	X		X		X	
Artamidae	<i>Artamus cyanopterus</i>		Dusky Woodswallow			X	X		X			X	X
Artamidae	<i>Artamus personatus</i>		Masked Woodswallow				X						X
Artamidae	<i>Artamus superciliosus</i>		White-browed Woodswallow			X							
Artamidae	<i>Cracticus nigrogularis</i>		Pied Butcherbird			X	X	X	X	X	X	X	
Artamidae	<i>Cracticus tibicen</i>		Australian Magpie			X	X	X	X	X	X	X	X
Artamidae	<i>Cracticus torquatus</i>		Grey Butcherbird			X	X			X	X		X
Artamidae	<i>Strepera graculina</i>		Pied Currawong			X	X	X	X		X	X	X
Cacatuidae	<i>Cacatua galerita</i>		Sulphur-crested Cockatoo			X	X	X	X	X		X	X
Cacatuidae	<i>Cacatua sanguinea</i>		Little Corella			X	X			X			X
Cacatuidae	<i>Callocephalon fimbriatum</i>		Gang-gang Cockatoo	V		X	X	X	X				
Cacatuidae	<i>Calyptorhynchus funereus</i>		Yellow-tailed Black-Cockatoo			X							
Cacatuidae	<i>Calyptorhynchus lathami</i>		Glossy Black-Cockatoo	V		X							
Cacatuidae	<i>Eolophus roseicapillus</i>		Galah			X	X	X	X	X	X	X	
Campephagidae	<i>Coracina novaehollandiae</i>		Black-faced Cuckoo-shrike			X	X	X		X	X	X	X

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Campephagidae	<i>Coracina papuensis</i>		White-bellied Cuckoo-shrike			X	X					X	
Campephagidae	<i>Coracina tenuirostris</i>		Cicadabird				X	X					
Campephagidae	<i>Lalage sueurii</i>		White-winged Triller				X			X			X
Charadriidae	<i>Elsyornis melanops</i>		Black-fronted Dotterel			X							
Charadriidae	<i>Vanellus miles</i>		Masked Lapwing			X							
Climacteridae	<i>Climacteris picumnus victoriae</i>		Brown Treecreeper (eastern subspecies)	V		X	X	X	X	X		X	X
Climacteridae	<i>Cormobates leucophaea</i>		White-throated Treecreeper			X	X	X	X	X		X	X
Columbidae	<i>Geopelia cuneata</i>		Diamond Dove			X	X		X			X	
Columbidae	<i>Geopelia humeralis</i>		Bar-shouldered Dove			X	X					X	
Columbidae	<i>Geopelia striata</i>		Peaceful Dove			X	X			X		X	X
Columbidae	<i>Leucosarcia melanoleuca</i>		Wonga Pigeon			X	X					X	
Columbidae	<i>Macropygia amboinensis</i>		Brown Cuckoo-dove			X	X		X				
Columbidae	<i>Ocyphaps lophotes</i>		Crested Pigeon			X	X	X		X	X		X
Columbidae	<i>Phaps chalcoptera</i>		Common Bronzewing			X	X	X	X	X		X	X
Corcoracidae	<i>Corcorax melanorhamphos</i>		White-winged Chough			X	X	X		X	X	X	X
Corcoracidae	<i>Struthidea cinerea</i>		Apostlebird			X	0						

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Corvidae	<i>Corvus coronoides</i>		Australian Raven			X	X	X	X	X	X	X	X
Corvidae	<i>Corvus mellori</i>		Little Raven			X	X					X	
Cuculidae	<i>Cacomantis flabelliformis</i>		Fan-tailed Cuckoo			X	X	X	X				
Cuculidae	<i>Cacomantis pallidus</i>		Pallid Cuckoo				X			X			
Cuculidae	<i>Cacomantis variolosus</i>		Brush Cuckoo				X		X				
Cuculidae	<i>Chalcites basalis</i>		Horsfield's Bronze-Cuckoo				X						X
Cuculidae	<i>Chalcites lucidus</i>		Shining Bronze-Cuckoo			X	X					X	
Cuculidae	<i>Eudynamys orientalis</i>		Eastern Koel				X	X					
Cuculidae	<i>Scythrops novaehollandiae</i>		Channel-billed Cuckoo				X		X	X			X
Estrildidae	<i>Neochmia modesta</i>		Plum-headed Finch			X	X		X				
Estrildidae	<i>Neochmia temporalis</i>		Red-browed Finch			X	X	X	X				
Estrildidae	<i>Stagonopleura guttata</i>		Diamond Firetail	V		X	X					X	X
Estrildidae	<i>Taeniopygia bichenovii</i>		Double-barred Finch			X	X	X	X	X		X	X
Estrildidae	<i>Taeniopygia guttata</i>		Zebra Finch			X	X			X			X
Falconidae	<i>Falco berigora</i>		Brown Falcon			X							
Falconidae	<i>Falco cenchroides</i>		Nankeen Kestrel			X	X					X	X
Falconidae	<i>Falco longipennis</i>		Australian Hobby			X							
Falconidae	<i>Falco peregrinus</i>		Peregrine Falcon			X	X	X					

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Hirundinidae	<i>Cheramoeca leucosterna</i>		White-backed Swallow				X	X					
Hirundinidae	<i>Hirundo neoxena</i>		Welcome Swallow			X	X		X	X		X	X
Hirundinidae	<i>Petrochelidon nigricans</i>		Tree Martin			X	X			X		X	X
Maluridae	<i>Malurus cyaneus</i>		Superb Fairy-wren			X	X	X	X	X		X	X
Megaluridae	<i>Cincloramphus mathewsi</i>		Rufous Songlark			X	X					X	
Megapodiidae	<i>Alectura lathami</i>		Australian Brush-turkey				X	X					
Meliphagidae	<i>Acanthagenys rufogularis</i>		Spiny-cheeked Honeyeater				X			X			
Meliphagidae	<i>Acanthorhynchus tenuirostris</i>		Eastern Spinebill			X	X					X	X
Meliphagidae	<i>Anthochaera carunculata</i>		Red Wattlebird			X	X					X	
Meliphagidae	<i>Anthochaera phrygia</i>		Regent Honeyeater	CE	E	X							
Meliphagidae	<i>Entomyzon cyanotis</i>		Blue-faced Honeyeater			X	X				X		
Meliphagidae	<i>Lichenostomus chrysops</i>		Yellow-faced Honeyeater			X	X	X	X			X	X
Meliphagidae	<i>Lichenostomus fuscus</i>		Fuscous Honeyeater			X	X			X		X	X
Meliphagidae	<i>Lichenostomus leucotis</i>		White-eared Honeyeater			X	X	X		X		X	
Meliphagidae	<i>Lichenostomus melanops</i>		Yellow-tufted Honeyeater			X	X		X			X	X
Meliphagidae	<i>Lichenostomus penicillatus</i>		White-plumed Honeyeater			X	X	X	X	X		X	X
Meliphagidae	<i>Manorina melanocephala</i>		Noisy Miner			X	X	X		X	X	X	X

Table H.1 Fauna species recorded in the offset areas during surveys

Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Meliphagidae	<i>Manorina melanophrys</i>		Bell Miner			X	X						X
Meliphagidae	<i>Melithreptus brevirostris</i>		Brown-headed Honeyeater			X	X					X	X
Meliphagidae	<i>Melithreptus gularis gularis</i>		Black-chinned Honeyeater (eastern subspecies)	V		X	X					X	
Meliphagidae	<i>Melithreptus lunatus</i>		White-naped Honeyeater			X							
Meliphagidae	<i>Myzomela sanguinolenta</i>		Scarlet Honeyeater			X							
Meliphagidae	<i>Philemon citreogularis</i>		Little Friarbird			X							
Meliphagidae	<i>Philemon corniculatus</i>		Noisy Friarbird			X	X	X	X	X	X	X	X
Meliphagidae	<i>Plectorhyncha lanceolata</i>		Striped Honeyeater			X	X			X		X	X
Menuridae	<i>Menura novaehollandiae</i>		Superb Lyrebird			X	X	X				X	
Meropidae	<i>Merops ornatus</i>		Rainbow Bee-eater		J	X	X					X	
Monarchidae	<i>Grallina cyanoleuca</i>		Magpie-lark			X	X	X	X	X		X	X
Monarchidae	<i>Myiagra inquieta</i>		Restless Flycatcher			X	X	X	X			X	
Monarchidae	<i>Myiagra rubecula</i>		Leaden Flycatcher			X	X					X	
Motacillidae	<i>Anthus novaeseelandiae</i>		Australian Pipit			X	X			X			X
Nectariniidae	<i>Dicaeum hirundinaceum</i>		Mistletoebird			X	X	X		X	X	X	X
Neosittidae	<i>Daphoenositta chrysoptera</i>		Varied Sittella	V			X						X
Oriolidae	<i>Oriolus sagittatus</i>		Olive-backed Oriole			X	X	X	X	X		X	X

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Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Pachycephalidae	<i>Colluricincla harmonica</i>		Grey Shrike-thrush			X	X	X	X	X		X	X
Pachycephalidae	<i>Falcunculus frontatus</i>		Crested Shrike-tit			X	X		X				X
Pachycephalidae	<i>Pachycephala pectoralis</i>		Golden Whistler			X	X	X				X	X
Pachycephalidae	<i>Pachycephala rufiventris</i>		Rufous Whistler			X	X	X	X	X		X	X
Pardalotidae	<i>Pardalotus punctatus</i>		Spotted Pardalote			X	X	X	X	X		X	X
Pardalotidae	<i>Pardalotus striatus</i>		Striated Pardalote			X	X		X		X	X	X
Passeridae	<i>Passer domesticus</i>	*	House Sparrow			X							
Pelecanidae	<i>Pelecanus conspicillatus</i>		Australian Pelican			X	X					X	
Petroicidae	<i>Eopsaltria australis</i>		Eastern Yellow Robin			X	X	X	X	X		X	X
Petroicidae	<i>Melanodryas cucullata cucullata</i>		Hooded Robin (south-eastern form)	V		X	X					X	X
Petroicidae	<i>Microeca fascians</i>		Jacky Winter			X	X	X				X	X
Petroicidae	<i>Petroica rosea</i>		Rose Robin			X	X	X					
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>		Little Pied Cormorant			X							
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>		Little Black Cormorant			X							
Phasianidae	<i>Coturnix pectoralis</i>		Stubble Quail			X							
Phasianidae	<i>Coturnix ypsilophora</i>		Brown Quail			X	X						X
Podargidae	<i>Podargus strigoides</i>		Tawny Frogmouth			X							

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Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Podicipedidae	<i>Tachybaptus novaehollandiae</i>		Australasian Grebe			X							
Pomatostomidae	<i>Pomatostomus superciliosus</i>		White-browed Babbler			X	X						X
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>		Grey-crowned Babbler (eastern subspecies)	V		X	X		X			X	
Psittacidae	<i>Alisterus scapularis</i>		Australian King-Parrot			X	X	X	X			X	X
Psittacidae	<i>Glossopsitta concinna</i>		Musk Lorikeet			X	X					X	
Psittacidae	<i>Glossopsitta pusilla</i>		Little Lorikeet	V		X	X	X				X	
Psittacidae	<i>Melopsittacus undulatus</i>		Budgerigar			X							
Psittacidae	<i>Neophema pulchella</i>		Turquoise Parrot	V		X	X					X	
Psittacidae	<i>Platycercus elegans</i>		Crimson Rosella			X	X	X				X	
Psittacidae	<i>Platycercus eximius</i>		Eastern Rosella			X	X	X	X	X	X	X	X
Psittacidae	<i>Psephotus haematonotus</i>		Red-rumped Parrot			X	X	X	X	X	X	X	X
Psophodidae	<i>Cinclosoma punctatum</i>		Spotted Quail-thrush			X							
Psophodidae	<i>Psophodes olivaceus</i>		Eastern Whipbird				X						X
Ptilonorhynchidae	<i>Ptilonorhynchus violaceus</i>		Satin Bowerbird			X	X	X				X	X
Rallidae	<i>Fulica atra</i>		Eurasian Coot			X							
Rallidae	<i>Gallinula tenebrosa</i>		Dusky Moorhen			X							

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Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Rallidae	<i>Porphyrio porphyrio</i>		Purple Swampphen			X							
Rhipiduridae	<i>Rhipidura albiscapa</i>		Grey Fantail			X	X	X	X	X		X	X
Rhipiduridae	<i>Rhipidura leucophrys</i>		Willie Wagtail			X	X	X	X	X		X	X
Strigidae	<i>Ninox connivens</i>		Barking Owl	V			X			X			X
Strigidae	<i>Ninox novaeseelandiae</i>		Southern Boobook			X	X					X	X
Sturnidae	<i>Sturnus tristis</i>	*	Common Myna			X							
Sturnidae	<i>Sturnus vulgaris</i>	*	Common Starling			X	X		X			X	
Threskiornithidae	<i>Threskiornis spinicollis</i>		Straw-necked Ibis			X	X				X	X	
Timaliidae	<i>Zosterops lateralis</i>		Silvereye			X							
Tytonidae	<i>Tyto javanica</i>		Eastern Barn Owl			X	X				X	X	
Mammals													
Bovidae	<i>Bos taurus</i>	*	European cattle			X	X	X			X	X	
Bovidae	<i>Capra hircus</i>	*	Goat			X							
Canidae	<i>Canis lupus</i>	*	Dingo, domestic dog			X	X	X				X	
Canidae	<i>Vulpes vulpes</i>	*	Fox			X	X	X		X		X	X
Cervidae	<i>Dama dama</i>	*	Fallow Deer			X	X					X	
Dasyuridae	<i>Antechinus flavipes</i>		Yellow-footed Antechinus			X	X					X	

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Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Dasyuridae	<i>Sminthopsis murina</i>		Common Dunnart			X							
Emballonuridae	<i>Saccolaimus flaviventris</i>		Yellow-bellied Sheath-tail-bat	V		X	X	X	X				
Equidae	<i>Equus caballus</i>	*	Horse			X	X	X					
Felidae	<i>Felis catus</i>	*	Cat			X	X					X	
Leporidae	<i>Oryctolagus cuniculus</i>	*	Rabbit			X	X	X	X	X		X	X
Macropodidae	<i>Macropus giganteus</i>		Eastern Grey Kangaroo			X	X	X		X	X	X	X
Macropodidae	<i>Macropus robustus</i>		Common Wallaroo			X	X	X	X	X		X	X
Macropodidae	<i>Macropus rufogriseus</i>		Red-necked Wallaby			X	X	X	X	X		X	X
Macropodidae	<i>Petrogale penicillata</i>		Brush-tailed Rock-wallaby	E	V	X							
Macropodidae	<i>Wallabia bicolor</i>		Swamp Wallaby			X	X	X	X	X		X	X
Molossidae	<i>Austronomus australis</i>		White-striped Freetail-bat			X	X	X	X	X	X	X	X
Molossidae	<i>Mormopterus "Species 4" (big penis)</i>					X	X	X				X	
Molossidae	<i>Mormopterus planiceps</i>		Little Mastiff-bat				X	X	X	X	X		X
Molossidae	<i>Mormopterus ridei</i>		Eastern Free-tailed Bat				X	X	X	X	X		X
Muridae	<i>Mus musculus</i>	*	House Mouse			X	X	X				X	
Muridae	<i>Pseudomys novaehollandiae</i>		New Holland Mouse		V	X	X	X					

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Family	Scientific Name	*	Common Name	TSC Act Status	EPBC Act Status	Study Area	Offset Areas	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Yarran View Offset Area
Muridae	<i>Rattus fuscipes</i>		Bush Rat			X	X					X	
Petauridae	<i>Petaurus breviceps</i>		Sugar Glider			X	X	X	X				
Phalangeridae	<i>Trichosurus vulpecula</i>		Common Brushtail Possum			X	X	X	X	X		X	X
Pseudocheiridae	<i>Pseudocheirus peregrinus</i>		Common Ringtail Possum			X	X					X	
Rhinolophidae	<i>Rhinolophus megaphyllus</i>		Eastern Horseshoe-bat			X	X	X	X			X	X
Suidae	<i>Sus scrofa</i>	*	Pig			X	X	X		X			X
Tachyglossidae	<i>Tachyglossus aculeatus</i>		Short-beaked Echidna			X	X	X	X			X	
Vespertilionidae	<i>Chalinolobus dwyeri</i>		Large-eared Pied Bat	V	V	X	X	X	X		X	X	X
Vespertilionidae	<i>Chalinolobus gouldii</i>		Gould's Wattled Bat				X	X	X	X	X		X
Vespertilionidae	<i>Chalinolobus morio</i>		Chocolate Wattled Bat			X	X	X	X	X	X	X	X
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>		Eastern False Pipistrelle	V			X			X	X		X
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>		Eastern Bentwing-bat	V		X	X	X	X	X	X	X	X
Vespertilionidae	<i>Nyctophilus geoffroyi</i>		Lesser Long-eared Bat			X	X					X	X
Vespertilionidae	<i>Nyctophilus gouldi</i>		Gould's Long-eared Bat			X	X	X				X	
Vespertilionidae	<i>Nyctophilus sp.</i>					X	X	X	X	X	X	X	X
Vespertilionidae	<i>Scoteanax rueppellii</i>		Greater Broad-nosed Bat	V		X	X	X		X		X	X
Vespertilionidae	<i>Scotorepens balstoni</i>		Inland Broad-nosed Bat			X	X	X				X	

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Vespertilionidae	<i>Vespadelus pumilus</i>		Eastern Forest Bat			X							
Vespertilionidae	<i>Vespadelus regulus</i>		Southern Forest Bat			X	X	X	X		X	X	X
Vespertilionidae	<i>Vespadelus sp.</i>						X	X					
Vespertilionidae	<i>Vespadelus troughtoni</i>		Eastern Cave Bat	V		X	X	X	X	X	X	X	X
Vespertilionidae	<i>Vespadelus vulturnus</i>		Little Forest Bat			X	X	X	X	X	X	X	X
Vombatidae	<i>Vombatus ursinus</i>		Common Wombat			X	X	X		X		X	X
Maluridae	<i>Malurus lamberti</i>		Variegated Fairy-wren			X	X			X			
Reptiles													
Agamidae	<i>Amphibolurus nobbi</i>		Nobbi				X						X
Agamidae	<i>Intellagama lesueurii</i>		Eastern Water Dragon				X	X					
Chelidae	<i>Chelodina longicollis</i>		Eastern Snake-necked Turtle				X	X					
Chelidae	<i>Emydura macquarii</i>		Macquarie Turtle			X							
Elapidae	<i>Pseudechis porphyriacus</i>		Red-bellied Black Snake				X	X					
Gekkonidae	<i>Diplodactylus vittatus</i>		Wood Gecko			X	X						X
Scincidae	<i>Carlia tetradactyla</i>		Southern Rainbow-skink			X							
Scincidae	<i>Ctenotus robustus</i>		Robust Ctenotus			X	X		X				

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Scincidae	<i>Ctenotus taeniolatus</i>		Copper-tailed Skink			X							
Scincidae	<i>Eulamprus quoyii</i>		Eastern Water-skink				X	X					
Scincidae	<i>Lampropholis delicata</i>		Dark-flecked Garden Sunskink			X							
Scincidae	<i>Lerista bougainvillii</i>		South-eastern Slider			X							
Scincidae	<i>Morethia boulengeri</i>		South-eastern Morethia Skink			X							
Varanidae	<i>Varanus varius</i>		Lace Monitor			X	X	X	X			X	X

* denotes exotic species

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory