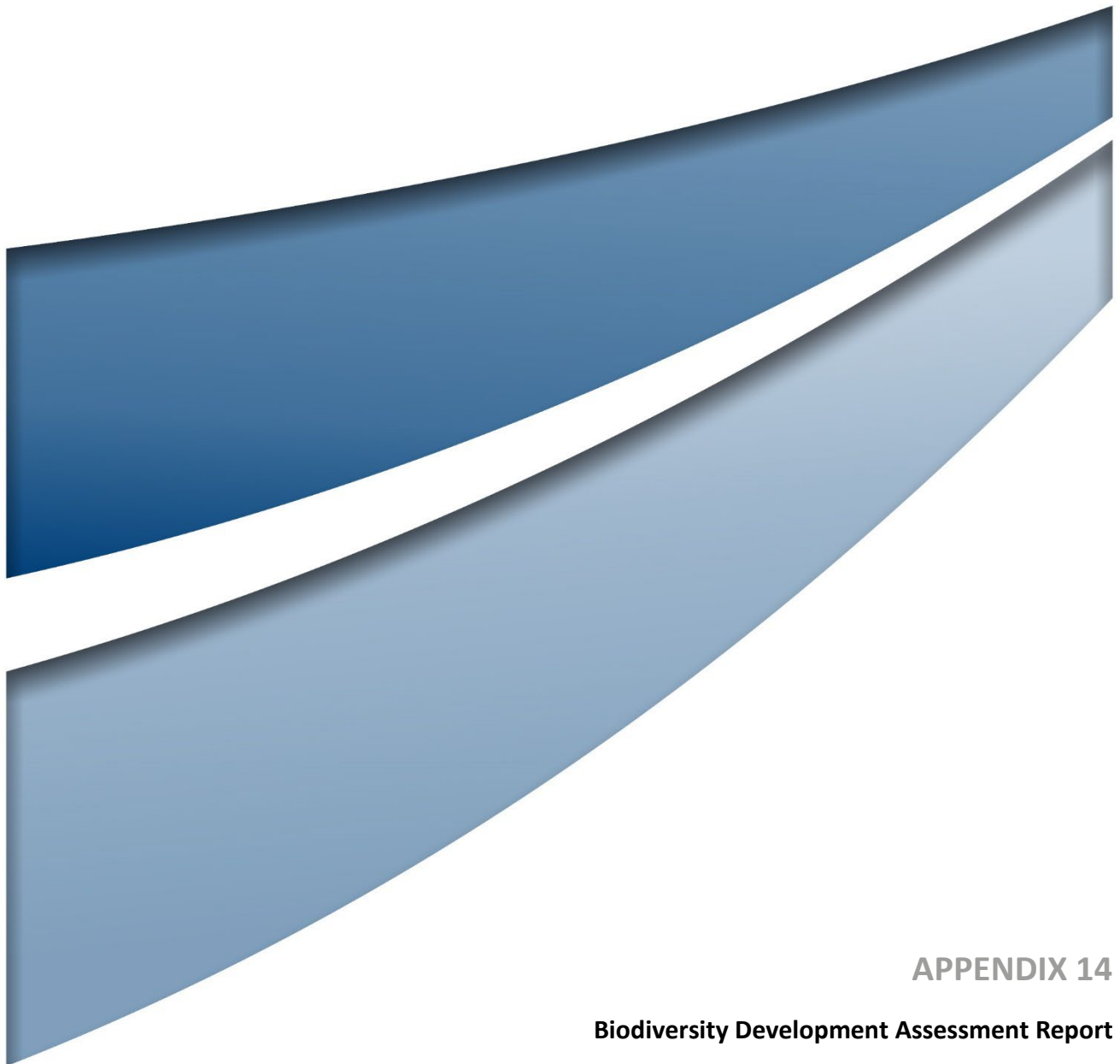




APPENDIX 14

Biodiversity Development Assessment Report



Richmond Valley Solar Farm Biodiversity Development Assessment Report

DRAFT REPORT

Prepared for Umwelt

6 May 2024

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Biosis Project no.:	38804
File name:	38804.Richmond.Valley.Solar.BDAR.FIN02.20240503
Citation:	Biosis 2024. Richmond Valley Solar Farm BDAR. Report for Umwelt. King, K., Palmer, M. Biosis Pty Ltd., Newcastle, NSW. Project no. 38804

Document control

Version	Internal reviewer	Date issued
Draft version 01	Mitch Palmer	12/03/2024
Final version 01	Brendon True	10/04/2024
Final version 02	Mitch Palmer	06/05/2024

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- Ark Energy
- Umwelt: Jessica Henderson-Wilson, Anna Slotnick and Alistair Campbell
- Biodiversity Conservation and Science: Dmitry Young, Don Owner and Gene Mason
- Commonwealth Department of Climate Change, Energy, the Environment and Water for access to the Protected Matters Search Tool of the Australian Government.
- NSW Department of Climate Change, Energy, the Environment and Water for access to the BioNet Atlas of NSW Wildlife.
- BirdLife Australia for access to the New Atlas of Australian Birds 1998-2013.
- NSW Department of Primary Industries for access to indicative mapping of freshwater threatened species and fish populations.

Biosis staff involved in this Project were:

- Brendon True, Joel Nicholson, Dylan Mason and Julia Hutton (assistance in the field)
- Jenny Beckius and Lauren Harley (mapping)

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Contents

Contents	ii
Glossary	viii
Certification and Declarations	x
Summary	xi
Stage 1 – Biodiversity Assessment	1
1 Introduction	2
1.1 Project description	2
1.2 Purpose of this assessment	3
1.3 The Subject Land, Development Footprint and Assessment Area	4
1.4 Sources of information	4
1.5 Legislative requirements	5
1.6 Consultation	8
2 Landscape Context	10
2.1 Subject Land description	10
2.1.1 IBRA Bioregions and subregions	10
2.1.2 Native vegetation cover	11
2.1.3 Rivers and streams	11
2.1.4 Wetlands	11
2.1.5 Connectivity	12
2.1.6 Geological features of significance	13
2.1.7 Areas of outstanding biodiversity value	13
2.1.8 NSW (Mitchell) Landscape	13
2.1.9 Additional landscape features	13
2.1.10 Hydrology	14
2.1.11 Mapped Important Area	14
2.2 Land Categorisation Assessment	14
3 Native vegetation	21
3.1 Native vegetation and habitat assessment	21
3.1.1 Native vegetation extent	21
3.1.2 Review of existing information	21
3.1.3 Field investigation of biodiversity values	21
3.1.4 Local data	23
3.1.5 Non-native vegetation	23
3.1.6 Plant community types	25
3.1.7 Threatened Ecological Communities	36
3.2 Vegetation integrity assessment	43
3.2.1 Vegetation zones and patch size class	43
3.2.2 Vegetation integrity	43
3.2.3 Vegetation integrity score	45
3.2.4 Scattered paddock trees	45

3.2.5	Planted vegetation.....	48
4	Threatened species.....	56
4.1	General habitat features.....	56
4.2	Ecosystem credit species.....	56
4.3	Species credit species.....	59
4.3.1	Threatened species survey details.....	63
4.3.2	Incidental flora and fauna surveys.....	83
4.3.3	Local data.....	84
4.3.4	Expert reports.....	84
4.3.5	Threatened species summary and polygons.....	84
	Stage 2 — Impact Assessment (Biodiversity Values).....	104
5	Avoid and minimise impacts.....	105
5.1	Site Selection.....	105
5.2	Constraints and opportunities preliminary assessment.....	106
5.3	Alternative footprints.....	107
5.3.1	Retention of hollow-bearing trees.....	108
5.4	Summary.....	109
6	Impacts that are unable to be avoided.....	114
6.1	Direct impacts.....	114
6.1.1	Loss of hollow bearing trees.....	115
6.1.2	Loss of scattered paddock trees.....	116
6.2	Indirect impacts.....	116
6.3	Prescribed impacts.....	126
6.3.1	Human-made structures and non-native vegetation.....	129
6.3.2	Habitat connectivity.....	129
6.3.3	Water bodies, water quality and hydrological processes.....	130
6.3.4	Vehicle strikes.....	131
6.4	Impacts considered uncertain.....	133
6.5	Impacts to Groundwater Dependent Ecosystems (GDE).....	133
6.6	Cumulative Impacts.....	135
7	Mitigation and management of impacts.....	138
7.1	Biodiversity Management Plan.....	142
7.2	Adaptive management strategy.....	143
8	Impact summary.....	144
8.1	TECs and threatened species.....	144
8.2	Serious and irreversible impacts.....	144
8.3	Identification of impacts requiring offset.....	146
8.3.1	Impacts to native vegetation (ecosystem credits).....	146
8.3.2	Impacts to threatened species and their habitat.....	146
8.3.3	Impacts to scattered trees.....	147
8.4	Identification of impacts not requiring offset.....	148

8.5	Identification of areas not requiring assessment.....	148
9	Assessment against biodiversity legislation	150
9.1	Environment Protection and Biodiversity Conservation Act 1999	150
9.2	Environmental Planning and Assessment Act 1979/Environmental Planning and Assessment Regulation 2021	161
9.3	State Environmental Planning Policies	161
9.3.1	State Environmental Planning Policy (Biodiversity and Conservation) 2021	161
9.4	Local Land Services Act 2013 and Local Land Services Amendment Act 2016.....	161
9.5	Biodiversity Conservation Act 2016	162
9.6	Biosecurity Act 2015.....	162
9.7	Water Management Act 2000	163
9.8	Fisheries Management Act 1994.....	163
10	Biodiversity offset strategy	165
10.1	Offsetting obligations and options	165
11	Biodiversity credit report	168
	References	195
	Appendices	201
Appendix 1	Survey methods	202
Appendix 2	BAM Candidate species assessment.....	203
Appendix 3	Flora	248
Appendix 4	Fauna	282
Appendix 5	Significant Impact Criteria assessments	284

Tables

Table 1	Summary of SEARs, Agency advice (BCS) and supplementary SEARs	6
Table 2	Consultation summary	8
Table 3	PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest	26
Table 4	PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest	29
Table 5	PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	31
Table 6	PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest	34
Table 7	Summary of BC Act TECs within the Subject Land	37
Table 8	Summary of EPBC Act TECs within the Subject Land	37
Table 9	Subtropical Coastal Floodplain Forest BC Act TEC summary	38
Table 10	Decision process for Subtropical Coastal Floodplain Forest to determine alignment with EPBC Act listed TEC	39
Table 11	Swamp Sclerophyll Forest BC Act TEC summary	41
Table 12	Decision process for Coastal Swamp Sclerophyll Forest to determine alignment with EPBC Act listed TEC	41
Table 13	Vegetation zones within the Subject Land	43
Table 14	BAM plots completed within the Subject Land.....	44

Table 15	Vegetation zone integrity scores	45
Table 16	Tree cover benchmark data for relevant PCTs	46
Table 17	Scattered tree summary	46
Table 18	Planted native vegetation – streamlined assessment D.1	48
Table 19	Ecosystem credit species (predicted species) with potential to occur	57
Table 20	Candidate flora species credit species.....	59
Table 21	Candidate fauna species credit species.....	61
Table 22	Weather observations during targeted flora and fauna surveys (Casino, NSW)	63
Table 23	Targeted flora survey personnel and relevant experience.....	64
Table 24	Summary of targeted flora survey method and results	65
Table 25	Habitat features with potential to support threatened species credit species.....	68
Table 26	Targeted nocturnal bird survey personnel and relevant experience.....	69
Table 27	Summary of nocturnal bird survey method and results.....	70
Table 28	Targeted diurnal bird survey personnel and relevant experience	72
Table 29	Summary of diurnal bird survey method and results	72
Table 30	Targeted frog survey personnel and relevant experience.....	74
Table 31	Summary of frog survey method and results.....	74
Table 32	Targeted reptile survey personnel and relevant experience.....	76
Table 33	Summary of reptile survey method and results.....	76
Table 34	Targeted mammal survey personnel and relevant experience	77
Table 35	Summary of mammal survey method and results	78
Table 36	Targeted microbat survey personnel and relevant experience	81
Table 37	Bat call confidence ratings	81
Table 38	Summary of microbat survey method and results	82
Table 39	Threatened species polygons within the Development Footprint.....	84
Table 40	Framework and hierarchy of constraints applied in Project planning	106
Table 41	Summary of hollow bearing trees not including scattered trees.....	108
Table 42	Avoidance and minimisation of impact	110
Table 43	Summary of direct impacts to vegetation	115
Table 44	Summary of direct impacts species credit habitat or individuals	115
Table 45	Summary of scattered trees impacted by the Project.....	116
Table 46	Assessment of indirect impacts.....	117
Table 47	Identification of prescribed impacts	127
Table 48	Cumulative impact summary	136
Table 49	Measures to mitigate and manage impacts.....	139
Table 50	Offsets required (ecosystem credits).....	146
Table 51	Offsets required (species credits).....	146
Table 52	Offsets required (scattered trees)	147
Table 53	Assessment of the proposed development against the EPBC Act.....	150
Table 54	Summary of relevant EPBC Act threatened species and ecological communities	152
Table 55	Priority weeds within the Subject Land	162
Table 56	Offsets required (ecosystem credits).....	165

Table 57	Offsets required (species credits).....	165
Table 58	SIC assessment for Subtropical eucalypt floodplain forest and woodland	284
Table 59	Significant Impact Criteria for Scrub Turpentine	288
Table 60	SIC assessment for <i>Paspalidium grandispiculatum</i>	291
Table 61	SIC assessment for Sandstone Rough-barked Apple	294
Table 62	SIC assessment for Slaty Red Gum	298
Table 63	SIC assessment for Square-fruited Ironbark	301
Table 64	SIC assessment for Australasian Bittern	305
Table 65	SIC assessment for Glossy Black Cockatoo	308
Table 66	SIC assessment for Greater Glider	311
Table 67	SIC assessment for Yellow-bellied Glider	316
Table 68	SIC assessment for Grey-headed Flying Fox.....	320
Table 69	SIC assessment for Koala	324
Table 70	SIC assessment for Hooded Robin.....	327
Table 71	SIC assessment for Spotted-tailed Quoll	331
Table 72	SIC assessment for woodland birds.....	334
Table 73	SIC assessment for Amphibians	338

Appendix Tables

Table A 1	Threatened flora species assessment	203
Table A 2:	Threatened fauna species assessment	218
Table A 3:	BAM plot floristics.....	248
Table A 4:	BAM plot summary.....	253
Table A 5:	Fauna species recorded at the Subject Land	282

Figures

Figure 1	Subject Land	9
Figure 2	Site map	16
Figure 3	Location map.....	17
Figure 4	Native vegetation cover	18
Figure 5	Native vegetation regulatory map.....	19
Figure 6	Land categories.....	20
Figure 7	Vegetation within the Subject Land	51
Figure 8	Vegetation zones and plot locations	52
Figure 9	Patch size locations	53
Figure 10	TECs within the Subject Land	54
Figure 11	Scattered paddock trees.....	55
Figure 12	Targeted flora and fauna surveys	86
Figure 13	Threatened species polygons	88
Figure 14	Constraints and opportunities mapping	111

Figure 15 Final Development Footprint 112

Figure 16 Alternate options and avoidance 113

Figure 17 Estimated zones of indirect impact for the Project..... 125

Figure 18 Prescribed impacts 132

Figure 19 Impacts requiring offsets, not requiring offsets and not requiring assessment 149

Glossary

Assessment Area	All land within 1500 m of a site-based development
BAM	NSW Biodiversity Assessment Method 2020
BAM-C	BAM Calculator
BC Act	<i>Biodiversity Conservation Act 2016</i>
BCS	Biodiversity Conservation and Science Directorate of the NSW DCCEEW
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	<i>Biosecurity Act 2015</i>
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water
DA	Development Application
DBH	Diameter at Breast Height
Development Footprint	The area of land that is directly impacted by the Project inclusive of road upgrades.
DoIW	Directory of Important Wetlands
DPE	NSW Department Planning and Environment
DPI	NSW Department of Primary Industries
DTDB	Digital topographic databases
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
Ecosystem credit species	Threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.
EEC	Endangered Ecological Community
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
Ha	Hectares
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LLS Act	<i>Local Land Services Act 2013</i>

Locality	Area located within 10 kilometre radius from the Subject Land
LPI	NSW Land and Property Information
MNES	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
PCT	Plant Community Type
Project Area	The area encompassing the Subject Land which was originally assessed
SAII	Serious and Irreversible Impact
SALIS	NSW Soil and Land Information System
SEARs	Secretary's Environmental Assessment Requirements
SEPP	NSW State Environmental Planning Policy
SIS	Species Impact Statement
Species credits	A class of biodiversity credits required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
Species credit species	Threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the Subject Land. Alternatively, the proponent may elect to assume the species is present for development/clearing Projects only.
SSD	State Significant Development
Subject Land	The areas within or the combined areas of the Development Footprint, and any area where indirect and prescribed impacts may occur. The area to which the BAM has been applied.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
WM Act	<i>NSW Water Management Act 2000</i>

Certification and Declarations

I certify that this report has been prepared based on the requirements of, and information provided under the Biodiversity Assessment Method (DPIE 2020) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

Signature:



Date:

06/05/2024

**BAM Assessor Accreditation
Number:**

BAAS17051

Summary

Ark Energy Pty Ltd proposes to develop the Richmond Valley Solar Farm (the Project). The Project is considered State Significant Development (SSD) and will be assessed under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). The Project is proposed on land in the Myrtle Creek/ Ellangowan locality between the towns of Casino and Grafton (hereafter referred to as the Subject Land (Figure 1).

A SSD triggers the Biodiversity Offset Scheme (BOS), and an assessment is required in accordance with the *NSW Biodiversity Assessment Method* (BAM) (DPIE 2020a) and the *Biodiversity Conservation Act 2016* (BC Act). This Biodiversity Development Assessment Report (BDAR) has been prepared by Mitchell Palmer, an Accredited Assessor (BAAS17051), to accompany the SSD Application (SSDA). This BDAR describes the outcome of the major projects development assessment case (00040375/BAAS17051/23/00040376) and scattered tree assessment (00040375/BAAS17051/24/00046692) conducted consistent with the BAM.

The SSDA for the Project and scoping report was lodged in July 2022, with Secretary's Environmental Assessment Requirements (SEARs) issued on 21 September 2022. The Project is consistent with NSW Government policy for the development of renewable energy generation and storage infrastructure. It would assist in meeting NSW and Australian Government renewable energy generation and emissions reduction targets. An EPBC Act referral was lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities as the relevant controlling provisions. Supplementary SEARs were subsequently issued on 4 March 2024. The Project design has since been subject to further refinement and is deemed unlikely to have a significant impact on EPBC Act threatened entities (as per the Referral) given implementation of avoidance measures and substantial reduction of direct impacts. However, all SEARs and EPBC Act requirements are addressed and assessed in this BDAR, in accordance with the NSW Assessment Bilateral Agreement.

An original Project Area of 1,475 hectares was initially identified (Figure 1), of which a worse case 823.68 hectare Development Footprint would be sited, including proposed road upgrades. Field investigation, undertaken in accordance with the BAM, recorded 137.56 hectares of native vegetation within the refined Subject Land, representing four Plant Community Types (PCTs), including three threatened ecological communities (TECs). The remainder of the vegetation within the Subject Land consists of Category 1 Land as defined by the *Local Land Services Act 2013*.

Avoidance of native vegetation, TECs and threatened species habitat has been undertaken to restrict impacts to a total of 21.27 hectares of native vegetation. Consideration has also been given to avoiding and minimising impacts to biodiversity where possible during the assessment and detailed design. Mitigation and management measures will be put in place to adequately address impacts associated with the Project, both direct, indirect and prescribed.

Four PCTs were recorded and as such, in accordance with Section 10 of the BAM, offsets are to be secured for the project:

- PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest.
- PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest.
- PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest.
- PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest.

PCTs within the Project Area were found to be consistent with three TECs listed under the BC Act and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* (Endangered, BC Act).
- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* (Endangered, EPBC Act).

A total of eleven threatened species were recorded within the Subject Land, and an additional three were assumed to be present:

- Squirrel Glider *Petaurus norfolcensis*.
- Barking Owl *Ninox connivens*.
- Square-tailed Kite *Lophoictinia isura* (ecosystem credit only).
- Grey-crowned Babbler *Pomatostomus temporalis* (ecosystem credit only).
- Microbat species:
 - Southern Myotis *Myotis Macropus*.
 - Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (ecosystem credit only).
 - Little Bent-winged Bat *Miniopterus australis* (ecosystem credit only).
 - Large Bent-winged Bat *Miniopterus orianae oceanensis* (ecosystem credit only).
 - Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris* (ecosystem credit only).
 - Hoary Wattled Bat *Chalinolobus nigrogriseus* (ecosystem credit only).
 - Greater Broad-nosed Bat *Scoteanax rueppellii* (ecosystem credit only).
- Brush-tailed Phascogale *Phascogale tapoatafa* (assumed present).
- Common Planigale *Planigale maculata* (assumed present).
- Green-thighed Frog *Litoria brevipalmata* (assumed present).

As such, in accordance with Section 10 of the BAM, offsets are required to be secured for the Project.

Although not detected during detailed surveys, it is known that habitat for species such as Koala *Phascolarctos cinereus* and the Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area *Dromaius novaehollandiae - endangered population* (Coastal Emu) do occur within the Subject Land and broader locality, and may occur on a transient basis or infrequently reside in or nearby the Subject Land. Detailed surveys did not record Koala or Coastal Emu within the Subject Land, and found that habitat within the Subject Land is not considered to constitute optimal core habitat, given land use history, previous clearing and disturbance from recent fires. As such, impacts to any potential habitat for Koala and Coastal Emu are addressed as ecosystem species only, with key avoidance of the highest biodiversity value areas and mitigation measures implemented to reduce potential impacts to these two species.



Stage 1 – Biodiversity Assessment

1 Introduction

Biosis Pty Ltd (Biosis) was commissioned by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Ark Energy Projects Pty Ltd (the applicant) (Ark Energy) to undertake a Biodiversity Development Assessment Report (BDAR) for the Richmond Valley Solar Farm (the Project), in the Northern Rivers region of New South Wales (NSW), approximately seven kilometres (km) to the east of the town of Rappville in the Richmond Valley Local Government Area (LGA).

The purpose of this BDAR is to apply the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a) to the Project. This BDAR will be submitted to the Minister for Planning and Public Spaces or the Independent Planning Commission as part of Environmental Impact Statement (EIS) and SSDA, under Part 4 of the E&A Act.

1.1 Project description

The Project involves the construction, operation and decommissioning of up to 500 Megawatt (MW) of DC solar generation, a Battery Energy Storage System (BESS) and a transmission line to connect the Project from the substation to the national electricity market (NEM). The Project will include various associated infrastructure including inverters to convert DC to AC electricity, a substation and switching substation, temporary construction facilities, operations and maintenance (O&M) facility, internal roads, civil works, Asset Protection Zones (APZs) and other required electrical infrastructure, as well as road upgrades along Avenue Road, Main Camp Rd, and Summerland Way that will have footprint of 11 hectares for the latter.

Key components of the Project would include, but not be limited to:

- Up to 730,000 bifacial photovoltaic (PV) modules (solar panels) in an east-west single-axis tracking arrangement with a maximum height of 4 m above ground level at maximum tilt.
- A BESS with an approximate 275 MW power and 2,200 Megawatt hours (MWh) storage capacity, housed in a series of outdoor containers, aggregated in one central location adjacent to the substation and switching substation.
- Up to 118 inverter stations to convert the DC solar panel electricity to AC electricity.
- One onsite 330kV switching substation and 330 kV/33kV substation for the BESS and solar farm, with underground electrical conduits and cabling.
- Approximately 2 km of new transmission line connecting to the Transgrid Lismore – Coffs Harbour 330 kV transmission line (line 89) from a 330 kV switching substation and a 330 kV / 33 kV substation.
- Underground electrical cable reticulation between solar arrays and infrastructure within the Project Area to transport power from the solar arrays to the onsite substation.
- Office and an O&M facility with parking for the operations team.
- Three access points from Avenue Rd (SA1, SA2 and SA3) via Main Camp Rd and Summerland Way.
- Internal roads to allow for Project maintenance and emergency response.
- Road upgrades - The access route from Summerland Way will require upgrades including Summerland Way / Main Camp Rd intersection, Main Camp Rd and Avenue Rd Intersection and sealing of sections of Avenue Rd from Main Camp Rd to the north most Project access point (SA3).
- A biodiversity corridor to improve habitat connectivity and reduce visual amenity impacts (Figure 1).

- Drainage line crossings (where required) to manage existing surface water flows (to be determined during further design development).
- Vegetation clearance associated with establishment of infrastructure.
- Perimeter security fencing around the development, crossing gates, water tanks and/or dams, and internal access points around the project.

The Project meets the criteria for State Significant Development (SSD) and therefore the Biodiversity Offset Scheme (BOS) is triggered, and a Biodiversity Development Assessment Report (BDAR) is required. The Scoping Report for the Project was lodged and Secretary's Environmental Assessment Requirements (SEARs) issued on 21 September 2022. This BDAR addresses the *Biodiversity Conservation Act 2016* (BC Act), including the Biodiversity Assessment method (BAM), and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

A referral under the EPBC Act was lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities as the relevant controlling provisions. The Project design has since been subject to further refinement and is deemed unlikely to have a significant impact on EPBC Act threatened entities. All EPBC Act requirements will be addressed and assessed in this BDAR in accordance with the NSW Assessment Bilateral Agreement.

The vast majority of the Subject Land (as described in Section 1.1) consisted of a former Tea Tree plantation authorisation under the *Plantations & Reafforestation Act 1999* and Code of Practice 2001. The plantation authorisation has since been cancelled as of August 2023 with land returned to improved pasture grazing and cropping. Additionally, a portion in the north-west of the Subject Land across Lot 34 /755607 and Lot 32/755607, and adjacent vegetation is subject to a private forestry agreement under Part 5B of the *Local Land Services Act 2013*. This agreement is subject to a private native forestry plan (PNF-Plan-06868) which details the area and conditions of the management of the agreement).

1.2 Purpose of this assessment

This BDAR will:

- Address the BAM (DPIE 2020a) and the BOS.
- Identify how the applicant has avoided and minimised impacts to biodiversity.
- Identify any potential impact that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development.
- Identify measures to avoid, mitigate and offset impacts, with the objective of achieving an overall 'improve or maintain' environmental outcome for the Project.
- Consider and assess the Project in accordance with other relevant legislation such as the Commonwealth EPBC Act.
- Address issued SEARs and supplementary SEARs for the Project.

All biodiversity assessments have been undertaken in accordance with the BAM, and this BDAR has been prepared and reviewed by Accredited Assessor Mitchell Palmer Accredited Assessor (BAAS17051). This BDAR

describes the outcome of the development assessment case (00040375/BAAS17051/23/00040376 – Revision 6) and scattered tree assessment (00040375/BAAS17051/24/00046692) conducted consistent with the BAM.

1.3 The Subject Land, Development Footprint and Assessment Area

The terms Subject Land, Development Footprint, Project Area and Assessment Area are used throughout this BDAR and are defined below.

- The Subject Land comprises 1,078. Approximately 11 hectares and is located along Avenue Road. The Subject Land includes the Development Footprint, and additional areas where indirect and prescribed impacts may occur, and ultimately the areas to which the BAM has been applied. This includes a buffer of 100 m surrounding the Development Footprint and 20 metre buffer surrounding the proposed road upgrade areas, clipped to the Project Area.
- The Development Footprint is 814 hectares and comprises all areas of direct impact arising from vegetation clearing, construction and operation of the Project including the road upgrade areas. This includes 803 hectares within the main development footprint and 11 hectares due to road upgrades. For the biodiversity assessment only, a buffer of 10m on the road upgrade was incorporated to inform site survey requirements and has been included currently into a worse case development footprint of 823.60 ha.
- The Assessment Area includes the Subject Land and the area of land within the 1500 m buffer zone surrounding the Subject Land that is determined as per the Section 3.1.2 of the BAM. This area comprises approximately 5,302.41 ha.
- The Project Area is the boundary that was initially investigated and assessed for constraints and opportunities, and importantly used to guide avoid and minimisation of impacts, based on biodiversity values identified. This area comprises approximately 1,475 ha.

These areas are shown in Figure 1.

1.4 Sources of information

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports.

In order to provide a context for the Assessment Area, records of flora and fauna from within 10 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife, Department of Planning and Environment (DPE), for species, populations and ecological communities listed under the BC Act.
- NSW BAM Calculator.
- Biodiversity values map (NSW DCCEEW 2024a).
- Native vegetation regulatory map.
- BAM Important Areas maps (DPE 2023a).
- PlantNET (The Royal Botanic Gardens and Domain Trust).

- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.

Other sources of biodiversity information relevant to the Assessment Area were sourced from:

- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (NSW DCCEEW 2024b).
- Relevant vegetation mapping:
- NSW State Vegetation Type Map Current Release C1.1.M1.1 (SVTM) (DPE 2023b).

The following reports were also reviewed and relied on to provide additional information:

- Richmond Valley Solar Farm Constraints and Opportunities Assessment (Biosis 2023).
- Richmond Valley Solar Farm Scoping Report (Epuron Projects Pty Ltd 2022).
- Richmond Valley Solar Farm Planning Secretary's Environmental Assessment Requirements SSD-41020244 (DPIE 2022b).
- Richmond Valley Solar Farm Planning Supplementary Secretary's Environmental Assessment Requirements SSD-41020244 (Department of Planning, Housing and Infrastructure 2024).
- Summerville Solar Farm Biodiversity Development Assessment Report (BDAR) (Eco Logical Australia 2023).

Basemap data was obtained from NSW Land and Property Information (LPI) 1:25,000 digital topographic databases, with cadastral data obtained from LPI digital cadastral database.

The following spatial datasets were utilised during the development of this report:

- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:
 - Digital mapping with aerial photography showing 1:1000 or finer.
 - Site map as described in subsection 3.1.1 of the BAM (DPIE 2020a).
 - Location map as described in subsection 3.1.2 of the BAM (DPIE 2020a).
 - Landscape map with features including 1,500 metre buffer, as described in section 3.1.3 of the BAM (DPIE 2020a).

1.5 Legislative requirements

The Project has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999.*
- *Environmental Planning and Assessment Act 1979.*
- *Biodiversity Conservation Act 2016.*

- *Local Land Services Amendment Act 2016.*
- *Fisheries Management Act 1994.*
- *Biosecurity Act 2015.*
- State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP).
- *Richmond Valley Development Control Plan (DCP) 2021.*
- *Richmond Valley Local Environmental Plan (LEP) 2012.*

A key objective of this BDAR is to address the requirements of the BAM, as required in the SEARs, agency advice from relevant authorities such as the Biodiversity, Conservation and Science (BCS) Directorate and supplementary SEARs, as summarised below in Table 1.

Table 1 Summary of SEARs, Agency advice (BCS) and supplementary SEARs

Biodiversity requirements	Relevant section
SEARS	
<i>An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW) (BC Act), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR), including a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts (including on grasslands) of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act</i>	The BDAR has been prepared in accordance with the BC Act and BAM. Efforts to avoid and minimise impacts are discussed throughout and is a key focus for the Project discussed in detail within Section 5 and Section 7. Biodiversity values to be impacted are discussed throughout and summarised in Section 8. Residual offsets are considered in Section 8.3 and Section 10.
<i>An assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts, including impacts to Physics Creek;</i>	The BDAR has discussed potential impacts to aquatic environments in Section 2 and Section 9.
<i>If an offset is required, details of the measures proposed to address the offset obligations.</i>	A strategy to secure offsets required for residual unavoidable impacts is provided in Section 8.3 and Section 10.
BCS Advice	
<i>The EIS must assess biodiversity impacts related to the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2017 using the Biodiversity Assessment Method (BAM) and must document this assessment in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and the BAM, unless the Biodiversity and Conservation Division and Planning and Assessment Group determine that the project is not likely to have any significant impacts on biodiversity values.</i>	The BDAR has been prepared in accordance with the BC Act, Biodiversity Conservation Regulation and the BAM.
<i>The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.</i>	Efforts to avoid and minimise impacts are discussed throughout and is a key focus for the Project discussed in detail within Section 5 and Section 7.

Biodiversity requirements	Relevant section
<i>The BDAR must include details of the measures proposed to address the offset obligation as follows:</i> • <i>The total number and classes of biodiversity credits required to be retired for the project;</i> • <i>The number and classes of like-for-like biodiversity credits proposed to be retired;</i> • <i>The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules;</i> • <i>Any proposal to fund a biodiversity conservation action;</i> • <i>Any proposal to conduct ecological rehabilitation (if a mining project);</i> • <i>Any proposal to make a payment to the Biodiversity Conservation Fund.</i> <i>If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.</i>	The BDAR has included details of the measures proposed to address offset obligations in Section 8.3 and Section 11.
<i>The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.</i>	BAM plot spatial data is provided in Appendix 3.1 and Appendix 3.2. All spatial data associated with threatened species targeted surveys and threatened species observations will be submitted with the BDAR.
<i>The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.</i>	The BDAR has been prepared by a person accredited with the BAM (Mitchell Palmer BAAS17051).
<i>The EIS should include an appropriate assessment of the potential impacts on the following threatened species known to occur within or near the project boundary:</i> • Koala <i>Phascolarctos cinereus</i> • Squirrel Glider <i>Petaurus norfolcensis</i> • Emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area <i>Dromaius novaehollandiae</i> • Slaty Red Gum <i>Eucalyptus glauca</i> • Rufous Bettong <i>Aepyprymnus rufescens</i>	Appropriate assessment has been undertaken for each of the listed species in Section 4, Section 6, Appendix 2 and Appendix 5.
Supplementary SEARs	
Impacts - <i>The EIS/BDAR must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions</i>	The BDAR has discussed relevant EPBC Act listed entities in Section 6, Section 9.1 and Appendix 5.
Avoid and minimise - <i>For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action</i>	Avoidance and minimisation of impacts are discussed throughout and is a key focus for the Project, discussed in detail within Section 5 and Section 7.
Key biodiversity issue - <i>The EIS must identify each EPBC Act listed threatened species and community likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity</i>	The BDAR has discussed relevant EPBC Act listed entities in Section 9.1 and Appendix 5.

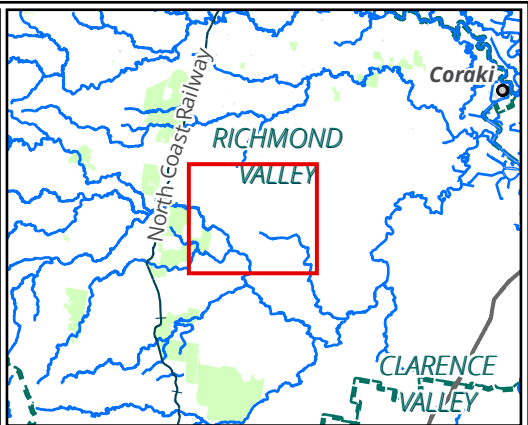
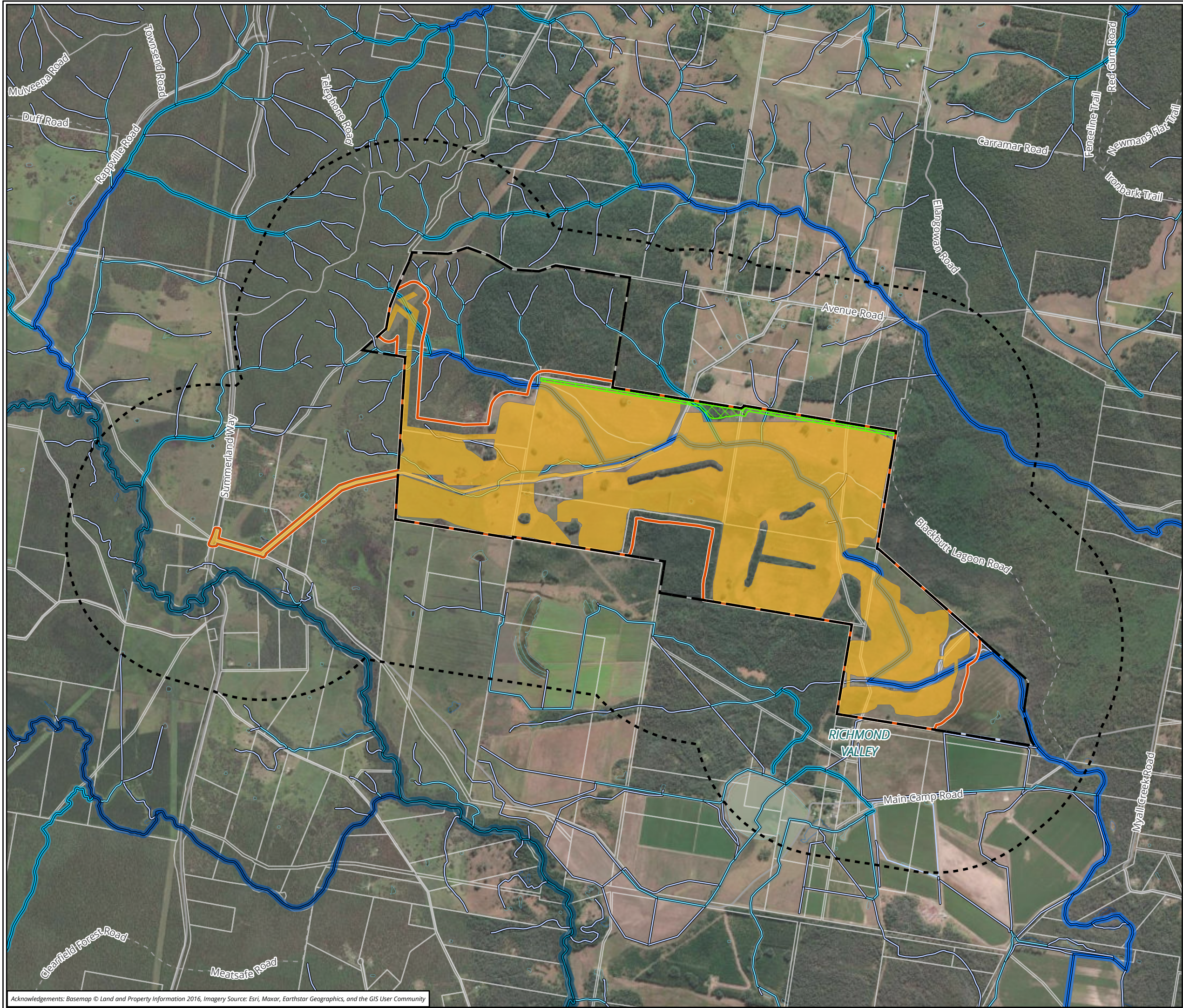
Biodiversity requirements	Relevant section
<i>that are not likely to be impacted, provide evidence why they are not likely to be impacted.</i>	

1.6 Consultation

Consultation was carried out with the NSW Biodiversity Conservation and Science (BCS) north-east office on several occasions during the assessment phase of the Project. A summary of the consultation undertaken is demonstrated below in Table 2.

Table 2 Consultation summary

Date	Consultation	Purpose	Outcomes
24/07/2023	Biosis, Umwelt and BCS	Project overview and introductions	Discussion and general consensus of site suitability for solar farm development.
22/08/2023	BCS and map review team	Request NVR map for to assist with land category assessment.	NVR map used to inform land category and biodiversity constraints assessments for avoidance and minimisation of impact (Section 5.2).
04/11/2023	Biosis and BCS assessment team – Dimitri Young, Don Owner and Gene Mason	Site visit, discussion on survey and BAM assessment.	Discussion and general consensus of suitable threatened species survey to date. General consensus on land categories (Section 2.2). General consensus of site suitability for solar farm development from a biodiversity perspective (Section 5). Discussion and agreeance on avoidance of highest biodiversity values.
22/11/2023	BCS assessment team	Project overview documentation provided to BCS team including vegetation mapping, constraints assessment, threatened species records and land category assessment.	Design revisions and avoidance and minimisation of impacts (Section 5).
18/03/2024	Biosis, Umwelt and BCS	Project catch-up and reporting of key findings prior to EIS submission	Justification of PCT 3420 alignment with threatened ecological community based on floristic data. Discussion of assumed presence for Brush-tailed Phascogale and Common Planigale (Section 4.3.1).



Legend

- Subject Land
- Project Area
- Development Footprint
- Assessment Area
- Biodiversity corridor
- Lot

Strahler stream order / buffers

- 1
- 2
- 3
- 4
- 5
- 6

Figure 1 Subject Land

0 400 800 1,200 1,600 2,000 N

Metres
Scale: 1:37,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

biosis

Matter: 38804, Date: 10 April 2024,
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F1_SubjectLand

2 Landscape Context

This chapter describes the landscape and site context of the Subject Land, describing the landscape features present within the Subject Land and within a 1500 metre buffer (Assessment Area), as required by the BAM (DPIE 2020a). Figure 1 shows the location of the Subject Land and landscape features within the Assessment Area.

2.1 Subject Land description

The Subject Land is located along Avenue Road, located approximately seven kilometres to the east of the town of Rappville and 25 kilometres south of Casino. The Subject Land is located in the Richmond Valley Local Government Area (LGA) and the North Coast Local Land Services (LLS) Region and is zoned as RU1 Primary Production under the Richmond Valley Local Environmental Plan 2012 (LEP).

The current land use is livestock grazing and Private Native Forestry (PNF) with a former Melaleuca/Tea Tree plantation under the *Plantations & Reafforestation Act 1999* and Code of Practice. The plantation authorisation for the latter has since been cancelled as of August 2023. The Subject Land is privately owned and predominantly comprised of farmland, with one rural residence within the southern portion of the Subject Land and several farm sheds scattered throughout.

Vegetation within the Subject Land is comprised of linear windbreak plantings, and remnant patches of dry sclerophyll forest, eucalypt floodplain forest and forested wetlands that occur within a matrix of exotic pastureland. Patches of native vegetation contain varying levels of disturbance including understorey thinning and weed ingress. A large patch of intact remnant and regenerating vegetation occurs within the northernmost section of the Subject Land, having been recently burnt in the 2019-2020 bushfires, and is also designated under a private forestry agreement. The Subject Land is characterised by low-lying terrain and includes a number of farm dams and naturally occurring ephemeral waterways, including Physics Creek.

2.1.1 IBRA Bioregions and subregions

The Assessment Area occurs within the South Eastern Queensland IBRA bioregion and the Clarence Lowlands IBRA subregion (Figure 2, Figure 3).

The South Eastern Queensland IBRA bioregion occurs on the north east coast of NSW and extends north into south-east Queensland. In NSW, it covers an area of approximately 1,655,317 hectares and occupies about 2.1 per cent of NSW and extends from south east Queensland south to encompass Grafton, having previously formed part of the NSW North Coast Bioregion, which it is now bordered by to the south and west. The South Eastern Queensland bioregion experiences a climate ranging from sub-tropical in the east through to temperate in the uplands and comprises a wide variety of soils, vegetation, climate and topography. The South East Queensland bioregion has over 300 threatened animal and plant species (DPE 2016).

The Clarence Lowlands covers an area of 520,496 hectares and stretches from Ballina in the north to Coutts Crossing in the south. The Clarence Lowlands spans the local government areas (LGAs) of the Clarence Valley, Richmond Valley, Lismore, Ballina, Kyogle and Byron Shire councils (Department of Environment and Climate Change 2008).

2.1.2 Native vegetation cover

Vegetation within the Assessment Area (within the 1500 metre buffer area) was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping (DPE 2023b).

Much of the vegetation modelled for the Clarence Lowlands subregion was confirmed during the field investigation. However, a greater area of PCT 3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest was modelled within the Subject Land when compared to the vegetation mapped in the field. For example, a large area modelled as PCT 3428 within the south of the Subject Land was confirmed as PCT 4046 Northern Lowland Swamp Turpentine-Red Gum Forest. In addition, PCT 3987 Far North Floodplain Paperbark-Swamp Oak Forest mapped within the south-eastern corner of the Subject Land was found to be PCT 4001 Northern Floodplain Paperbark Fern Swamp Forest. This is further described in Section 3.2.

The total area of the 1,500 metre buffer around the Subject Land is 5,302.41 hectares, with the area of native vegetation mapped within the buffer being 2,942.05 hectares (Figure 4). This is a native vegetation cover of 55% (30–70% class as defined in Section 3.2.3 of the BAM (DPIE 2020a)) and this value was entered into the BAM calculator.

2.1.3 Rivers and streams

The Subject Land is located within the North Coast Local Land Services Region and the Richmond River catchment. The closest river-mouth is the Evans River located approximately 33 kilometres to the east of the Project. The closest major waterbody is Myrtle Creek, a 6th Strahler order waterbody, located approximately 1.3 kilometres to the south-west of the site (Figure 2).

Several human-made dams and ephemeral waterways occur within the Subject Land which have been subjected to historic trampling and grazing, and impacted by previous plantation activities. These include:

- 14 1st order tributaries
- 10 2nd order tributaries
- Four 3rd order tributaries
- Three 4th order tributaries (Figure 1).

It is noted that one of the fourth order tributaries of Physics Creek running from the north-west of the Subject Land to Physics Creek in the south-east did not exhibit the features of a defined channel with bed and banks.

Key Fish Habitats as mapped by the NSW Department of Primary Industries (DPI) are mapped within the Subject Land, comprising a 4th Strahler order tributary of Physics Creek which occurs in the south-east, and a 3rd Strahler order tributary in the north-west (DPI 2013). The 4th Strahler order tributary of Physics Creek and connected tributaries to the north are mapped as freshwater fish habitat for Southern Purple Spotted Gudgeon (DPI 2023). However, this ephemeral waterway occurs in low condition, with a moderate level of erosion and runoff from surrounding land use including grazing and trampling, and contains a large population of Cane Toads. Given the degraded nature of the waterway, it is unlikely to provide habitat for threatened fish species including Purple Spotted Gudgeon.

2.1.4 Wetlands

Forested swamp/wetland vegetation consistent with PCT 4001 Northern Floodplain Paperbark Fern Swamp Forest occurs within the south-eastern most portion of the Subject Land. This area generally occurs in a

moderate to good ecological condition, and is subject to cattle grazing and congregating, creating pugging and compaction in some areas. This area will not be directly impacted by the Project (Section 6.3.3).

No areas of the Subject Land, and Development Footprint, are mapped as a Wetland in the DoIW of Australia (Cth DCCEEW 2005). The closest DoIW wetland occurs approximately 5.5 kilometres to the north-east of the Subject Land, comprising the Lower Bungawalbin Catchment Wetland Complex; a large contiguous system of coastal floodplain wetlands. This wetland complex is unlikely to be impacted by the Project, either directly or indirectly, given the physical distance and position of the wetland (separated by Bungawalbin State Forest and National Park), and that waterways originating within the Subject Land do not feed into the wetland complex. Mitigation measures discussed in Section 7 will also be implemented to ensure any indirect impacts to local waterways are reduced during construction and operation.

The Subject Land lies approximately 161.6 kilometres to the north-east of the Ramsar wetland Little Llangothlin Nature Reserve. Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity. They are included on the List of Wetlands of International Importance developed under the Ramsar convention. The Little Llangothlin Nature Reserve was listed for the following reasons:

- Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
- Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
- Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Given the large geographical separation between the Little Llangothlin Nature Reserve and the Subject Land, no direct or indirect impacts to the wetlands are likely to occur as a result of the Project. See Section 9.1 for further details.

2.1.5 Connectivity

Much of the Subject Land consists of Category 1-exempt land (Biosis 2023), having been historically modified due to Tea Tree plantation, and more recently, cattle grazing and cropping. However, large tracts of forested areas occur within the Subject Land, of varying patch size (Figure 9), as well as wetland vegetation within the south-east of the Subject Land. Wetland areas and associated vegetation may provide movement and dispersal areas for waterbirds and semi-terrestrial species, such as frogs. In addition, although highly ephemeral, tributaries of Physics Creek may provide transient terrestrial and aquatic habitat corridors across the Subject Land during more optimal environmental conditions, such as significant rainfall and flooding events.

Forests within the Subject Land provide connectivity to larger patches of native vegetation, as well as reserves including Bungawalbin State Forest and National Park to the east and Ellangowan State forest to the north-west of the Subject Land. These connectivity features provide breeding, foraging and dispersal resources for terrestrial and arboreal mammals, flying mammals, and avifauna (Figure 2 and Figure 3).

Parts of the Assessment Area and broader locality were burnt by the summer 2019/2020 bushfires which burnt large tracts of the surrounding vegetation. Some of this vegetation had been burnt from a high to very high degree of intensity, as observed during the field investigation and on the Google Earth Engine Burnt Area Map (GEEBAM). Many of the areas are slowly recovering from these fires, as well as smaller backburning

operations since 2020, consisting of regenerating dense pioneering native species but also environmental weeds.

2.1.6 Geological features of significance

There are no recorded karst, caves, crevices, cliffs or other areas of geological significance within the Subject Land or within the Assessment Area (1500 m).

2.1.7 Areas of outstanding biodiversity value

Under the BC Act, the Minister for the Environment has the power to declare Areas of Outstanding Biodiversity Value (AOBVs). To date no AOBVs have been declared within the Development Footprint or Subject Land (NSW DCCEEW 2024c).

2.1.8 NSW (Mitchell) Landscape

The Subject Land occurs partially within the Clarence – Richmond Alluvial Plains and the Grafton – Whiporie Basin Mitchell Landscapes Figure 2. The proportions of each of these landscapes within the Subject Land are:

- Clarence – Richmond Alluvial Plains – 49.6%
- Grafton – Whiporie Basin – 50.4%

As per the BAM, the dominant Mitchell Landscape (Grafton – Whiporie Basin landscape) was entered into the BAM-C.

The Clarence – Richmond Alluvial Plains landscape is characterised by wide valleys, channels, floodplains, terraces and estuaries of the Clarence and Richmond Rivers and other coastal streams on Quaternary alluvium. The general elevation is 0 to 50m. Soils consist of deep brown earths and structured brown clay on floodplains and terraces with yellow texture-contrast soil containing ironstone concretions. Vegetation associated with this landscape has been extensively cleared across the valley floor, as well as forest of key species including Cabbage Gum *Eucalyptus amplifolia*, Forest Red Gum *Eucalyptus tereticornis*, Broad-leaved Apple *Angophora subvelutina*, and River Oak *Casuarina cunninghamiana* (Department of Environment & Climate Change NSW 2002).

The Grafton – Whiporie Basin landscape is characterised by extensive low undulating hills and large drainage basins on sub-horizontal upper Jurassic interbedded quartz sandstone, lithic sandstone, clayey siltstone and coal measures. This landscape often exhibits ironstone concretions in the weathering profile and occurs on general elevations of 50 to 150m, with a local relief 50m. Soils consist of yellow and brown texture-contrast soils on slopes and dark grey clays along valley floor streamlines. Vegetation consist of dry hardwood forest of; Spotted Gum *Corymbia maculata*, Blackbutt *Eucalyptus pilularis*, Large-fruited Blackbutt *Eucalyptus pyrocarpa*, with grasses and Burrawang *Macrozamia* sp. (Department of Environment & Climate Change NSW 2002).

2.1.9 Additional landscape features

The Subject Land and Assessment Area do not contain any soil hazard features such as acid sulphate soils or other additional features that are required to be assessed.

2.1.10 Hydrology

The Subject Land is not mapped as having Groundwater Vulnerability (Richmond Valley LEP 2012).

2.1.11 Mapped Important Area

The Subject Land is not within any Mapped Important Area of any relevant species (DPIE 2022a).

2.2 Land Categorisation Assessment

Section 6.8(3) of the BC Act provides that the BAM is to exclude the assessment of the impacts of clearing of native vegetation on Category 1-Exempt Land (within the meaning of Part 5A of the *Local Land Services Act Amendment Act 2015*).

- **BC Act s6.8(3):** The biodiversity assessment method is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-Exempt Land (within the meaning of Part 5A of the LLS Act), other than any impacts prescribed by the regulations under section 6.3;
- **BAM cl1.5 (BAM2020):** Biodiversity values not assessed under the BAM include: (d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-Exempt Land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation; (that being prescribed impacts)

Consultation was undertaken with NSW DCCEEW to obtain a copy of the draft Native Vegetation Regulatory (NVR) and land category mapping for the Subject Land. This data was analysed and used as the primary determinant, alongside the features listed below in order to complete the Land Category Assessment (LCA) for the Project. A review of the NVR map and desktop vegetation mapping to PCT was undertaken to inform the extent of the area subject to assessment under the BAM and BC Act, as well as preliminary PCT mapping and field validation. This also included reviewing historical imagery at and around 1990. This was then compared to the NVR map provided for the Subject Land under licence to confirm the LCA.

Category 1- exempt land is classified broadly as

- Land cleared of native vegetation as of 1 January 1990 or lawfully cleared after 1 January 1990 and before 25 August 2017.
- Land containing low conservation value grasslands or groundcover.
- Native vegetation identified as regrowth in a Property Vegetation Plan (PVP) under the repealed Native Vegetation Act 2003 only where the PVP specifies a regrowth date.
- Land bio-certified under the BC Act.

Category 2 – regulated land is classified broadly as

- Vulnerable and sensitive regulated land.
- Land not cleared of native vegetation before 1 January 1990 or unlawfully cleared of native vegetation after 1 January 1990.
- Land containing native vegetation grown or preserved using public funds.
- Land subject to an expired remedial action to restore or protect the biodiversity values.

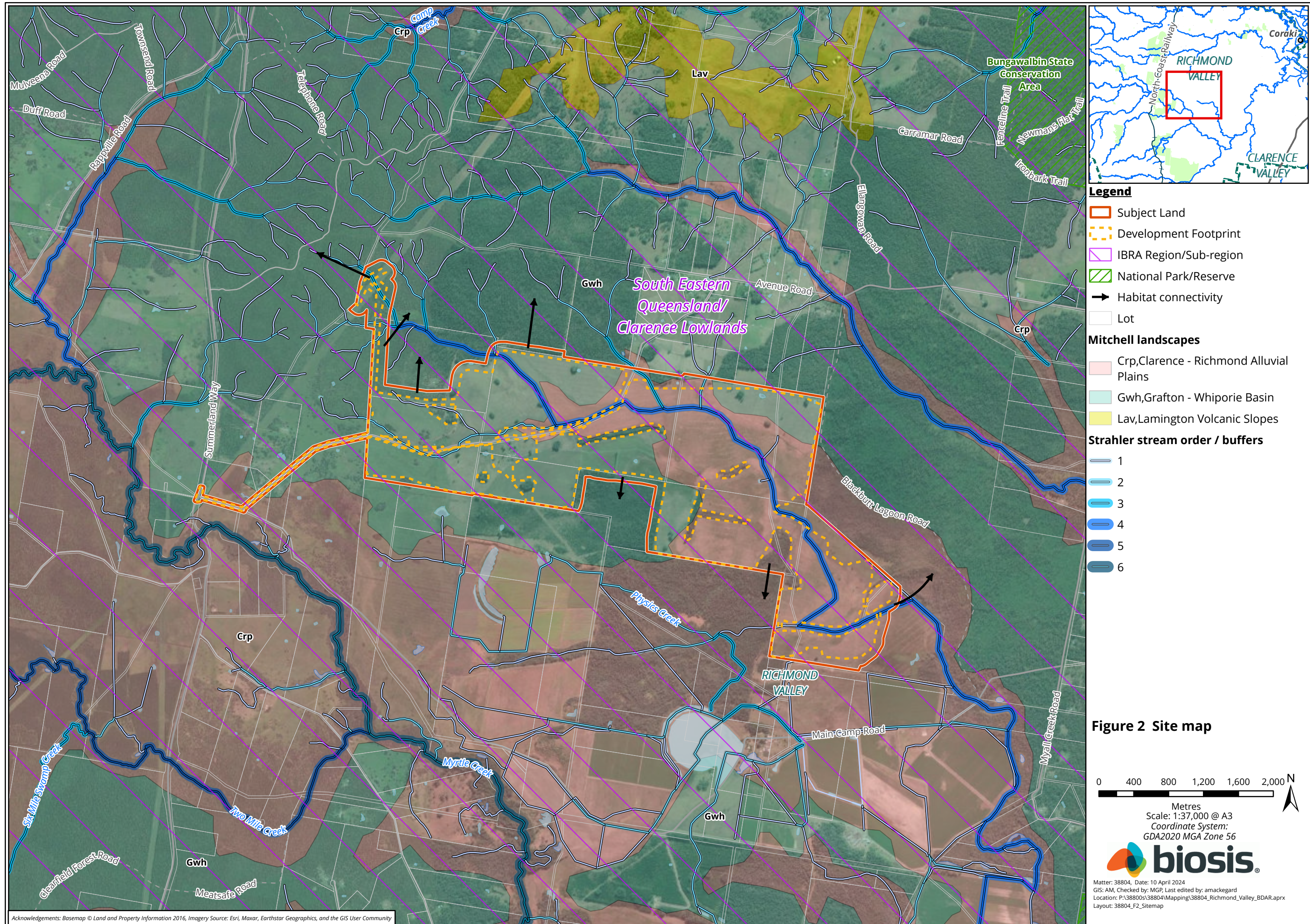
- Land in the proximity area of a coastal wetland or littoral rainforest areas of the coastal zone under the Coastal Management Act 2016.
- Land subject to (or previously subject to) a private native forestry plan under either the Forestry Act 2012 or the Native Vegetation Act 2003
- Land containing medium conservation value grasslands.
- Land containing low conservation grasslands beneath the canopy or drip line of woody vegetation.
- Land is a travelling stock reserve (unless the land is located in the Western Division).
- The land is otherwise prescribed by the Local Land Services Regulation as category 2-regulated land.

There are no areas of Critically Endangered Ecological Communities (CEEC) that are required to be re-categorised as Category 2-regulated land within the Subject Land. Marginal areas of habitat for Critically Endangered species such as *Rhodamnia rubescens* and *Rhodomyrtus psidioides* within Category 1-exempt land have been converted to Category 2-regulated land and subjected to survey, although these areas contain small patch size and are subsequently degraded.

The vast majority of the properties and areas identified as Category 1-exempt land were subject to a former Tea Tree plantation authorisation under the *Plantations & Reafforestation Act 1999* and Code of Practice 2001. This authorisation required areas of retained vegetation to be managed in accordance with the code of practice, and results in their allocation as sensitive regulated land under the transitional NVR map. The plantation authorisation has since been cancelled as of August 2023 with land returned to improved pasture grazing and cropping, releasing any obligation to retain and manage these areas. However, for the purpose of BAM application and due to their viability and connectivity in the landscape, these areas remained as sensitive regulated land as per the NVR map, identified as a high constraint during preliminary assessment and as such direct impacts are avoided.

NVR mapping provided to Biosis indicating land categories is shown on Figure 5.

Areas identified as non-native vegetation or Category 1-exempt land by Biosis once compared to NVR mapping are shown on Figure 6. Vegetation integrity data collected within Category 1-exempt land, when entered into the BAM-C, returned an extremely low vegetation integrity score of 0.4 ((Section 3.2.3). The results of the Biosis land categorisation assessment, including the extremely low condition of areas mapped as Category 1-exempt land, were discussed with BCD during a site meeting on 22 November 2023.



Legend

- Subject Land
 - Development Footprint
 - IBRA Region/Sub-region
 - National Park/Reserve
 - Habitat connectivity
 - Lot
- Mitchell landscapes**
- Crp,Clarence - Richmond Alluvial Plains
 - Gwh,Grafton - Whiporie Basin
 - Lav,Lamington Volcanic Slopes
- Strahler stream order / buffers**
- 1
 - 2
 - 3
 - 4
 - 5
 - 6

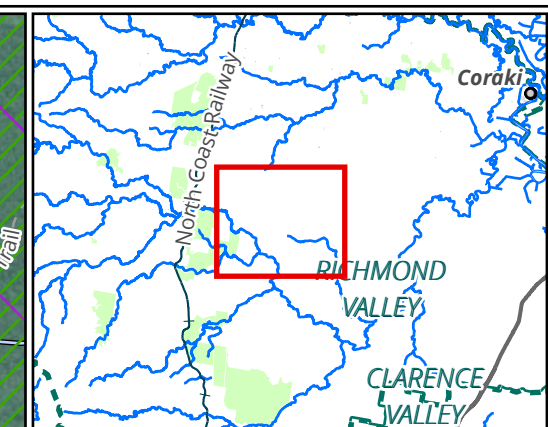
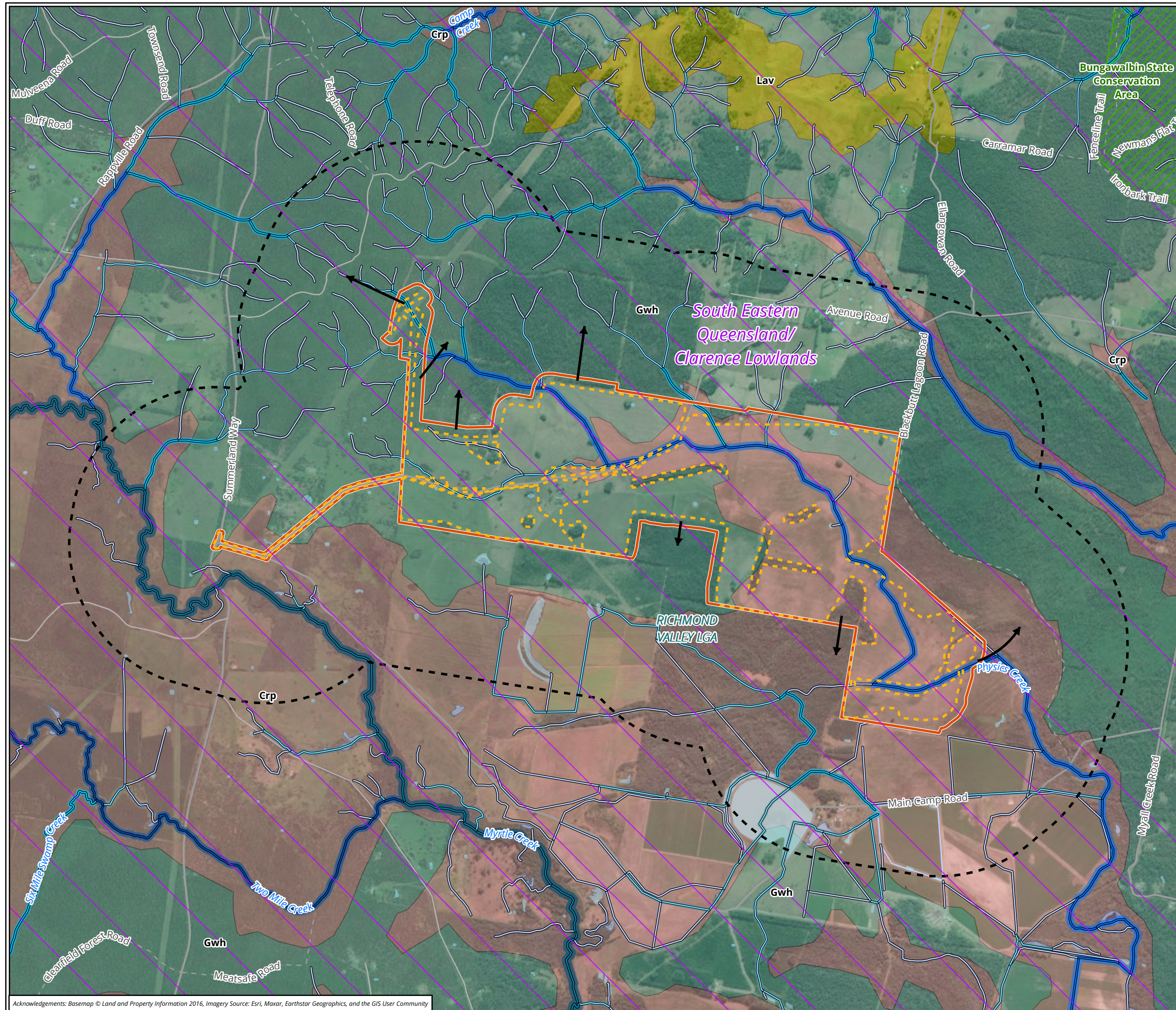
Figure 2 Site map

0 400 800 1,200 1,600 2,000 N

Metres
Scale: 1:37,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

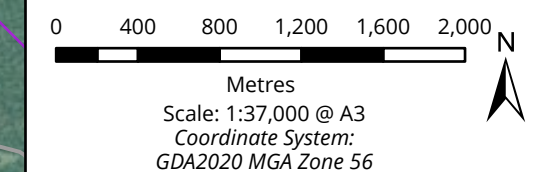
biosis

Matter: 38804, Date: 10 April 2024
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F2_Sitemap

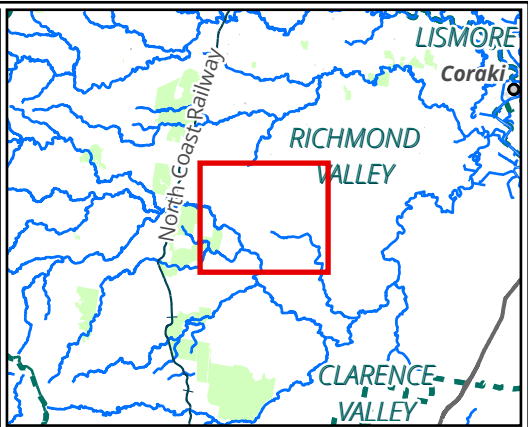


- Legend**
- Subject Land
 - Development Footprint
 - Assessment Area
 - IBRA Region/Sub-region
 - National Park/Reserve
 - Habitat connectivity
- Mitchell landscapes**
- Crp, Clarence - Richmond Alluvial Plains
 - Gwh, Grafton - Whiporie Basin
 - Lav, Lamington Volcanic Slopes
- Strahler stream order / buffers**
- 1
 - 2
 - 3
 - 4
 - 5
 - 6

Figure 3 Location map



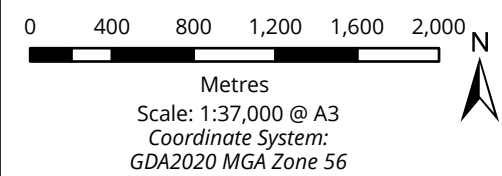
Matter: 38804, Date: 10 April 2024
 GIS: AM, Checked by: MGP, Last edited by: amackegard
 Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
 Layout: 38804_F3_Location

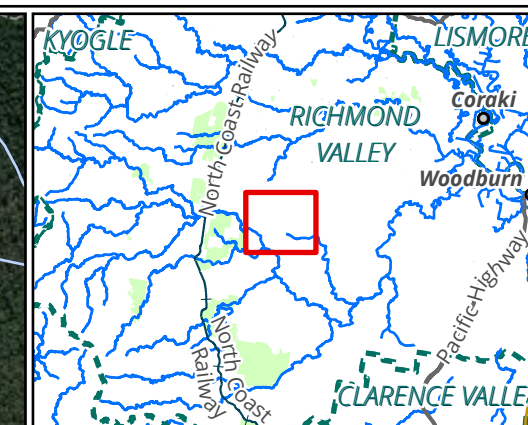
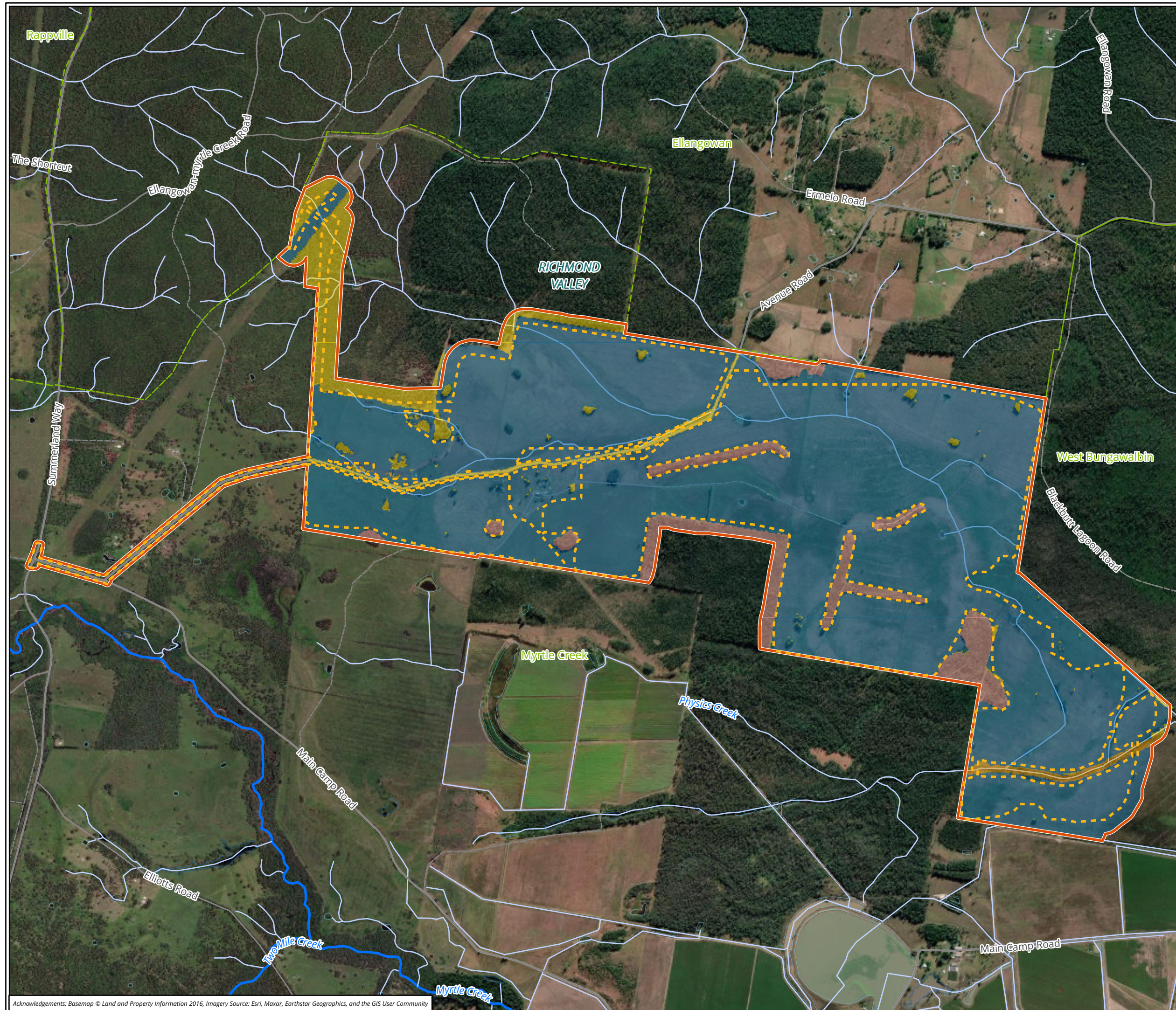


Legend

- Subject Land
- Development Footprint
- Assessment Area
- Habitat connectivity
- Native vegetation

Figure 4 Native vegetation cover





Legend

- Subject Land
- Development Footprint

NVR Category

- Category 1 - Exempt land
- Category 2 - Regulated land
- Category 2 - Vulnerable regulated land
- Category 2 - Sensitive regulated land
- Land excluded from the LLS Act

Figure 5 Native vegetation regulatory map

0 200 400 600 800 1,000

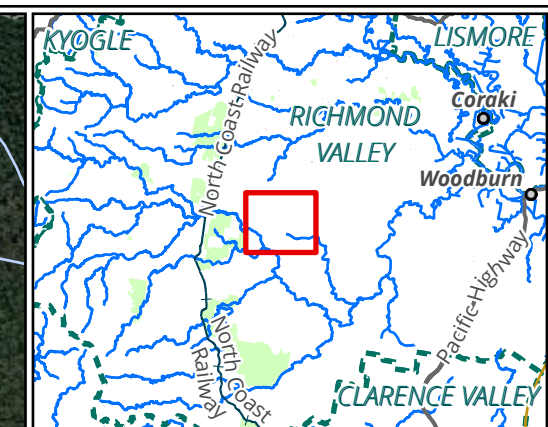
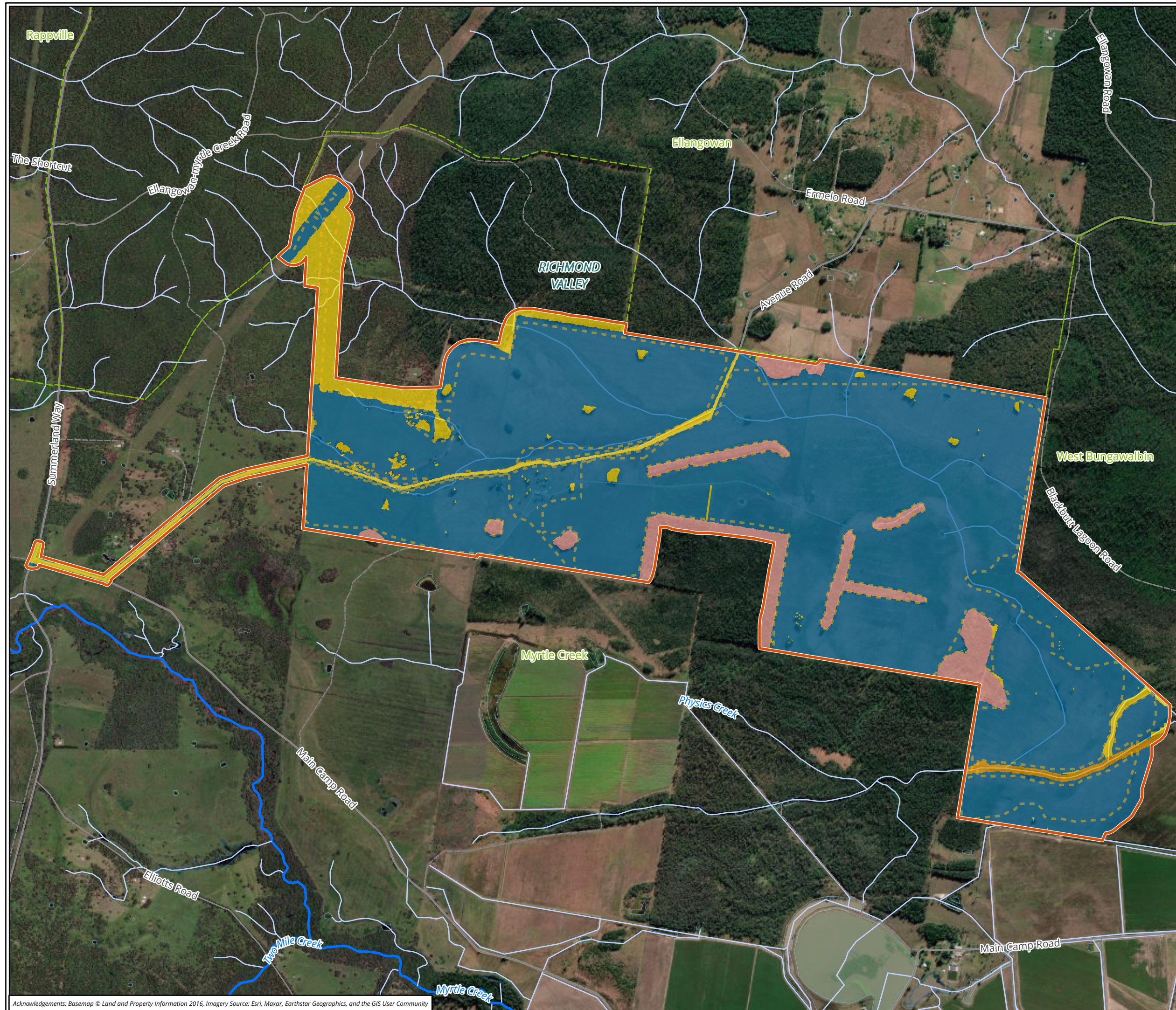
Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA2020 MGA Zone 56



Matter: 38804,
Date: 10 April 2024,
GIS: JET, Checked by: MGP, Last edited by: amackegard
Layout: 38804_FS_NVR
Project: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx



Legend

- Subject Land
- Development Footprint
- Land category**
- Category 1 - Exempt
- Category 2 - Regulated land
- Category 2 - Vulnerable regulated land
- Category 2 - Sensitive regulated land
- Land excluded from the LLS Act

Figure 6 Land categories

0 200 400 600 800 1,000
Metres
Scale: 1:25,000 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 38804,
Date: 10 April 2024,
GIS: AM, Checked by: MGP, Last edited by: amackegard
Layout: 38804_F6_LandCat
Project: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx

3 Native vegetation

The Subject Land is comprised of 1,076.9 hectares of vegetation (137.56 hectares of native vegetation, 1.74 hectares of planted native vegetation, and 937.6 hectares of Category 1 exempt land). Most of the native vegetation remaining within the Subject Land is comprised of dry sclerophyll forest and eucalypt floodplain forest occurring in several conditions due to varying levels of historic clearing of overstorey forest species, private forestry activities and understorey grazing by cattle. The remainder of the vegetation consists of forested wetland communities which occur in moderate to good condition.

3.1 Native vegetation and habitat assessment

3.1.1 Native vegetation extent

The extent of native vegetation, threatened ecological communities, and vegetation integrity within the Subject Land was determined using the results of site investigations, previous studies undertaken (Biosis 2023) and Section 4 of the BAM (DPIE 2020a).

Figure 7 provides a map of the native vegetation extent recorded within the Subject Land and Development Footprint. The figure includes all areas of native vegetation (native ground cover and areas with canopy) within the Subject Land. Areas not shown as native vegetation cover in Figure 4 are considered cleared / Category 1 – exempt land, or non-native vegetation, and are addressed further below.

3.1.2 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- Regional vegetation mapping:
- NSW State Vegetation Type Map Current Release C1.1.M1.1 (DPE 2023b).
- Richmond Valley Solar Farm Biodiversity Constraints and Opportunities Assessment (Biosis 2023).
- Richmond Valley Solar Farm Scoping Report (Epuron Projects Pty Ltd 2022).

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the Subject Land and Development Footprint.

3.1.3 Field investigation of biodiversity values

Opportunistic and rapid assessment surveys of vegetation and habitat to inform the initial biodiversity constraints and opportunities assessment were conducted in April 2023. Following the constraints assessment, systematic biodiversity assessments were conducted during the following times:

- April 2023 - Rapid assessment and vegetation mapping of Project Area.
- August 2023 – Targeted fauna surveys, opportunistic/incidental surveys.
- September 2023 – Targeted flora and fauna surveys, opportunistic/incidental surveys.
- December 2023 - BAM plots, targeted flora and fauna surveys, opportunistic/incidental surveys.

- January 2024 – Vegetation mapping, BAM plots and targeted flora surveys of additional road upgrade and transmission line areas.

These surveys were conducted under the terms of Biosis' Scientific Licence issued by the NSW DCCEEW under the National Parks and Wildlife Act 1974 (SL100758, expiry date 31 May 2024). Fauna surveys were conducted under approval CSB 17/892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2025).

Assessment in accordance with the BAM was planned/overseen /managed by Accredited Assessor Mitchell Palmer (BAAS17051).

The Subject Land was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in NSW State Vegetation Type Map Current Release C1.1.M1.1 (DPE 2022a).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to Surveying Threatened Plants and Their Habitats (DPIE 2020b).
- Incidental observations using the “random meander” method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site.
- An assessment of the natural resilience of the vegetation of the site.
- Identifying and mapping fauna habitats (e.g., hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species' habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches, fur, feathers and diggings).
- Targeted surveys for threatened fauna species.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW
- EPBC Act for significance within Australia.

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally ± 5 m.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition was determined and assigned. Identification of PCTs within the Subject Land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the

NSW BioNet Vegetation Classification database (NSW DCCEEW 2024b). Locations of floristic plots surveyed are shown on Figure 8.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.3.1 below.

3.1.4 Local data

No local appropriate data or non-standard benchmark has been used in the preparation of this BDAR or added to the BAM Calculator.

3.1.5 Non-native vegetation

Approximately 937.6 hectares (87%) of the Subject Land is mapped as Category 1 land with no native over-storey or mid-storey cover, and met the definition of non-native vegetation and Category 1 - exempt land (Figure 6). A total of 800.9 hectares of Category 1 land will be impacted by the Project.

Areas not shown as native vegetation cover in Figure 7, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE 2020a). Non-native vegetation which does provide habitat for threatened species is required to be assessed.



Photo 1 Cleared areas with the within the Subject Land



Photo 2 Non-native vegetation / Category 1 Land within the Subject Land

3.1.6 Plant community types

The following Plant Community Types (PCT) were assessed as present within the Subject Land:

- PCT 4046 – *Northern Lowland Swamp Turpentine-Red Gum Forest* (Table 3).
- PCT 4001 – *Northern Floodplain Paperbark Fern Swamp Forest* (Table 4).
- PCT 3428 – *Northern Lowland Red Gum-Swamp Turpentine Grassy Forest* (Table 5).
- PCT 3420 – *Clarence Lowland Ironbark-Spotted Gum Grassy Forest* (Table 6).

Table 3 to Table 6 provide detailed descriptions of the four PCTs recorded within the Subject Land. PCTs recorded within the Subject Land are shown in Figure 7.

Table 3 PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest

PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest	
Common name	Northern Lowland Swamp Turpentine-Red Gum Forest
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Floodplain Wetlands
Extent within Subject Land	55.51 ha
Condition	This community at the Subject Land was recorded in several conditional states including moderate and riparian.
Description	Generally, Northern Lowland Swamp Turpentine-Red Gum Forest typically occurs as a very tall to extremely tall sclerophyll open forest occurring on floodplains and low rises of the southern Richmond River and Lower Clarence valleys. Swamp Turpentine <i>Lophostemon suaveolens</i> is almost always present in the canopy or sub-canopy, very frequently with red gums (Forest Red Gum <i>Eucalyptus tereticornis</i> or Narrow-leaved Red Gum <i>Eucalyptus seeana</i>). Scattered Grey Ironbark <i>Eucalyptus siderophloia</i> and Pink Bloodwood <i>Corymbia intermedia</i> are also occasionally present. Smaller tree species include <i>Acacia aulacocarpa</i>, <i>Acacia disparrima</i> and <i>Melaleuca alternifolia</i>. The shrub layer is sparse and commonly includes scattered Coffee Bush <i>Breynia oblongifolia</i>. The mid-dense ground layer typically includes graminoids, climbers and forbs, very frequently including Blady Grass <i>Imperata cylindrica</i>, Scrambling Lily <i>Geitonoplesium cymosum</i> and Common Silkpod <i>Parsonsia straminea</i>, commonly <i>Ottochloa gracillima</i> and occasionally <i>Gynochthodes jasminoides</i> (NSW DCCEEW 2024b). Within the Subject Land, Northern Lowland Swamp Turpentine-Red Gum Forest occurs in moderate condition and as several medium sized patches within the eastern portion of the Subject Land. The canopy is dominated by Swamp Turpentine and Broad-leaved Apple, with scattered occurrences of Narrow-leaved Red Gum, Forest Red Gum <i>Eucalyptus tereticornis</i>, Large-leaved Spotted Gum <i>Corymbia henryi</i> and Pink Bloodwood. The midstorey is sparse and contains regenerating small tree and shrub species such as Coffee Bush, Curracabah <i>Acacia leiocalyx subsp. leiocalyx</i> and Red Ash <i>Alphitonia excelsa</i>, with exotic species such as Lantana <i>Lantana camara</i> also present. The groundstorey is dominated by grasses such as Common Couch <i>Cynodon dactylon</i>, Weeping Grass <i>Microlaena stipoides</i>, Water Couch <i>Paspalum distichum</i> and stands of Blady Grass. Forbs, ferns and scramblers are less frequent and include Common Silkpod, Whiteroot <i>Lobelia purpurascens</i> and Bracken <i>Pteridium esculentum</i>, with exotic species such as Parramatta Grass <i>Sporobolus parramattensis</i> and Indian Pennywort <i>Centella asiatica</i> also frequent. Northern Lowland Swamp Turpentine-Red Gum Forest in riparian condition occurs along the riparian corridors and adjacent periodically inundated areas of Physics Creek and its tributaries within the south-east corner of the Subject Land. Canopy and sub-canopy species include Forest Red Gum, Swamp Oak <i>Casuarina glauca</i>, Swamp Turpentine and Broad-leaved Paperbark <i>Melaleuca quinquenervia</i>. The midstorey is largely absent, with the understorey dominated by grasses and forbs that favour wet areas including Water Couch, Common Couch, Brown's Lovegrass <i>Eragrostis brownii</i>, Lesser Joyweed <i>Alternanthera denticulata</i>, and Spreading Nut-heads <i>Epaltes australis</i>.
Survey effort	Seven BAM plots (moderate; RV_13, RV_15, RV_20, RV_21, riparian; RV_17, RV_18, RV_19) were collected over the course of the field assessment (Figure 8).
Justification of PCT	Northern Lowland Swamp Turpentine-Red Gum Forest within the Subject Land meets the PCT description (NSW DCCEEW 2024b) via the following: • Soil - occurs on sandy alluvial substrates on the Clarence - Richmond Alluvial Plains Mitchell landscape. • Structure – tall open sclerophyll forest

PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest	
	• Dominant species - canopy dominated by Swamp Turpentine, Broad-leaved Apple, Forest Red Gum and Narrow-leaved Red Gum with a mid-storey of Coffee Bush, Red Ash and Broad-leaved Paperbark and a grassy understorey of Common Couch, Blady Grass, Weeping Grass, Common Silkpod, and Whiteroot. • IBRA region and subregion – South Eastern Queensland region and Clarence Lowlands subregion.
TEC Status	NSW BC Act: All conditional states were determined to meet the criteria for the BC listed EEC <i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>, given the final determination does not distinguish condition thresholds, and encompasses scattered trees (NSW Scientific Committee 2004). Commonwealth EPBC Act: Patches in moderate and riparian conditional states meet the condition thresholds outlined in the Listing Advice for the EPBC Act listed EEC <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions</i> (Cth DCCEEW 2022a) as: • All patches are ≥ 0.5 ha. • Ground cover richness ≥ 4 native species per 20 x 20 metre plot. • At least ≥ 30 % of the total perennial understorey vegetation cover comprises native species. State and Commonwealth TECs are mapped on Figure 10.
Estimate of percent cleared value of PCT (BioNet)	69.9% (NSW DCCEEW 2024b).
PCT 4046 – Moderate	

PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest

PCT 4046 – Riparian



Table 4 PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest

PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest	
Common name	Northern Floodplain Paperbark Fern Swamp Forest
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Floodplain Wetlands
Extent within Subject Land	1.1 ha
Condition	This community was recorded in low condition within the Subject Land.
Description	Northern Floodplain Paperbark Fern Swamp Forest occurs as a mid-high to very tall <i>Melaleuca</i> open forest with a sparse to absent mid-stratum and a ground layer of sedges, ferns and aquatic forbs. The tree canopy includes a high cover of Broad-leaved Paperbark, Swamp Oak and rarely Forest Red Gum. Where present, the mid-stratum is a sparse cover of small trees which includes <i>Melaleuca alternifolia</i>. The vine Common Silkpod occurs almost always on tree stems of the mid and upper strata. The ground layer is characterised by a sparse to dense cover, often in or adjoining standing fresh water, depending on prevailing seasonal conditions. Species very frequently include Tall Sedge <i>Carex appressa</i>, <i>Enydra woollsii</i>, Spotted Knotweed <i>Persicaria strigosa</i> and Indian Pennywort <i>Centella asiatica</i>, with a patchy cover of ferns Harsh Ground Fern <i>Hypolepis muelleri</i> or Swamp Water Fern <i>Telmatablechnum indicum</i> (NSW DCCEEW 2024b). Within the Subject Land, Northern Lowland Swamp Turpentine-Red Gum Forest in low condition occurs as a small patch on the far south-eastern boundary of the Subject Land, adjacent to the tributaries of Physics Creek. This conditional state mostly lacked an upper and mid stratum due to clearing and grazing, barring some regenerating Broad-leaved Paperbark and <i>Melaleuca alternifolia</i>. However, the patch occurs directly adjacent to large stands of the community in an intact condition to the north of the Subject Land boundary forming part of Bungwalbin State Forest. The ground storey is dominated by Water Couch, Frogsmouth <i>Philydrum lanuginosum</i>, Spreading Nut-heads, Indian Pennywort, Slender Knotweed and <i>Juncus</i> spp.
Survey effort	One BAM plot (RV_16) was collected over the course of the field assessment (Figure 8).
Justification of PCT	Northern Floodplain Paperbark Fern Swamp Forest within the Subject Land meets the PCT description (NSW DCCEEW 2024b) via the following: • Soil - occurs on floodplains on the Clarence - Richmond Alluvial Plains Mitchell landscape. • Structure – occurs as a mid-high to very tall <i>Melaleuca</i> open forest. • Dominant species – regenerating canopy includes Broad-leaved Paperbark and <i>Melaleuca alternifolia</i>. Understorey is disturbed, however includes characteristic species including Indian Pennywort and <i>Juncus</i> spp. • IBRA region and subregion – South Eastern Queensland region and Clarence Lowlands subregion.
TEC Status	NSW BC Act: The low conditional state was determined to meet the criteria for the BC listed EEC <i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>, given the final determination does not distinguish condition thresholds (Threatened Species Scientific Committee 2011). Commonwealth EPBC Act: Northern Floodplain Paperbark Fern Swamp Forest within the Subject Land does not meet the key diagnostic characteristics listed within the approved conservation advice for the EPBC Act listed EEC <i>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland</i> (Cth DCCEEW 2022a) principally as: • The community contains a crown canopy cover of <10%.

PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest	
	The community does not contain other tree or subcanopy species. State and Commonwealth TECs are mapped on Figure 10.
Estimate of percent cleared value of PCT (BioNet)	71.88% (NSW DCCEEW 2024b).
PCT 4001 – Low	

Table 5 PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest

PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	
Common name	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest
Vegetation formation	Dry Sclerophyll Forests (shrub/grassy sub-formation)
Vegetation class	Clarence Dry Sclerophyll Forests
Extent within Subject Land	16.7 ha
Condition	This community at the Subject Land was recorded in moderate and low conditional states.
Description	Northern Lowland Swamp Turpentine-Red Gum Forest occurs as a mid-tall sclerophyll open forest with a mid-stratum of a soft-leaved shrubs and <i>Melaleucas</i> with a ground cover of grasses and graminoids. The canopy almost always includes red gum eucalypts (Forest Red Gum, Narrow-leaved Red Gum, Bancroft's Red Gum <i>Eucalyptus bancroftii</i> and Slaty Red Gum <i>Eucalyptus glaucina</i>) and Swamp Turpentine which is also present in the mid-stratum. The mid-dense mid-stratum almost always includes one or more <i>Melaleuca</i> species and <i>Acacia</i> species, of which <i>Melaleuca nodosa</i>, <i>Melaleuca alternifolia</i> and <i>Acacia concurrens</i> are the most frequent and abundant. Red Ash is also very frequent in the mid-stratum and the vine Common Silkpod commonly scrambles into the higher strata. The ground layer is typically comprised of a diverse suite of graminoids and forbs, very frequently including Blady Grass, Kangaroo Grass and Spiny-headed Mat Rush, and commonly Whiteroot <i>Lobelia purpurascens</i>, <i>Vernonia cinerea</i>, <i>Entolasia stricta</i> and Stinking Pennywort <i>Centella asiatica</i>. While this PCT is often found on or near the edge of floodplains, it can occur on sedimentary substrates of the Clarence-Morton Basin near the upper limit of the floodplain (NSW DCCEEW 2024b). Northern Lowland Swamp Turpentine-Red Gum Forest in moderate condition occurs as several small patches within the central and northern sections of the Subject Land. The canopy consists of Forest Red Gum and Narrow-leaved Red Gum with occurrences of Swamp Turpentine, Red Ironbark <i>Eucalyptus fibrosa</i>, and Large-leaved Spotted Gum. The midstory is very sparse and is comprised of <i>Melaleuca alternifolia</i>, <i>Acacia leiocalyx</i> subsp. <i>leiocalyx</i> and Red Ash with Common Silkpod. The understorey is subject to a low-moderate level of grazing and includes Common Couch, Kangaroo Grass, Blady Grass and Indian Pennywort with sporadic occurrences grass and forb species; Whiteroot and Browns Lovegrass <i>Eragrostis brownii</i>. Weeds include African Lovegrass and Kikuyu Grass. Northern Lowland Swamp Turpentine-Red Gum Forest in low condition occurs as several small patches within the western and north-eastern portions of the Subject Land. The canopy is slightly sparser compared to the moderate conditional state, which includes species such as Forest Red Gum, Pink Bloodwood and Grey Ironbark. The midstory is absent, barring some sporadic occurrences of <i>Acacia leiocalyx</i> subsp. <i>leiocalyx</i>. The ground story has been heavily grazed, and as a result displayed a higher cover of exotic grass species such as African Lovegrass, Parramatta Grass and Rhodes Grass, amongst disturbance tolerant native species such as Common Couch and Blady Grass.
Survey effort	A total of seven BAM plots (four moderate; RV_11, RV_12, RV_23, RV_24 and three low; RV_1, RV_14, RV_22) were collected over the course of the field assessment. (Figure 8).
Justification of PCT	Northern Lowland Swamp Turpentine-Red Gum Forest within the Subject Land meets the PCT description (NSW DCCEEW 2024b) via the following: • Soil - occurs on floodplains on the Clarence - Richmond Alluvial Plains Mitchell landscape. • Structure – occurs as a mid-tall sclerophyll open forest. • Dominant species – Forest Red Gum, Narrow-leaved Red Gum and Swamp Turpentine and Red Ash with a sparse mid storey including <i>Acacia leiocalyx</i> subsp.

PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	
	<i>leiocalyx</i> and <i>Melaleuca alternifolia</i>. The understorey includes characteristic species such as Blady Grass, Kangaroo Grass, Indian Pennywort and Common Silkpod. IBRA region and subregion – South Eastern Queensland region and Clarence Lowlands subregion.
TEC Status	NSW BC Act: All conditional states were determined to meet the criteria for the BC listed EEC <i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>, given the final determination does not distinguish condition thresholds, and encompasses scattered trees (NSW Scientific Committee 2004). Commonwealth EPBC Act: Patches in the moderate conditional state are determined to meet the condition thresholds outlined in the Listing Advice for the EPBC Act listed EEC <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions</i> (Cth DCCEEW 2022a) as: - Patches are ≥ 0.5 ha. - Ground cover richness ≥ 4 native species per 20 x 20 metre plot. ≥ 6 very large native trees per ha and/or; - At least ≥ 30 % of the total perennial understorey vegetation cover comprises native species. Patches of low condition and do not meet the condition threshold given all patches are < 0.05 ha. State and Commonwealth TECs are mapped on Figure 10.
Estimate of percent cleared value of PCT (BioNet)	72.91% (NSW DCCEEW 2024b).
PCT 3428 – Moderate	

PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest

PCT 3428 – Low



Table 6 PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest

PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest	
Common name	Clarence Lowland Ironbark-Spotted Gum Grassy Forest
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub formation)
Vegetation class	Clarence Dry Sclerophyll Forest
Extent within Subject Land	64.25 ha
Condition	This community at the Subject Land was recorded in several conditional states including; good, moderate and regenerating.
Description	Clarence Lowland Ironbark-Spotted Gum Grassy Forest typically occurs as a tall to very tall sclerophyll open forest with a grassy ground cover on rolling siltstone and claystone hills in the lowlands of the lower Clarence and Richmond valleys. The canopy has a diverse suite of trees, almost always including ironbarks (Grey Ironbark or Narrow-leaved Ironbark <i>Eucalyptus crebra</i>), very frequently Large-leaved Spotted Gum and commonly Grey Gum <i>Eucalyptus moluccana</i>. In addition, red gums (Narrow-leaved Red Gum or Cabbage Gum <i>Eucalyptus amplifolia</i>) may occasionally occur. The sparse mid-stratum is layered and includes small trees and shrubs. The tallest component of the mid-stratum very frequently comprises scattered individuals of Red Ash. The lower layers almost always include one or more species of Acacia, commonly <i>Acacia concurrens</i> or more rarely <i>Acacia aulacocarpa</i> or <i>Acacia leiocalyx subsp. leiocalyx</i>. Occasional shrubs such as Coffee Bush complete the mid-stratum. The mid-dense ground layer typically includes grasses, forbs, twiners, vines and a hardy fern. Blady Grass is almost always present with Whiteroot, Wombat Berry <i>Eustrephus latifolius</i>, Iron Weed <i>Vernonia cinerea</i>, Kangaroo Grass and <i>Entolasia stricta</i> very frequent. Clarence Lowland Ironbark-Spotted Gum Grassy Forest in good condition occurs as several small – medium sized patches in the north and south-western portions of the Subject Land. The canopy is dominated by Large-leaved Spotted Gum, Grey Ironbark and rarely Grey Gum and Forest Red Gum. The midstory is sparse and consists of Red Ash and <i>Acacia leiocalyx subsp. leiocalyx</i> and Spiny Bush-pea <i>Pultenaea spinosa</i>. The ground storey includes native species such as Common Couch, Slender Rat's Tail Grass, Brown's Lovegrass, and Blady Grass. Exotic species include African Lovegrass and South African Pigeon Grass <i>Setaria sphacelata</i>. Clarence Lowland Ironbark-Spotted Gum Grassy Forest in moderate condition occurs within the north-western portion of the Subject Land. The canopy is dominated by Grey Ironbark, Large-leaved Spotted Gum with less frequent occurrences of Grey Gum and Forest Red Gum. The understory is subject to a moderate level of disturbance from clearing and grazing, and as such the midstory is predominantly absent with the occasional <i>Acacia leiocalyx subsp. leiocalyx</i>. Native species within the understory include Slender Rat's Tail Grass, Blady Grass and <i>Entolasia marginata</i> and Brown's Lovegrass, with African Lovegrass as the most dominant exotic species. Clarence Lowland Ironbark-Spotted Gum Grassy Forest in regenerating condition occurs along the existing transmission line within the north western portion of the Subject Land, adjacent to a large intact patch forming part of the private forestry agreement. The canopy consists of regenerating saplings of Large-leaved Spotted Gum, and Red Ash. Shrubs include <i>Acacia falcata</i> and sporadic occurrences of Amulla <i>Eremophila debilis</i>. The ground storey is disturbed and includes Brown's Lovegrass, Weeping Grass, African Lovegrass, South African Pigeon Grass and Blady Grass.
Survey effort	A total of ten BAM plots (good; RV_02, RV_03, RV_04, moderate; RV_06, RV_08, RV_09, RV_10, RV_26 regenerating; RV_05, RV_07) were collected over the course of the field assessment. (Figure 8)

PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest	
Justification of PCT	Clarence Lowland Ironbark-Spotted Gum Grassy Forest within the Subject Land meets the PCT description (NSW DCCEEW 2024b) via the following: • Soil - occurs on sandy skeletal and clayey siltstone soils on low hills on the Grafton - Whiporie Basin Mitchell landscape. • Structure – occurs as a tall to very tall sclerophyll open forest. • Dominant species – Large-leaved Spotted Gum, Grey Gum with a spare midstorey including <i>Acacia leiocalyx subsp. leiocalyx</i>. The understorey includes characteristic species such as Blady Grass and Browns Lovegrass. • IBRA region and subregion – South Eastern Queensland region and Clarence Lowlands subregion.
TEC Status	NSW BC Act: This community is known to be partially associated with the EEC <i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i> where it occurs on floodplain alluvium. However, the occurrence of the community within the Subject Land is not considered to form part of the listing, given: • Landscape position – the community does not occur on the floodplain, instead occurs on low hills. • Soil – the community does not occur on the floodplain alluvium, instead occurs on siltstone and claystone of the Grafton – Whiporie Basin soil landscape. • Dominant species – the community is dominated by Large-leaved Spotted Gum and Grey Ironbark. In some instances the community contains sporadic occurrences of Forest Red Gum, which is considered to be abundant and widespread within the EEC (NSW Scientific Committee 2004). However floristic data entered during collection of BAM plots indicates the species generally did not comprise more than 3% of a 20 x 20 metre plot, the highest cover recorded was 10% in one plot (RV_02). Due to the landscape position, soil type and species assemblage, Clarence Lowland Ironbark-Spotted Gum Grassy Forest is not considered to meet listing requirements under the final determination for the EEC. Commonwealth EPBC Act: Clarence Lowland Ironbark-Spotted Gum Grassy Forest does not meet the following key diagnostic characteristics listed within the Approved Conservation Advice for the EPBC Act listed EEC <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions</i> (DCCEEW 2022). Principally, it does not occur on alluvial landforms or alluvial soils. Further discussion is provided in Section 3.1.7.
Estimate of percent cleared value of PCT (BioNet)	55.29% (NSW DCCEEW 2024b).

PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest

PCT 3420 – Good



PCT 3420 – Moderate



PCT 3420 – Regenerating



3.1.7 Threatened Ecological Communities

Vegetation within the Subject Land was found to represent two TECs listed under the NSW BC Act, and one TEC listed under the Commonwealth EPBC Act, as outlined in Table 7 and Table 8 below and illustrated on Figure 10. A considerable effort has been made to avoid and minimise impacts to the highest value areas of

these TECs through the Project design and environmental assessment process. Further assessment and descriptions are provided below.

Table 7 Summary of BC Act TECs within the Subject Land

BC Act TEC	Listing status	Subject Land (Ha)	Development Footprint (Ha)
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	Endangered	72.22	5.6
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	1.1	0

Table 8 Summary of EPBC Act TECs within the Subject Land

EPBC Act TEC	Listing status	Subject Land (Ha)	Development Footprint (Ha)
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	70.28	4.33

Subtropical Coastal Floodplain Forest EEC

Subtropical Coastal Floodplain Forest is listed as endangered under the BC and EPBC Act. The community occurs in the New South Wales North Coast and South Eastern Queensland IBRA bioregions and on Curtis Island in the Brigalow Belt North IBRA Bioregion generally on alluvial soils and is dominated by *Eucalypts*, *Angophora* spp., *Corymbia* spp., *Lophostemon* spp. and *Syncarpia* spp.

The main threats to this community are clearing and the selective harvesting of the dominant canopy tree species, altered fire and hydrological regimes, livestock grazing, weeds, invasive fauna (pests), climate change, disease, pathogens and dieback (e.g. bell miner associated dieback), and human disturbance (Cth DCCEEW 2022a). There is no adopted or made Recovery Plan for this ecological community.

Intact Subtropical Coastal Floodplain Forest and sparse canopy forests (represented by PCT 4046, 3428) occur patchily across the Subject Land. This forest vegetation is composed of a canopy dominated by Swamp Turpentine, Forest Red Gum, Broad-leaved Apple, Pink Bloodwood, Narrow-leaved Red Gum, and Grey Ironbark. PCT 4046 typically occurs on sandy alluvial sediments or sandstone substrates and PCT 3428 occurs on sedimentary substrates of the Clarence-Morton Basin near the upper limit of the floodplain (NSW DCCEEW 2024b). PCT 3420 occurs on clay-rich sediments, and is recognised as partially comprising the Subtropical Coastal Floodplain Forest EEC (NSW DCCEEW 2024b). Due to the landscape position and floristic composition of PCT 3420 within the Subject Land, it was not determined to meet either BC or EPBC listings.

The EPBC Act listing advice provides a clear definition of this community based on key diagnostic characteristics and condition thresholds. The decision process for attributing a patch of PCT 4046 and 3428 to the TEC relies on observations of dominant canopy species and cover, native understorey cover and richness, and patch size.

Within the Subject Land, intact treed patches of Subtropical Coastal Floodplain meet the EPBC Act definition. The BC Act does not contain key diagnostics or condition thresholds for this community, but instead relies on

a general description of the community and a list of characteristic plant species. All Subtropical Coastal Floodplain Forest patches have been concluded to meet the general description of the BC Act definition.

An assessment of the different condition states of Subtropical Coastal Floodplain Forest present in the Subject Land, and how they align with TEC requirements are presented in Table 9 (BC Act) and Table 10 (EPBC Act) below.

Table 9 Subtropical Coastal Floodplain Forest BC Act TEC summary

Final Determination Key Criteria	PCT 3420	PCT 3428	PCT 4046
Occurs on clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains	No. Occurs on sandstone and clayey siltstone on low hills at slightly higher elevations than the floodplain.	Yes. All zones. The vegetation zones within each PCT predominantly occur on clay-loam and sandy loam floodplain throughout the Subject Land.	
The community is characterised by the assemblage of species listed in the Final Determination	No. All zones. This PCT does not comprise the characteristic species as listed in the Final Determination, principally, Forest Red Gum is sparse and is instead dominated by Large-leaved Spotted Gum with occasional occurrences of Grey Ironbark and Grey Box.	Yes. All zones. Characteristic species as listed in the Final Determination were recorded in all zones for each PCT.	
Occurs within the NSW North Coast bioregion and Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, but may occur elsewhere in this bioregion	Yes. All zones. The Subject Land occurs within the South East Queensland Bioregion. This bioregion originally formed part of the NSW North Coast bioregion until recently, with the release of IBRA Version 7. However, the Subject Land occurs within the Richmond Valley LGA.		
Consists of a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. The most widespread and abundant dominant trees include Forest Red Gum, Grey Ironbark Pink Bloodwood and, north of the Macleay floodplain, Swamp Turpentine	No. All zones. The most dominant species are Large-leaved Spotted Gum and Grey Ironbark. Forest Red Gum occurs sporadically.	Yes. All zones of each PCT contain an overstorey structure as an open tree layer dominated by one or more of the listed widespread species.	
BC Act Listed Subtropical Coastal Floodplain Forest EEC	NO	YES	YES

Table 10 Decision process for Subtropical Coastal Floodplain Forest to determine alignment with EPBC Act listed TEC

Decision steps(from approved conservation advice (DCCEEW 2022))	Response	Justification
It occurs in the New South Wales North Coast and South Eastern Queensland IBRA bioregions, and on Curtis Island in the Brigalow Belt North IBRA Bioregion.	Yes for all zones in PCT 4046, 3428 and 3420.	The Subject Land is wholly contained within the South Eastern Queensland IBRA bioregion.
It occurs in the catchments of the eastern watershed of the Great Dividing Range, typically in their lower reaches	Yes for all zones in PCT 4046, 3428 and 3420.	The Subject Land is wholly contained within the Richmond River catchment which is within the lower reaches of the eastern watershed of the Great Dividing range.
It occurs at elevations up to 250 m above sea-level (ASL), most typically below 50 m ASL	Yes for all zones in PCT 4046, 3428 and 3420.	The Subject Land occurs at elevations between 30-80 m ASL.
It occurs on alluvial landforms including river floodplains, riparian zones (e.g., along riverbanks, lake foreshores and creek lines), the floors of tributary gullies, floodplain pockets, alluvial flats, fans, terraces, and localised colluvial fans; as well as on localised depressions amongst low rises and on associated sites where water can pond	Yes for all zones in PCT 4046 and 3428. No for all zones in PCT 3420.	PCT 3428 was found to occur along riparian corridors of creek lines, localised depressions and floodplains within the northern and western portions of the Subject Land. Within the Subject Land, PCT 4046 occurs along riparian zones of Physics Creek, localised depressions, and floodplains within the eastern portion of the Subject Land. PCT 3420 was found to occur on low hills at slightly higher elevations
It does not typically occur on soils that are primarily marine or aeolian sands, but may occur on such substrates after they have been modified by fluvial activity	Yes for all zones in PCT 4046 and 3428. No for all zones in PCT 3420.	PCT 3428 and 4046 occur on alluvial soils primarily on the Clarence - Richmond Alluvial Plains Mitchell landscape. PCT 3420 occurs on sandstone and clay siltstone outside of the floodplain on low hills.
It occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland. The canopy has a crown cover of at least 20%	Yes for PCT 3428 moderate, PCT 4046 (all zones) and 3420 (good and moderate). No for PCT 3428 low and planted and PCT 4046 scattered	PCT 3428 moderate, PCT 4046 (all zones) and PCT 3420 (good and moderate) occurs as a tall open forest with a canopy of at least 20% PCT 3428 low and planted and PCT 4046 do not contain a canopy of at least 20%
It has a canopy dominated by one or a combination of <i>Angophora</i>, <i>Corymbia</i>, <i>Eucalyptus</i>, <i>Lophostemon</i> and/or <i>Syncarpia</i> tree species, but NOT dominated by Swamp Mahogany <i>Eucalyptus robusta</i>. Other canopy tree	Yes for PCT 3428, PCT 4046 and PCT 3420 (all zones)	PCT 3428 is dominated by Forest Red Gum, Grey Gum, Grey Ironbark and Swamp Turpentine. PCT 4046 are dominated by Forest Red Gum and Swamp Turpentine. PCT 3420 is dominated by Large-leaved Spotted Gum and Grey Ironbark.

Decision steps(from approved conservation advice (DCCEEW 2022))	Response	Justification
species may be present, and in some areas rainforest trees may be prominent		None of the PCT's above are dominated by Swamp Mahogany.
A mid-layer (including a sub-canopy, and/or shrub-layer) may be present, sparse or absent; and fauna may be abundant or rare	Yes for PCT 3428, PCT 4046 and PCT 3420 (all zones)	A midstorey is sparse or absent in all zones
EPBC Act listed Subtropical Floodplain Eucalypt Forest	PCT 3428 moderate condition – Yes PCT 3428 low – No PCT 4046 all zones – Yes PCT 3420 all zones – No	As above.

Swamp Sclerophyll Forest EEC

Swamp Sclerophyll Forest is listed as endangered under the BC and EPBC Act. The community Forest occurs on the mainland and islands near the coast (within 20 kilometres) within the South East Queensland, NSW North Coast, Sydney Basin, and the Bateman subregion of the South East Corner. This community occurs in low-lying coastal alluvial areas with minimal relief, such as swamps, floodplain pockets, depressions, alluvial flats, back-barrier flats, fans, terraces, and behind fore-dunes on alluvial deposits, as well as soils that are primarily marine or aeolian sand in origin, but where silts, clays and organic matter have been incorporated. The community features a canopy and/or sub-canopy dominated by *Melaleuca* spp. and/or *Eucalyptus robusta* and other species including Pink Bloodwood, Forest Red Gum, Woollybutt *Eucalyptus longifolia*, Bangalay *Eucalyptus botryoides* Swamp Gum, *Eucalyptus ovata*, and Swamp Box *Lophostemon suaveolens* (DAWE 2021).

The main threats to this community are clearing, fragmentation and degradation. There is no adopted or made Recovery Plan for this ecological community.

Swamp Sclerophyll Forest (represented by PCT 4001) occurs as an isolated patch within the south-eastern most portion of the Subject Land. This community varies from open woodland to closed forest with a crown cover of at least 10% and typically no more than 70%. In an intact forest, the canopy can be layered, with a sub-canopy of *Melaleuca* grading into a taller mixed *Melaleuca* and/or *Eucalypt* canopy.

The BC Act does not contain key diagnostics or condition thresholds for this community, but instead relies on a general description of the community and a list of characteristic plant species. All areas of PCT 4001 have been concluded to meet the general description of the BC Act definition.

The EPBC Act listing advice provides a clear definition of this community based on key diagnostic characteristics and condition thresholds. The decision process for attributing a patch of PCT 4001 to the TEC relies on observations of dominant canopy species and cover, native understorey cover and richness, and patch size. Within the Subject Land, low condition patches of Swamp Sclerophyll Forest were determined not to meet the EPBC Act definition.

An assessment of the different condition states of Subtropical Coastal Floodplain Forest present in the Subject Land, and how they align with TEC requirements are presented in Table 11 (BC Act) and Table 12 (EPBC Act) below.

Table 11 Swamp Sclerophyll Forest BC Act TEC summary

Final Determination Key Criteria	PCT 4001
Occurs on humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains.	Yes. All zones. The vegetation zones within PCT 4001 predominantly occur on sandy loams in periodically inundated alluvial flats within the Subject Land.
The community is characterised by the assemblage of species listed in the Final Determination	Yes. All zones. Characteristic species as listed in the Final Determination were recorded in all zones.
Occurs within the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions	Yes. All zones. The Subject Land occurs within the South East Queensland Bioregion. This bioregion originally formed part of the NSW North Coast bioregion until recently, with the release of IBRA Version 7. However, the Subject Land occurs within the Richmond Valley LGA.
Consists of an open too dense tree layer of <i>Eucalypts</i> and Paperbarks, which may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality	Yes. All zones contain an overstorey structure as an open too dense tree layer dominated by <i>Melaleuca</i> spp..
BC Act Listed Swamp Sclerophyll Forest EEC	YES

Table 12 Decision process for Coastal Swamp Sclerophyll Forest to determine alignment with EPBC Act listed TEC

Decision steps (from approved conservation advice (DAWE 2021))	Response	Justification
Occurs on the mainland and islands near to the coast (within 20 km from South East Queensland to south-eastern NSW specifically within these IBRA Bioregions: South Eastern Queensland, NSW North Coast, Sydney Basin and the Bateman sub-region of the South East Corner	Yes for all zones	The Subject Land is wholly contained within the South Eastern Queensland IBRA bioregion.
Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL.	Yes for all zones	The Subject Land is wholly contained within the Richmond River on the north coast of NSW and occurs at elevations between 30-80 m ASL.
Occurs on hydric soils with inundation patterns ranging from intermittent to episodic	Yes for all zones	PCT 4001 occurs on hydric soils
Vegetation structure varies from tall closed to open forest to woodland, to dense	No for all zones	PCT 4001 (low) was found to have a crown cover of <10% based on the BAM floristic data.

Decision steps (from approved conservation advice (DAWE 2021))	Response	Justification
(closed) shrubland or scrub forest. Minimum crown cover is at least 10%, but it is more typically in the range 50% to 70%		
The canopy is typically dominated or co-dominated by <i>Melaleuca quinquenervia</i> and/or <i>Eucalyptus robusta</i> . In some areas, the canopy may be locally dominated by other melaleuca species including <i>M. dealbata</i> (SEQ bioregion) (rarely); <i>M. biconvexa</i> (mid-NSW coast to south of Sydney); <i>M. decora</i> (north of Shoalhaven), frequently with <i>Parsonsia straminea</i> climbing on the trunks of canopy species. In the SEC bioregion, <i>M. ericifolia</i> may occur as a dominant canopy or sub-canopy species	Yes for all zones	PCT 4001 (low) within the Subject Land is dominated by <i>Melaleuca quinquenervia</i> .
Other tree species may occur in the canopy (or sub-canopy) in some areas, but they are not dominant across a patch, including <i>Casuarina glauca</i> , <i>Banksia</i> spp., <i>Callistemon salignus</i> , <i>Corymbia intermedia</i> (Pink Bloodwood), <i>E. tereticornis</i> , (Forest Red Gum/Queensland Blue Gum), <i>E. longifolia</i> (Woollybutt), <i>E. botryoides</i> (Southern Mahogany/Bangalay), <i>E. ovata</i> (Swamp Gum), <i>Livistona australis</i> and/or <i>Lophostemon</i> Spp.	No for all zones	PCT 4001 within the Subject Land does not contain occurrences of other tree species.
The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically <i>Gahnia</i> spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially <i>Imperata cylindrica</i> (Blady Grass).	Yes for all zones	PCT 4001 within the Subject Land contains a ground layer dominated by grasses and sedges.
While they can occur regularly in the ground layer, the ecological community is not present if halophytic species, more typically associated with estuarine/saltmarsh areas, dominate the ground layer of a patch, for example, <i>Appium prostratum</i> , <i>Atriplex cineria</i> , <i>Chenopodium glaucum</i> , <i>Rhagodia candolleaus</i> and <i>Samolus repens</i> .	Yes for all zones	PCT 4001 within the Subject Land does not contain a ground layer dominated by halophytic species listed.
EPBC Act listed Subtropical Floodplain Eucalypt Forest	No for all zones	As above.

3.2 Vegetation integrity assessment

3.2.1 Vegetation zones and patch size class

PCTs within the Subject Land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM, and as described in Table 3 to Table 6 above. This resulted in 11 vegetation zones identified within the Subject Land. Table 13 describes each of the zones, and provides details on the numbers of BAM floristic plots undertaken in each zone.

Patch size classes for each vegetation zone present within the Subject Land were assessed as per Section 4.3.2 of the BAM (DPIE 2020a) using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres (m) from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land (Figure 9).

Native vegetation within the Subject Land was mapped sequentially and it was found to form part of a very large patch of connecting vegetation with an area of approximately >9000 hectares. The connected vegetation comprises Bungwalbin State Forest and State Conservation Area, and Ellangowan State Forest, as well as intact bushland adjacent to the north-west and south-east of the Subject Land.

Patch size classes for each vegetation zone are also outlined in Table 13 below.

Table 13 Vegetation zones within the Subject Land

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Area (ha)	Max. patch size Development Footprint
4046_Moderate	PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest	Moderate	4	44.42	101
4046_Riparian		Riparian	3	11.09	101
4001_Low	PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest.	Low	1	1.1	101
3428_Moderate	PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest.	Moderate	4	14.76	101
3428_Low		Low	3	1.94	101
3420_Good	PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest.	Good	3	12.16	101
3420_Moderate		Moderate	5	48.57	101
3420_Regen		Regenerating	2	3.52	101

3.2.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes and function.
- A 20 metre x 20 metre quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). In total, 26 BAM plots have been completed within the vegetation zones present within the

Development Footprint, details are provided in Table 14 and shown on Figure 8. A number (12) of these 26 BAM plots included in the assessment are no longer located within the final Development Footprint as a result of design refinements over the course of the Project, however they still occur within the Subject Land. These plots have been retained for use in the assessment and are still considered to be representative of the vegetation present within the Development Footprint.

Table 14 BAM plots completed within the Subject Land

BAM plot reference	Vegetation zone
RV_01	3428_Low
RV_02	3420_Good
RV_03	3420_Good
RV_04	3420_Good
RV_05	3420_Regen
RV_06	3420_Moderate
RV_07	3420_Regen
RV_08	3420_Moderate
RV_09	3420_Moderate
RV_10	3420_Moderate
RV_11	3428_Moderate
RV_12	3428_Moderate
RV_13	4046_Moderate
RV_14	3428_Low
RV_15	4046_Moderate
RV_16	4001_Low
RV_17	4046_Riparian
RV_18	4046_Riparian
RV_19	4046_Riparian
RV_20	4046_Moderate
RV_21	4046_Moderate
RV_22	3428_Low
RV_23	3428_Moderate
RV_24	3428_Moderate
RV_25	Category 1 Land
RV_26	3420_Moderate

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database. A list of flora species was compiled for each BAM plot completed and is included in Appendix 3. Records of all flora species will be submitted to DCCEEW for incorporation into the Atlas of NSW Wildlife.

3.2.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix 3, with vegetation integrity scores for each vegetation zone provided in Table 15.

Table 15 Vegetation zone integrity scores

Vegetation zone	Composition score	Structure score	Function score	VI score*	Hollow-bearing Trees present
4046_Moderate	53.7	63.5	84.5	66.0	Yes
4046_Riparian	39.1	63.8	21.1	37.5	No
4001_Low	27.5	15.9	3	10.9	No
3428_Moderate	22.4	43.4	62.7	39.4	Yes
3428_Low	10.5	31.6	43	24.2	Yes
3420_Good	37.7	77	79.9	61.5	Yes
3420_Moderate	36.3	67	56.3	51.6	Yes
3420_Regen	25.4	45.1	20.7	28.8	No
Planted**	N/A	N/A	N/A	N/A	No
Scattered***	N/A	N/A	N/A	N/A	Yes
Category 1 Land	7.7	0	0.3	0.4	No

* Benchmark (pristine) condition vegetation would receive a VI score of 100.

** Assessed via planted vegetation module

*** Assessed via scattered tree module

As outlined in Section 9.2.1 of the BAM (DPIE 2020a), an offset is required for impacts on native vegetation where the vegetation integrity score is:

- ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community.
- ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.
- ≥ 20 where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are not required for vegetation zone 4001_low due to having a VI score of 10.9.

3.2.4 Scattered paddock trees

As outlined in Appendix B of the BAM (DPIE 2020a), an assessment of the impact of clearing scattered trees can be made using this module where:

- The impacts of clearing or development proposals are for vegetation that meets the definition of scattered trees, and
- The scattered tree is not a threatened species itself nor does it have any record of candidate species credit species (flora or fauna) incidentally using it, and

- The impact is unlikely to be serious or irreversible.

A total of 42 scattered/paddock trees were identified within the Subject Land (Figure 11), and 28 were entered into the scattered tree calculator as being present within the Development Footprint. A scattered paddock tree was assigned due to criteria one of the scattered tree module:

- Have a percent foliage cover that is less than 25% of the benchmark for tree cover for the most likely plant community type and are on category 2-regulated land and surrounded by category 1-exempt land on the Native Vegetation Regulatory Map under the LLS Act as per Table 16.

Table 16 Tree cover benchmark data for relevant PCTs

PCT	Tree cover benchmark value (Average)	25% of benchmark value	Min. m ² cover of 400m ² plot (assuming 100% PFC)
3420 Clarence Lowland Ironbark-Spotted Gum Grassy Forest	62%	15.5%	62 m ²
3428 Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	68%	17%	68 m ²
4046 Northern Lowland Swamp Turpentine-Red Gum Forest	28%	7%	28 m ²

Scattered paddock trees occurring in Category 1-exempt land, associated with PCT 4046 or 3428, consisted of isolated individual canopy species such as Swamp Turpentine, Pink Bloodwood, Forest Red Gum and Narrow-leaved Red Gum. Scattered paddock trees associated with PCT 3420 occur as predominantly as isolated Large-leaved Spotted Gum. A summary of scattered paddock trees is provided in Table 17 and shown in Figure 11.

Table 17 Scattered tree summary

Tree ID	Species	PCT	Class	Hollows	Impacted/Retained
1	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Impacted</i>
2	<i>Eucalyptus tereticornis</i>	4046	3	N	<i>Impacted</i>
3	<i>Eucalyptus tereticornis</i>	4046	3	N	<i>Impacted</i>
4	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Impacted</i>
5	<i>Lophostemon suavolens</i>	4046	3	N	<i>Impacted</i>
6	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Retained</i>
7	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Retained</i>
8	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Retained</i>
9	<i>Eucalyptus tereticornis</i>	4046	3	Y	<i>Retained</i>
10	<i>Eucalyptus tereticornis</i>	4046	2	N	<i>Retained</i>
11	<i>Eucalyptus tereticornis</i>	4046	2	N	<i>Retained</i>

12	<i>Eucalyptus tereticornis</i>	4046	3	Y	Retained
13	<i>Lophostemon suavolens</i>	4046	3	N	Retained
14	<i>Eucalyptus tereticornis</i>	4046	3	Y	Retained
15	<i>Eucalyptus tereticornis</i>	4046	3	N	Retained
16	<i>Corymbia henryi</i>	3420	3	Y	Impacted
17	<i>Corymbia henryi</i>	3420	3	Y	Impacted
18	<i>Corymbia henryi</i>	3420	3	Y	Impacted
19	<i>Corymbia henryi</i>	3420	3	Y	Retained
20	<i>Corymbia henryi</i>	3420	3	Y	Retained
21	<i>Eucalyptus siderophloia</i>	4046	2	Y	Impacted
22	<i>Eucalyptus tereticornis</i>	4046	3	N	Impacted
23	<i>Eucalyptus tereticornis</i>	4046	3	N	Impacted
24	<i>Eucalyptus tereticornis</i>	4046	3	N	Impacted
25	<i>Eucalyptus tereticornis</i>	4046	3	Y	Impacted
26	<i>Eucalyptus tereticornis</i>	4046	3	N	Impacted
27	<i>Corymbia henryi</i>	3428	3	N	Impacted
28	<i>Corymbia henryi</i>	3428	3	N	Impacted
29	<i>Corymbia henryi</i>	3428	3	N	Impacted
30	<i>Corymbia henryi</i>	3420	3	N	Impacted
31	<i>Corymbia henryi</i>	3420	3	Y	Retained
32	<i>Eucalyptus propinqua</i>	3428	3	Y	Impacted
33	<i>Corymbia intermedia</i>	3428	2	N	Impacted
34	<i>Corymbia henryi</i>	3428	3	Y	Impacted
35	<i>Eucalyptus siderophloia</i>	3428	3	Y	Impacted
36	<i>Eucalyptus tereticornis</i>	3428	2	N	Retained
37	<i>Eucalyptus tereticornis</i>	3428	3	N	Impacted
38	<i>Eucalyptus tereticornis</i>	3428	3	Y	Impacted
39	<i>Eucalyptus siderophloia</i>	3428	3	N	Impacted
40	<i>Corymbia intermedia</i>	3428	3	N	Impacted
41	<i>Eucalyptus siderophloia</i>	3428	3	N	Impacted
42	<i>Eucalyptus tereticornis</i>	3428	3	N	Impacted

Any proposed clearing of native vegetation that does not meet the definition of scattered trees was assessed with Section 4 of the BAM (DPIE 2020a). The BAM requires the identification of all species at risk of a SAI that would be impacted by the clearing of scattered trees. No such entities exist as part of the current assessment.

3.2.5 Planted vegetation

Where only part of the Subject Land contains planted native vegetation, the streamlined assessment module provided in Appendix D of the BAM may be used to assess that part of the development, activity, clearing or biodiversity certification proposal. Planted vegetation occurs as several small, isolated patches within the northern portion of the Subject Land, as category 1-exempt land or surrounded by cleared Category 1-exempt land, as well as wind break vegetation, and along the verges of Avenue Road. These patches consist of uniform line plantings of Dunn's White Gum *Eucalyptus dunnii* with a predominantly exotic understorey, and plantation stands of *Melaleuca alternifolia*.

Following implementation of D.1 – Decision-making key (outlined in Table 18 below), an assessment of the habitat values this vegetation provides to threatened species was undertaken in accordance with D.2 – Assessment of planted native vegetation for threatened species habitat.

Table 18 Planted native vegetation – streamlined assessment D.1

Decision Key		Response
1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?		No. The planted native vegetation is not part of a mosaic of planted and remnant vegetation. Planted vegetation was used as wind breaks or remaining following plantation use. Go to question 2
2. Is the planted native vegetation:	a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and	No
	b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	No – Go to 3
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:		Not that the applicant is aware of – Go to 4
a. a species recovery project b. Saving our Species project c. other types of government funded restoration project d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or		

Decision Key	Response
g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?	
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	No – Go to 5. As far as known, the plantings were for native plantation forestry use or windbreak in agriculture or forestry landscapes
5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or tea tree farms?	Yes – As far as known, the plantings were for native plantation forestry use or windbreak in agriculture or forestry landscapes. The vegetation must be assessed in accordance with D2- Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?	N/a

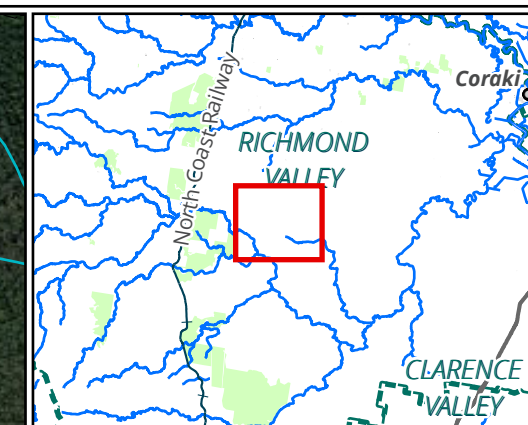
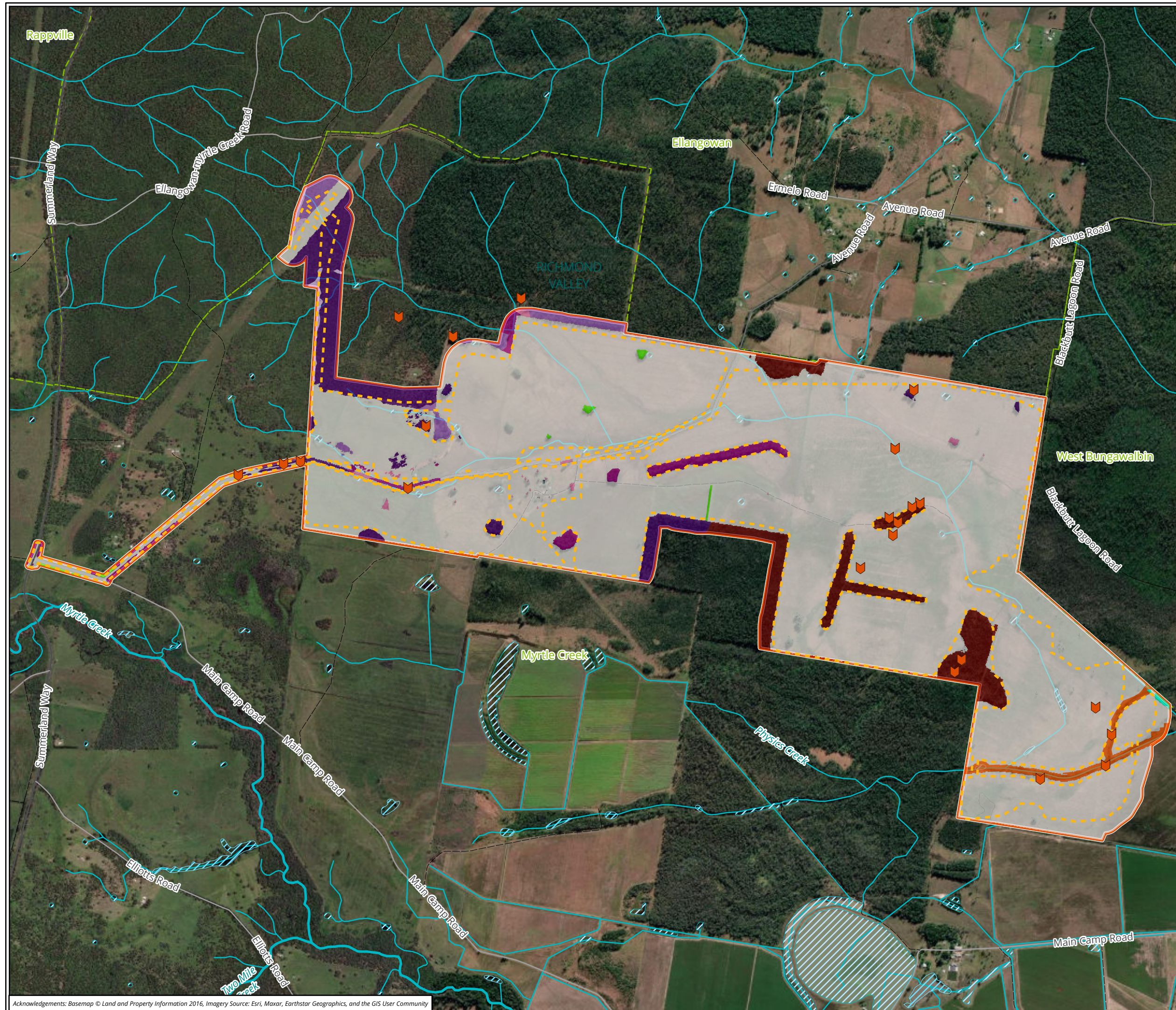
In accordance with Section D.2 (of Appendix D of the BAM), the assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species using, inhabiting or being part of the planted native vegetation. Planted trees and shrubs were generally immature individuals with no evidence of nests or hollows observed. No evidence of use by species credit species was observed during any of the survey periods. Mitigation measures will be implemented to minimise any potential direct and indirect impacts resulting from the removal of planted vegetation.



Photo 3 Planted Dunns White Gum as part of a wind break



Photo 4 Plantation of *Melaleuca alternifolia*



Legend

- Subject Land
- Development Footprint
- ▣ Hollow-bearing tree
- Category 1 Land

Plant Community Types, Condition

- 3420, Moderate
- 3420, Good
- 3420, Regen
- 3428, Moderate
- 3428, Low
- 4001, Low
- 4046, Moderate
- 4046, Riparian
- Planted

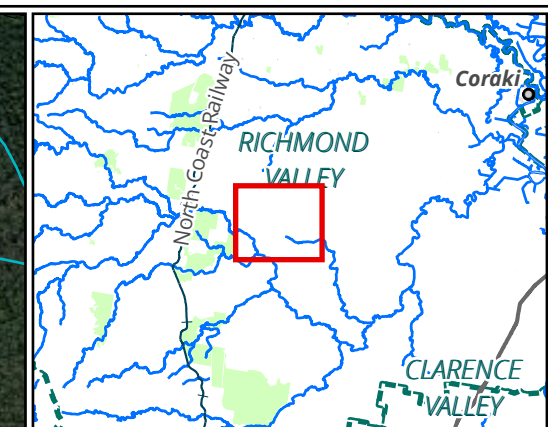
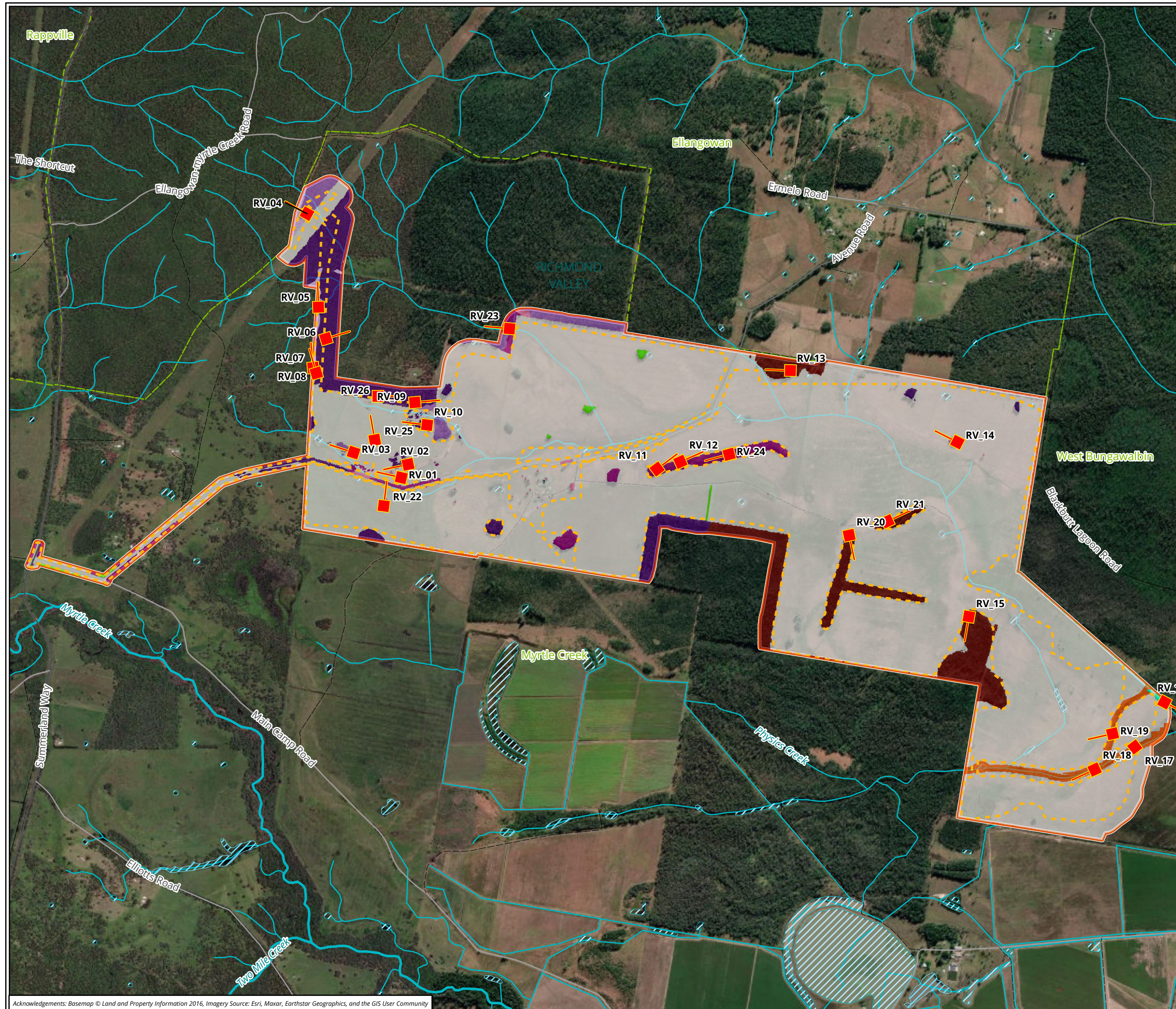
Figure 7 Vegetation within the Subject Land

0 200 400 600 800 1,000
Metres

Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



Matter: 38804, Date: 10 April 2024
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F7_BiosisVeg



Legend

- Subject Land
- Development Footprint
- BAM plot
- Category 1 Land

Plant Community Types, Condition

- 3420, Moderate
- 3420, Good
- 3420, Regen
- 3428, Moderate
- 3428, Low
- 4001, Low
- 4046, Moderate
- 4046, Riparian
- Planted

Figure 8 Vegetation zones and plot locations

0 200 400 600 800 1,000

Metres
Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

biosis

Matter: 38804, Date: 10 April 2024
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F8_VegZones



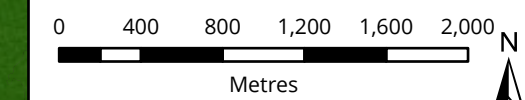
Legend

Subject Land
 Assessment Area

Patch size

<5ha
 5-25ha
 >100ha

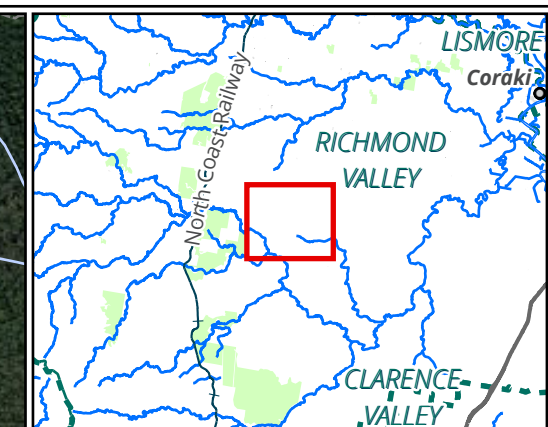
Figure 9 Patch size locations



Scale: 1:37,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 38804, Date: 10 April 2024
 GIS: AM, Checked by: MGP, Last edited by: amackegard
 Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
 Layout: 38804_F9_PatchSize



Legend

- Subject Land
- Development Footprint

Threatened Ecological Communities

EPBC Act

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Endangered)

BC Act

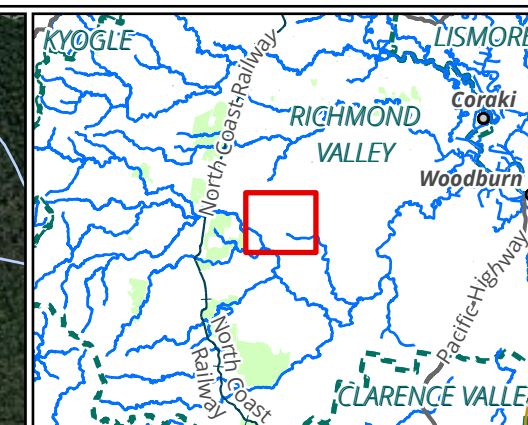
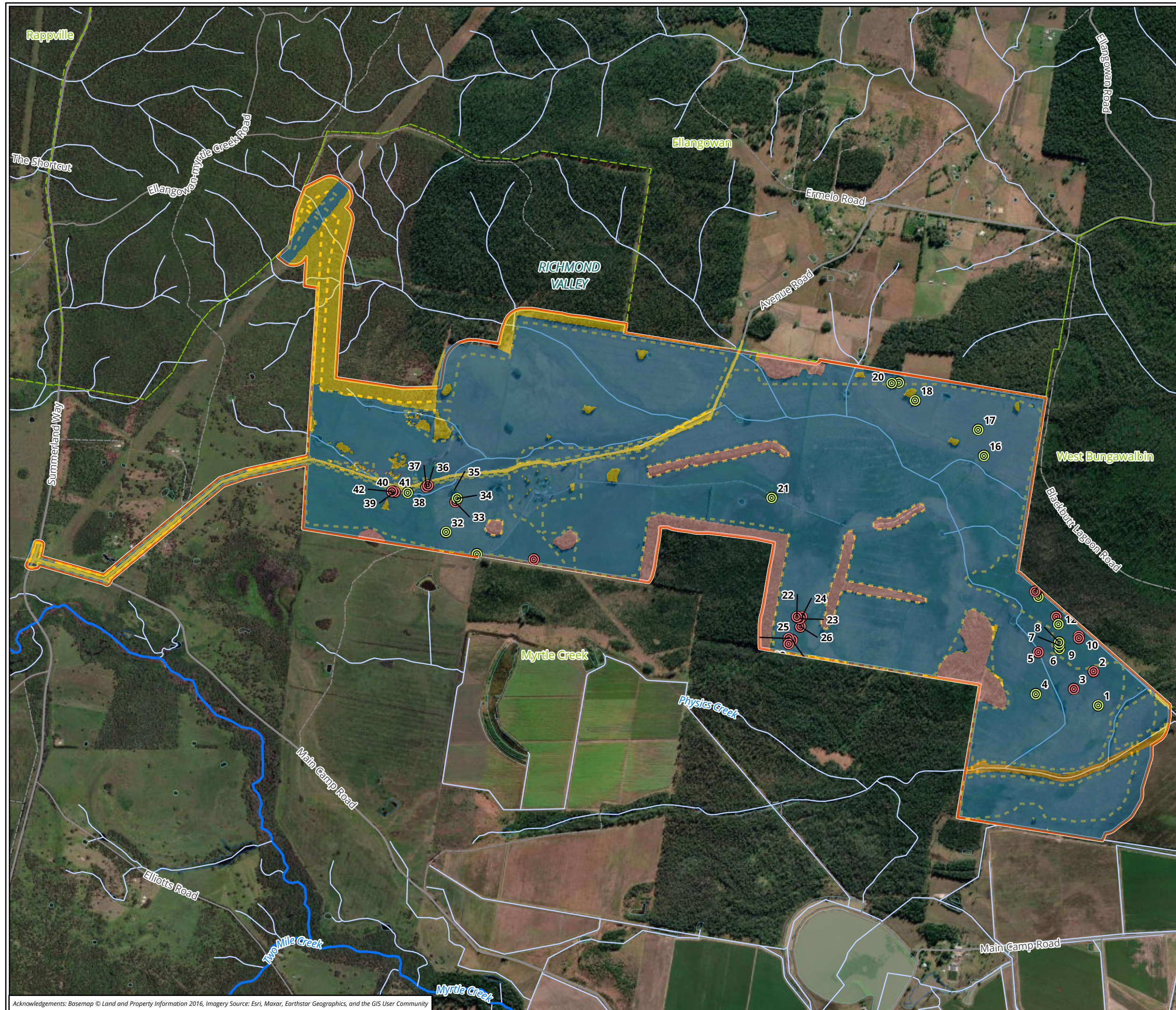
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
- Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Endangered)

Figure 10 Threatened ecological communities within the Subject Land

0 200 400 600 800 1,000
Metres
Scale: 1:25,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

biosis

Matter: 38804,
Date: 10 April 2024,
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR



Legend

- Subject Land
- Development Footprint

Scattered paddock tree

- Hollow present
- Hollow absent

Land category

- Cat 1 - Exempt
- Cat 2 - Regulated
- Cat 2 - Regulated (Sensitive)
- Cat 2 - Regulated (Vulnerable)
- Excluded

Figure 11 Scattered paddock trees

0 200 400 600 800 1,000

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA2020 MGA Zone 56



Matter: 38804,
Date: 10 April 2024,
GIS: AM, Checked by: MGP, Last edited by: amackegard
Layout: 38804_F11_PaddockTrees
Project: P:\38800s\38804\Mapping\
38804_Richmond_Valley_BDAR.aprx

4 Threatened species

4.1 General habitat features

The Subject Land predominantly consists of Category 1-exempt land used for cattle grazing and cropping, which is interspersed with patches of Clarence Dry Sclerophyll Forests, Coastal Floodplain Wetlands and Coastal Swamp Forests. There are also multiple natural drainage systems, farm dams and depressions (particularly in the south-east portion of the Subject Land) that support semi-permanent wetland habitats, albeit in highly degraded states.

Clarence Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests and associated drainage lines provide foraging, shelter, movement and breeding resources for native fauna such as Square-tailed Kite *Lophoictinia isura*, Grey-Crowned Babbler *Pomatostomus temporalis*, other woodland birds and raptor species. Seasonally flooded grassy/sedge drainage lines, wetlands, farm dams in the Subject Land provide habitat for a range of common fauna, including Little Pied Cormorant *Microcarbo melanoleucos* and Masked Lapwing *Vanellus miles*.

Due to the impacts of historical plantation activities, grazing, private forestry and disturbance by fire, the presence of threatened flora is severely limited within areas of Category 1-exempt land, and unlikely within disturbed native vegetation including patches of scattered trees, planted areas, low condition, and regenerating vegetation. Forested vegetation consistent with PCT 3420, 3428 and 4046 in moderate and good condition has a greater potential for threatened species to occur, however no threatened flora species were detected during the targeted surveys (refer Section 4.3.1).

Generally, although not detected during detailed surveys, it is known that habitat for species such as Koala and Coastal Emu do occur within the Subject Land and broader locality, and may occur on a transient basis or infrequently reside in or nearby the Subject Land. Neither of these species were recorded during targeted surveys, and the Subject Land is not considered to constitute optimal habitat, given land use history, previous clearing and disturbance from recent fires. As such, impacts to any potential habitat for Koala and Coastal Emu are addressed as ecosystem species only, with avoidance of the highest biodiversity value areas and mitigation measures implemented.

4.2 Ecosystem credit species

A list of predicted species (ecosystem credit species) expected to occur within the Subject Land was generated as per Section 5 of the BAM (DPIE 2020a). Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection (TBDC). Table 19 lists the ecosystem credit species that could not be discounted, based on geographical restrictions or a lack of suitable habitat, from using the Subject Land on occasion.

These species were considered when prescribing management and mitigation measures for the Project, and a number have been specifically considered as part of the assessment under the Commonwealth EPBC Act.

Table 19 Ecosystem credit species (predicted species) with potential to occur

Species name	Common name	Recorded during surveys	Sensitivity to gain class
<i>Anseranas semipalmata</i>	Magpie Goose	No	Moderate
<i>Anthochaera phrygia</i>	Regent Honeyeater	No	High
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	No	Moderate
<i>Botaurus poiciloptilus</i>	Australasian Bittern	No	Moderate
<i>Calidris canutus</i>	Red Knot	No	High
<i>Calidris ferruginea</i>	Curlew Sandpiper	No	High
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	No	High
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Yes	High
<i>Chthonicola sagittata</i>	Speckled Warbler	No	High
<i>Circus assimilis</i>	Spotted Harrier	No	Moderate
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	No	High
<i>Coracina lineata</i>	Barred Cuckoo-shrike	No	High
<i>Daphoenositta chrysoptera</i>	Varied Sittella	No	Moderate
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	No	High
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	No	Moderate
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Yes	High
<i>Glossopsitta pusilla</i>	Little Lorikeet	No	High
<i>Grus rubicunda</i>	Brolga	No	Moderate
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	No	High
<i>Hieraaetus morphnoides</i>	Little Eagle	No	Moderate
<i>Hirundapus caudacutus</i>	White-throated Needletail	No	High
<i>Ixobrychus flavicollis</i>	Black Bittern	No	Moderate
<i>Lathamus discolor</i>	Swift Parrot	No	Moderate
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit (baueri)	No	High
<i>Lophoictinia isura</i>	Square-tailed Kite	Yes	Moderate
<i>Macropus dorsalis</i>	Black-striped Wallaby	No	High
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	No	Moderate
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	No	Moderate
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Yes	High
<i>Miniopterus australis</i>	Little Bent-winged Bat	Yes	High
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Yes	High

Species name	Common name	Recorded during surveys	Sensitivity to gain class
<i>Numenius madagascariensis</i>	Eastern Curlew	No	High
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Yes	High
<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat	No	High
<i>Pandion cristatus</i>	Eastern Osprey	No	Moderate
<i>Petaurus australis</i>	Yellow-bellied Glider	No	High
<i>Petroica boodang</i>	Scarlet Robin	No	Moderate
<i>Phoniscus papuensis</i>	Golden-tipped Bat	No	High
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Yes	Moderate
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	No	High
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	No	High
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	No	High
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	No	Moderate
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	No	Moderate
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	No	Moderate
<i>Rostratula australis</i>	Australian Painted Snipe	No	Moderate
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Yes	High
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Yes	High
<i>Stagonopleura guttata</i>	Diamond Firetail	No	Moderate
<i>Syconycteris australis</i>	Common Blossom-bat	No	High
<i>Thylogale stigmatica</i>	Red-legged Pademelon	No	High

The following five ecosystem credit species were discounted from occurring within the Subject Land primarily due to the geographical distance from the coast (approximately 30.5 kilometres). Details for each discounted ecosystem credit species are listed below:

- Great Knot *Calidris tenuirostris* – Geographic limitations (the Subject Land is not within 5 km of coast or tidal influenced water bodies).
- Greater Sand-plover *Charadrius leschenaultii* – Geographic limitations (the Subject Land is not within 2 km of the coast).
- Lesser Sand-plover *Charadrius mongolus* – Geographic limitations (the Subject Land is not within 2 km of the coast).
- Sanderling *Calidris alba* – Geographic limitations (the Subject Land is not within 2 km of the coast).
- Terek Sandpiper *Xenus cinereus* – Geographic limitations (the Subject Land does not contain tidal influenced water bodies within 15 km of the coast).

4.3 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the Subject Land, or alternatively the species can be assumed to be present (DPIE 2020a).

Appendix 2 provides the lists of species credit species predicted to occur within the Subject Land based on the IBRA subregion(s) on/within which the Project occurs, the native vegetation cover present within the 1500 metre buffer area, the PCTs present within Subject Land, and patch sizes listed in Table 13.

The potential for a species to occur within the Subject Land was assessed in accordance with Section 5.2 of the BAM (DPIE 2020a) and species with geographical restrictions, or habitat constraints not present, were not required to be assessed. A total of 40 predicted species credit species have been excluded from occurring within the Subject Land based on geographic constraints, degradation of existing potential habitat, lack of microhabitat features, as well as the absence of mapped important habitat for any species (DPE 2023b). This is discussed further in Appendix 2.

A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the Subject Land is provided in Appendix 2. Species credit species considered to potentially occur within the Subject Land, and thus considered 'candidate species credit species' have been either assumed present, or the subject of the target of threatened species surveys.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 20 (flora species) and Table 21 (fauna species).

Threatened flora

Habitats for threatened flora species within the Subject Land occur across higher vegetation condition classes such as moderate and good condition dry sclerophyll forest, coastal swamp forest and coastal floodplain wetland communities. As much of the Subject Land has been subject to some level of management, including clearing/thinning, grazing and pasture improvement, these areas are less likely to provide threatened flora habitat. This includes open areas of Category 1 land subject to historical plantation activities, homogenous regenerating areas, scattered trees and small areas of lower condition vegetation that have been thinned and are generally where cattle congregate around gates and dams.

Table 20 provides a list of candidate flora species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below.

Table 20 Candidate flora species credit species

Species name	Common name	Associated PCT	Survey period	Method of assessment
<i>Acacia ruppia</i>	Rupp's Wattle	4046, 3428	All year	Targeted Survey
<i>Ancistrachne maidenii</i>	Ancistrachne maidenii	3420	December – April	Targeted Survey
<i>Angophora robur</i>	Sandstone Rough-barked Apple	3428, 3420	All year	Targeted Survey

Species name	Common name	Associated PCT	Survey period	Method of assessment
<i>Arthraxon hispidus</i>	Hairy Jointgrass	4046, 4001, 3428	November – February	Targeted Survey
<i>Callistemon linearifolius</i>	Netted Bottle Brush	3428	October – January	Targeted Survey
<i>Desmodium acanthocladum</i>	Thorny Pea	4046, 3428	All year	Targeted Survey
<i>Eucalyptus glaucina</i>	Slaty Red Gum	4046, 3420	All year	Targeted Survey
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	3428, 3420	All year	Targeted Survey
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	3420	January – March	Targeted Survey
<i>Grevillea masonii</i>	Mason's Grevillea	3428, 3420	All year	Targeted Survey
<i>Indigofera baileyi</i>	Bailey's Indigo	3420, 3428	All year	Targeted Survey
<i>Lindsaea incisa</i>	Slender Screw Fern	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Marsdenia longiloba</i>	Slender Marsdenia	3420	November – February	Targeted Survey
<i>Melaleuca irbyana</i>	Weeping Paperbark	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Melichrus gibberagee</i>	Narrow-leaf Melichrus	4046, 3420	September – May	Targeted Survey
<i>Oberonia complanata</i>	Yellow-flowered King of the Fairies	4046	All year	Targeted Survey
<i>Olex angulata</i>	Square-stemmed Olex	3420	All year	Targeted Survey
<i>Oldenlandia galioides</i>	Sweet False Galium	4046, 3428	December – May	Targeted Survey
<i>Persicaria elatior</i>	Tall Knotweed	4001	December – May	Targeted Survey
<i>Polygala linariifolia</i>	Native Milkwort	4046, 3428, 3420	October – February	Targeted Survey
<i>Prostanthera sejuncta</i>	Prostanthera sejuncta	4046, 3428, 3420	All year	Targeted Survey
<i>Rhodamnia rubescens</i>	Scrub Turpentine	4046, 4001	All year	Targeted Survey
<i>Rhodomyrtus psidioides</i>	Native Guava	4046, 4001, 3428	All year	Targeted Survey
<i>Rotala tripartita</i>	Rotala tripartita	3428, 3420	December – March	Targeted Survey

Threatened fauna

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed development contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Appendix 2.

The Subject Land provides suitable habitat values for several threatened fauna species credit species (Table 21). Native vegetation including dry sclerophyll forest, coastal swamp forest and coastal floodplain wetlands provides foraging and nesting habitat for bird species. For instance, Square-tailed Kite and Grey-crowned Babblers were frequently recorded foraging during multiple survey periods.

Ephemeral waterways, wetlands, farm dams and lowlying areas subject to periodic inundation and adjacent riparian vegetation were found to provide habitat for various common amphibian species such as Common Eastern Froglet *Crinia signifera*, Rocket Frog *Litoria nasuta*, Brown-striped Frog *Limnodynastes peroni* and Eastern Banjo Frog *Limnodynastes dumerilii*, however overall abundance was observed to be low. Overall numbers of common species as well as habitat for threatened species is likely to be minimal given the large populations of the highly invasive species Cane Toad *Rhinella marina*, which was routinely observed at all waterways and dams.

Treed areas subject to grazing may provide foraging resources for raptor species such as Square-tailed Kite *Lophoictinia isura*, as well as Owl species such as the Barking Owl *Ninox connivens*, however open areas of Category 1 lands are unlikely to provide more than marginal foraging habitat. Hollow-bearing trees may be utilised as roosting and/or breeding for Barking Owl and nocturnal arboreal mammals such as Squirrel Glider *Petaurus norfolcensis* in larger patches, however much of the vegetation within the Subject Land contains immature trees where many hollows are yet to form in significant size or numbers. A total of 42 hollow bearing trees, including seven trees with significant hollows were recorded sporadically throughout the Subject Land (Figure 7), and although may provide habitat for some hollow dependent fauna, species such as the Pale-headed Snake are unlikely to be present, given their requirement and bias towards high hollow bearing tree densities along floodplains and riparian areas.

Habitat requirements and potential for occurrence of fauna species candidate species are further discussed in Appendix 2.

Table 21 provides a list of candidate fauna species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below. Justification for species assumed present is provided in Section 4.3.1.

Table 21 Candidate fauna species credit species

Species name	Common name	Associated PCT	Survey period	Method of assessment
<i>Ninox connivens</i>	Barking Owl	4046, 4001, 3428, 3420	May – December	Targeted Survey
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	4046, 4001, 3428, 3420	December – June	Assumed Present
<i>Burhinus grallarius</i>	Bush Stone-curlew	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Planigale maculata</i>	Common Planigale	4046, 4001, 3428, 3420	All year	Assumed Present
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	4001, 3428, 3420	November – January	Targeted Survey
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	4046, 4001, 3428, 3420	October – March	Targeted Survey

Species name	Common name	Associated PCT	Survey period	Method of assessment
<i>Dromaius novaehollandiae</i> - endangered population	Emu	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Mixophyes iteratus</i>	Giant Barred Frog	4046, 4001, 3428, 3420	October – March	Targeted Survey
<i>Calyptorhynchus lathami lathami</i>	Glossy Black Cockatoo	4046, 4001, 3428, 3420	January – September	Targeted Survey
<i>Litoria aurea</i>	Green and Golden Bell Frog	4046, 4001, 3428, 3420	November – March	Targeted Survey
<i>Litoria brevipalmata</i>	Green-thighed Frog	4046, 3428, 3420	September – April	Assumed Present
<i>Phascolarctos cinereus</i>	Koala	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	4046, 4001, 3428, 3420	December – February	Targeted Survey
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	3428, 3420	November – January	Targeted Survey
<i>Miniopterus australis</i>	Little Bent-winged Bat	4046, 4001, 3428, 3420	December – February	Targeted Survey
<i>Hieraetus morphnoides</i>	Little Eagle	4046, 4001, 3428, 3420	August – October	Targeted Survey
<i>Potorous tridactylus</i>	Long-nosed Potoroo	4046, 3420	All year	Targeted Survey
<i>Tyto novaehollandiae</i>	Masked Owl	4046, 4001, 3428, 3420	May – August	Targeted Survey
<i>Ninox strenua</i>	Powerful Owl	4046, 4001, 3428, 3420	May – August	Targeted Survey
<i>Turnix maculosus</i>	Red-backed Button-quail	4001, 3420	All year	Targeted Survey
<i>Calyptorhynchus banksii banksii</i>	Red-tailed Black-Cockatoo (coastal subspecies)	4046, 3428, 3420	All year	Targeted Survey
<i>Erythrotriorchis radiatus</i>	Red Goshawk	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Aepyprymnus rufescens</i>	Rufous Bettong	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Petauroides volans</i>	Southern Greater Glider	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Myotis macropus</i>	Southern Myotis	4046, 4001, 3428, 3420	October – March	Targeted Survey
<i>Lophoictinia isura</i>	Square-tailed Kite	4046, 4001, 3428, 3420	September – January	Targeted Survey
<i>Petaurus norfolcensis</i>	Squirrel Glider	4046, 4001, 3428, 3420	All year	Targeted Survey
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	4046, 4001, 3428, 3420	October – March	Targeted Survey
<i>Cacophis harriettae</i>	White-crowned Snake	4046, 4001, 3428, 3420	September – April	Targeted Survey

4.3.1 Threatened species survey details

Targeted threatened species surveys of the Subject Land were undertaken seasonally over a 10-month period from April 2023 to January 2024 and are shown on Figure 12. Weather observations for each survey date are shown in Table 22.

Table 22 Weather observations during targeted flora and fauna surveys (Casino, NSW)

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)
		Min.	Max.	
General vegetation mapping, diurnal bird survey and hollow bearing trees	24 April 2023	15.4	25.7	6.2
	25 April 2023	14.9	23.8	1.6
	26 April 2023	14.7	25.7	3.0
	27 April 2023	15.1	24.2	1.0
Koala SAT surveys, diurnal bird surveys, nocturnal spotlighting	31 July 2023	12.1	28.0	0
	1 August 2023	10.5	25.2	0
	2 August 2023	7.9	23.7	0
	3 August 2023	7.0	21.4	0
	4 August 2023	5.4	20.7	0.2
Targeted flora surveys and nocturnal camera trapping	25 September 2023	8.9	26.0	0.2
	26 September 2023	7.2	30.6	0
	27 September 2023	9.1	34.1	0
	28 September 2023	17.8	25.0	0
	29 September 2023	9.7	29.7	5.8
Nocturnal camera trapping pickup	30 October 2023	9.8	32.0	0
BAM plots, targeted flora surveys, Koala SAT surveys, diurnal camera trapping, bat detectors	11 December 2023	16.1	31.8	0
	12 December 2023	13.6	31.5	0
	13 December 2023	17.2	33.7	0
	14 December 2023	21.8	36.9	0
	15 December 2023	21.5	34.4	5.6
Vegetation mapping, targeted flora surveys and BAM plots in road upgrade area and transmission line	18 January 2024	22.3	33.0	0.2
	19 January 2024	21.2	34.8	1.2

Information from the Australia Government Bureau of Meteorology website.

Details of surveys undertaken as part of the current assessment are provided below.

Threatened Flora

Survey method and effort

Targeted flora surveys were undertaken by qualified ecologists Mitchell Palmer (Manager – Ecology and GIS NSW), Brendon True (Senior Botanist – Major Projects), Kit King (Botanist) and Dylan Mason (Graduate Ecologist) on 25 – 29 September 2023, and 11 – 15 December 2023 and 18-19 January 2024 over a total of 80 person hours.

Each ecologist undertook surveys searching via parallel traverses 10 metres apart in areas of open vegetation and 5 metres apart in areas of dense vegetation across areas of suitable habitat for each target threatened flora species. Some portions of the Subject Land were not subject to targeted survey for threatened flora, as suitable habitat was not present, with the vast majority undertaken within the vegetation zones associated with the transmission line.

Survey was designed as far as practicable to maximise the likelihood of detection of targeted threatened flora species by grouping flora species considered likely to be consistently detected through survey according to optimal months of survey and specific associated habitat. Geospatial data was recorded using a handheld GPS, and illustrated in Figure 12.

Justification of survey method and effort

Survey guidelines followed included:

- Section 5 of the BAM to determine the potential for threatened species identified under the BAM as 'ecosystem credit species' and 'species credit species' to occur (DPIE 2020a).
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
- *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b).

Parallel traverses were undertaken at 10 metres apart in areas of open vegetation and 5 metres apart in areas of dense vegetation within suitable habitat for all candidate species credit species. These distances and level of survey effort were selected as the minimum distance requirements for herbs and forbs, but represent further additional survey effort for sub-shrubs, medium shrubs and tree species (DPIE 2020b).

Timing of survey

Targeted flora surveys were conducted in September 2023, December 2023 and January 2024 to coincide with the requirements for each threatened species credit species in the TBDC survey guides.

Survey personnel and relevant experience

Targeted flora surveys were undertaken by the Biosis ecologists listed in Table 23.

Table 23 Targeted flora survey personnel and relevant experience

Staff member	Role	Relevant experience
Brendon True	Senior Botanist – Major Projects	Over 10 years' experience and key expertise in the identification of native flora and vegetation communities throughout NSW, including conducting flora surveys within the NSW North Coast region.

Staff member	Role	Relevant experience
Kit King	Botanist	Two years' experience conducting threatened flora surveys within NSW.
Dylan Mason	Graduate Ecologist	One years' experience conducting threatened flora surveys in NSW.

Results

Table 24 provides a summary of the results of the targeted flora surveys completed.

Table 24 Summary of targeted flora survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Acacia ruppii</i>	Rupp's Wattle	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Ancistrachne maidenii</i>	Ancistrachne maidenii	10 m separated transect searches of potential habitat - December 2023	Not recorded during surveys	N/A
<i>Angophora robur</i>	Sandstone Rough-barked Apple	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Arthraxon hispidus</i>	Hairy Jointgrass	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Callistemon linearifolius</i>	Netted Bottle Brush	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Desmodium acanthocladum</i>	Thorny Pea	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Eucalyptus glaucina</i>	Slaty Red Gum	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	10 m separated transect searches of potential habitat - January 2024	Not recorded during surveys	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Grevillea masonii</i>	Mason's Grevillea	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Indigofera baileyi</i>	Bailey's Indigo	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Lindsaea incisa</i>	Slender Screw Fern	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Marsdenia longiloba</i>	Slender Marsdenia	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Melaleuca irbyana</i>	Weeping Paperbark	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Melichrus gibberagee</i>	Narrow-leaf Melichrus	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Oberonia complanata</i>	Yellow-flowered King of the Fairies	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Olax angulata</i>	Square-stemmed Olax	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Oldenlandia galioides</i>	Sweet False Galium	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Persicaria elatior</i>	Tall Knotweed	10 m separated transect searches of potential habitat - December 2023	Not recorded during surveys	N/A
<i>Polygala linariifolia</i>	Native Milkwort	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A
<i>Prostanthera sejuncta</i>	Prostanthera sejuncta	10 m separated transect searches of potential habitat	Not recorded during surveys	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		September and December 2023, January 2024		
<i>Rhodamnia rubescens</i>	Scrub Turpentine	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Rhodomyrtus psidioides</i>	Native Guava	10 m separated transect searches of potential habitat - September and December 2023, January 2024	Not recorded during surveys	N/A
<i>Rotala tripartita</i>	Rotala tripartita	10 m separated transect searches of potential habitat - December 2023, January 2024	Not recorded during surveys	N/A

Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 21 and Appendix 2. Habitat assessments focussed on the presence of the following features within the Subject Land:

- Habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs and canopy/understorey feed tree species.
- Soil type.
- Condition and type of native vegetation and the presence of exotic species.
- Presence and condition of pools and waterways.
- Quantity of ground litter and woody debris.
- Searches for indirect evidence of fauna (i.e. feathers, tracks and scats).
- General degradation of the site as a result of past and current disturbances such as vegetation clearing and industrial land management practices.
- Topography and landscape morphology.
- Presence of flying-fox camps.

Generally, small patch sizes and understorey habitats are generally degraded throughout most of the Subject Land and subjected to negative pressures associated with historical plantation activities, grazing and weed ingress, and are thus considered to be of little value to potential candidate fauna species that rely on higher condition understorey habitats for survival. However, larger patches to the north west, and surrounding the

boundaries of the Subject Land contain higher condition states and several habitat features with potential to support threatened species credit species were identified during these habitat assessments, and were a focus of targeted survey, and where species were recorded. These features have been summarised in Table 25.

Table 25 Habitat features with potential to support threatened species credit species

Habitat feature	Presence within the Subject Land
Hollow-bearing trees	Much of the vegetation in the Subject Land is considered immature or not of considerable hollow bearing age, however, habitat trees supporting hollows of a variety of size classes from small (<50 mm diameter) through to extra-large (> 400 mm diameter) were present across the Subject Land on occasion. These trees have the potential to provide breeding resources for a range of native fauna species including threatened cockatoos (Red-tailed Glossy Black-Cockatoo), owls (Barking Owl, Masked Owl, and Powerful Owl), microbats, and arboreal mammals (Squirrel Glider).
Caves and rocky overhangs	The Subject Land was not found to contain any caves or rocky overhangs that may provide potential breeding habitat for threatened microbats including Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, and Southern Myotis.
Feed tree species	A variety of tree species identified as Koala feed trees within the North Coast Koala management area, which includes the Subject Land, were detected during the assessment including Forest Red Gum <i>Eucalyptus tereticornis</i> and Narrow-leaved Forest Red Gum <i>Eucalyptus seeana</i> . Trees and shrubs providing food resources for smaller mammals such as Eastern Pygmy Possum and Squirrel Glider are also present.
Open grassland	Areas of open Category 1-exempt land are likely to provide sub-optimal foraging resources only for Raptors and Owls such as Square-tailed Kite and Barking Owl, given the level of disturbance from previous land use.
Major and minor watercourses and waterbodies (i.e. dams)	Wetlands, ephemeral waterways and periodically inundated low lying areas and surrounding riparian vegetation may support threatened amphibians such as Giant Barred Frog and Green-thighed Frog, however these areas are degraded and inhabited by large populations of Cane Toads. These areas have been largely avoided.
Woody debris and leaf litter	Woody debris and leaf litter was prevalent in the remnant vegetation patches across the Subject Land providing potential foraging habitat for birds, raptors and owl species.

Field capture of detailed fauna habitat information allowed for confirmation of presence/absence of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the Development Footprint. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat criteria that allowed for planning of further targeted survey for select species, or the exclusion of the potential for occurrence of various candidate species from the Subject Land.

Nocturnal birds

Survey method and effort

Targeted survey for Barking Owl, Powerful Owl, Masked Owl and Bush Stone Curlew were undertaken by qualified ecologists Joel Nicholson (Zoologist) and Kit King (Botanist) on 31 July – 4 August 2023 over a total of 100 person hours in potential habitat. Surveys were undertaken on all nights where conditions were considered favourable. Suitable areas of habitat were determined using the data collected during the preliminary field investigation to ensure a focussed survey effort.

The following methodology was implemented during the targeted surveys:

- Searches for suitably sized hollows and fallen/standing timber within native vegetation was undertaken where potential habitat had been identified due to the presence of indicator PCTs.
- Hollow-bearing trees were mapped and any signs of recent use by owl species was also recorded.
- Suitable vegetation containing fallen and/or standing timber were mapped.
- Nocturnal spotlighting and call playback to flush cryptic species.
- Remote camera trapping for Red-backed Button Quail.

Two ecologists conducted surveys by both walking and slow driving transects through all woodland habitats within the Subject Land over four nights. Spotlights were used to search vegetation on either side of the transect to detect eye shine of target species. Call playback was also utilised wherever suitable habitat was encountered and included a five-minute quiet listening period followed by three five-minute call playback sessions. Each of the spotlighting transects and call playback points were repeated twice. Geospatial data was recorded using a handheld GPS and illustrated in Figure 12.

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010).
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
- *BioNet Threatened Species Data Collection* (DPE 2023c).

Timing of survey

Surveys were undertaken in March 2023, April 2023 and July/August 2023, which coincides with each species survey timing requirements for all species. Survey requirements for Masked Owl recommend six nights of call playback and spotlighting , however spotlighting and call playback was only undertaken over four nights. The species was not detected during the survey and to compensate for the reduced survey effort, additional habitat survey was undertaken. Six suitable breeding hollows occur within the Subject Land, with several found to be inhabited by common species such as Barn Owl *Tyto alba* and Brush-tailed possums *Trichosurus vulpecula*.

Survey personnel and relevant experience

Nocturnal bird surveys were undertaken by the Biosis ecologists outlined in Table 26.

Table 26 Targeted nocturnal bird survey personnel and relevant experience

Staff member	Role	Relevant experience
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Kit King	Botanist	Two years' experience conducting threatened fauna surveys within NSW.

Results

Table 27 provides a summary of the results of the nocturnal bird surveys completed.



Photo 5 Barking Owl located within the north west of the Subject Land

Table 27 Summary of nocturnal bird survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Ninox connivens</i>	Barking Owl	- Call playback and spotlighting across four survey nights - July/August 2023	Recorded within Project Area slightly outside Subject Land	7.84 ha within Zones: 3420_Good 3420_Moderate 3428_Low 3428_Moderate 4046_Moderate 4046_Riparian
<i>Tyto novaehollandiae</i>	Masked Owl	- Call playback and spotlighting across four survey nights - Habitat survey - July/August 2023	Not recorded during surveys	N/A
<i>Ninox strenua</i>	Powerful Owl	- Call playback and spotlighting across four survey nights - July/August 2023	Not recorded during surveys	N/A
<i>Burhinus grallarius</i>	Bush Stone Curlew	- Spotlighting transects to flush species across four survey nights - July/August 2023	Not recorded during surveys	N/A
<i>Turnix maculosus</i>	Red-backed Button-quail	- Spotlighting transects to flush species across four survey nights - Remote camera traps	Not recorded during surveys	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		- July/August 2023 - January 2024		

Diurnal birds

Survey method and effort

Diurnal transects, opportunistic surveys and observations for diurnal birds, as well as large stick nests, hollow bearing tree surveys, scat and feather detection surveys were conducted in March 2023, April 2023, July/August 2023 and January 2024. In addition, two diurnal camera traps were set up along cleared areas including fence lines recording from dawn until dusk in December 2023. Surveys consisted of transects, observing hollows for use and other evidence of breeding.

Methods employed as part of this assessment included:

- Survey for the presence of eucalypts containing hollows that are at least 8 m above the ground, and with hollow diameter of 15 cm or larger with an angle of at least 45 degrees.
- Survey for the presence of breeding on site as follows; (a) begging birds of any age or sex; or (b) lone adult males identified during the breeding season (April to August); or (c) an occupied nest.
- Survey for the presence of nest trees supporting large stick nests.
- Diurnal camera trapping within cleared areas and along fence lines for Emu and Red-backed button quail.
- Detailed searches of movement corridors and fence lines for evidence of Emu feather and scat detection.

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010).
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
- *BioNet Threatened Species Data Collection* (DPE 2023c).

Currently, the TBDC stipulates a staged approach for the detection of breeding. This includes the identification of signs of breeding (presence of the species during breeding season) and potential nest trees (suitable hollow-bearing trees).

Two one – two-hour diurnal surveys were conducted in areas of suitable habitat including suitable nest trees and hollow-bearing trees, as well as opportunistic diurnal surveys during the day and at dusk. The survey methods and effort completed by Biosis are considered to fulfil this requirement.

Timing of survey

Surveys were undertaken in March, April, July/August, December 2023 and January 2024 which coincides with each species survey timing requirements.

Survey personnel and relevant experience

Diurnal bird surveys were undertaken by the Biosis ecologists are outlined in Table 28.

Table 28 Targeted diurnal bird survey personnel and relevant experience

Staff member	Role	Relevant experience
Mitch Palmer	Manager – Ecology and GIS (NSW) BAM Accredited Assessor Principal Ecologist	Over 13 years' experience and key expertise in the identification of native flora, vegetation communities and avifauna species throughout NSW, including conducting flora and fauna surveys within the Riverina region.
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Kit King	Botanist	Two years' experience conducting threatened fauna surveys within NSW.
Julia Hutton	Zoologist	One year experience conducting threatened fauna surveys within NSW.

Results

Table 29 provides a summary of the results of the diurnal bird surveys completed.

Table 29 Summary of diurnal bird survey method and results

Species Name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Calyptorhynchus banksii banksii</i>	Red-tailed Black-Cockatoo (coastal subspecies)	Diurnal transects	Not recorded during surveys	N/A
<i>Calyptorhynchus lathami lathami</i>	Glossy Black Cockatoo	Diurnal transects	Not recorded during surveys	N/A
<i>Dromaius novaehollandiae - endangered population</i>	Emu	- Diurnal transects - Camera trapping - Feather detection - Scat detection	Not recorded during surveys	N/A
<i>Erythrotriorchis radiatus</i>	Red Goshawk	- Opportunistic observation - Habitat searches - Stick nest searches	Not recorded during surveys	N/A
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	- Opportunistic observation - Habitat searches - Stick nest searches	Not recorded during surveys	N/A
<i>Hieraetus morphnoides</i>	Little Eagle	- Opportunistic observation - Habitat searches - Stick nest searches	Not recorded during surveys No stick nests recorded	N/A
<i>Lophoictinia isura</i>	Square-tailed Kite	Opportunistic observation	Recorded foraging incidentally during	N/A (no breeding)

Species Name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		- Habitat searches - Stick nest searches	vegetation mapping, however no large sick nests observed.	
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	Diurnal transects	Not recorded during surveys	N/A

Amphibians

Survey method and effort

Suitable amphibian habitat primarily comprised Physics Creek and scattered farm dams that were assessed during the day on 11 December 2023 by Joel Nicholson (Zoologist) and Julia Hutton (Graduate Zoologist). Transects and call playback points were established during the day to determine suitable habitat to be targeted during nocturnal survey. The surveys were undertaken over 4 nights between 11 – 14 December 2023, in order to coincide with the allowable survey periods for each species. During surveys, large populations of Cane Toad were observed at all waterways and dams.

The following methodology was implemented during each survey:

- An initial five minute period of passive listening at the start of each transect to detect and identify calling frogs present at the site.
- At each 50 metre interval along the transect a five minute passive listening period was completed followed by two minutes of call broadcast and an additional two minutes of listening for each species.
- Each interval was followed by a slow walking visual inspection for five minutes where suitable habitat was searched with torches.

Nocturnal listening surveys were undertaken along one watercourse and eight farm dams.

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- NSW Survey Guide for Threatened Frogs* (DPIE 2020c).

Timing of survey

Surveys were undertaken in Summer 2023 from 11 – 14 December, which coincides with the species survey timing requirements. Survey requirements were not met for Green-thighed Frog due to the lack of suitable rainfall during the survey period. A reduced level of survey was undertaken (habitat assessment and survey across four nights), however, the species was not able to be ruled out and therefore has been assumed present.

Survey personnel and relevant experience

Frog surveys were undertaken by the Biosis ecologists outlined in Table 30.

Table 30 Targeted frog survey personnel and relevant experience

Staff member	Role	Relevant experience
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Julia Hutton	Zoologist	One year experience conducting threatened fauna surveys within NSW.

Results

Table 31 provides a summary of the results of the frog surveys completed. Large and significant numbers of Cane Toads were observed in multiple locations during surveys. Observations of common frogs were also limited. The large numbers of Cane Toads are considered a threat to common frogs and importantly threatened frogs, as a competitor for other food sources as well as a food source themselves.

**Photo 6 Cane toads present within the Subject Land****Table 31 Summary of frog survey method and results**

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Mixophyes iteratus</i>	Giant Barred Frog	- Call playback, transect searches and listening points across 4 survey nights 11 – 14 December 2023	Not recorded during surveys. Habitat concluded to be degraded. Large numbers of cane toads.	N/A
<i>Litoria aurea</i>	Green and Golden Bell Frog	- Call playback, transect searches and listening points across 4 survey nights 11 – 14 December 2023	Not recorded during surveys. Habitat concluded to be degraded. Large	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
			numbers of cane toads.	
<i>Litoria brevipalmata</i>	Green-thighed Frog	- Habitat assessment and call playback across 4 survey nights 11 – 14 December 2023	Not recorded during assessment however suitable rainfall conditions were not optimal. Assumed present in gilgaied waterways and forested areas.	Assumed present in 0.64 ha across zones: 4046_Riparian

Reptiles

Survey method and effort

Surveys included habitat assessment and spotlighting within areas of suitable vegetation in conjunction with amphibian surveys, particularly forested areas in proximity to riparian areas and dams. Survey was undertaken from 11 – 14 December 2023 by qualified ecologists Joel Nicholson (Zoologist) and Julia Hutton (Graduate Zoologist).

The following methodology was implemented during the targeted surveys:

- Visual habitat survey within areas of suitable habitat for active and non-active individuals.
- Nocturnal spotlighting.

Two hour transect survey (two 60 minute person transects) were undertaken at 12 points across the Subject Land across four nights.

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act* (DEWHA 2011a).
- *Threatened Reptiles Biodiversity Assessment Method survey guide* (DPE 2022a).

Timing of survey

Surveys were undertaken in Summer 2023 from 11 – 14 December, which coincides with the species survey timing requirements.

Survey personnel and relevant experience

Reptile surveys were undertaken by the Biosis ecologists outlined in Table 32.

Table 32 Targeted reptile survey personnel and relevant experience

Staff member	Role	Relevant experience
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Julia Hutton	Zoologist	One year experience conducting threatened fauna surveys within NSW.

Results

Table 33 provides a summary of the results of the reptile surveys completed.

Table 33 Summary of reptile survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Nocturnal spotlighting	Not detected during surveys	N/A
<i>Cacophis harriettae</i>	White-crowned Snake	Nocturnal spotlighting	Not detected during surveys	N/A

Mammals

Survey method and effort

All forested areas and scattered trees within the Subject Land were identified and recorded during the general biodiversity assessment described above and this ensured a focussed effort for targeted surveys.

Targeted survey for nocturnal arboreal fauna, including Squirrel Glider, Greater Glider, Eastern Pygmy-possum and Koala, and terrestrial fauna, including Long-nosed Potoroo and Rufous Bettong, were undertaken over four survey nights from 31 July to 3 August 2023. Two ecologists walked transects through all suitable forested habitats using spotlights to detect eye shine and utilising call playback opportunistically. Targeted survey also included dusk 'stag-watching' surveys at hollow-bearing trees identified as potential habitat during this period.

Targeted survey for nocturnal and diurnal arboreal fauna also included:

- Ten baited camera traps deployed in areas of suitable habitat over four weeks (26 September – 30 October 2023).
- Camera traps were dispersed across the site in the most suitable habitat for the targeted species. This included multiple vegetation zones across the Subject Land.
- A combination of universal bait types (peanut butter, oats and honey) was used for the target species.

Diurnal Koala SAT searches were also undertaken in suitable vegetation within the Subject Land. Surveys were undertaken in August and December 2023. The following methodology was implemented during the SAT survey:

- Seven diurnal SAT searches completed over three days in August 2023, followed by two additional surveys in December 2023 for a total of nine SAT searches over Winter and Summer.

- Searches were undertaken opportunistically for Koala scats beneath suitable trees across the Development Footprint in accordance with the method described in Phillips & Callaghan (2011). This involves searching the ground surface for scats within a distance of 100 cm of at the base of 30 trees for two minutes per tree.
- Each tree was also inspected for scratch marks.

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act* (DEWHA 2011b).
- *EPBC Act referral guidelines for the vulnerable Koala* (DoE 2014a).

Timing of survey

Surveys were undertaken in July/August, September, October and December 2023. Nocturnal spotlighting surveys were undertaken from 31 July – 3 August 2023, and camera trapping was undertaken over four weeks from 26 September to 30 October 2023. Koala SAT surveys were undertaken from 2 – 4 August 2023 and 11 – 14 December 2023. This coincides with the species survey timing requirements.

Presence was assumed for both Brush-tailed Phascogale *Phascogale tapoatafa* and Common Planigale *Planigale maculata* as survey requirements could not be met during targeted surveys. Given the size of the Subject Land and potential habitat, survey for Brush-tailed Phascogale would require the setup of 42 camera traps and re-baiting after two weeks, while Common Planigale would require at least 10 pitfall traps and survey. Based on the nearby records, it was considered highly likely the species may be found within the Subject Land. Given these factors, the decision was made to assume presence for these two species.

While survey requirements were not met, general habitat assessment, reduced camera trapping, and incidental observations were still undertaken in areas of suitable habitat.

Survey personnel and relevant experience

Terrestrial and arboreal mammal surveys were undertaken by the Biosis ecologists outlined in Table 34.

Table 34 Targeted mammal survey personnel and relevant experience

Staff member	Role	Relevant experience
Brendon True	Senior Botanist – Major Projects	Over 10 years' experience conducting threatened fauna surveys within NSW.
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Kit King	Botanist	Two years' experience conducting threatened fauna surveys within NSW.

Results

Table 35 provides a summary of the results of the mammal surveys completed.



Photo 7 Observed Squirrel Glider within the Subject Land

Table 35 Summary of mammal survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Not recorded during surveys.	N/A
<i>Petauroides volans</i>	Southern Greater Glider	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Not recorded during surveys.	N/A
<i>Petaurus norfolcensis</i>	Squirrel Glider	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Recorded during spotlighting surveys.	10.09 ha within Zones: 3428_Moderate 3420_Good 3420_Moderate 3420_Regen
<i>Phascolarctos cinereus</i>	Koala	SAT surveys	Not recorded during surveys.	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		2 – 4 August and 11 – 14 December 2023 - Nocturnal spotlighting 31 July – 3 August 2023		
<i>Potorous tridactylus</i>	Long-nosed Potoroo	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Not recorded during surveys.	N/A
<i>Aepyprymnus rufescens</i>	Rufous Bettong	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Not recorded during surveys.	N/A
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	- Camera trapping 26 September – 30 October 2023 - Nocturnal spotlighting 31 July – 3 August 2023	Not recorded during surveys.	Assumed present. 21.27 ha within Zones: 4046_Moderate 4046_Riparian 3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Regen
<i>Planigale maculata</i>	Common Planigale	- Habitat assessment - Incidental observation	Not recorded during surveys.	Assumed present. 21.27 ha within Zones: 4046_Moderate 4046_Riparian 3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Regen

Microchiropteran bats

Survey method and effort

Calls were recorded from dusk until dawn using eight Titley Scientific Anabat Chorus ultrasonic recorders, fitted with omnidirectional microphones. Default settings for trigger, sensitivity, sampling rate and minimum / maximum frequency were used. Each time a bat flies past the detector, its call is recorded as a digital file (defined here as a 'pass') that is saved directly onto a memory card in the detector unit. Files were recorded in

full spectrum format (.wav). Units were set on trigger mode to record at night. Units were located in flyways within target habitat areas to allow space in front and around the microphone to minimise echoes from hard surfaces, call attenuation from surrounding vegetation, and ensure adequate flight space around the microphone.

Units were deployed in a variety of habitats including post-fire regenerating woodland, farm dams, vegetated windrows and a riparian corridor to sample a wide variety of potential bat habitat across the site.



Photo 8 Example of unit deployment within Subject Land

Justification of survey method and effort

Survey was undertaken with reference to the following guidelines:

- *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (NSW Office of Environment and Heritage, 2018).
- *Survey guidelines for Australia's threatened bats* (Department of the Environment, Water, Heritage and the Arts, 2010).

Timing of survey

A total of eight ultrasonic recorders were placed within the Subject Land for a total of four nights, totalling 32 nights of survey during December 2023, which coincides with the species survey timing requirements.

Survey personnel and relevant experience

Microbat surveys were undertaken by Joel Nicholson (Zoologist) and Julia Hutton (Zoologist), and data analysis was undertaken by Felicity Williams (Senior Zoologist – Bat Ecology) (Table 36).

Table 36 Targeted microbat survey personnel and relevant experience

Staff member	Role	Relevant experience
Felicity Williams	Senior Zoologist – Bat Ecology	Over 12 years' experience in bat call data analysis.
Joel Nicholson	Zoologist	Five years' experience conducting threatened fauna surveys within NSW.
Julia Hutton	Zoologist	One year experience conducting threatened fauna surveys within NSW.

Results

Data was viewed using Anabat Insight (version 2.0.8, licensed), by Titley Scientific.

Species identification was first refined by using known species geographic distributions (Churchill 2008, Australasian Bat Society 2022) to generate a list of species with potential to occur within the Subject Land. Species identification was guided by the probability of occurrence within the Subject Land based on distribution, database records obtained from NSW BioNet and known habitat values at each detector point and across the Subject Land more broadly.

Files not containing bat calls (noise files) were filtered out using a standard “allbats” filter in Anabat Insight and not included in further analysis. A custom decision tree was used to sort the remaining files into likely species and species groups. Calls were identified by visually comparing the spectrogram and call characteristics (e.g. characteristic frequency and call shape) with reference calls and descriptions from available reference materials (Reinhold et al. 2001, Pennay, Law, & Reinhold 2004). A call (pass) was defined as a sequence of five or more consecutive pulses of similar frequency and shape. Identification was not attempted for sequences with less than five defined consecutive pulses (unless for readily identifiable species such as the White-striped Freetail-bat *Austronomus australis*). Similarly, sequences containing multiple bats or pulses with irregular frequency and / or shape (non-search-phase calls) were not identified to species level.

The focus of call analysis was to generate a list of species present, with a focus on threatened species, rather than analyse species activity. Once a species was positively identified, it was recorded as present. Species identification was, therefore, not attempted for all files recorded. Where a threatened species was not identified through the decision tree, additional checks were used to improve confidence that a false negative was not recorded including target frequency filters and manual review of ‘noise’ files.

Due to variability in the quality of calls and difficulty in distinguishing some species a conservative approach was taken when analysing calls and assigning an identification. The identification of each call was assigned a confidence rating (Duffy et al. 2000) as summarised in the table below.

Table 37 provides a summary of microbat confidence ratings and Table 38 provides a summary of the results of the microbat surveys completed.

Table 37 Bat call confidence ratings

Identification	Description
C – Almost certain	Call characteristics diagnostic, matching those described in reference material, including species reference calls.
PR – Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or frequency, or call lacks sufficient detail (e.g. call quality) to be

Identification	Description
	definite.
SG – Species Group	Call characteristics (e.g. frequency, shape) overlap with other species or call lacks sufficient detail (e.g. call quality) making it too difficult to distinguish between species.
X – Not Detected	Of the data analysed, no calls were attributable to this species.

Table 38 Summary of microbat survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Austronomus australis</i>	White-striped Free-tailed Bat	Acoustic detection	C	N/A
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Acoustic detection	C	N/A
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Acoustic detection	C – Ecosystem credit only	N/A
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Acoustic detection	C – however no breeding habitat such as caves, present.	N/A
<i>Miniopterus australis</i>	Little Bent-winged Bat	Acoustic detection	C – however no breeding habitat present.	N/A
<i>Myotis macropus</i>	Southern Myotis	Acoustic detection	C	7.44 ha within Zones: 4046_Moderate 4046_Riparian 3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Regen
<i>Ozimops ridei</i>	Ride's Free-tailed Bat		C	N/A
<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat	Acoustic detection	C	N/A
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	Acoustic detection	C – Ecosystem credit only	N/A
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Acoustic detection	PR – Ecosystem credit only	N/A
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Acoustic detection	PR – Ecosystem credit only	N/A
<i>Scotorepens greyii</i>	Little Broad-nosed Bat	Acoustic detection	PR	N/A
<i>Scotorepens orion</i>	South-eastern Broad-nosed Bat	Acoustic detection	PR	N/A
<i>Vespadelus pumilus</i>	Eastern Forest Bat	Acoustic detection	PR	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Acoustic detection	SG – Ecosystem credit only	N/A
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	Acoustic detection	SG	N/A
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	Acoustic detection	SG	N/A
<i>Scotorepens sp.</i>	Parnaby's Broad-nosed Bat	Acoustic detection	SG	N/A
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Acoustic detection	SG	N/A
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Acoustic detection	X	N/A
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Acoustic detection	X	N/A
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	Acoustic detection	X	N/A
<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat	Acoustic detection	X	N/A
<i>Phoniscus papuensis</i>	Golden-tipped Bat	Acoustic detection	X	N/A

Limitations

Ultrasonic sampling is associated with a number of limitations. Detectability of bats relates to the intensity of their calls, their flight characteristics and the structure of the surrounding vegetation, all of which influence the distance over which a bat can be detected. Differences in the probability of detection may result in a reduced likelihood of recording and, therefore, positively identifying some species as present within a site.

Manual call analysis is also associated with limitations, including the sometimes arbitrary selection of useable calls and subjectivity of the observer.

Where threatened species calls overlap with non-threatened species, call analysis has taken a conservative approach in assuming the call could represent the threatened species.

4.3.2 Incidental flora and fauna surveys

The following threatened species were recorded during incidental surveys undertaken as part of the current assessment;

- Grey-crowned Babbler *Pomatostomus temporalis* (Vulnerable, BC Act) – Multiple observations within the Subject Land near Physics Creek.
- Square-tailed Kite *Lophoictinia isura* (Vulnerable, BC Act) – Observed foraging within forested vegetation within the southern portion of the Subject Land.

4.3.3 Local data

No local data was used for threatened species assessment.

4.3.4 Expert reports

Sections 5.2 and 5.3 of the BAM outlines that an expert report may be obtained instead of undertaking a species survey for a Project, where the expert report is prepared by a person who, in the opinion of the Environment Agency Head, possesses specialised knowledge based on training, study or experience to provide an expert opinion in relation to the biodiversity values to which an expert report relates (DPIE 2020a).

No expert reports were utilised for the current assessment. Targeted surveys have been undertaken for the majority of species, with presence assumed for three species (Brush-tailed Phascogale, Common Planigale and Green-thighed Frog) where survey requirements were not able to be met.

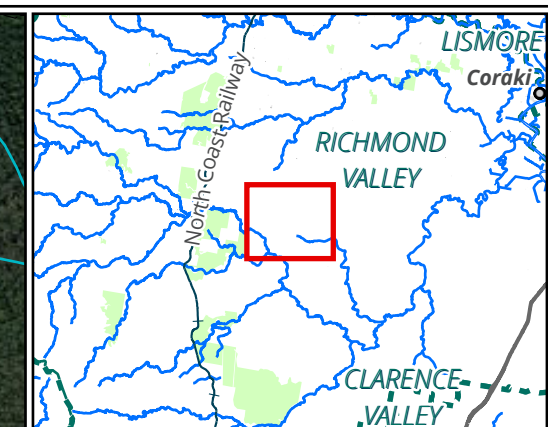
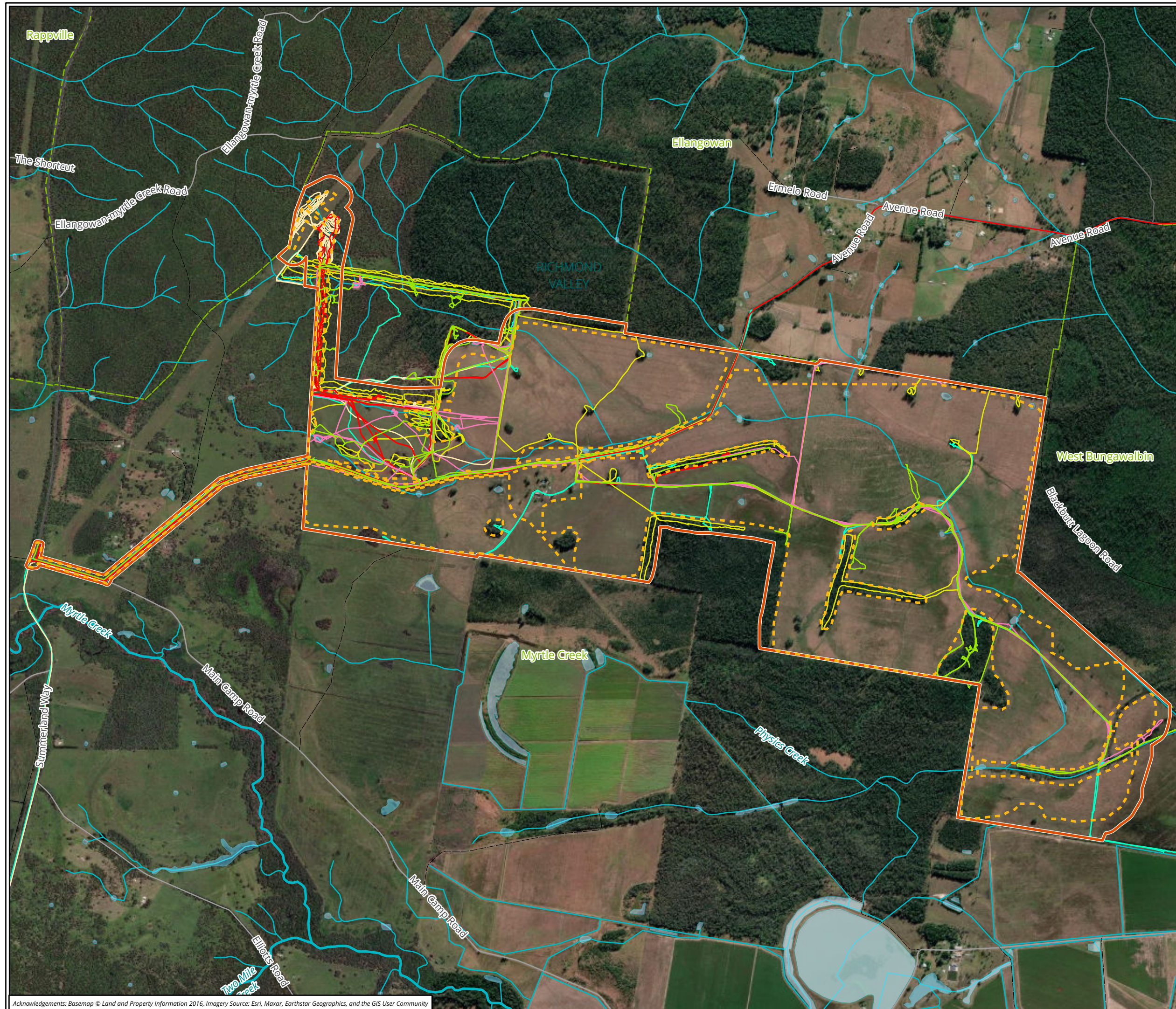
4.3.5 Threatened species summary and polygons

Table 39 provides details of threatened species impacted by the Project and outlines the attributes that comprise the threatened species polygons. The presence of threatened species impacted by the Project is illustrated in Figure 13.

Table 39 Threatened species polygons within the Development Footprint

Threatened species	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes within Development Footprint
Fauna				
Barking Owl	Observed	Area	2	Observed within Project Area, outside the Subject Land. The species polygon aligns with 800 m buffers around potential nest trees containing hollows of at least 20 cm diameter and at least 4 m above ground within associated PCTs (4046, 4001, 3428, 3420) within the Subject Land, clipped within the Development Footprint. Total impacted area within buffers of 7.84 ha
Southern Myotis	Observed	Area	2	Observed within the Project Area. The species polygon aligns with associated PCTs (3420, 3428, 4001 and 4046) within 200 m of waterbodies with 3 m or wider stretches, suitable for species' foraging activities. Including artificial dams that contain suitable habitat for foraging purposes. Total impacted area of 7.44 ha
Squirrel Glider	Observed	Area	2	Observed within Project Area, but outside the Subject Land. The species polygon aligns with associated PCTs (3420, 3428, 4001 and 4046) connected to the patch where the species was observed. Total impacted area of 10.09 ha

Threatened species	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes within Development Footprint
Brush-tailed Phascogale	Assumed Present	Area	2	Assumed present in relevant associated PCTs (3420, 3428, 4001 and 4046) Total assumed species impacts of 21.27 ha
Common Planigale	Assumed Present	Area	2	Assumed present in relevant associated PCTs (3420, 3428, 4001 and 4046) Total assumed species impacts of 21.27 ha
Green-thighed Frog	Assumed Present	Area	1.5	Assumed present in relevant aquatic habitats and a buffer, incorporating the PCTs with which the species is associated (3428, 3420, 4001 and 4046). Total area impacted within PCTs and buffer of 0.64 ha



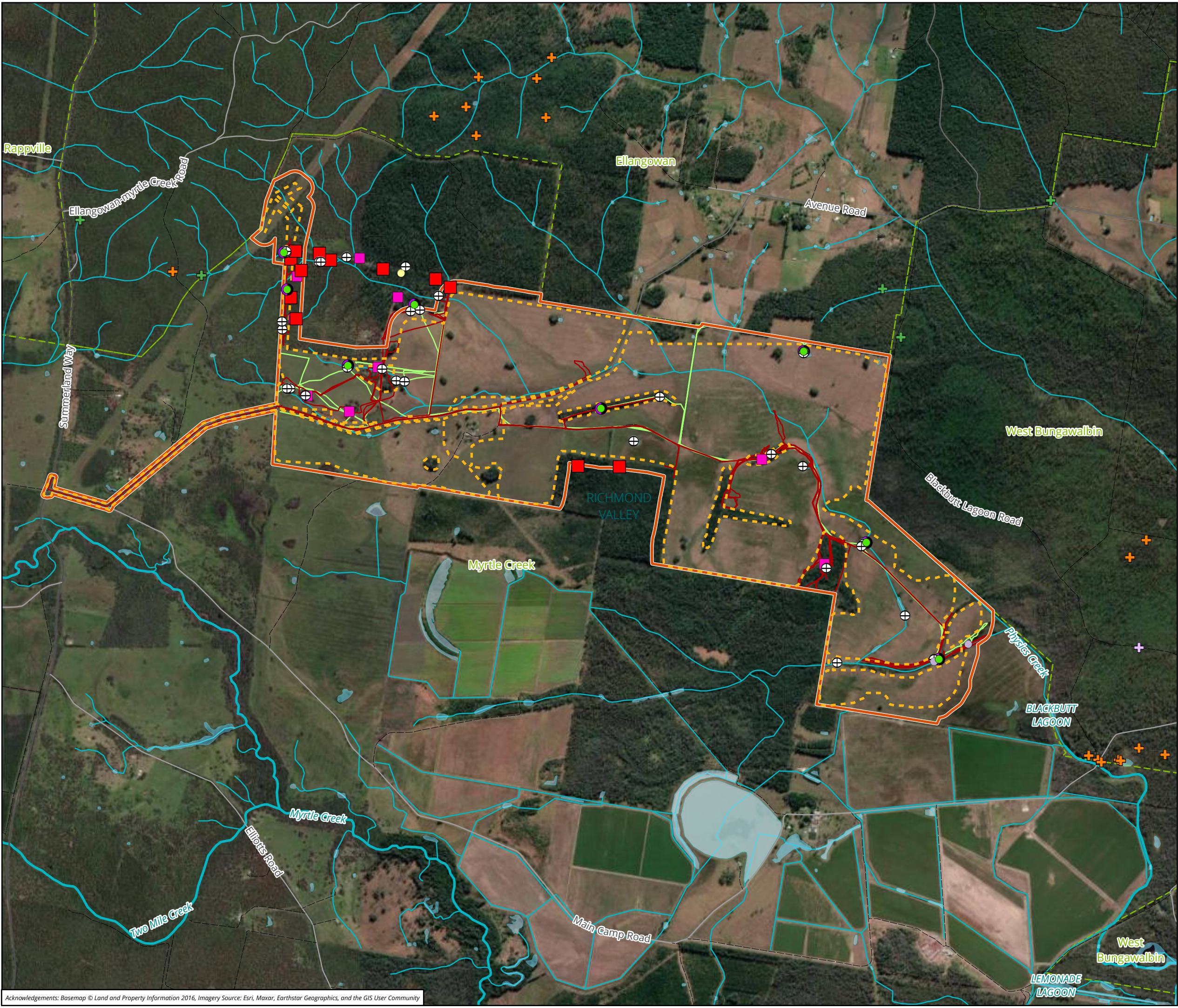
- Legend**
- Subject Land
 - Development Footprint
- Survey tracks**
- January 2024
 - December 2023
 - September 2023
 - Winter 2023
 - April 2023
 - Summer 2023

Figure 12.1 Targeted flora mapping

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Coordinate System:
GDA2020 MGA Zone 56



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Layout: 38804_F12.1_TargetedFlora



Legend

- Subject Land
- Development Footprint
- Call playback
- Bat detector
- Camera trap
- Koala SAT survey

Survey tracks

- August 2023
- November - December 2023

Threatened fauna (BioNet 2024)

- Barking Owl, *Ninox connivens*
- Brush-tailed Phascogale, *Phascogale tapoatafa*
- Grey-crowned Babbler (eastern subspecies), *Pomatostomus temporalis temporalis*
- Square-tailed Kite, *Lophoictinia isura*
- Squirrel Glider, *Petaurus norfolcensis*
- Green-thighed Frog, *Litoria brevipalmata*

Threatened fauna (Biosis 2024)

- Barking Owl, *Ninox connivens*
- Grey-crowned Babbler (eastern subspecies), *Pomatostomus temporalis temporalis*
- Square-tailed Kite, *Lophoictinia isura*
- Squirrel Glider, *Petaurus norfolcensis*
- Large Bent-winged Bat, *Miniopterus orianae oceanensis*
- Southern Myotis, *Myotis macropus*
- Eastern Coastal Free-tailed Bat, *Micronomus norfolkensis*
- Greater Broad-nosed Bat, *Scoteanax rueppellii*
- Hoary Wattled Bat, *Chalinolobus nigrogriseus*
- Little Bent-winged Bat, *Miniopterus australis*

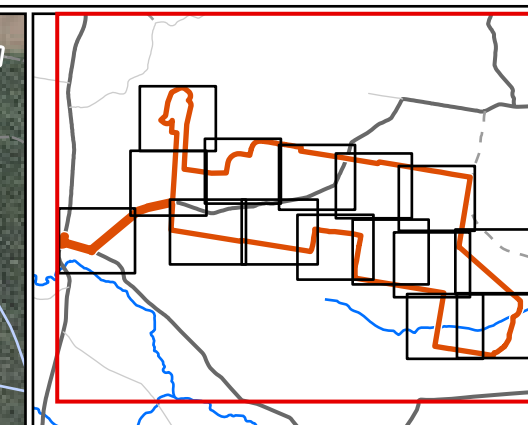
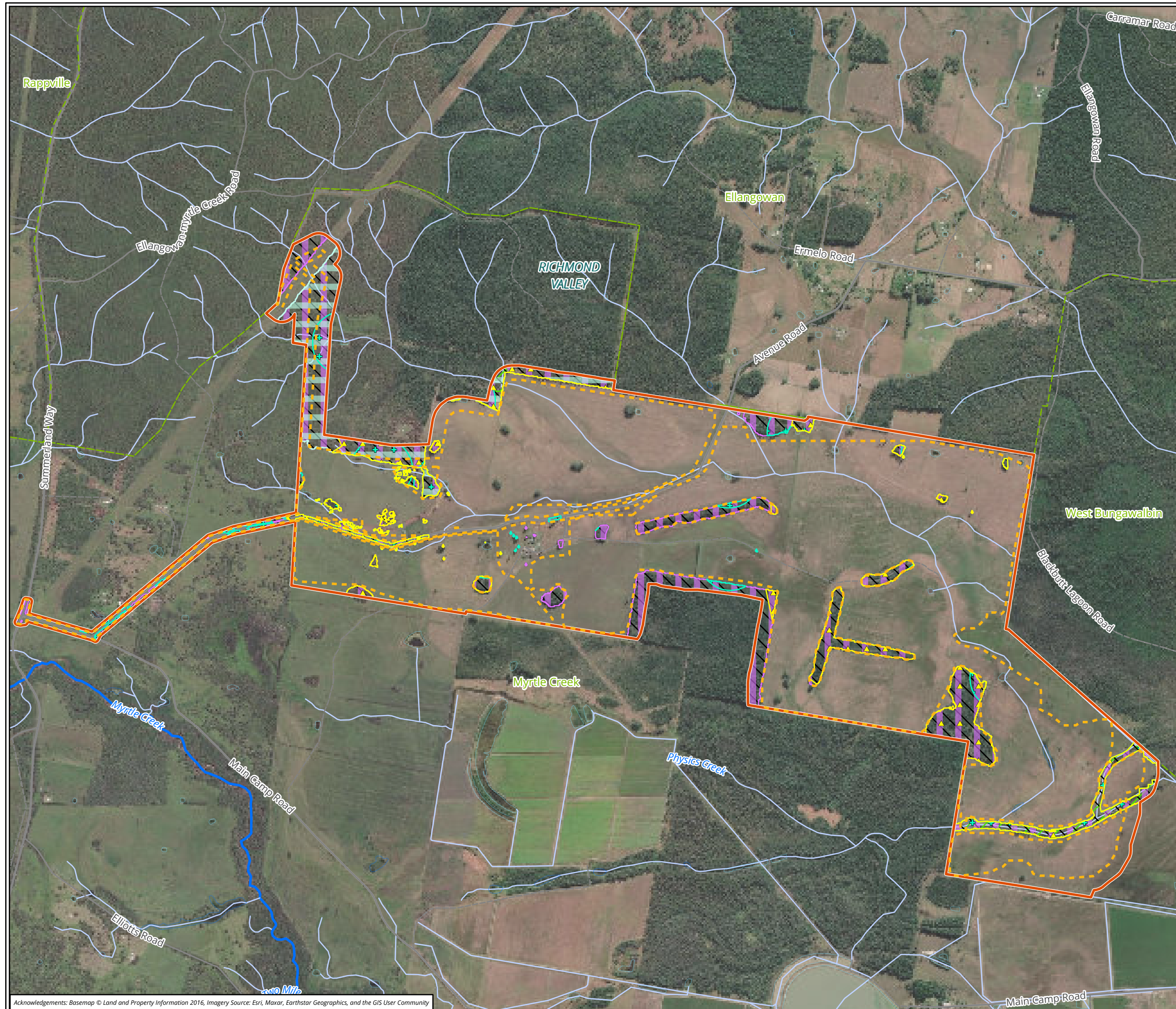
Figure 12.2 Targeted fauna mapping

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GDA2020 MGA Zone 56



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Legend

- Subject Land
- Development Footprint
- Threatened species polygons**
- Barking owl
- Southern myotis
- Brush-tailed phascogale
- Squirrel glider
- Common planigale
- Green-thighed frog

Figure 13 Threatened species polygons

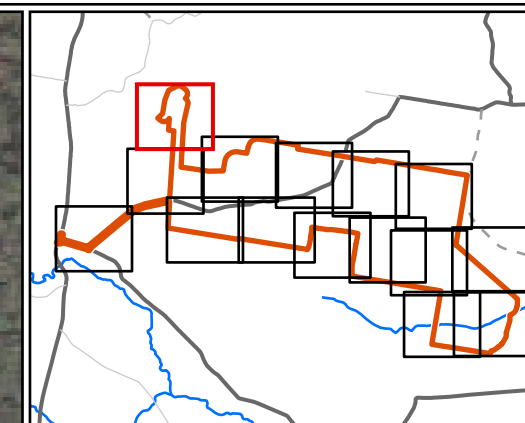
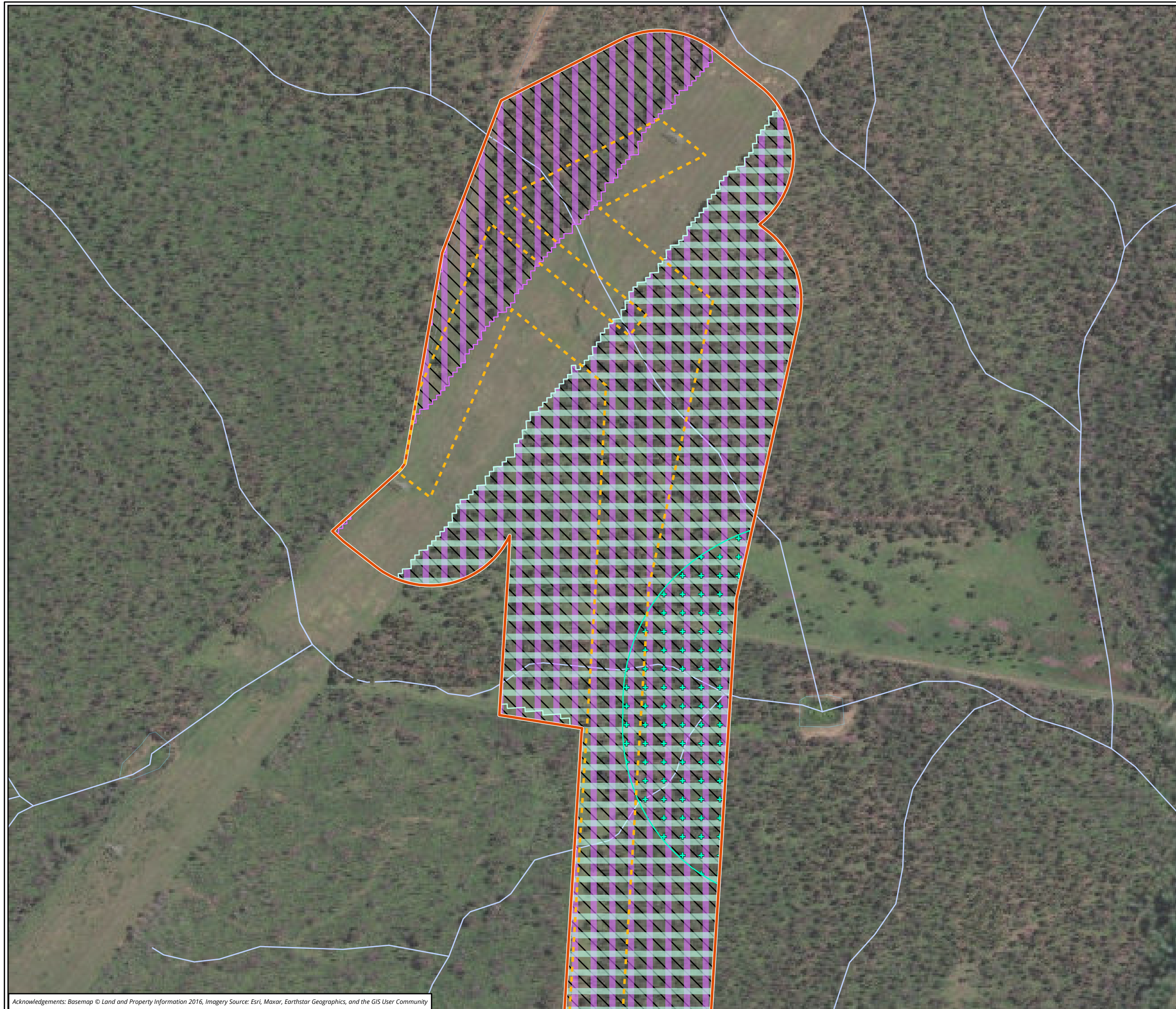
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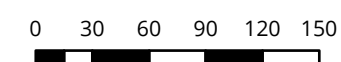


Legend

-  Subject Land
-  Development Footprint
- Threatened species polygons**
-  Southern myotis
-  Brush-tailed phascogale
-  Squirrel glider
-  Common planigale

Figure 13 Threatened species polygons

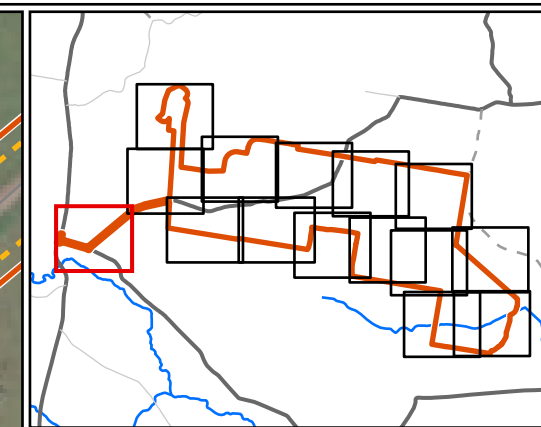
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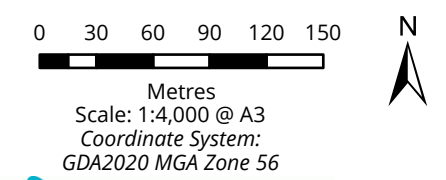


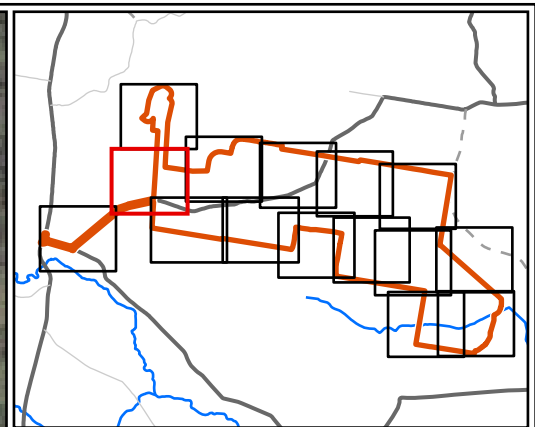
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Layout: 38804_F13_ThrSpp



- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale

Figure 13 Threatened species polygons

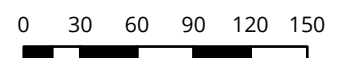




Legend

-  Subject Land
-  Development Footprint
- Threatened species polygons**
-  Barking owl
-  Southern myotis
-  Brush-tailed phascogale
-  Squirrel glider
-  Common planigale

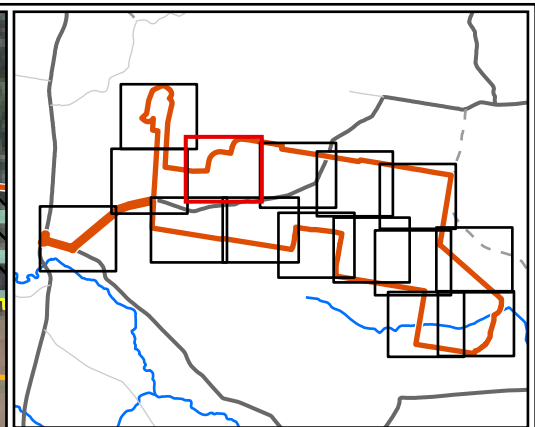
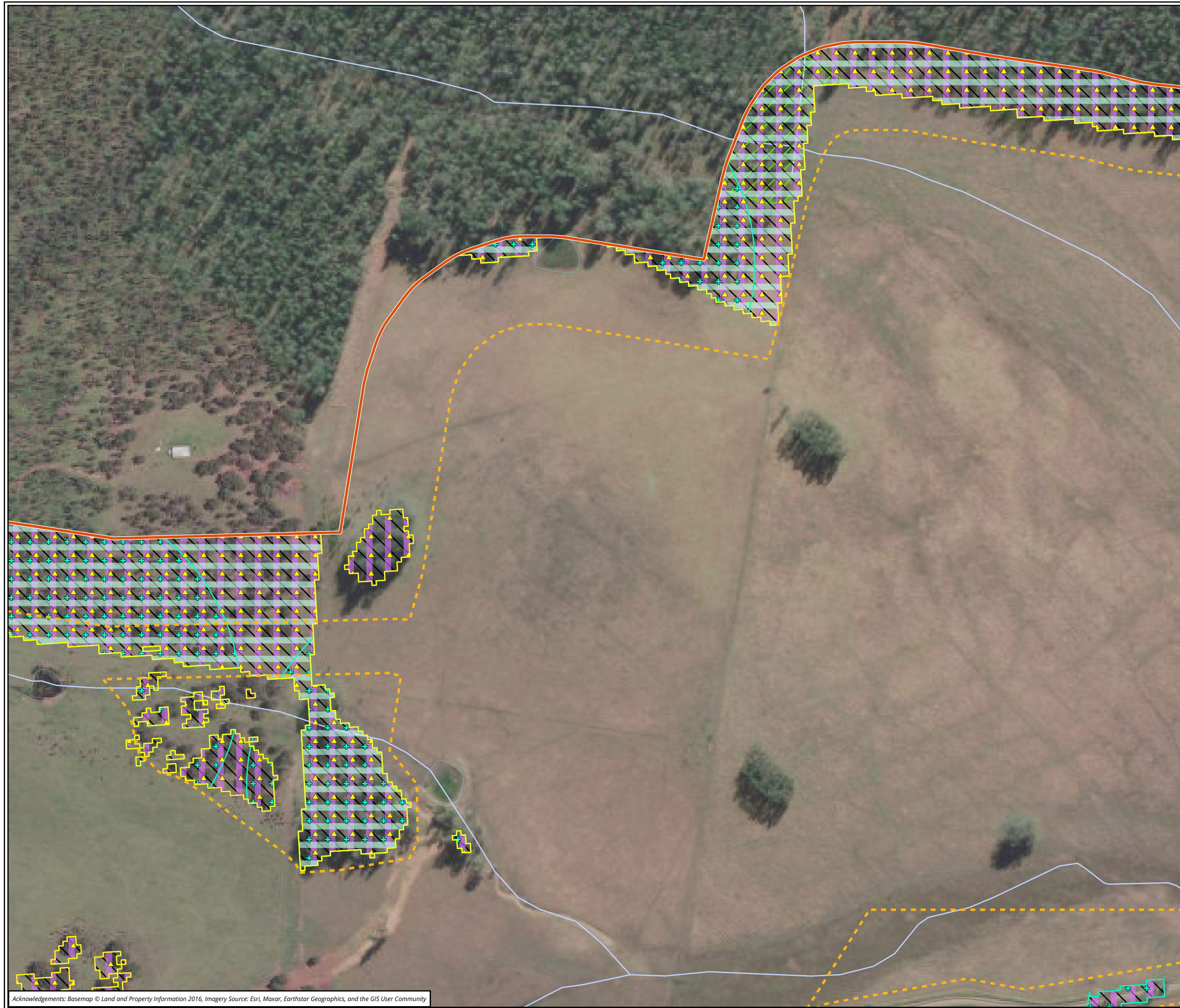
Figure 13 Threatened species polygons



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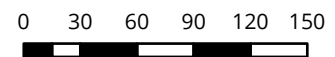
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Legend

- Subject Land
- Development Footprint
- Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Squirrel glider
 - Common planigale
 - Green-thighed frog

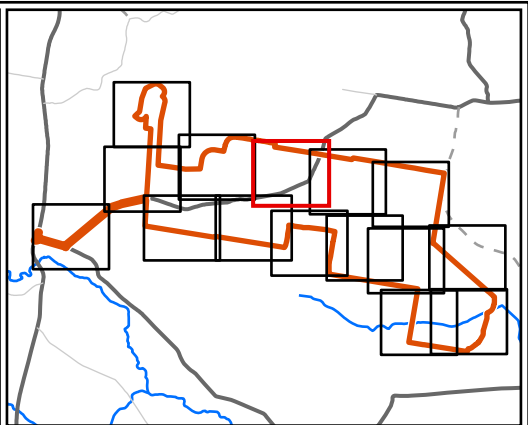
Figure 13 Threatened species polygons



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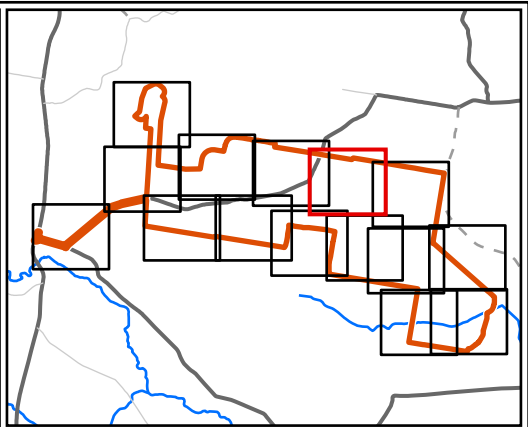
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- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Squirrel glider
 - Common planigale

Figure 13 Threatened species polygons

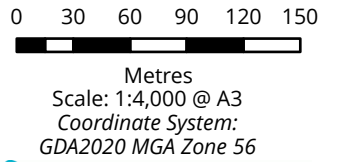
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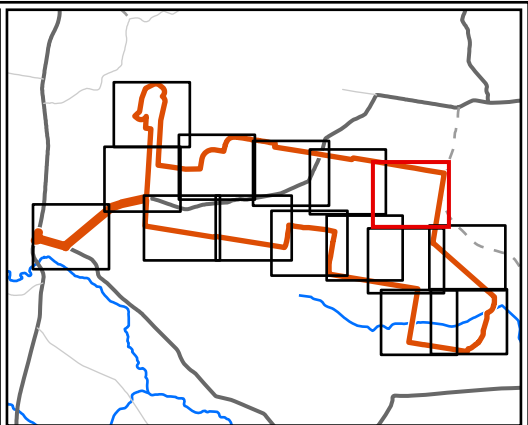


Legend

- Subject Land
- Development Footprint
- Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Squirrel glider
 - Common planigale

Figure 13 Threatened species polygons





Legend

Subject Land

Development Footprint

Threatened species polygons

Barking owl

Southern myotis

Brush-tailed phascogale

Common planigale

Figure 13 Threatened species polygons

0 30 60 90 120 150

Metres

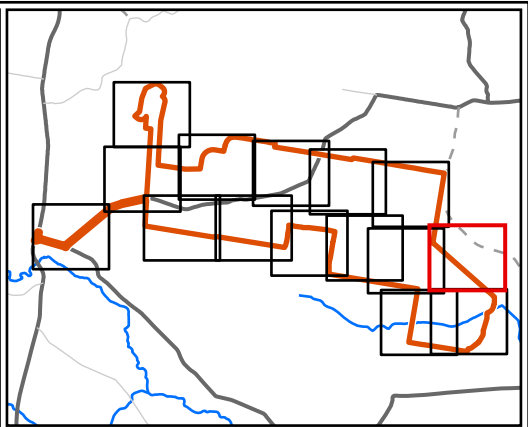
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Legend

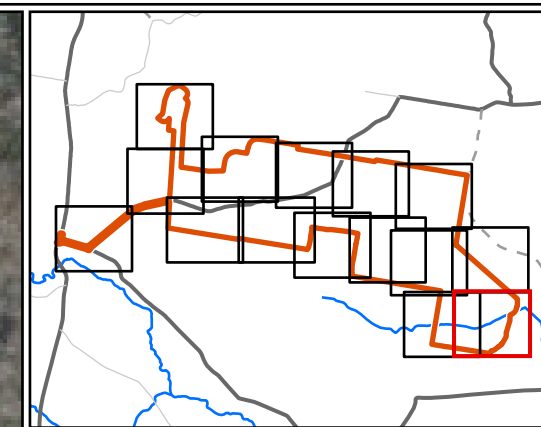
- Subject Land
- Development Footprint
- Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale
 - Green-thighed frog

Figure 13 Threatened species polygons

0 30 60 90 120 150
Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



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Layout: 38804_F13_ThrSpp



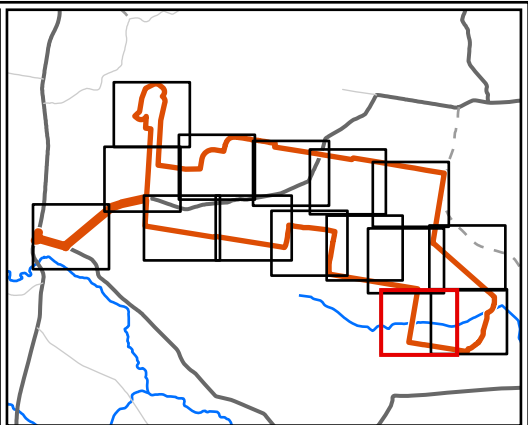
- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale
 - Green-thighed frog

Figure 13 Threatened species polygons

0 30 60 90 120 150
Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

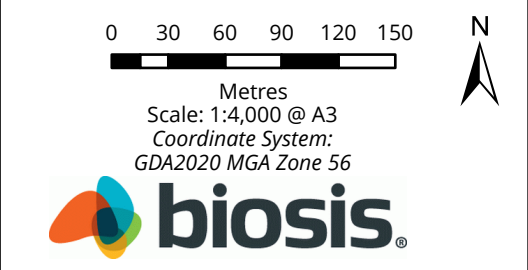
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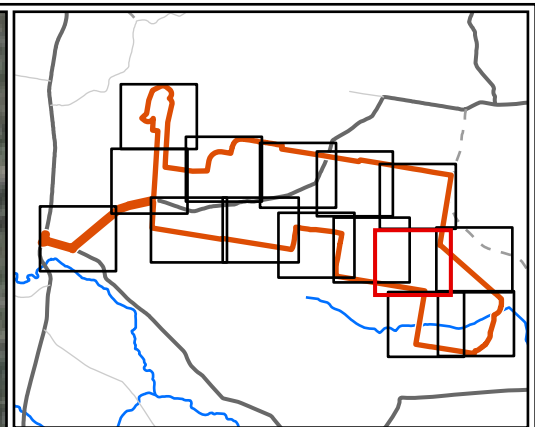
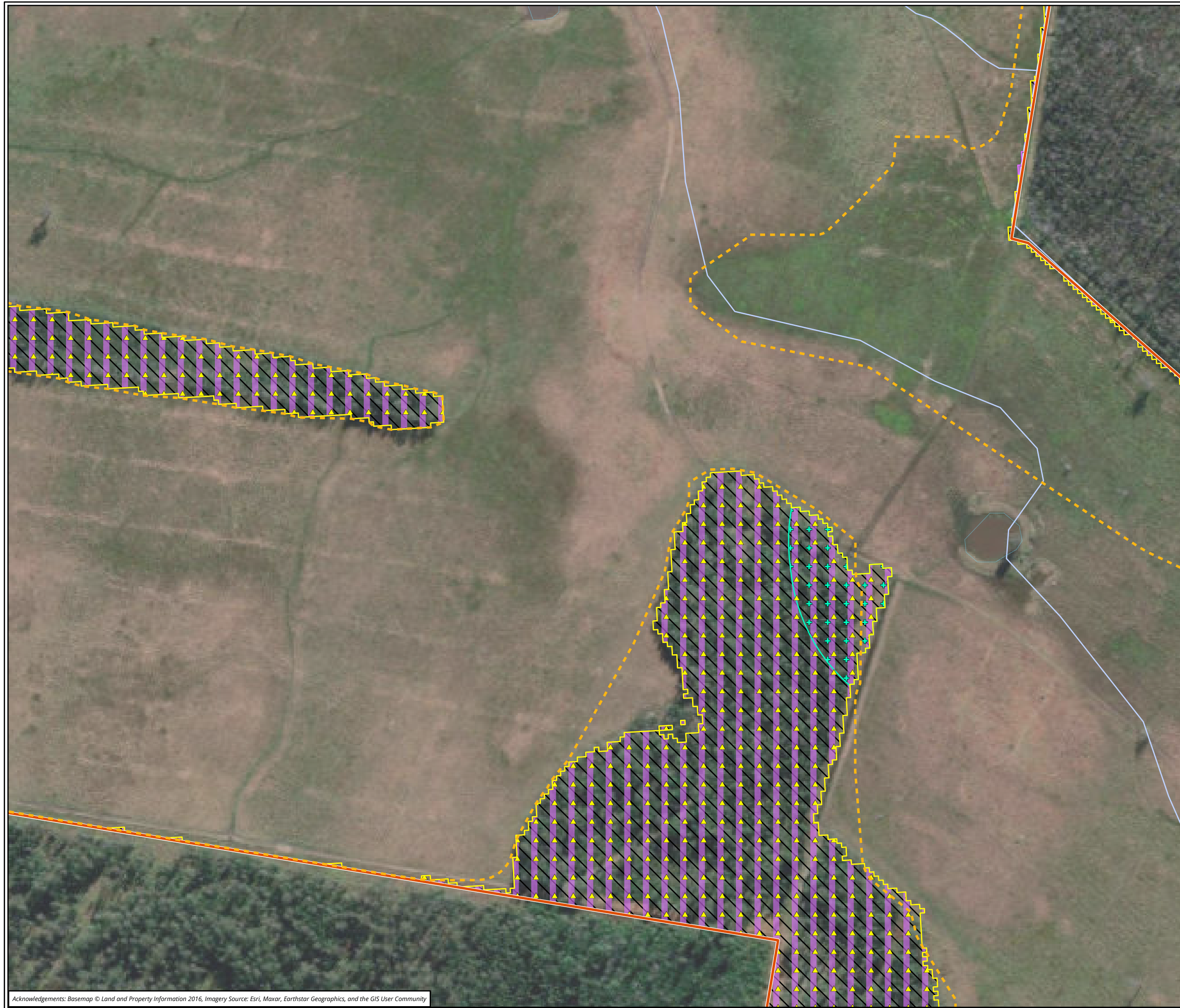
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- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale
 - Green-thighed frog

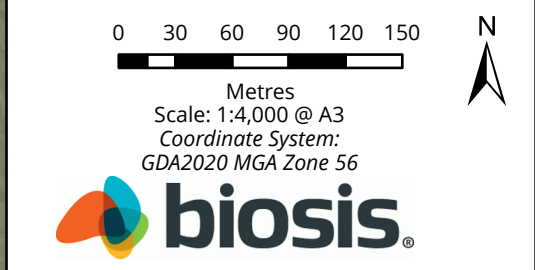
Figure 13 Threatened species polygons

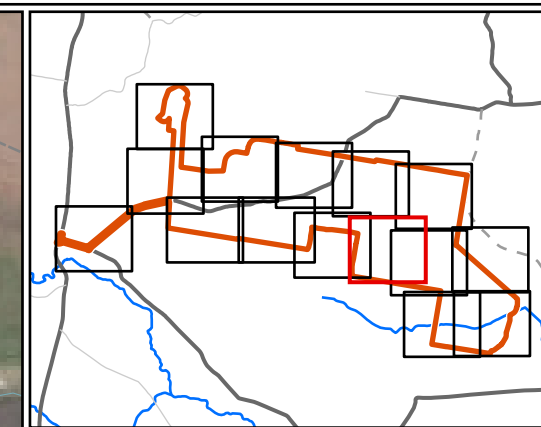
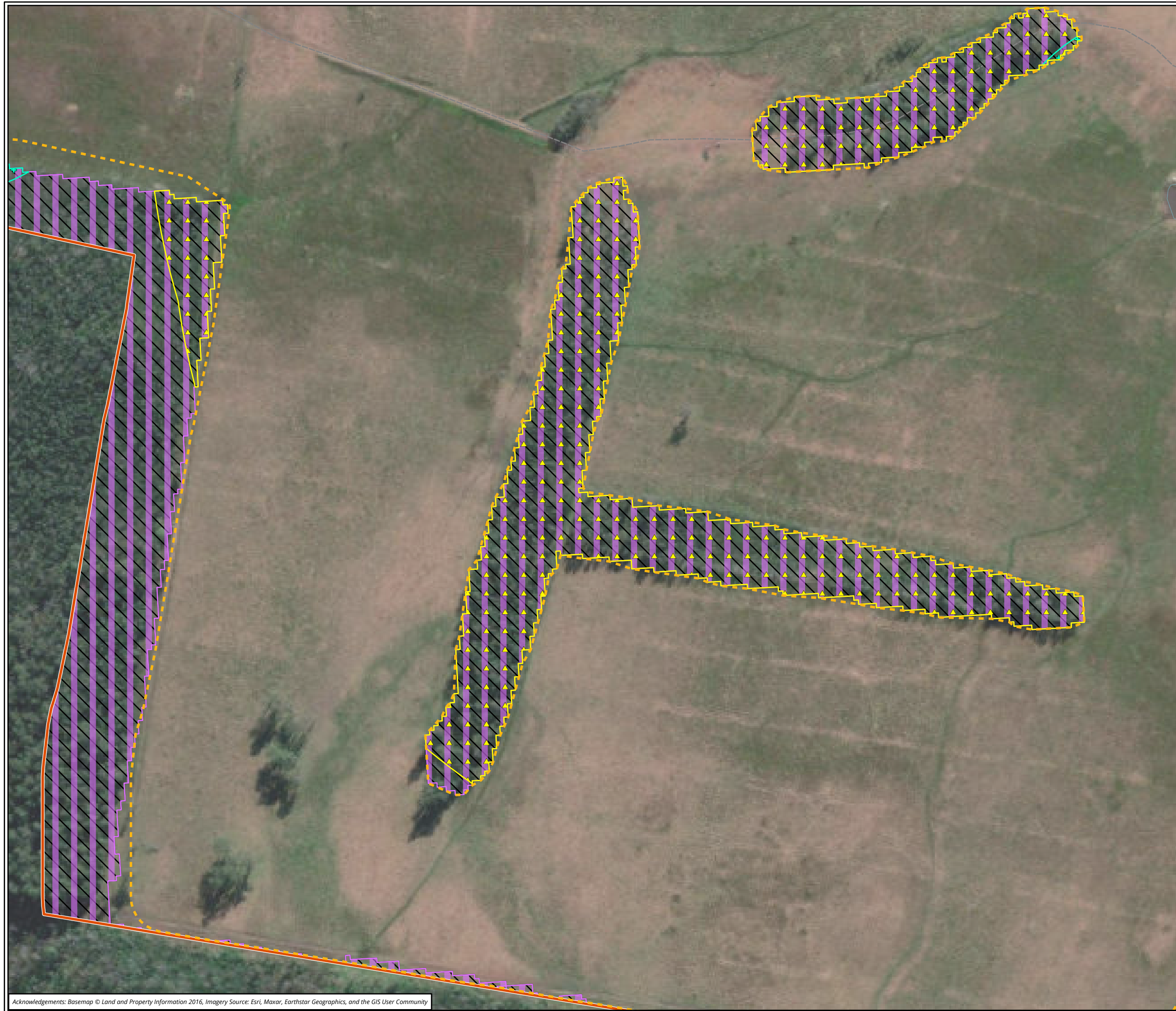




- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale

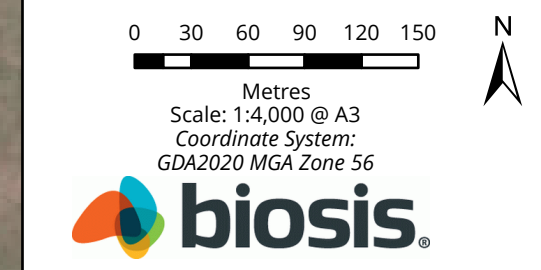
Figure 13 Threatened species polygons

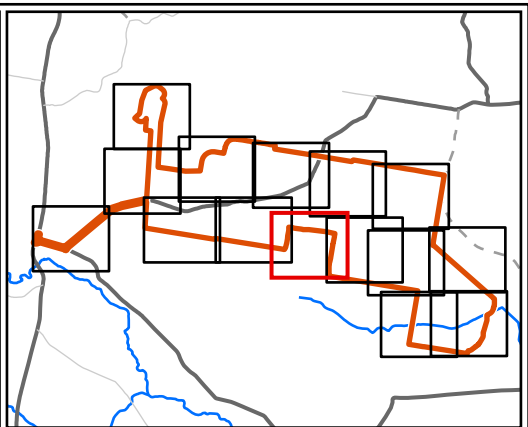
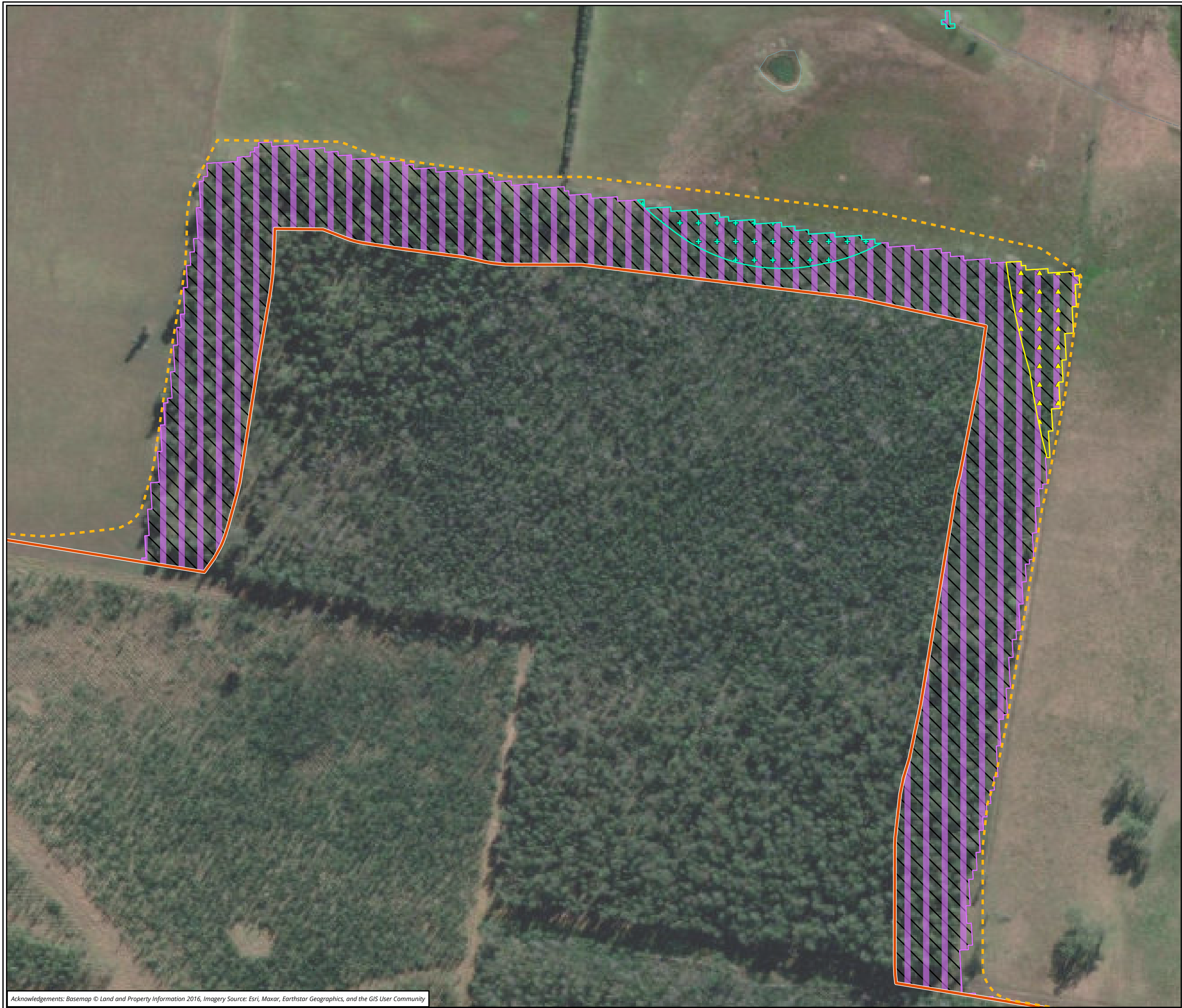




- Legend**
- Subject Land
 - Development Footprint
 - Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale

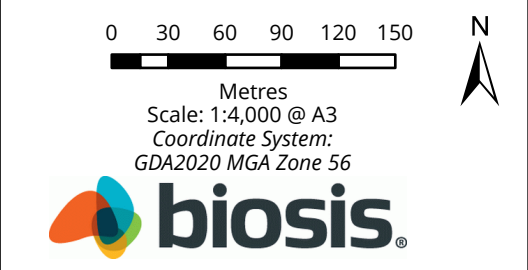
Figure 13 Threatened species polygons

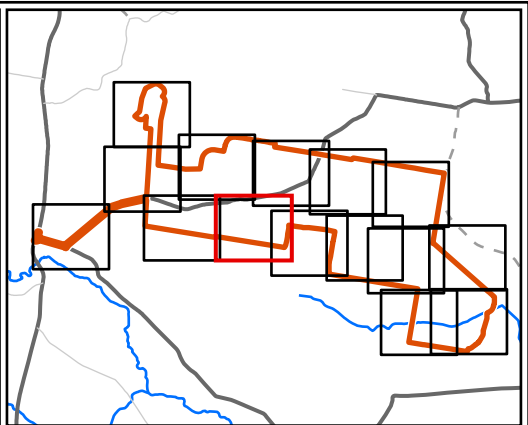




- Legend**
- Subject Land
 - Development Footprint
- Threatened species polygons**
- ▲ Barking owl
 - + Southern myotis
 - Brush-tailed phascogale
 - Common planigale

Figure 13 Threatened species polygons

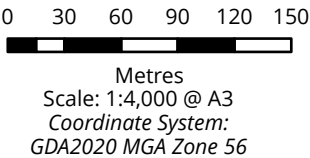




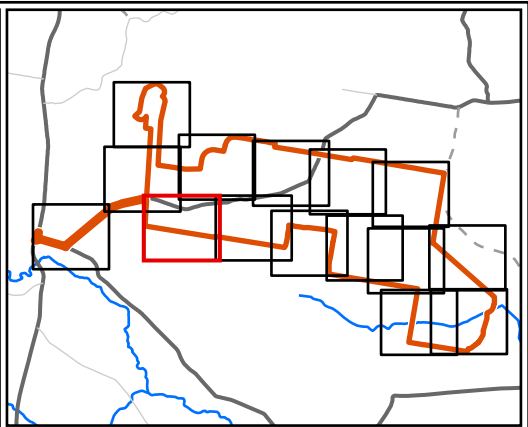
Legend

- Subject Land
- Development Footprint
- Threatened species polygons**
 - Barking owl
 - Southern myotis
 - Brush-tailed phascogale
 - Common planigale

Figure 13 Threatened species polygons



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Legend

Subject Land

Development Footprint

Threatened species polygons

Barking owl

Southern myotis

Brush-tailed phascogale

Common planigale

Figure 13 Threatened species polygons

0 30 60 90 120 150

Metres

Scale: 1:4,000 @ A3

Coordinate System:
GDA2020 MGA Zone 56



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Stage 2 — Impact Assessment (Biodiversity Values)

5 Avoid and minimise impacts

This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the Project location in accordance with BAM, including an analysis of alternatives:

- Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.
- Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.
- Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location.
- Alternative sites within a property on which the Project is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.
- Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through Project design.
- Identification of any other site constraints that the proponent has considered in determining the location and design of the Project.

A description of the efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through design refinements is also provided through other site constraints that the applicant has considered in determining the location and design of the Project are also identified.

5.1 Site Selection

Throughout the site selection and design process, the applicant has considered alternative site locations based on proximity to the NSW electricity grid (existing and proposed) and the solar generation potential of the region, which are discussed further within the EIS. Alternatives were excluded for various reasons including inconsistency with the strategic planning context set by the New South Wales Government's Renewable Energy Zones, costs and potential environmental impacts. The Project Area was shown to be more suitable than alternatives considered as it provides the optimal combination of:

- Availability of land of a suitable scale for a viable commercial-scale solar farm project.
- Distance from existing dwellings.
- Proximity to the 330 kV transmission line located within the Project Area.
- Compatible land use zoning both on the Project Area and adjacent land holdings.
- Reduced environmental constraints with potential environmental impacts that can be managed with appropriate mitigation and management.
- Access to the major transport network namely Summerland Way.
- Agreements with host landholders.
- Low number of landholders and neighbours considering the size of the Project.

The Project Area comprises two freehold properties that span across ten cadastral lots. Host Landholder agreements are in place for long term leases of farmland with the two owners of the ten cadastral lots that make up the Project Area.

The alternative sites are further from a Renewable Energy Zone, closer to existing dwellings and were considered likely to result in fragmentation of existing agricultural operations and greater environmental impacts. From a biodiversity perspective, the current site has been selected based on previous disturbance within the Subject Land and surrounding landscape, which is subject to agricultural processes such as grazing, cropping and native plantations.

5.2 Constraints and opportunities preliminary assessment

Biosis was commissioned by Umwelt on behalf of the applicant in early 2023 to undertake a preliminary biodiversity opportunities and constraints assessment within the Project Area to inform avoidance and minimisation as part of the Project and inform the EPBC referral. The constraints and opportunities assessment was undertaken via desktop assessment, followed by rapid field investigation to verify findings. The scope of this assessment was to identify high level constraints and describe biodiversity values within the Subject Land and neighbouring properties and allowed for recommendations to be provided in terms of avoidance, mitigation and/or further detailed assessment of biodiversity, guiding concept, preliminary and final designs. The constraints identified across the Project Area are shown in Table 40.

Table 40 Framework and hierarchy of constraints applied in Project planning

Constraint category	Definition	Solar, battery, substation and general infrastructure constraint value
No Go areas (Constraint score – 5)	These are areas that should be avoided and if not, may seriously affect regulatory approval of the Project (i.e. regulators may require significant redesign to reduce impacts).	Areas of sensitive regulated land that contain significant biodiversity values and/or are part of set aside areas in relation to existing private native forestry agreement.
High Constraint (Constraint score – 4)	These are areas that should be avoided if possible and will require justification in a Biodiversity Development Assessment Report (BDAR) if they cannot be avoided. Likely to result in areas that may generate high biodiversity credit per hectare requirements that will require offsetting.	50 m buffer of Ellangowan and Bungawalbin State Forests. 25 m buffer of sensitive regulated land. 40 m buffer of and including Physics Creek and areas of Vulnerable regulated land. 40 m buffer of Strahler 3 and 4 waterways. - Native vegetation and threatened species habitat including PCT3420 in moderate and good condition. - All remnant NSW listed and Commonwealth listed Threatened ecological communities (TECs)
Moderate Constraint (Constraint score – 3)	Suitable for development. These areas do not necessarily need to be avoided but will generate a moderate biodiversity credit per hectare that requires offsetting.	20 m buffer of Strahler zero, first and second order waterways. - Regenerating areas of native vegetation that contains moderate habitat for threatened species. 25 m buffer NSW listed and Commonwealth listed TECs.

Constraint category	Definition	Solar, battery, substation and general infrastructure constraint value
Low Constraint (Constraint score – 1)	Best suited for development. These areas will generate low biodiversity credits per hectare that requires offsetting.	- Low condition non-TEC native vegetation that contains sub-optimal threatened species habitat. - Scattered trees potentially containing hollows and nests comprising from all known PCTs observed, wholly surrounded by Category 1 land. - Areas of planted vegetation wholly surrounded by Category 1 land.
Negligible Constraint (Constraint score – 1)	Best suited for development. These areas are unlikely to generate biodiversity credits (i.e. exotic/cultivated/irrigated areas) and outside of prescribed impacts, do not require assessment under the BAM.	Non-native vegetation or areas likely to meet the definition of Category 1 land and where prescribed impacts are considered negligible.

5.3 Alternative footprints

The Development Footprint has been refined through consideration of the findings of a preliminary ecological study and identification of constraints and opportunities mapped through the environmental impact assessment process (including this BDAR). This has resulted in the selection of a footprint that is predominantly comprised (97.26 %) of Category 1 Land. The intent of this process was to avoid impacts to the highest ecological values identified as much as possible, whilst taking into account the proportion of native vegetation within the Subject Land. Although impacts to native vegetation, habitat and TECs will occur, complete avoidance of impacts was not possible due to the extent of native vegetation within the Subject Land and broader investigation area, with instead a focus on avoidance of the highest value areas (Figure 14, Figure 15, and Figure 16).

Measures to avoid and minimise impacts on highest value areas of native vegetation were considered during the planning stage of the Project and designs were 'workshopped' through an iterative mapping process between the applicant, Umwelt and the Biosis BAM Assessors and Project ecologists. Other disciplines such as flooding and archaeology were also considered during multiple revisions of the Development Footprint to ensure highest biodiversity values, as well archaeological values and areas likely to be inundated during significant flood events were accounted for.

Overall, this process of refinement has resulted in impacts to areas of highest biodiversity value being avoided and/or minimised, including;

- Avoidance of impacts throughout the broader Project Area, and an overall reduction in loss of higher quality habitats from multiple design revisions.
- Avoidance and minimisation of impacts to the EPBC listed Subtropical Coastal Floodplain Forest EEC by relocating transmission line infrastructure along the north-western boundary of the Subject Land, reducing impacts to the higher quality PCT 3428 and PCT 4046 from 17.51 hectares to 4.57 hectares.
- Avoidance of impacts to the vast majority of forested areas of PCT 3420, 3428 and 4046 within the northern section of the Subject Land where higher fauna activity was observed (such as Barking Owl

and Squirrel Glider), with impacts only to smaller isolated patches of planted, paddock trees and regenerating woody vegetation from 63.17 hectares to 21.27 hectares.

- Avoidance of approximately 50 % of hollow bearing trees recorded, including those with active hollows flagged during design iterations.
- Avoidance of medium-sized patches of intact vegetation within the Subject Land of PCT 3420, 3428 and 4046 comprising connectivity to larger patches.
- Total avoidance of impacts to wetland vegetation communities and drainage lines comprising the BC and EPBC listed EEC Swamp Sclerophyll Forest within the south-east corner of the Subject Land.

Two transmission corridors were initially proposed to connect the switching substation to the 330 kV transmission line in the north-western portion of the Subject Land. The two options included a new transmission line from the switching substation, following the southern and western boundary or a transmission line along the eastern and northern boundary of Lot 32 DP 775607. The connection along the southern and western boundary of this lot was decided on for the final Project design largely based on minimising biodiversity impacts.

5.3.1 Retention of hollow-bearing trees

Many patches of forested vegetation within the Subject Land contain a number of hollow bearing trees. Recording of hollow bearing tree data was focused on the medium or greater size classes that many of the threatened fauna in the region would occupy. The Project would result in the loss of 10 hollow-bearing trees and 11 scattered paddock trees that contain hollows, a total of 21 out of the 42 recorded within the Subject Land and Project Area that contain small, medium and large, or a combination of all three. This represents approximately 50 % retention of woody vegetation containing hollows. These hollows provide denning, sheltering and breeding for a raft of hollow dependent native fauna, however observations during multiple seasonal surveys noted use of the hollows by more common fauna such as Barn Owl. A summary of the hollow bearing trees is found in Table 41.

Table 41 Summary of hollow bearing trees including scattered trees

Species	Diameter at breast height (dbh) class	Small	Medium	Large	Extra Large	Proposed impact
<i>Angophora subvelutina</i>	Very Large Tree > 100cm	Yes			Yes	Retained
<i>Angophora subvelutina</i>	Large Tree 50-100cm				Yes	Retained
<i>Angophora subvelutina</i>	Large Tree 50-100cm		Yes	Yes	Yes	Retained
<i>Corymbia henryi</i>	Large Tree 50-100cm		Yes			Retained
<i>Corymbia henryi</i>	Very Large Tree > 100cm	Yes	Yes			Removed
<i>Corymbia henryi</i>	Very Large Tree > 100cm	Yes				Removed
<i>Corymbia henryi</i>	Large Tree 50-100cm	Yes				Removed
<i>Corymbia henryi</i>	Large Tree 50-100cm		Yes		Yes	Removed
<i>Corymbia henryi</i>	Large Tree 50-100cm					Removed
<i>Corymbia henryi</i>	Large Tree 50-100cm			Yes		Removed
<i>Corymbia henryi</i>	Large Tree 50-100cm		Yes			Removed
<i>Corymbia intermedia</i>	Large Tree 50-100cm			Yes		Retained

Species	Diameter at breast height (dbh) class	Small	Medium	Large	Extra Large	Proposed impact
<i>Corymbia intermedia</i>	Large Tree 50-100cm			Yes		Retained
<i>Corymbia intermedia</i>	Very Large Tree > 100cm			Yes		Retained
<i>Corymbia intermedia</i>	Very Large Tree > 100cm		Yes			Retained
<i>Corymbia intermedia</i>	Very Large Tree > 100cm		Yes			Retained
<i>Corymbia intermedia</i>	Large Tree 50-100cm			Yes	Yes	Retained
<i>Eucalyptus moluccana</i>	Very Large Tree > 100cm		Yes		Yes	Retained
<i>Eucalyptus propinqua</i>	Large Tree 50-100cm			Yes		Removed
<i>Eucalyptus siderophloia</i>	Medium Tree 20-50cm	Yes				Removed
<i>Eucalyptus siderophloia</i>	Large Tree 50-100cm	Yes				Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm			Yes		Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm		Yes		Yes	Retained
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm		Yes			Removed
<i>Eucalyptus tereticornis</i>	Very Large Tree > 100cm	Yes	Yes			Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm		Yes			Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm			Yes		Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm			Yes		Removed
<i>Eucalyptus tereticornis</i>	Large Tree 50-100cm		Yes			Removed
<i>Melaleuca alternifolia</i>	Medium Tree 20-50cm	Yes				Removed
Stag	Very Large Tree > 100cm		Yes		Yes	Retained
Stag	Large Tree 50-100cm			Yes	Yes	Removed
Stag	Large Tree 50-100cm			Yes		Removed
Stag	Very Large Tree > 100cm				Yes	Removed

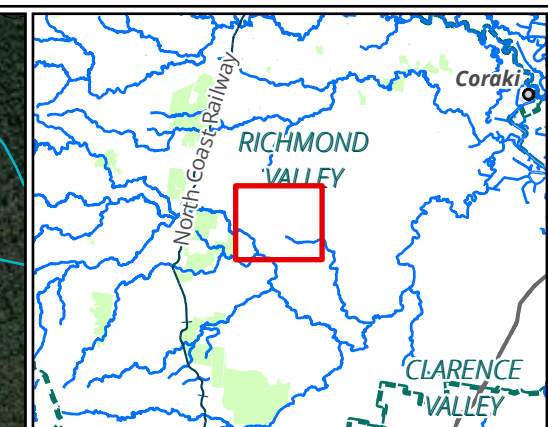
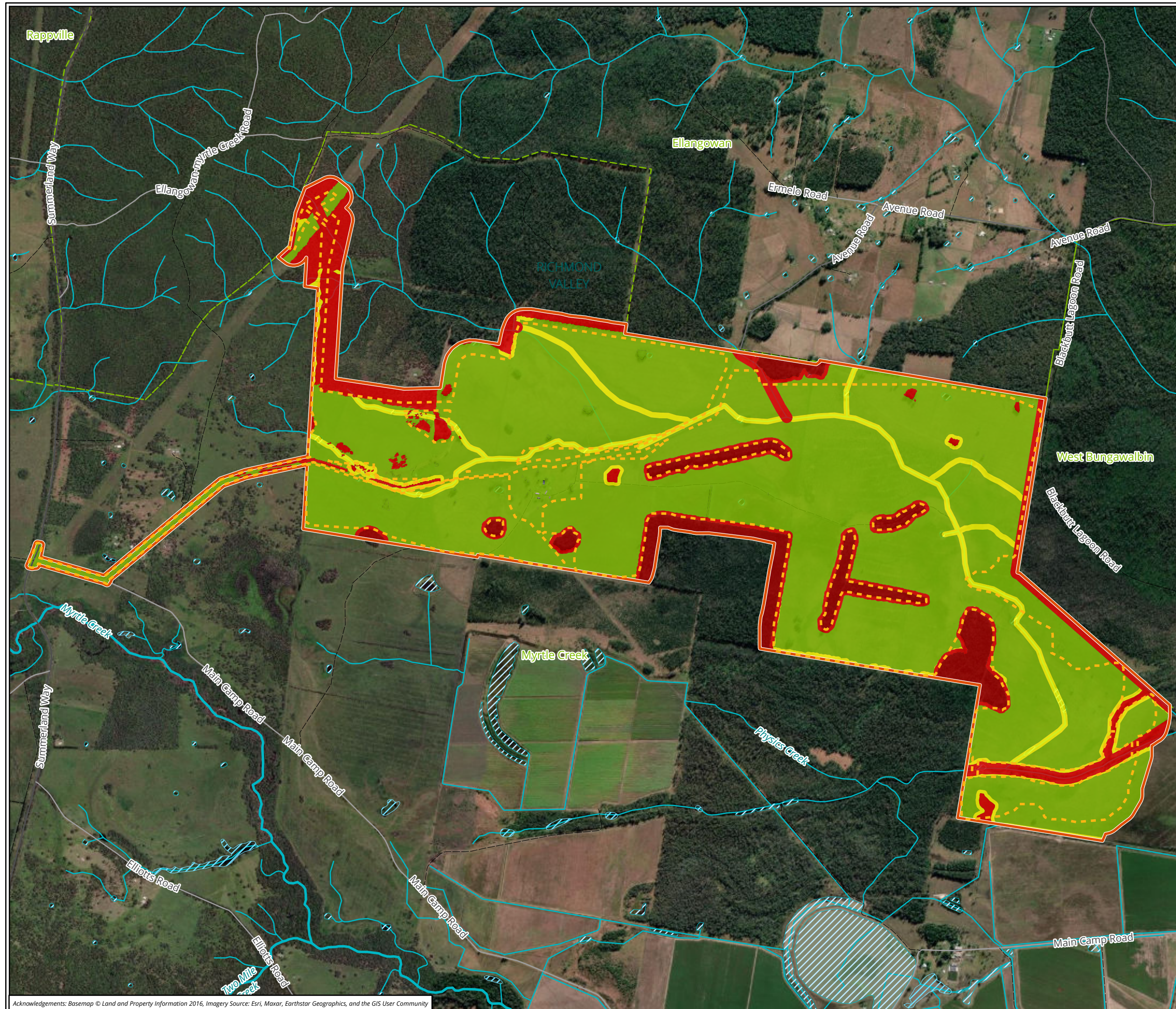
5.4 Summary

As previously mentioned, the principal means to reduce impacts on biodiversity values within the Subject Land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered in Table 42.

Figure 14 shows the constraints and opportunities mapping, Figure 15 demonstrates the final Development Footprint, while Figure 16 shows an alternative footprint considered to avoid or minimise impacts on biodiversity values. The final Development Footprint and biodiversity corridor, as well as demonstrated prescribed impacts and indirect impact zones where applicable is shown in Figure 17 and Figure 18.

Table 42 Avoidance and minimisation of impact

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
<i>Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.</i>	Investigate modes or technologies that would avoid or minimise impacts on biodiversity values. Solar tracking systems. Not require site leveling or heavy disturbance to groundcover.	Reduction in impacts beneath, but more so between, solar arrays to incentivise and to retain a level of biodiversity value. Avoidance of site leveling. Temporary impacts of compaction as opposed to full clearing and levelling of groundcover that will regenerate.	Project design Construction	The applicant Contractors
<i>Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.</i>	Utilisation existing access as far as possible. Good access to existing local and regional roads.	Minimise clearing impacts Avoidance of higher biodiversity values.	Project design	The applicant
<i>Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location</i>	Site selection Location next to existing transmission lines in areas of farmland that area predominantly cleared of native vegetation.	Minimise clearing impacts Avoidance of higher biodiversity values.	Project design	The applicant
<i>Alternative sites within a property on which the Project is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.</i>	Constraints and opportunities assessment Utilising Project design to avoid areas of highest biodiversity value.	Avoidance of higher biodiversity values. Avoidance of Swamp Sclerophyll Forest and habitat for Barking Owl Minimising impacts to hollow bearing trees.	Project design	The applicant Contractors
<i>Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through Project design.</i>	Constraints and opportunities assessment Utilising Project design to avoid areas of highest biodiversity value.	Avoidance of higher biodiversity values. Avoidance of Swamp Sclerophyll Forest and habitat for Barking Owl Minimising impacts to hollow bearing trees.	Project design	The applicant Contractors
<i>Identification of any other site constraints that the proponent has considered in determining the location and design of the Project.</i>	Conduct surveys to identify site constraints and opportunities to avoid and minimise.	Avoidance and minimising impacts to large tracts of intact native vegetation to the north of the Subject Land, and wetland habitats to the south-east.	Project design Construction	The applicant Contractors



Legend

- Subject Land
- Development Footprint

Constraints

- Negligible
- Moderate
- High
- No Go

Figure 14 Constraints and opportunities

0 200 400 600 800 1,000

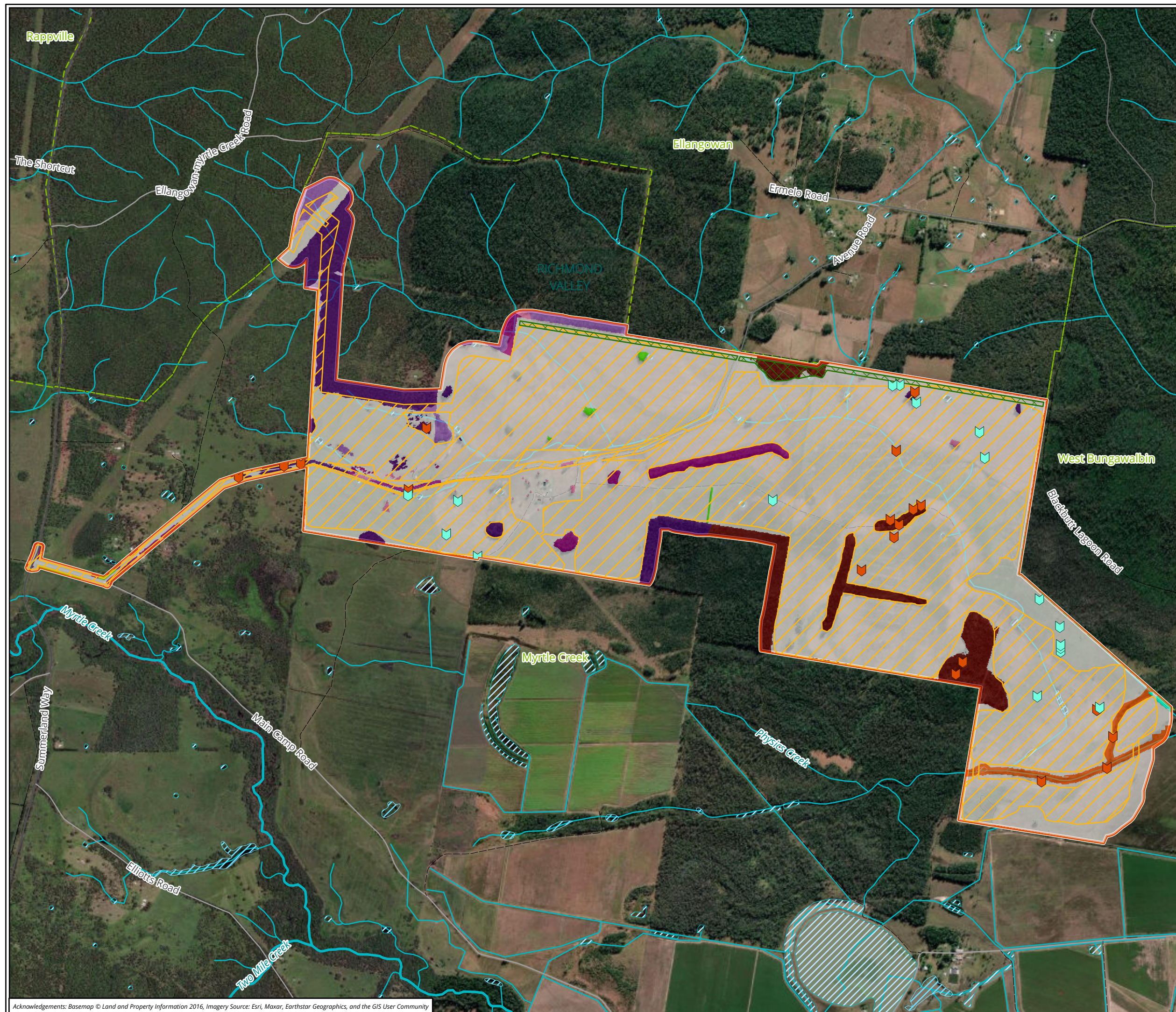
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Layout: 38804_F14_Constraints
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Legend

- Subject Land
- Development Footprint
- Hollow-bearing tree
- Paddock tree - Hollow present
- Biodiversity corridor
- Category 1 Land

Vegetation zones

- 3420, Moderate
- 3420, Good
- 3420, Regen
- 3428, Moderate
- 3428, Low
- 4001, Low
- 4046, Moderate
- 4046, Riparian
- Planted

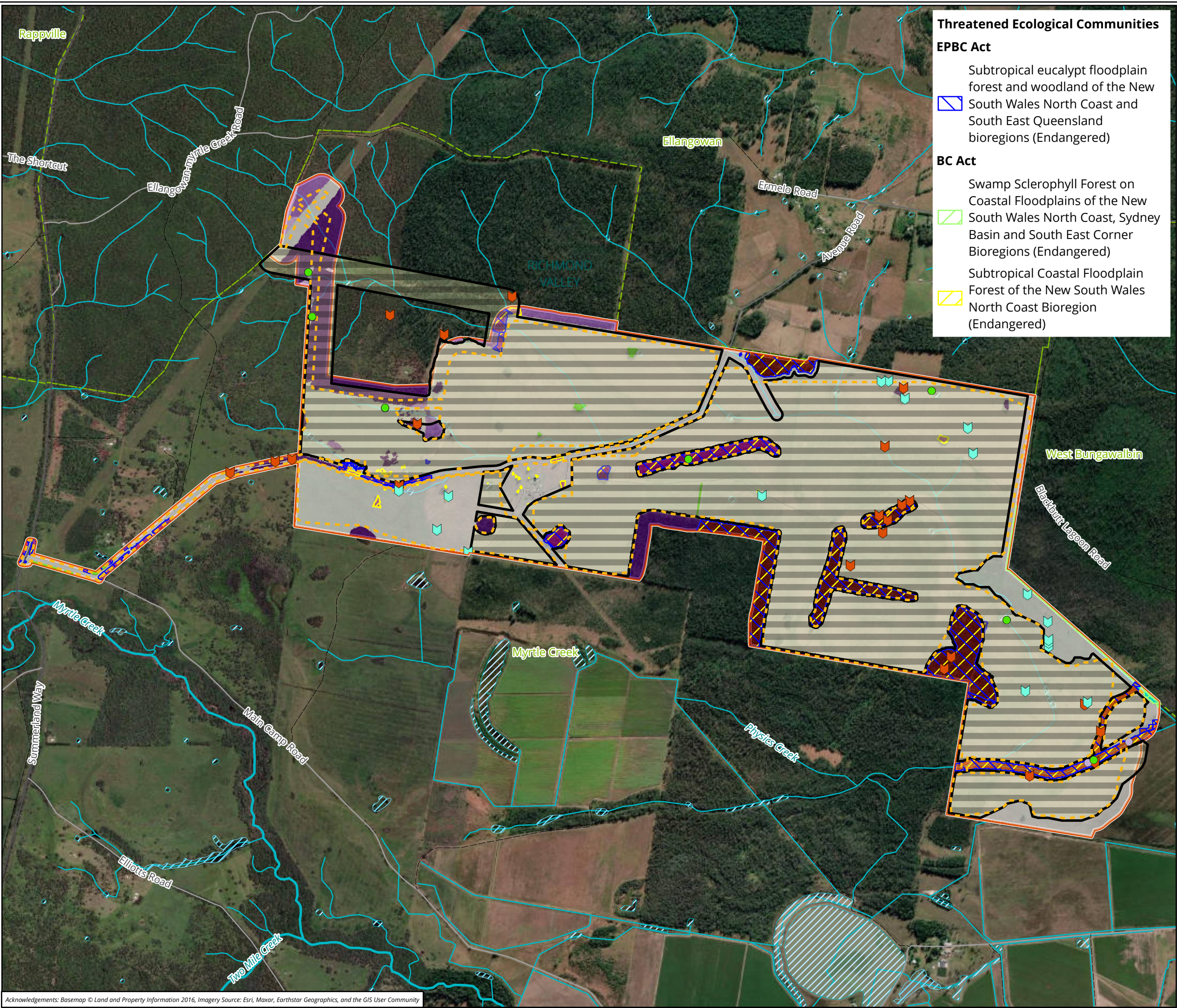
Figure 15 Final Development Footprint

0 200 400 600 800 1,000
Metres

Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

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Threatened Ecological Communities

EPBC Act

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Endangered)

BC Act

- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
- Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Endangered)

Legend

- Subject Land
- Development Footprint
- Alternative Development Footprint
- Hollow-bearing tree
- Paddock tree - Hollow present
- Category 1 Land

Threatened fauna (Biosis 2024)

- Barking Owl, *Ninox connivens*
- Grey-crowned Babbler (eastern subspecies), *Pomatostomus temporalis temporalis*
- Square-tailed Kite, *Lophoictinia isura*
- Squirrel Glider, *Petaurus norfolcensis*
- Large Bent-winged Bat, *Miniopterus orianae oceanensis*
- Southern Myotis, *Myotis macropus*
- Eastern Coastal Free-tailed Bat, *Micronomus norfolkensis*
- Greater Broad-nosed Bat, *Scoteanax rueppellii*
- Hoary Wattled Bat, *Chalinolobus nigrogriseus*
- Little Bent-winged Bat, *Miniopterus australis*

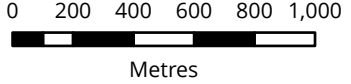
Threatened fauna (BioNet 2024)

- Barking Owl, *Ninox connivens*
- Brush-tailed Phascogale, *Phascogale tapoatafa*
- Grey-crowned Babbler (eastern subspecies), *Pomatostomus temporalis temporalis*
- Square-tailed Kite, *Lophoictinia isura*
- Squirrel Glider, *Petaurus norfolcensis*
- Green-thighed Frog, *Litoria brevipalmata*

Plant Community Types, Condition

- 3420, Moderate
- 3420, Good
- 3420, Regen
- 3428, Moderate
- 3428, Low
- 4001, Low
- 4046, Moderate
- 4046, Riparian
- Planted

Figure 16 Alternate options and avoidance



Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



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6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a). The following direct and indirect impacts are unable to be avoided in progressing the proposed development.

6.1 Direct impacts

Direct impacts include vegetation clearing calculated from the area of proposed lot boundaries, roads and easements for service infrastructure.

Direct impacts arising from the Project include:

- Removal of 21.27 hectares of remnant native vegetation including:
 - 1.12 hectares of PCT 4046.
 - 4.48 hectares of PCT 3428, 4.33 hectares of which represents Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Endangered, EPBC Act).
 - 15.67 hectares of PCT 3420, 5.6 hectares of which represents Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Endangered, BC Act).
- Removal of up to 21.27 hectares of individual threatened species habitat including:
 - 21.27 hectares of Brush-tailed Phascogale assumed habitat.
 - 7.84 hectares of Barking Owl habitat buffer.
 - 10.09 hectares of Squirrel Glider habitat.
 - 7.44 hectares of Southern Myotis habitat buffer.
 - 21.27 hectares of Common Planigale assumed habitat.
 - 0.64 hectares of Green-thighed Frog assumed habitat.
- Removal of 1.32 hectares of planted native vegetation in addition to the 21.27 hectares noted above.
- Removal of 28 scattered paddock trees.
- Removal of 21 hollow-bearing trees in total, out of the 42 recorded.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 5.1 above will help to minimise the potential impacts to biodiversity values that remain present within the Subject Land.

A summary of PCTs/zones directly impacted is demonstrated in Table 43.

Table 43 Summary of direct impacts to vegetation

Zone	PCT	TEC	Area within Subject Land (ha)	Area impacted (ha)	VI Score
4046_Moderate	PCT 4046 – <i>Northern Lowland Swamp Turpentine-Red Gum Forest</i>	Subtropical Coastal Floodplain Forest	44.42	0.48	66
4046_Riparian			11.09	0.64	37.5
4001_Low	PCT 4001 – <i>Northern Floodplain Paperbark Fern Swamp Forest.</i>	Swamp Sclerophyll Forest	1.1	0.00	10.9
3428_Moderate	PCT 3428 – <i>Northern Lowland Red Gum-Swamp Turpentine Grassy Forest.</i>	Subtropical Coastal Floodplain Forest	14.76	3.21	39.4
3428_Low			1.94	1.27	24.2
3420_Good	PCT 3420 – <i>Clarence Lowland Ironbark-Spotted Gum Grassy Forest.</i>	N/A	12.16	2.08	61.5
3420_Moderate			48.57	11.81	51.6
3420_Regen			3.52	1.78	28.8
Planted	N/A	N/A	1.74	1.32	N/A
Scattered	N/A	N/A	40 trees	26 trees	N/A
Category 1	N/A	N/A	937.60	800.90	0.4

Table 44 Summary of direct impacts species credit habitat or individuals

Species	Sensitivity	Area (ha)
Barking Owl	2	7.84
Squirrel Glider	2	10.09
Southern Myotis	2	7.44
Brush-tailed Phascogale	2	21.27
Common Planigale	2	21.27
Green-thighed Frog	1.5	0.64

6.1.1 Loss of hollow bearing trees

The Project will result in the loss of a total of 21 hollow-bearing trees including hollow-bearing scattered paddock trees.

6.1.2 Loss of scattered paddock trees

Out of the 42 scattered trees identified, 28 will be impacted (66%), with 14 being retained. Each of these trees has been categorised into one of the following classes as per Appendix B of the BAM:

- Class 1: trees that are <20 cm DBH and without hollows.
- Class 2: trees that are ≥20 cm DBH and less than the large tree benchmark for the most likely plant community type or trees that are <20 cm DBH that contain at least one hollow.
- Class 3: trees that are greater than or equal to the large tree benchmark for the most likely plant community type.

Table 45 provides a summary of the numbers and classes of scattered trees likely to be impacted by the Project.

Table 45 Summary of scattered trees impacted by the Project

Class	No. trees impacted
1	-
2	2
3	26

6.2 Indirect impacts

This section details potential indirect impacts associated with the construction and operation of the Project following the implementation of proposed avoidance and minimisation measures. Indirect impacts are considered to potentially occur in areas outside the Development Footprint, but within the Subject Land. In accordance with the BAM, a proponent can retire credits to offset indirect impacts that cannot be avoided or adequately minimised. In this case, all indirect impacts can be adequately mitigated within a Biodiversity Management Plan (BMP) and Vegetation Management Plan (VMP) via active management and improve and maintain principles.

Potential indirect impacts arising from the Project are outlined and addressed in Table 46.

Table 46 Assessment of indirect impacts

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	All PCT/zones All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings) Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog	116.29 ha of adjacent vegetation subject to monitoring and enhancement	One-off	Long-term	Construction, operation and rehabilitation	Low. Impacts to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a Biodiversity Management Plan (BMP) and Construction Environmental Management Plan (CEMP) or similar detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards adjacent retained habitat.
Reduced viability of adjacent habitat due to edge effects	All PCT/zones All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings)	116.29 ha of adjacent vegetation subject to monitoring and enhancement	Unknown	Short-term	Construction and operation	Low. Adjacent habitats are currently subject to disturbance via clearing and existing agricultural land use. Improve and maintain principles will apply within the BMP and Vegetation Management Plan (VMP) to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
	Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog					
Reduced viability of adjacent habitat due to noise, dust or light spill	All PCT/zones All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings) Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog Common Planigale	116.29 ha of adjacent vegetation subject to monitoring and enhancement	Temporary	Short-term	Construction and operation	Low. It is predicted that the adjacent habitat may be impacted in a small way by noise, dust, compaction and light spill, during construction and operation. However, this will be managed via best practices outlined in a BMP and CEMP or similar. Improve and maintain principles will apply within the BMP and VMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.
Transport of weeds and pathogens	All PCT/zones	116.29 ha of adjacent	Unknown	Possibly long-term	Construction and operation	Low. Weeds occurring within the Subject Land are common with those occurring within

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
from the site to adjacent vegetation	All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings) Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog	vegetation subject to monitoring and enhancement				adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur but will be managed by biosecurity measures outlined in the CEMP.
Increased risk of starvation, exposure and loss of shade or shelter	All PCT/zones All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings) Swamp Sclerophyll Forest EEC (BC and EPBC Act listing)	116.29 ha of adjacent vegetation subject to monitoring and enhancement	Unknown	Possibly long-term	Construction and operation	Low. Improve and maintain principles will apply within the BMP and VMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts. While the removal of sheltering vegetation within the Development Footprint is a small proportion of the commensurate habitat available within the Subject Land and broader Project Area, the removal of potential roost/sheltering sites is a more adverse impact, but not one that is likely to result in mortality of individuals, however, may result in

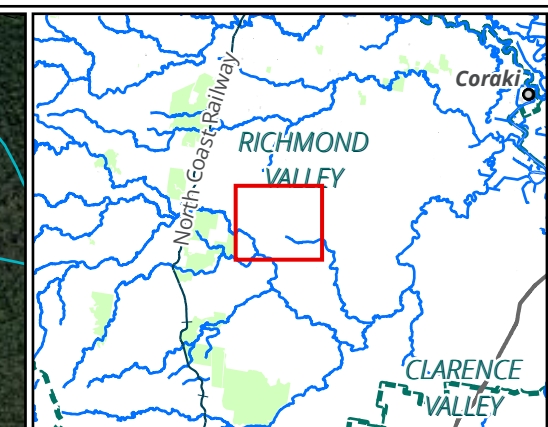
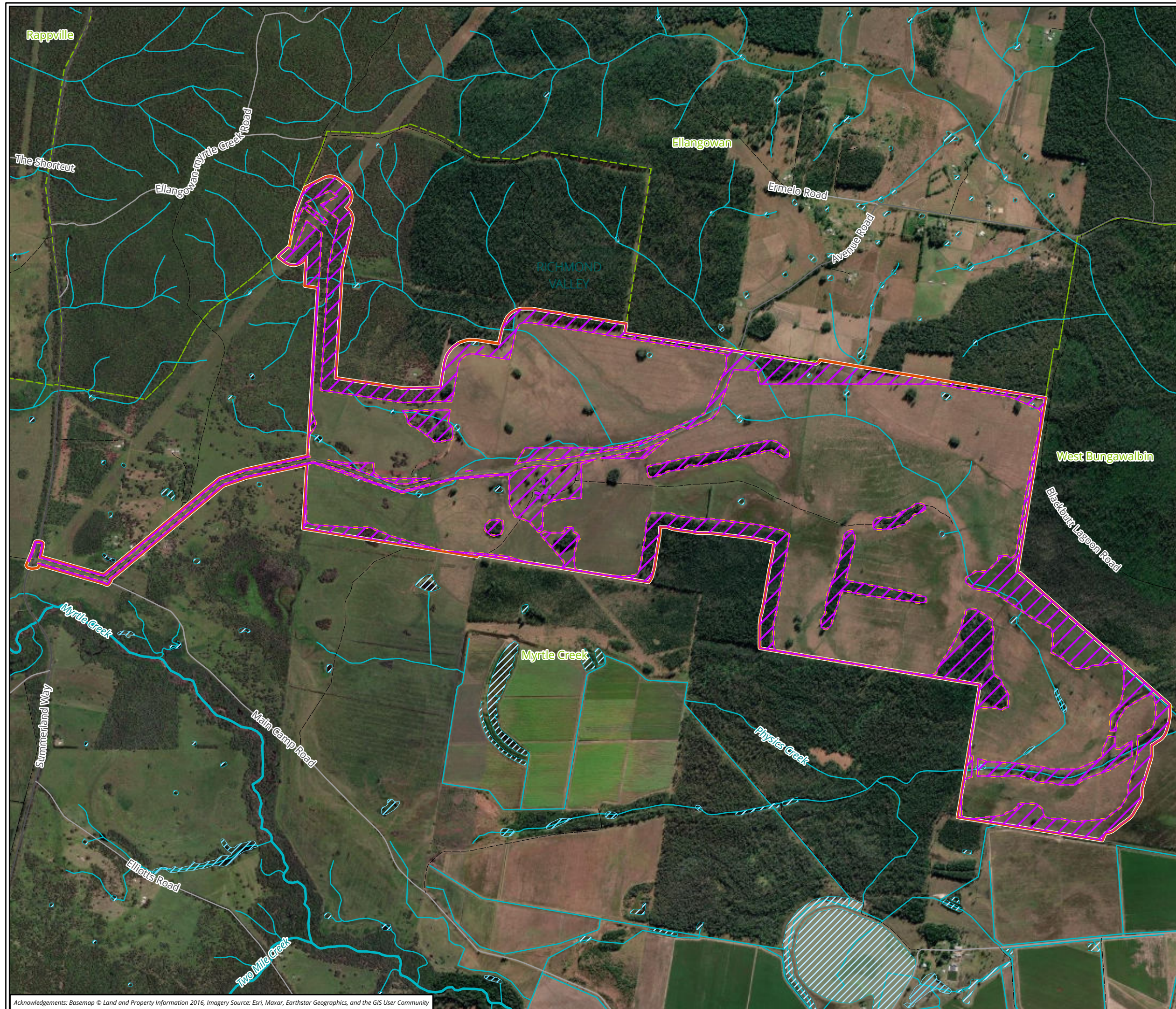
Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
	Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog					an increase of competition for remaining habitat features.
Loss of breeding habitats	Hollow dependent fauna All ecosystem credit species assumed present	116.29 ha of adjacent vegetation subject to monitoring and enhancement 21 retained hollow bearing trees	One-off	Long-term	Construction	Low. 21 hollow-bearing trees will be removed by the Project, leaving 21 remaining in adjacent vegetation. Indirect impacts associated with the loss of breeding habitats are not considered likely to be substantial or significant to any locally occurring threatened, or non-threatened, species.
Trampling of threatened flora species	None	116.29 ha of adjacent vegetation subject to monitoring and enhancement	One-off	Long-term	Construction	Low. No threatened flora species were found within the Subject Land. Improve and maintain principles will apply within the BMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.
Inhibition of nitrogen fixation and increased soil salinity	N/A	N/A	N/A	N/A	N/A	Negligible. Not expected to result from the Project. May be associated with ongoing treatment of nearby agricultural land unrelated to the Project. Any future excavations or soil disturbance resulting from the future development of the Subject Land

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
						would be largely restricted to areas having undergone significant previous disturbance through cattle grazing and vehicular traffic. As such it is not considered likely that the future development of the Subject Land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift	N/A	N/A	N/A	N/A	N/A	Negligible. The Subject Land has a long history of grazing over its total extent. Grazing is still active in all areas. Exotic species dominance and presence is common. No fertiliser is proposed to be used.
Rubbish dumping	N/A	N/A	N/A	N/A	N/A	Negligible. Standard environmental controls for the Project will ensure potential impacts are minimised. Works will follow an approved CEMP or similar and specific waste and water management requirements.
Wood collection	N/A	N/A	N/A	N/A	N/A	Negligible. Not expected to result from the Project. Future development proposed within the Subject Land is unlikely to increase access to any retained vegetation, beyond current access capacity. Future landholders are not expected to undertake wood collection beyond existing private forestry agreements within the retained vegetation to a level that it will have a detrimental effect. Unauthorised access and collection of wood is expected to be negligible.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
Removal and disturbance of rocks, including bush rock	N/A	N/A	N/A	N/A	N/A	Negligible. The Subject Land does not support bush rock.
Increase in predators and pest animal populations	Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale All ecosystem credit species assumed present	116.29 ha of adjacent vegetation subject to monitoring and enhancement	One-off	Long-term	Operation	Moderate. Wild dogs are noted and have been observed on multiple occasions during this assessment, however this is a common occurrence in this rural area, along with rabbits, foxes and cats. The Project is not expected to increase numbers with required mitigation, however movement through the Subject Land and increased visibility of predators may be considered to be exacerbated with construction and improved access roads through the Subject Land. The BMP will detail pest management regimes in order to control pest species within the Subject Land during construction and operations.
Changed fire regimes	N/A	N/A	N/A	N/A	N/A	Low. Appropriate asset protection zones and fire mitigation systems will be implemented for the Project and the implementation of bushfire management and mitigation measures for the Project will help to manage risk of fire within the Subject Land.
Disturbance to specialist breeding and foraging habitat, e.g.	None	1.1 ha of adjacent wetland vegetation	Unknown	Possibly long-term	Construction and operation	Low. No mapped important areas occur within the Subject Land. A small area of forested wetland occurs within the far south-east portion of the Subject Land, providing

Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
important mapped areas		subject to monitoring and enhancement				potential foraging habitat for wetland species. However, this area will not be impacted by the Project. Impacted dams occur in a low condition and are not likely to support the foraging or breeding behaviours of migratory species. Retained areas will be managed and improved under a BMP implemented for the Project.
Fragmentation of movement corridors	All PCT/zones All ecosystem credit species assumed present Subtropical Coastal Floodplain Forest Weeping Myall EEC (BC Act and EPBC Act listings) Swamp Sclerophyll Forest EEC (BC and EPBC Act listing) Barking Owl Squirrel Glider Southern Myotis Brush-tailed Phascogale Common Planigale Green-thighed Frog	116.29 ha of adjacent vegetation subject to monitoring and enhancement	One-off	Long-term	Construction and operation	Low. The Subject Land has been subjected to previous historical disturbances such as clearing and fire and is heavily modified in terms of mature woody vegetation. Patches of movement corridors have been maintained within the Development Footprint for more mobile fauna. Improve and maintain principles will apply within the BMP and VMP to ensure retained adjacent habitat and revegetated areas do not decline or are subjected to adverse impacts. A biodiversity corridor will be implemented at the northern end of the Subject Land to connect areas of vegetation, but also act as a visual amenity screen. Perimeter fencing may disturb the movement of larger ground dwelling fauna such as Kangaroos and Emus as well movement of Koalas, however patches of vegetation will be retained to allow movement, and the creation of a new biodiversity corridor will occur within the northern portion of the site.

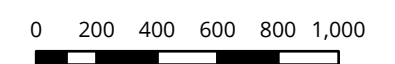
Indirect impact (Describe impact, e.g. transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
						Fauna escape structures will be implemented as part of the BMP to allow species such as Koala to escape in the unlikely event they become contained within the perimeter fencing.



Legend

- Subject Land
- Development Footprint
- Indirect impact

Figure 17 Estimated zones of indirect impact for the Project



Metres

Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



Matter: 38804, Date: 11 April 2024,
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F17_IndirectImpact

6.3 Prescribed impacts

Identification and assessment of prescribed biodiversity impacts are outlined and addressed in Table 47, and the section below, and shown in Figure 18.

Table 47 Identification of prescribed impacts

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Importance of habitat feature to impacted species
Karst, caves, crevices, cliffs, rocks and other geological features of significance	The Subject Land does not contain any karst, caves, crevices, cliffs, rocks and other geological features of significance. This prescribed impact is not discussed further.	N/A	N/A
Occurrences of human-made structures and non-native vegetation	The Subject Land contains large areas of Category 1 land due to historical clearing and grazing, and contains several rural-residential dwellings, however these will not be impacted as part of the Project.	Barking Owl Southern Myotis	Low. Non-native vegetation may act as marginal foraging habitat for raptors and owls, given increased visibility of prey. However, these areas are not likely to contain a sufficient amount of a particular resource to be considered important to the fauna species recorded or assumed present in relation to the amount of forested areas that will be retained both within and adjacent to the Subject Land. Raptors and Owls will continue to forage in adjacent forested and cleared areas. Improve and maintain principles to be applied within BMP and VMP implemented for the Project. Rural-residential dwellings will not be impacted as part of the Project.
Corridors or other areas of connectivity linking habitat for threatened entities	The Subject Land is largely cleared and fragmented in regard to woody vegetation and does not form part of a recognised wildlife corridor, however, does contain some important linkages to surrounding habitats in intact vegetation.	<i>Subtropical Coastal Floodplain Forest</i> EEC <i>Swamp Sclerophyll Forest</i> EEC Barking Owl Brush-tailed Phascogale Southern Myotis Common Planigale Green-thighed Frog Emu	Low. Habitat connectivity is critical for maintaining healthy populations, as it promotes biological diversity through the exchange of genes. While the Project will diminish local connectivity, this is unlikely to prevent genetic exchange of the threatened entities known, or assumed to be, inhabiting the Subject Land and broader Project Area. A biodiversity corridor will be implemented at the northern end of the Subject Land to

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Importance of habitat feature to impacted species
		Koala	connect areas of vegetation, but also act as a visual amenity screen. Fauna escape structures will be implemented as part of the BMP to allow species such as Koala to escape in the unlikely event they become contained within the perimeter fencing.
Water bodies or any hydrological processes that sustain threatened entities	The Subject Land encompasses several farm dams and tributaries of Physics Creek. To the south-west of the Project is Myrtle Creek, a 6 th Strahler order waterway. Generally these waterways and dams occur in a poor – moderate condition, having been heavily disturbed by grazing livestock and surrounding clearing.	Green-thighed Frog Southern Myotis	Negligible. No significant alterations to hydrology are anticipated and drainage lines and wetlands have largely been avoided. Residual impacts such as sedimentation and pollution to be mitigated through implementation of a CEMP.
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	The Project will result in increased vehicle traffic during construction and to a far less extent, operations. This increased vehicle traffic has the potential to impact upon native fauna species that are active during the day, and generally with a higher potential for impact in areas where refuge/forage habitat exists immediately adjacent to areas where vehicle movements will occur. As such, construction traffic moving through the proposed access/ transmission corridors is seen as the highest risk.	Common Planigale	Low. Ground-dwelling threatened species assumed present including Common Planigale may be impacted by vehicle strike within the transmission line corridor. In addition, non-threatened, ground dwelling fauna known to inhabit the general area, particularly macropods such as Eastern Grey Kangaroo are notoriously prone to vehicle strike. Vehicle strike of small marsupials and macropods is likely to be an impact already in place, which may be exacerbated during construction. Low or reduced speed limits and construction timing during construction will be proposed to reduce impacts to macropods and nocturnal species within the CEMP.

6.3.1 Human-made structures and non-native vegetation

Nature

The Subject Land contains 937.6 hectares (87 %) Category 1- exempt land due to historical clearing, plantation activities and grazing. These areas comprise Category 1 – Exempt land and have therefore been prioritised for development. These areas retain minimal biodiversity value due to the scarcity or absence of native understorey, canopy, and overall structure and are unlikely to provide suitable foraging or breeding habitat, including for threatened species. The Subject Land contains several rural-residential dwellings, however these will not be impacted as part of the Project.

Extent

The extent of this impact is considered to be low. While large areas of the Subject Land comprise non-native vegetation and will be impacted by the Project, the resources within these areas are not considered significant in relation to similar resources that will continue to be available within retained forests and vegetation and open farmland areas within the broader locality.

Duration

This impact would be one-off and permanent.

Consequences for entities detailed in Table 47

The proposed removal of non-native vegetation constitutes a small reduction in general foraging habitat for local raptor and owl populations, however, this is unlikely to be of consequence to the long-term persistence of any of these highly mobile species. Retained forested areas and a newly created biodiversity corridor will provide similar resources and connectivity to adjacent farmland. Within these areas vegetation condition and function will be maintained and improved through the implementation of a BMP and VMP.

6.3.2 Habitat connectivity

Nature

Loss of native vegetation and habitat has potential to affect landscape connectivity permanently or temporarily during construction and operation.

Extent

The extent of this impact is considered to be minor. Larger intact areas of higher condition forests and wetland habitats have been prioritised for avoidance, with retained areas subject to improvement within criteria set out in a BMP and newly created biodiversity corridors created through the implementation of a VMP. Therefore, connectivity is expected to largely remain for more mobile fauna. However, the Project may cause disruption to large ground dwelling fauna such as Kangaroos and Coastal Emu due to perimeter fencing. Although not detected during detailed surveys, impacts to the movement of Koalas may occur should they be moving throughout the broader area. In the unlikely event that Koalas be contained within the perimeter fencing, mitigation measures such as Koala escape structures at key areas will be installed, as well protocols for suitable qualified personnel to remove and relocate Koalas to suitable habitat outside of the fenced area would be initiated.

Duration

This impact would be one-off and permanent and subject to stringent mitigation measures.

Consequences for entities detailed in Table 47

Habitat connectivity is critical for maintaining healthy populations, as it promotes biological diversity through the exchange of genes. However, much of the Subject Land is largely cleared and fragmented, consisting of Category 1- exempt land and having been historically modified due to plantation activities and cattle grazing. The Subject Land does not form part of a recognised wildlife corridor, however, does contain some important linkages to surrounding habitats in Bungwalbin State Forest and State Conservation Area and Ellangowan State Forest. Intact vegetation within the broader locality generally consists of Clarence Lowland Ironbark-Spotted Gum Grassy Forest, Northern Lowland Red Gum-Swamp Turpentine Grassy Forest and small patches of Northern Floodplain Paperbark Fern Swamp Forest that have been prioritised for avoidance during detailed design. Heavily modified areas previously cleared of mature vegetation contain regeneration of juvenile vegetation and scattered trees and provide some level of connectivity. Retained forested areas create dispersal routes for mobile fauna to actively move through the Subject Land, as well as promoting movement of genetic floristic material into adjacent areas of habitat such as riparian and wetland areas.

While the Project would cause a slight decrease in local scale connectivity, this is unlikely to prevent genetic exchange of the threatened entities known, or assumed to be, inhabiting the Subject Land and broader Assessment Area. In addition, a new biodiversity corridor will be created through revegetation along the northern boundary of the Subject Land, creating increased habitat connectivity within that area.

6.3.3 Water bodies, water quality and hydrological processes

Nature

The Subject Land is largely within a flat uniform landscape on poorly drained brown and dark grey clay and sandy soils with minor ephemeral drainage lines or slightly lower lying depressions forming forested wetlands. Current water quality and hydrological process (how water flows and is distributed across the Subject Land) contribute to the sustenance and resilience of the vegetation present, and in turn, the flora and fauna species that rely on said vegetation.

Extent

The extent of impacts associated with the Project are considered to be minor. No significant direct impacts are considered to occur to major water ways or wetlands in the region, change hydrological flow, or contribute to the degradation of waterways within the Subject Land or broadly. Infrastructure, with the exception of the solar arrays, such as the BESS and substation are located outside of flooding areas.

Duration

Associated project impacts would be ongoing but temporary, limited to predominantly construction stages. During more significant but infrequent flood events ,perimeter fencing may cause access issues during flooding events.

Consequences for entities detailed in Table 47

No significant alterations to hydrology are anticipated and drainage lines and wetland areas have largely been avoided, particularly those containing the highest biodiversity value within the subject land.. Overall, the Project is expected to minimally impact existing surface water quality and flow patterns through the implementation of numerous mitigation and management measures, most of which would be captured in the CEMP or similar.

6.3.4 Vehicle strikes

Nature

The Project has the potential to result in increased vehicle strikes during construction from increased light and heavy vehicle movements.

Extent

Increased heavy vehicle movements will occur, predominantly during construction. However the existing public roads that lead to the Subject Land, such as Summerland Way currently act as a major conduit of heavy vehicle traffic in the region, while rural Main Camp Road and Avenue Road harbour a low level of traffic. While there is fencing currently surrounding the Subject Land, this fencing allows for the movement of fauna through large gaps. Sturdier perimeter fencing may create a barrier that prevents access to the Subject Land in some instances, funnels mobile large ground dwelling fauna towards rural roads.

Duration

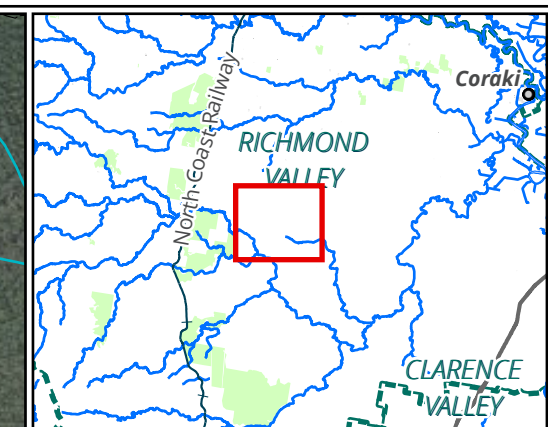
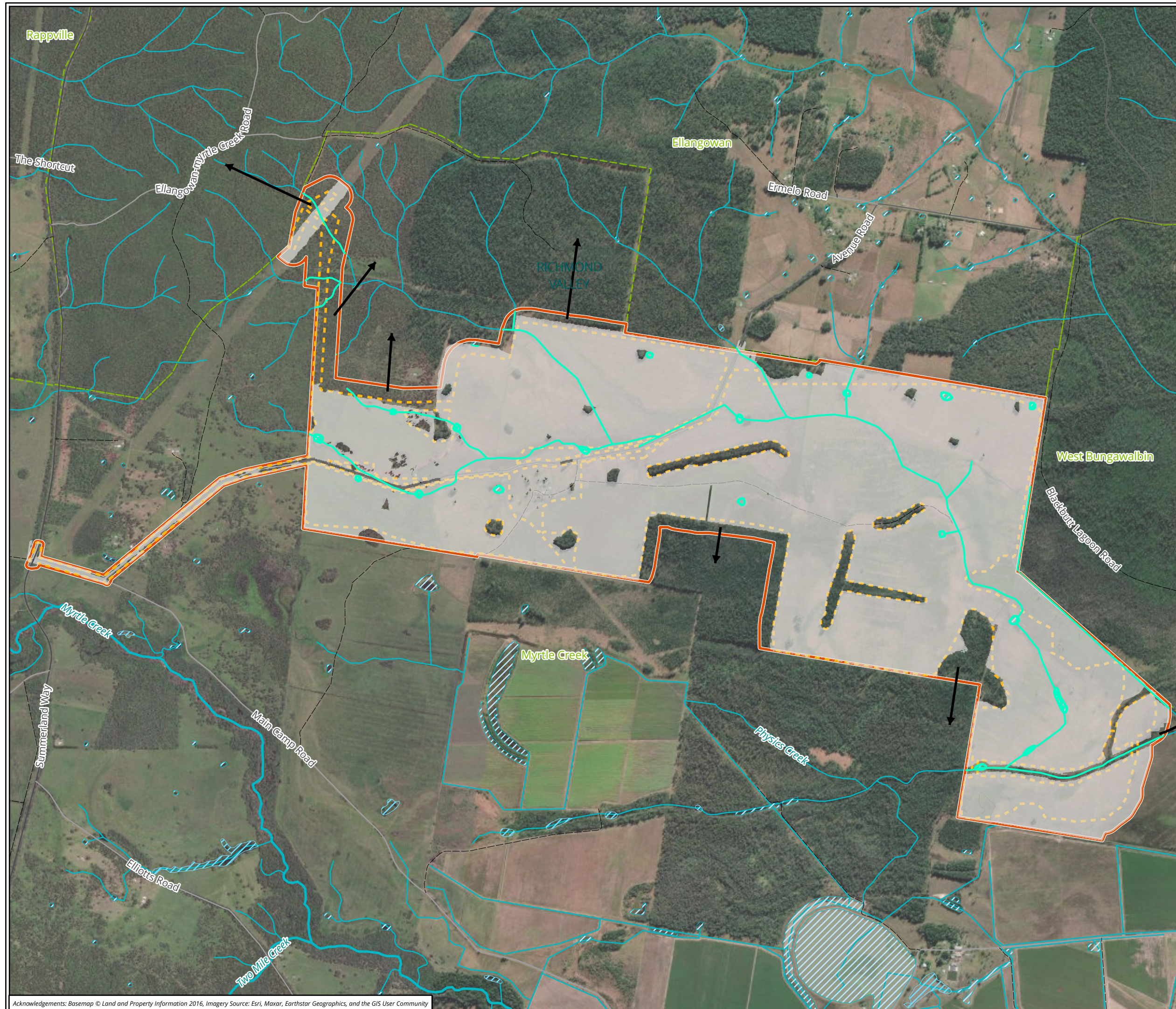
This impact would be ongoing but temporary, limited to predominantly construction stages. Perimeter fencing may cause occasional fauna to venture towards rural roads on a rare yet permanent basis.

Consequences for entities detailed in Table 47

Non-threatened, ground dwelling fauna known to inhabit the general area, such as Brush-tailed Possums, and macropods such as Eastern Grey Kangaroo are notoriously prone to vehicle strike. Vehicle strike of macropods is likely to be an impact already in place due to the exiting road network including major road Summerland Way and traffic levels, which may be exacerbated during construction.

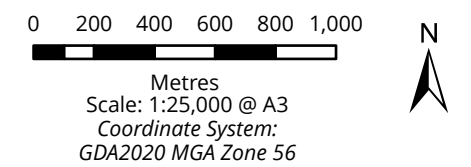
Common low flying ground foraging birds such as Eastern Rosella and Rainbow Lorikeet are also prone to increased collision due to increase in traffic during construction.

It can be reasonably expected that the potential for vehicle strikes can be effectively managed through driver awareness training on the potential for fauna to occur, as well as on-site measures such as reduced speed limits, stringent construction hours and signage and education programs for staff. As such, the Project is not expected to result in any substantial or significant impacts associated with vehicle strikes outside of what already exists due to the Project's proximity to a major regional road corridor (Summerland Way).



- Legend**
- Subject Land
 - Development footprint
- Prescribed impacts**
- Farm dam
 - Waterway
 - Habitat connectivity
 - Category 1 Land

Figure 18 Prescribed impacts



Matter: 38804, Date: 11 April 2024
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 Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
 Layout: 38804_F18_PrescribedImpacts

6.4 Impacts considered uncertain

At this stage of the assessment, a total loss of groundcover has been assumed to occur as a direct impact within the Development Footprint, including areas of temporary shading and in between solar panel row alignments as well as APZs. This is considered a conservative measure as groundcover and a reduced level of biodiversity value is known to persist in currently operating solar farms in NSW. It is possible that a direct impact may not result in complete loss of all biodiversity value. However, with required management between arrays and APZs for bushfire and insurance purposes, the level of value that remains post construction is highly uncertain and difficult to quantify, but estimated at a best case to be down to approximately an 80% loss of biodiversity value compared to that prior to construction and under current land use regimes. This is however not expected to be considerable, across much of the Development Footprint, given the quantity of Category 1-exempt land that currently comprises a low level of native biodiversity.

6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

Groundwater Dependent Ecosystems (GDEs) are ecosystems that are partially or completely dependent on underground water, or the surface expression of this water, for their existence or health. These ecosystems include flora and fauna species and communities that are dependent on water discharge to the surface at a level where they can access, to persist in permanently wet environments, or to persist during times of extended low rainfall via the access to subsurface water reserves.

Assessment of the potential for the Subject Land to support GDEs was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). The Subject Land is mapped as supporting low, moderate and high potential GDEs associated with an aquifer in Appendix 8 of the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (DPI 2012).

Non-dependent ecosystems are the ecosystems that occur mostly in recharge areas and have no connection with groundwater. Obligate ecosystems are those that are entirely groundwater dependent if they are restricted to locations of groundwater discharge. Facultative GDEs require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function (Kuginis et al. 2016).

Parts of PCTs 3428 and 3420 are mapped as comprising low, medium and high potential GDEs. However, these PCTs are likely not obligate and entirely dependent on groundwater. It is likely these communities are not restricted to locations of groundwater discharge or located within aquifers. These PCTs are likely to be opportunistic facultative GDEs that depends on the subsurface presence of groundwater in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function (Kuginis et al. 2016).

Wetlands identified as being groundwater dependent can be either ephemeral or permanent systems that have a continuous or seasonal connection with groundwater (Howe et al. 2007). Although rainfall is the dominant source of water for nearly all wetland systems, groundwater plays a role in many of Australia's wetlands (Hatton & Evans 1998, Kuginis et al. 2016). PCT 4046 and PCT 4001 within the far south-eastern section of the Subject Land are wetland communities and as such are mapped as a high potential GDE. However, impacts to these PCTs have been prioritised for avoidance, with impacts to PCT 4046 being minor (1.12 hectares), and PCT 4001 will not be impacted as a result of the Project.

The Subject Land is not identified as having Groundwater Vulnerability according to the Richmond Valley Council LEP (Richmond Valley LEP 2012).

6.6 Cumulative Impacts

An assessment of proposed and current renewable and other Projects within similar PCTs, habitats and sited in the broader locality has been carried out to provide a summary of potential cumulative impacts to biodiversity (Table 48). Impacts resulting from the Project are largely consistent with impacts that are considered to occur at other nearby proposals, more so with those occurring within 50 kilometres or less.

The summary of biodiversity impacts from publicly available information was reviewed to gain an understanding of the level of biodiversity impacts and how these may contribute to cumulative impacts when considering the development of the Project, and overall significance of these impacts broadly.

Based on available published information, cumulative impacts to similar PCTs, TECs including Subtropical Coastal Floodplain Forest, and threatened species will occur within the broader locality. A summary of cumulative impacts is provided below in Table 48.

Table 48 Cumulative impact summary

Project, description and location	Distance from subject land	Overview	Potential biodiversity impacts (DPHI 2024)
Myrtle Creek Solar Farm, Richmond Valley (EIS stage)	Directly south	Includes construction and operation of 100MWac solar farm, including 215,000 solar PV panels and BESS, over approximately 240 ha.	Scoping Report - Direct impacts to six PCTs comprising two TECs including Coastal Swamp Oak Forest and Subtropical Coastal Floodplain Forest.
Summerville Solar Farm, Rappville (Response to Submissions)	1.4 km east	Includes construction and operation of 90MWac solar farm, including 215,000 solar PV panels and BESS, over approximately 240 ha.	EIS/BDAR – Estimated impacts to 124.33 ha of native vegetation, including four PCTs and two TECs. Impacts to Subtropical Coastal Floodplain Forest are anticipated. Impacts to SAIL entity <i>Rotala tripartita</i> .
Pacific Highway – Woolgoolga to Ballina (Approved)	19 km west	Staged road upgrades of the Pacific Highway from Woolgoolga to Ballina, providing 155 km of four-lane divided road.	EIS/BDAR – Impacts to approximately 948 ha of native vegetation comprising 5 TECs, 11 threatened flora species, twenty threatened fauna species and one endangered population.
Richmond Valley Power Station (Approved)	20 km north	Includes 30 MW gas fired power project and associated coal seam gas field development.	EIS/BDAR – Impacts to native vegetation avoided.
Coraki Quarry (Approved)	24 km east-north-east	Quarry establishment and extraction of approximately 800,000 tonnes of hard rock material per annum.	EIS/BDAR – Direct impacts to pre-disturbed native vegetation including scattered paddock trees, planted amenity screens and heavily disturbed and exotic-dominated patches of regrowth.
Lismore BESS facility (EIS stage)	26 km north-east	Includes a battery system that will store approximately 200MWh of electricity and 100MW battery power.	EIS/BDAR - Impacts to a single native tree.
Casino Biohub (bioenergy facility) (EIS stage)	27km north	Process around 900,000 tonnes of waste per year (mainly liquid waste) to generate 2.2 megawatts or 16,000 megawatt hours of electricity annually.	EIS/BDAR – Estimated direct impacts to 0.57 ha of native vegetation comprising one PCT occurring as scattered trees and degraded patches.
Champions Quarry (Approved)	30 km north-east	Expansion of sandstone quarry from two to 16 ha to increase extraction rate to 250,000 tonnes per annum.	EIS/BDAR – Impacts to 134 trees (approximately 1.5) ha of native vegetation.
Lismore Hospital Redevelopment – Stage 3C (Approved)	38 km north-east	Addition of 4 storeys to the approved (and to be constructed) northern tower at the back of the recently developed southern tower.	EIS/BDAR – No impacts to biodiversity.

Project, description and location	Distance from subject land	Overview	Potential biodiversity impacts (DPHI 2024)
Blakebrook Quarry (Approved)	40 km north-east	Increase of quarry extraction rate from 237,000 tonnes per annum to 600,000 tonnes per annum and the use of mobile crusher plant within the quarry pit.	EIS/BDAR – Impacts to approximately 25.8 ha of native vegetation, one threatened flora species, seven threatened fauna species, one EEC.
Lismore to Mullumbimby Transmission Upgrade (Approved)	50 km north-west	Upgrade and installation of 132 kV transmission line and construction of two 132/11 kV substations.	EIS/BDAR- Impacts to two TEC's including Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest.
Clarence Valley Solar Farm (EIS stage)	50 km south	Includes construction and operation of 85MWac solar farm, including a BESS, over approximately 280 ha.	EIS/BDAR - Likely impacts to five PCTs comprising three TECs including Subtropical Coastal Floodplain Forest. Extent of impacts unknown at this time.

7 Mitigation and management of impacts

Identification of measures to mitigate or manage impacts (Table 49) has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Mitigating prescribed biodiversity impacts.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Table 49 Measures to mitigate and manage impacts

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
<i>Displacement of resident fauna</i>	A Biodiversity Management Plan (BMP) would be prepared and implemented as part of the CEMP. It will include, but not be limited to: - Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. - Species lists for revegetation and biodiversity corridor. - Maintenance and monitoring requirements. - Pre-clearing survey requirements. - Clearing protocols. - Procedures for unexpected threatened species finds and fauna handling. - Location of Koala escape structures. - Contain and minimise impacts of Cane Toads.	Effective management of resident flora, fauna and ecological communities to minimise direct and indirect impacts.	Pre-construction, construction, and post construction.	The applicant /contractor.
<i>Indirect impacts on native vegetation and habitat</i>	- Exclusion zones, including flashing on perimeter fencing to restrict climbing Koalas and escape structures near forested areas and retained vegetation should Koalas become trapped. - Frog exclusion fencing would be set up at the limit of clearing and surrounding riparian corridors to be retained. - A native vegetation and biodiversity corridor would be re-established along the northern boundary of the Subject Land to aid in habitat connectivity and in other retained areas as part of the Projects BMP. - Weed species would be managed as part of the CEMP. - A biosecurity management plan prepared as part of the Project's CEMP/OEMP is recommended and will reduce the risk of spreading weeds and pathogens, and other biosecurity items into or out of the impact area upon implementation. - Minimise or eliminate the impacts of cane toads within the Subject Land.	Effective management of potential indirect impacts such that they do not occur or are minimal.	Pre-construction and construction.	The applicant /contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	- Prevent the spread of Cane Toads from within the Subject Land. - Shading and artificial light impacts would be minimised through detailed design. - All material stockpiles, vehicle parking and machinery storage, and other ancillary works are to be located within areas considered impacted within the current assessment and not be located within retained vegetation outside the impact area unless an updated impact assessment is undertaken. - Dust suppression is to be undertaken as required using water sprays, water carts or other media on: - Unpaved work areas subject to traffic or wind. - Sand, spoil and aggregate stockpiles. - During the loading and unloading of dust generating materials. - Consider biodiversity as sensitive receivers in noise and vibration management plan. - Noise will be managed as part of the CEMP. - Lighting will be designed in general accordance with Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting. - Two stage pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones and on-ground identification of specific habitat features to be retained and/ or relocated.			
Mitigating prescribed biodiversity impacts	Habitat connectivity - Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. - Revegetation of a biodiversity corridor to occur along the northern boundary of the Subject Land to aid in habitat	Effective management of prescribed impacts such that they do not occur or are minimal.	Pre-construction, construction and post-construction.	The applicant /contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	connectivity and provide additional linkages to retained patches. - Clearing protocols. Water bodies, water quality and hydrology - Preparation of an adaptive management component of the BMP outlining a cycle of 'do, monitor, evaluate and respond'. Note this is, the foundation of adaptive management widely applied to terrestrial and aquatic ecosystem management. - Prepare a CEMP and OEMP that will: - Describe measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants from the site during construction of the Project. - Describe how water will be managed to achieve compliance with relevant consent and licence conditions. - Establish responsibilities and reporting requirements. - Establish surface water quantity and quality monitoring requirements. - Establish erosion and sedimentation controls within impacted sections of riparian corridors. - Establish trigger action response plans to enable progressive improvement.			
Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain	- The CEMP would include an adaptive management component, for impacts on biodiversity that are uncertain such as: - Inadvertent impacts to native vegetation adjacent to the Development Footprint. - Introduction of pests, pathogens and weeds to native vegetation adjacent the Development Footprint and further afield. - Vehicle strikes.	Effective management of uncertain impacts to biodiversity by ensuring intervention can occur as needed.	Pre-construction, construction and post-construction.	The applicant /contractor.

7.1 Biodiversity Management Plan

A BMP will be implemented demonstrating adaptive management strategies to ensure key milestones are achieved. The BMP will be reviewed and approved by BCS prior to construction, and include the following framework and Project commitments:

- Protecting vegetation and fauna habitat outside the Development Footprint such as Koala habitat and managing the remaining remnant vegetation and fauna habitat within or surrounding the Subject Land toward a benchmark state using improve and maintain principles, minimising indirect impacts, especially to known threatened flora species and potential fauna species such as Barking Owl, Square-tailed Kite, Brush-tailed Phascogale, Common Planigale, Southern Myotis, and Green-thighed Frog.
- Replanting of a biodiversity corridor on the northern boundary of the Subject Land to increase visual amenity and connectivity between vegetation patches.
- Installation of flashing on perimeter fencing to restrict climbing Koalas and escape structures near forested areas retained vegetation should Koala become trapped within the perimeter fencing.
- Demarcation of retained areas of vegetation to be fenced off during construction.
- Ongoing vegetation monitoring of retained vegetation areas within the Subject Land including collection of BAM plots prior to construction (if no baseline data is applicable) and at year 1, year 3 and year 5 post construction to monitor improvement in vegetation condition and function.
- Training and education awareness for all construction staff and operational staff on key threatened species, both flora and fauna, relevant to the region and Project.
- Contain relevant sub plans for overall weed and biosecurity management, pest animal management and rehabilitation management.
- Fauna monitoring and management protocols including identification and reporting of fauna mortalities to the relevant BCS office.
- Collection of detailed baseline weed data prior to construction and ensure no increase of key emerging weeds or invasive pests post construction.
- Commit to ongoing consultation with Local Land Services (LLS) on control and baiting programs for invasive fauna such as wild dogs and foxes.
- Marking and identification of retained tree hollows and measures to minimise impacts to these features.
- Two stage pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones and on-ground identification of specific habitat features to be retained and/ or relocated.
 - For example, occupation surveys for no go threatened flora areas, application of exclusion measures / deterrents prior to vegetation clearing / earthworks, works undertaken in presence of spotter / catcher.
- Clear performance targets and monitoring criteria.
- Corrective actions and adaptive management.
- Timing and responsibilities of management actions and corrective actions.
- Annual reporting requirements and consultation program with the relevant regulator.

A recommended outline of the BMP is provided below with further details demonstrated within the mitigation measures listed in Table 48.

- Introduction
 - Background
 - Management scope and objectives
- Planning requirements
- Construction and operational activities
- Habitat management
 - Flora and fauna values
 - Soils
 - Weeds and pests (i.e. key emerging weeds and priority weeds)
 - Baseline data
 - Fencing requirements.
- Replanting and biodiversity corridor.
 - Species planting lists
- Environmental mitigation measure
- Site specifics
 - Inductions
 - Erosion /sediment control
 - Retained vegetation and rehabilitation works including replanting
- Adaptive management
 - Performance criteria, triggers, and responses
- Compliance management
- Review and Improvement

7.2 Adaptive management strategy

Construction and operational management plans will all contain an adaptive management component. Adaptive management strategies will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which will trigger adaptive management actions and allow for effective and quick responses.

8 Impact summary

8.1 TECs and threatened species

This section outlines the impact summary for the Project which has identified and assessed impacts on TECs and threatened species that are at risk of a SAI including:

- Addressing all criteria for each TEC listed as at risk of an SAI present within the Subject Land.
- Addressing all criteria for each threatened species at risk of an SAI present within the Subject Land.
- Documenting assumptions made and/or limitations to information.
- Documenting all sources of data, information, references used or consulted.
- Clearly justifying why any criteria could not be addressed.
- Identification of impacts requiring offset.
- Identification of impacts not requiring offset.
- Identification of areas not requiring offset.

8.2 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
- Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Two species; Little Bent-winged Bat and Large Bent-winged Bat, are considered to meet one or more of the above principles and were recorded within the Subject Land. Breeding habitat for these species is defined in TBDC (NSW DCCEW 2024d) as any:

'Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500 or from the scientific literature.'

No caves, tunnels, mines, culverts or other breeding structure occurs within the Subject Land or surrounding locality. These species are not noted as utilising buildings as breeding habitat (Churchill 2008). As cave-dwelling species, buildings would not represent typical habitat for the species unless they were found to closely mimic a cave environment as other man-made structures such as mines or tunnels may provide. The

suitability of the buildings within the subject site is therefore not considered consistent with the highly specific breeding habitat requirements documented for these species within the TBDC. Therefore, the Project will not result in impacts to breeding habitat and no further assessment is required.

8.3 Identification of impacts requiring offset

8.3.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥ 15 , where the PCT is representative of an EEC or a CEEC.
- ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

On this basis, offsets are required for impacts to all vegetation zones (Table 50).

The offset requirement for the Project was calculated using the BAM Calculator. Table 50 provides a summary of the ecosystem credit offsets required for impacts from proposed development at the Subject Land.

Table 50 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement	
4046_Moderate	0.48	Clearance	66	Yes	Yes	Yes	16	28
4046_Riparian	0.64	Clearance	37.5	Yes	Yes	No	12	
3428_Moderate	3.21	Clearance	39.4	Yes	Yes	Yes	63	78
3428_Low	1.27	Clearance	24.2	Yes	Yes	Yes	15	
3420_Good	2.08	Clearance	61.5	Yes	No	Yes	56	344
3420_Moderate	11.81	Clearance	51.6	Yes	No	Yes	266	
3420_Regen	1.78	Clearance	28.8	Yes	No	No	22	

8.3.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM, an offset is also required for the impacts of the proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥ 17 .

The offset requirement for the Project was calculated using the BAM Calculator. Table 51 provides a summary of the species credit offsets required for impacts from proposed development at the Subject Land.

Table 51 Offsets required (species credits)

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
Barking Owl	Direct	3428_Moderate 3428_Low 3420_Moderate	7.84	2	183
Southern Myotis	Direct	4046_Moderate 4046_Riparian	7.44	2	172

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
		3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Low			
Squirrel Glider	Direct	3428_Moderate 3420_Good 3420_Moderate 3420_Low	10.09	2	249
Brush-tailed Phascogale	Assumed	4046_Moderate 4046_Riparian 3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Low	21.27	2	500
Common Planigale	Assumed	4046_Moderate 4046_Riparian 3428_Moderate 3428_Low 3420_Good 3420_Moderate 3420_Low	21.27	2	500
Green-thighed Frog	Assumed	4046_Riparian	0.64	1.5	9

Species polygons for the above six species credit species impacted by the Project are illustrated on Figure 13.

8.3.3 Impacts to scattered trees

Offsets are required for the clearing of Class two (two scattered trees) and Class three (26 scattered trees) paddock trees and demonstrated in Table 52.

Table 52 Offsets required (scattered trees)

PCT	No. Cleared	Credit requirement
3420-Clarence Lowland Ironbark-Spotted Gum Grassy Forest	4	4
3428-Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	13	11
4046-Northern Lowland Swamp Turpentine-Red Gum Forest	11	11

8.4 Identification of impacts not requiring offset

As outlined in Section 9.2.1 of the BAM, offsets are not required for impacts to vegetation zones that have a vegetation integrity score of <15. For the Project, this includes 0.1 hectares of vegetation zone PCT 4001_Low (VI score = 10.9).

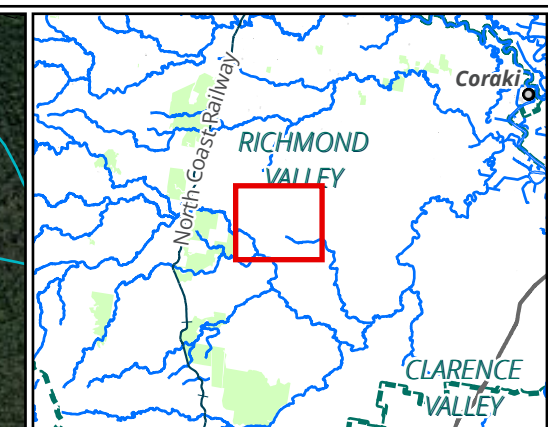
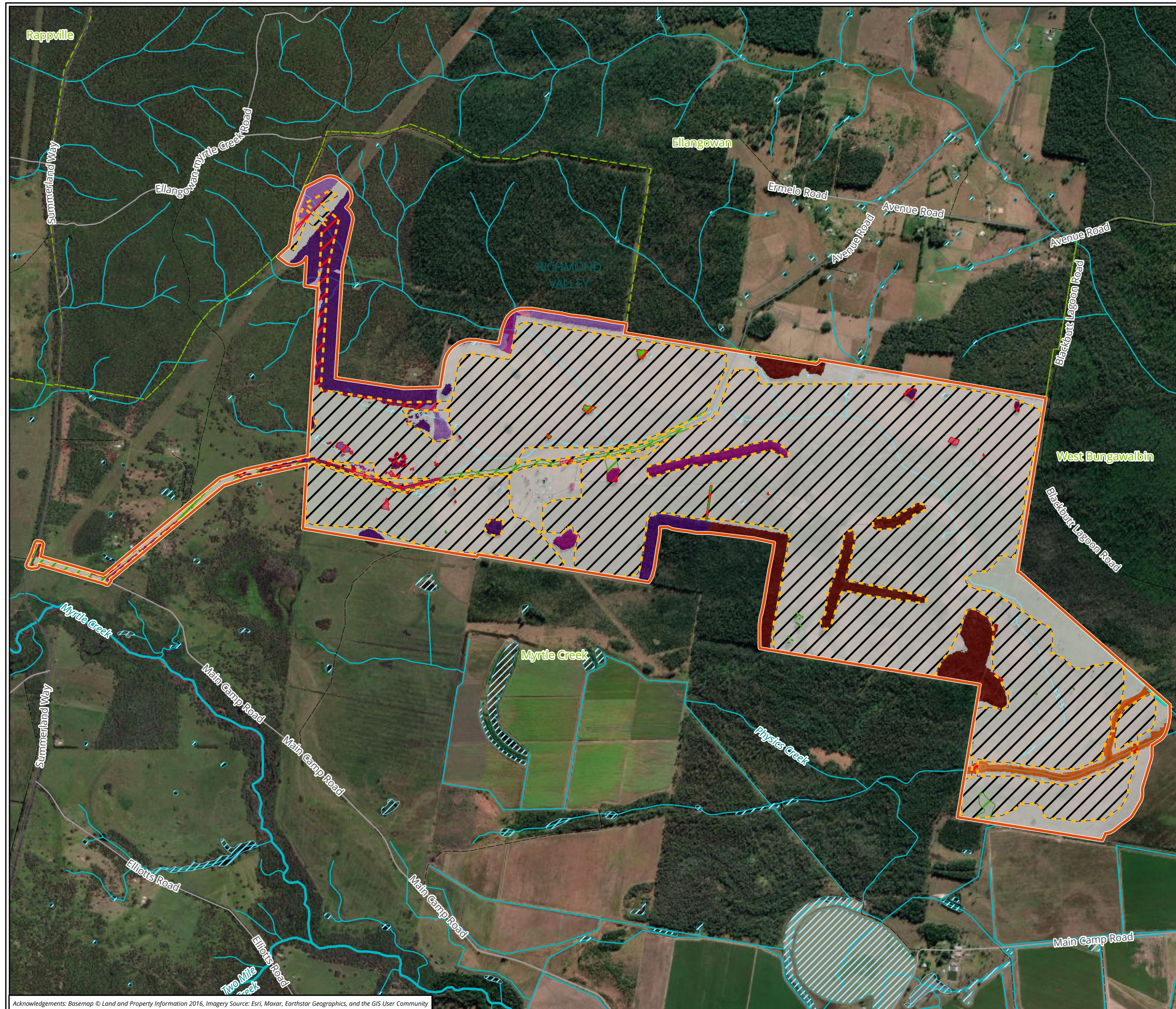
Indirect impacts do not require offsetting and are subject to detailed mitigation and management to improve and maintain vegetation within criteria set in the BMP.

8.5 Identification of areas not requiring assessment

As outlined in Section 9.3 of the BAM, areas within the Subject Land that do not contain native vegetation do not need to be assessed for ecosystem credits. Areas of land mapped as Category 1- exempt land under the LLS Act also do not require assessment under the BAM. Areas of land that do not contain native vegetation must still be assessed for threatened species habitat and prescribed biodiversity impacts in accordance with the BAM (Figure 19).

Following assessment the following areas do not require assessment in accordance with BAM:

- Areas of Category 1- exempt land with exemptions to prescribed impacts.



Legend

- Subject Land
- Development Footprint
- Category 1 Land

Plant Community Types, Condition

- 3420, Moderate
- 3420, Good
- 3420, Regen
- 3428, Moderate
- 3428, Low
- 4001, Low
- 4046, Moderate
- 4046, Riparian
- Planted

Impacts

- Impacts requiring offsets
- Impacts not requiring offsets
- Areas not requiring assessment

Figure 19 Impacts requiring offsets, not requiring offset, not requiring assessment

0 200 400 600 800 1,000
Metres

Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



Matter: 38804, Date: 10 April 2024
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F19_Impacts

9 Assessment against biodiversity legislation

9.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Commonwealth Minister for the Environment for assessment.

An EPBC Act referral was lodged on the 5 September 2023 and deemed a Controlled Action (EPBC 2023/09516) on the 22 November 2023 based on listed threatened species and communities as the relevant controlling provisions. Subsequently supplementary SEARs were issued on 4 March 2024. The Project design has since been subject to further refinement and is deemed unlikely to have a significant impact on EPBC Act threatened entities (as per the Referral) given implementation of avoidance measures and substantial reduction of direct impacts. However, all SEARs and EPBC Act requirements are addressed and assessed in this BDAR, in accordance with the NSW Assessment Bilateral Agreement.

An assessment of the impacts of the Project on MNES, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required. MNES relevant to the Project are summarised in Table 53. In accordance with the supplementary SEARs, Table 54 contains a summary of impacts to relevant MNES entities and Appendix 2 contains a summary of species predicted from the BAM-C, as well as those that are known or have a moderate or greater likelihood of occurrence. For species that are thought to have a moderate to higher likelihood of occurrence within the Subject Land, Significant Impact Criteria (SIC) assessments have been undertaken in Appendix 5. Following avoidance of biodiversity values as demonstrated in Section 5, measures and offsets would be implemented to address residual impacts under the EPBC Act and bilateral agreement.

Table 53 Assessment of the proposed development against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	Prior to the targeted survey program, a total of 17 EPBC Act listed species, such as Slaty Red Gum, Spotted-tailed Quoll, Koala, Grey-headed Flying Fox and Glossy Black Cockatoo were thought to have a medium or higher likelihood of occurring. Therefore, preliminary SIC assessment was undertaken (Appendix 5) and submitted as part of the EPBC referral. However, survey did not detect the presence of these EPBC listed species, and none were candidate species assumed present for the purposes of this BDAR..	Unlikely. No entities assessed were considered to have a significant impact resulting from the project following targeted survey and avoidance of direct impacts.
Threatened ecological communities	Direct and indirect impacts are considered to occur to one listed EPBC Act TEC: Subtropical eucalypt floodplain forest and woodland.	Unlikely. The Project will constitute a small reduction in the area of Subtropical eucalypt floodplain forest and woodland. Mitigation measures outlined in Section 7 will be implemented to ensure indirect

Matter of NES	Project specifics	Potential for significant impact
		impacts are reduced. Detailed assessment is provided in Appendix 5.
Migratory species	Background searches and habitat assessment undertaken in the constraints assessment identified the following migratory species as having a medium or higher potential to occur in the Subject Land: • White-throated Needletail <i>Hirundapus caudacutus</i> • Black-faced Monarch <i>Monarcha melanopsis</i> • Spectacled Monarch <i>Monarcha trivirgatus</i> • Yellow Wagtail <i>Montacilla flava</i> • Satin Flycatcher <i>Myiagra cyanoleuca</i>	Unlikely. There is no, or limited, suitable habitat within the Subject Land for migratory shorebird species, particularly those that are largely associated with tidal mudflats or coastal beaches and estuaries. Migratory species that may occur in inland areas such as Latham's Snipe and Glossy Ibis, may occasionally utilise wetland areas within the south east. Impacts to these areas are likely to be minimal, if any, with the Project design largely avoiding any impacts to wetland habitats. The nature and scale of the Project is unlikely to result in impacts to aerial species such as White-throated Needletail and Fork-tailed Swift, which forage on the wing and are unlikely to be affected by ground level disturbance.
National Heritage Places	The Subject Land contains no World Heritage Properties or National Heritage Places.	None. There are no national or world heritage places within or near the Subject Land. The Project is unlikely to result in any direct or indirect impacts to national or world heritage.
Wetlands of international importance (Ramsar sites)	There are no Ramsar wetland areas within or near the Subject Land. The Ramsar listed Little Llangothlin Nature Reserve is located 161.6 km to the south-west of the Subject Land.	None. Given the large geographical separation between Ramsar Wetlands and the Subject Land, no direct or indirect impacts to the wetlands are likely to occur as a result of the Project. Potential impacts from the Project are expected to be localised and not result in any direct or indirect impacts to the hydrological regime or ecological character of the identified wetlands.

Table 54 Summary of relevant EPBC Act threatened species and ecological communities

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
Development Footprint					
Subtropical Eucalypt Floodplain Forest and Woodland	Some risk of significant impact	Recorded within Development Footprint.	Yes	Impacts to known areas of this community have been avoided where possible and restricted to areas along the existing easement fringing areas of larger more connected patches. Approximately 4.57 ha will be impacted. This TEC has been prioritised for avoidance during design refinement. Approximately 138.51 ha of the TEC will be retained within the Subject Land and Project Area. In addition, areas likely to meet the TEC listing within the 10 km locality are likely over > 9000 ha, and the removal of 4.57 ha equates to < 1%. Given the amount of avoidance of the TEC, and despite potential for cumulative impacts from projects such as Myrtle Creek Solar Farm, Summerville Solar Farm, and Clarence Valley Solar Farm, it is unlikely that significant impacts would occur to this TEC as a result of the Project.	Significant impact unlikely
Coastal Swamp Sclerophyll Forest	Unlikely to be significant impacts	Not recorded within Development Footprint	No	This community does not occur within the refined Subject Land and Development Footprint and will not be impacted as a result of the Project.	Significant impact unlikely
Rupps Wattle <i>Acacia ruppii</i>	Some risk of significant impact	Not recorded within Development Footprint during targeted surveys	Unlikely	Targeted surveys for Rupps Wattle have been carried out throughout the Development Footprint in September and December 2023 and this species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 5.6 ha of PCTs associated with this species (PCT 3428 and 4046) will be removed, which is not considered to be substantial in relation to the 140.36 ha to be retained within the Project Area, including 66.62 ha within the Subject Land. Potential	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
				indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but is not limited to a detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
<i>Paspalidium grandispiculatum</i>	Unlikely to be significant impacts	Unlikely to be present	Unlikely	No individuals of <i>Paspalidium grandispiculatum</i> have been recorded within the Subject Land during field work, and the Subject Land lies outside the area where the species is generally known to occur (between Doubleduke and Whiporie National Parks). In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 15.67 ha of PCTs associated with the species (PCT 3420) will be removed, which is not considered to be substantial in relation to the 330.75 ha occurring within the Project Area including 64.25 ha within the Subject Land. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but is not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Sandstone Rough-barked Apple <i>Angophora robur</i>	Unlikely to be significant impacts	Not recorded within Development Footprint during targeted surveys	Unlikely	Targeted surveys for Sandstone Rough-barked Apple have been carried out throughout the Development Footprint in September and December 2023 and January 2024 and this species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 20.14 ha of PCTs associated with the species (PCT 3420 and 3428) will be removed, which is not considered to be substantial in relation to the 358.23 ha to be retained within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7,	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
				which includes but is not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Slaty Red Gum <i>Eucalyptus glaucina</i>	Some risk of significant impact	Not recorded within Development Footprint during targeted surveys	Unlikely	Targeted surveys for Slaty Red Gum have been carried out throughout the Development Footprint in September and December 2023 and January 2024 and this species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 16.79 ha of PCTs associated with the species (PCT 3420 and 4046) will be removed as a result of the Project, which is not considered to be substantial in relation to the 412.3 ha to be retained within the Subject Land and broader Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but is not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Square-fruited Ironbark <i>Eucalyptus tetrapleura</i>	Some risk of significant impact	Not recorded within Development Footprint during targeted surveys	Unlikely	Targeted surveys for Slaty Red Gum have been carried out throughout the Development Footprint in September and December 2023 and January 2024 and this species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 20.14 ha of PCTs associated with the species (PCT 3428 and 3420) will be removed as a result of the Project, which is not considered to be substantial in relation to the 358.23 ha to be retained within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but is not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
Australasian Bittern <i>Botaurus poiciloptilus</i>	Unlikely to be significant impacts	Transient only	Unlikely	There is suboptimal habitat for the Australasian Bittern within the Subject Land, consisting of degraded riparian and wetland fringes, with higher quality habitat actively avoided during the detailed design stages. A small area (1.12 ha) of PCTs associated with this species (PCT 4046) will be impacted by the Project, and it is unlikely that this species would occur within the Subject Land, other than rare transient use or during increased seasonal flooding events and only on a temporary basis. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	Unlikely to be significant impacts	Not recorded within Development Footprint during targeted surveys	Unlikely	Not recorded during targeted surveys in April 2023. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 20.14 ha of PCTs associated with this species (PCTs 3428 and 3420), however this is not considered to be substantial in relation to the 378.37 ha within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Greater Glider <i>Petauroides Volans</i>	Unlikely to be significant impacts	Not recorded within Development Footprint during targeted surveys	Unlikely	Not recorded during targeted surveys in July/August 2023, September 2023 and October 2023. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), however this is not considered to be substantial in relation to the	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
				471.56 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Yellow-bellied Glider <i>Peaurus australis australis</i>	Unlikely to be significant impacts	Unlikely to be present	Unlikely	In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), however this is not considered to be substantial in relation to the 455.44 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
Koala <i>Phascolarctos cinereus</i>	Some risk of significant impact	Not recorded within Development Footprint during targeted surveys	Unlikely	Not recorded during targeted surveys in August and December 2023. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420) including potential feed trees such as Forest Red Gum, however this is not considered to be substantial in relation to the 455.44 ha of potential habitat within the Subject Land and Project Area. Preferred feed trees and major connectivity and movement corridors have been avoided. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Hooded Robin <i>Melanodryas cucullata cucullata</i>	Unlikely to be significant impacts	Unlikely to be present	Unlikely	Hooded Robin was not recorded opportunistically within the Subject Land. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 20.14 ha of PCTs associated with this species (PCTs 3428 and 3420), however this is not considered to be substantial in relation to the 374.35 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Grey-headed Flying Fox <i>Pteropus Poliocephalus</i>	Some risk of significant impact	Previously recorded, however no habitat	Unlikely	No breeding camps were found to occur within the Subject Land. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species,	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
		constraints.		were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Approximately 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420) will be impacted by the project, which is not considered to be substantial in relation to the 471.56 ha to be retained within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but is not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	Unlikely to be significant impacts	Unlikely to be present	Unlikely	Spotted-tailed Quoll was not recorded opportunistically within the Subject Land. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), however this is not considered to be substantial in relation to the 455.44 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Diamond Firetail <i>Stagonopleura guttata</i>	Unlikely to be significant impacts	Previously recorded, however no habitat constraints.	Unlikely	Diamond Firetail was not recorded opportunistically within the Subject Land, but has been previously recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), which may be used opportunistically by the	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
				mobile species, however this is not considered to be substantial in relation to the 455.44 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	Unlikely to be significant impacts	Unlikely to be present	Unlikely	Brown Treecreeper was not recorded opportunistically within the Subject Land. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), which may be used opportunistically by the species, however this is not considered to be substantial in relation to the 455.44 ha of potential habitat within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Green and Golden Bell Frog	Unlikely to be significant impacts	Not recorded within Development Footprint during targeted surveys	Unlikely	Not recorded during targeted surveys in December 2023. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), however this is not considered to constitute breeding habitat, and is not substantial in relation to the 471.56 ha within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not	Significant impact unlikely

MNES	DCCEEW consideration (EPBC referral)	Updated likelihood of occurrence based on assessment	Potential impacts	Rationale	SIC self-assessment undertaken / result (Appendix 5)
				limited to detailed BMP, pre-clearance surveys, exclusion fencing, adaptive management and unexpected finds procedures.	
Giant Barred Frog	Some risk of significant impact	Not recorded within Development Footprint during targeted surveys	Unlikely	Not recorded during targeted surveys in December 2023. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the Development Footprint as demonstrated in Section 5.2 and 5.3. Direct impacts include removal of 21.27 ha of PCTs associated with this species (PCTs 4046, 3428 and 3420), however this is not considered to constitute breeding habitat, and is not substantial in relation to the 471.56 ha within the Subject Land and Project Area. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 7, which includes but not limited to detailed BMP, pre-clearance surveys, exclusion fencing, adaptive management and unexpected finds procedures.	Significant impact unlikely

9.2 Environmental Planning and Assessment Act 1979/Environmental Planning and Assessment Regulation 2021

The Project is SSD and development consent is being sought under Section 4 of the NSW EP&A Act. An EIS is a requirement of the development assessment process.

A Scoping Report was prepared and submitted to DPE in July 2022. SEARs were issued for the Project on 21 September 2022. The SEARs form the basis of the assessment criteria for the Project. The project was determined to be a Controlled Action under the Commonwealth EPBC Act (EPBC 2023/09641) based on the Project's preliminary Development Footprint and supplementary SEARs were issued on 4 March 2024. Following refinement of the Development Footprint and significant reduction in direct impacts, the Project is no longer deemed to have a significant impact on EPBC Act listed entities assessed in Appendix 5.

9.3 State Environmental Planning Policies

9.3.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 3: Koala habitat protection 2020

Chapter 3 of State Environmental Planning Policy (Biodiversity and Conservation) 2021, applies to identified LGAs in areas not zoned as RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry, and within these rural land zonings, the former State Environmental Planning Policy (Koala Habitat Protection) 2020 (Koala SEPP 2020) continues to apply. The Development Footprint occurs on rural zoning (RU1 Primary Production) so the Koala SEPP 2020 would be relevant to the Project; however, this chapter only applies to development applications where Council is the consent authority, which is not the case for the Project.

The aims of Chapter 3 Koala Habitat Protection 2020 and Chapter 4 Koala Habitat Protection 2021 are to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

These aims and considerations have been addressed in accordance with the BAM and the BC Act, as well as the Commonwealth EPBC Act, in preparation of this BDAR. Habitat and opportunistic surveys have been undertaken for Koala to ascertain their presence within the Subject Land with measures to avoid and minimise impacts to the species have been employed.

9.4 Local Land Services Act 2013 and Local Land Services Amendment Act 2016

The LLS Act defines 'category 1-exempt' and 'as areas of the State to which Part 5A of the LLS Act applies, which are designated as category 1-exempt land on the 'native vegetation regulatory map', prepared and published under the LLS Act. An assessment of non-native vegetation or areas exempt from further assessment was undertaken in accordance with BC Act s6.8(3), which states that any assessment relating to biodiversity is to exclude the clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the Local Land Services Amendment Act 2016 (LLS Act)). This excludes any impacts prescribed by the regulations under section 6.3. Additionally, in accordance with section 1.5 of the BAM, biodiversity values that do not need to be assessed include: (d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land

(within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation.

9.5 Biodiversity Conservation Act 2016

The NSW BC Act requires that the BAM be applied to all proposals that trigger the BOS, and that a BDAR is required to be submitted to the approval authority. This Project is SSD and, therefore, the BOS applies in accordance with Section 7.9 of the BC Act. A BDAR is required, prepared in accordance with the BAM (DPIE 2020a).

9.6 Biosecurity Act 2015

The Biosecurity Act provides for the identification, classification and control of priority weeds and pest fauna species with the purpose of determining if a biosecurity risk is likely to occur. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within NSW or any part of the State. A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

The General Biosecurity Duty as outlined in the Biosecurity Act states:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Three priority weeds for the North Coast LLS Region have been recorded in the Subject Land and are listed in Table 55, along with their associated Duty.

Table 55 Priority weeds within the Subject Land

Scientific name	Common name	Relevant biosecurity duty
<i>Lantana camara</i>	Lantana	General Biosecurity Duty.
<i>Lycium ferocissimum</i>	African Boxthorn	General Biosecurity Duty.
<i>Senecio madagascariensis</i>	Fireweed	General Biosecurity Duty.

In addition to invasive flora species, invasive fauna species identified during the field investigation or known to occur in the broader locality include Cane toad and Fire ants.

The invasion and establishment of the cane toad in NSW has been identified as a key threatening process under the BC Act and infestation poses a threat to the biosecurity of NSW. The large numbers observed during surveys suggest an infestation is evident. Landowners have a biosecurity duty under the NSW *Biosecurity Act 2015* to prevent the spread of cane toads from where they are currently established (north-east NSW to the Clarence River). Therefore, mitigations implemented are required to contain, and minimise the impacts of the cane toads in this region.

As of February 2024, Fire ants *Solenopsis invicta* have been detected in the community of Wardell, approximately 42 kilometres north east of the Subject Land. As a result, an NSW Biosecurity (fire ant) Emergency Order (No 3) has been implemented within northern NSW and southern Queensland (QLD).

Restrictions apply on the movement of fire ant carrier material:

- Redefines the fire ant zones following a new detection in Currumbin Waters, QLD on 6 March 2024.
- Controls movement of fire ant carrier materials into NSW from the fire ant infested areas of QLD and NSW.
- Controls movement of fire ant carrier materials from the Fire Ant Movement Control Areas in South Murwillumbah and Wardell

Anyone bringing organic mulch, compost, growing media, manure, soil, hay, straw, chaff, silage, potted plants, turf, agricultural equipment, earth moving equipment, sand, gravel, chitters, coal fines, coal stone, overburden and decomposed granite into NSW from Queensland must comply with the current NSW Biosecurity (Fire Ant) Emergency Order under the Biosecurity Act 2015 to prevent the spread of Fire ants. Therefore, mitigations implemented are required to contain, and minimise the spread of Fire ants in this region.

9.7 Water Management Act 2000

The WM Act provides for the sustainable and integrated management of the state's water. The WM Act is supported by a series of interpretation guidelines which provide design considerations and overarching management measures for works on waterfront land. These considerations and management measures should be considered when planning and undertaking the Project. To which the following guidelines are relevant:

- *Guidelines for watercourse crossings on waterfront land* (DPE 2022b).
- *Guidelines for outlet structures on waterfront land* (DPE 2022c).
- *Guidelines for laying pipes and cables in watercourses on waterfront land* (DPE 2022d).
- *Guidelines for instream works on waterfront land* (DPE 2022e).

Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt under Section 91E of the WM Act, Section 4.41 of the EP&A Act. Land is defined within the Act as the bed of any river, lake or estuary and any land within 40 m of the river banks, lake shore or estuary mean high water mark. While one fourth order ephemeral watercourse within the subject land did not exhibit defined bed and banks, several other ephemeral watercourses displaying these features occur within the subject land. In addition, Physics Creek occurs within 40 metres of Subject Land.

While the Project would be considered waterfront land, the Project is SSD, and is therefore exempt from the requirement to obtain a Controlled Activity Approval for activities on or under waterfront land. Therefore, works proposed within the mapped riparian corridor will be assessed as part of the EIS. The Project is consistent with the riparian corridor matrix (first, second, third and fourth order waterways) of the NSW Natural Resources Access Regular (NRAR) (2022f).

9.8 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through an Assessment of Significance process.

There is KFH as mapped within the Subject Land comprising a combination of 3rd and 4th order (Strahler 1964) tributaries of Physics Creek within the northwest and southeast. NSW DPI is required to assess all projects

that involve structures that span the full width of a waterway (including pipe crossings) or modifies the velocity or quantity of water. As earthworks or reclamation works may be required within the north-east of the Subject Land, a precautionary approach would involve applying for a permit under Part 7 of the FM Act to temporarily obstruct fish passage during construction (Section 219), and for dredging or reclamation works (Section 201).

Predicted habitat for threatened aquatic species Purple Spotted Gudgeon is mapped on the DPI spatial data portal within the south-east of the Subject Land (DPI 2023) comprising Physics Creek. However, no records of the species or other threatened aquatic species have been recorded within 10 kilometres of the Subject Land on the BioNet Atlas of NSW. The Project has the potential to result in changes in water quality and quantity, however this waterway is currently degraded, as it is mapped as poor habitat for freshwater fish species (DPI 2023); and is subject to runoff, trampling and erosion from surrounding land use, and observation during fieldwork indicates it is inhabited by a large population of Cane Toads.

It is therefore unlikely the ephemeral stream would constitute habitat for Purple Spotted Gudgeon or other threatened freshwater species. In addition, any waterway crossings would be in accordance with the Act and assessed as part of the EIS, and management measures developed to mitigate the identified risks, as would be specified in the CEMP and OEMP including erosion and sediment controls mean the potential for the Project to impact upon entities protected under the FM Act is considered low and not assessed further in this report.

10 Biodiversity offset strategy

10.1 Offsetting obligations and options

Table 56 and Table 57 provide details required by the Project's residual impacts to biodiversity values following all efforts to avoid and minimise those impacts.

Table 56 Offsets required (ecosystem credits)

Vegetation zone	Impact (ha)	VI score	TEC	HBTs	Credit requirement
4046_Moderate	0.48	66	Subtropical Coastal Floodplain Forest (Endangered, BC Act and EPBC Act)	Yes	16
4046_Riparian	0.64	37.5	Subtropical Coastal Floodplain Forest (Endangered, BC Act and EPBC Act)	No	12
3428_Moderate	3.21	39.4	Subtropical Coastal Floodplain Forest (Endangered, BC Act and EPBC Act)	Yes	63
3428_Low	1.27	24.2	Subtropical Coastal Floodplain Forest (Endangered, BC Act)	Yes	15
3420_Good	2.08	61.5	Not a TEC	Yes	56
3420_Moderate	11.81	51.6	Not a TEC	Yes	266
3420_Regen	1.78	28.8	Not a TEC	No	22
Total					450

Table 57 Offsets required (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)	Credit requirement
4046_Riparian	Green-thighed Frog	37.5	0.64	9
Subtotal				9
3420_Good	Southern Myotis	61.5	0.64	20
3420_Moderate		51.6	3.4	88
3428_Low		24.2	0.63	8
3428_Moderate		39.4	1.9	37
4046_Moderate		66	0.21	7
4046_Riparian		37.5	0.64	12
Subtotal				172
3420_Good	Barking Owl	61.5	0.91	28
3420_Moderate		51.6	3.68	95
3428_Low		24.2	1.08	13
3428_Moderate		39.4	1.22	24

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)	Credit requirement
4046_Moderate		39.4	0.32	11
4046_Riparian		37.5	0.64	12
Subtotal				183
3420_Good	Squirrel Glider	61.5	0.38	12
3420_Moderate		51.6	8.5	219
3420_Regen		28.8	1.2	18
Subtotal				249
3420_Good	Brush-tailed Phascogale	61.5	2.1	64
3420_Moderate		51.6	11.8	304
3420_Regen		28.8	1.8	26
3428_Low		24.2	1.3	15
3428_Moderate		39.4	3.2	63
4046_Moderate		66	0.48	16
4046_Riparian		37.5	0.64	12
Subtotal				500
3420_Good	Common Planigale	61.5	2.1	64
3420_Moderate		51.6	11.8	304
3420_Regen		28.8	1.8	26
3428_Low		24.2	1.3	15
3428_Moderate		39.4	3.2	63
4046_Moderate		66	0.48	16
4046_Riparian		37.5	0.64	12
Subtotal				500
Grand total				1613

To secure the above offset liability, the applicant has three broad options, which include:

- Payment to the Biodiversity Conservation Fund (the Fund) managed by the Biodiversity Conservation Trust (BCT).
- Purchase of credits from the open market.
- Establishment of a Biodiversity Stewardship Site(s) to generate credits for offsetting the project specifically.

An overview of each of the options is briefly outlined below.

Option 1: Payment to the Biodiversity Offset Fund managed by the BCT

Satisfying an offset obligation by paying to the Biodiversity Offset Fund (the Fund) has the major benefit of being an expedited and unambiguous way for a proponent to meet their obligations. However, it does include increased costs associated with the 'Risk premium', and an administrative cost per credit added on top of the costs to source/generate the credits, calculated by the BCT. As such, Payment to the Fund is considered likely to be the most expensive option available to a proponent, however it requires the least amount of time and effort in offset security, which can both be substantial (e.g., compared to establishing a Stewardship Site).

Option 2: Purchase credits from the open market

Biodiversity credits exist in an open market-based system whereby an owner of a Biodiversity Stewardship Site, who has generated a range of biodiversity credits, lists their credits in an online database for proponents with a credit obligation to interrogate and enter into price negotiations with relevant credit holders. As an open market, the price of credits is set by supply and demand factors as well as requirements for credits generated at a Biodiversity Stewardship Site to be sold for at least the minimum portion each credit contributes to the management costs of that site (Part A cost, further detailed below). Initial credit sales must all go to funding the management actions required to be undertaken at the Biodiversity Stewardship Site (the costing of which is termed the 'Total Fund Deposit' [TFD]), however once the TFD has been fully satisfied, any future credit sales are generally direct profit to the credit owner.

Option 3: Establish a Biodiversity Stewardship Site

Establishment of a Biodiversity Stewardship Site (or multiple sites) with the intention of generating credits to satisfy the Project's offset obligation is considered likely to be the most suitable option available to Ark Energy for the Project. This is partly due to the quantum of offsets required for the project, and the associated cost of securing those offsets through either the open credit market or via payment to the Fund. The suitability of this option is dependent on securing land that is both suitable for the establishment of a Biodiversity Stewardship Site and supports PCTs/habitats considered Like-for-Like with those impacted by the project. Establishing local Biodiversity Stewardship Sites provides the greatest benefit to locally occurring (and impacted) biodiversity values by establishing offsets and undertaking ecological restoration in the local area, potentially allowing for the benefits to be realised by populations of species impacted by the Project. Some of the areas avoided by the Project to date, where greater than 20 hectares, may be feasible for potential stewardship sites, particularly in the northwest of the Subject Land.

11 Biodiversity credit report

Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to vegetation zones, threatened species and scattered trees at the Subject Land. A biodiversity credit report is provided below.

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00040375/BAAS17051/23/00040376	Richmond Valley Solar Farm Impacts	14/03/2024
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	03/05/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	03/05/2024
Assessment Revision	Assessment Type	
6	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Clarence Lowland Ironbark-Spotted Gum Grassy Forest												
1	3420_Good	Not a TEC	61.5	61.5	2.1	PCT Cleared - 55%	High Sensitivity to Gain			1.75		56

BAM Credit Summary Report

2	3420_Moderate	Not a TEC	51.6	51.6	11.8	PCT Cleared - 55%	High Sensitivity to Gain			1.75		266
3	3420_Regen	Not a TEC	28.8	28.8	1.8	PCT Cleared - 55%	High Sensitivity to Gain			1.75		22
											Subtotal	344
Northern Lowland Red Gum-Swamp Turpentine Grassy Forest												
4	3428_Low	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	24.2	24.2	1.3	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		15
5	3428_Moderate	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	39.4	39.4	3.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		63
											Subtotal	78

BAM Credit Summary Report

Northern Lowland Swamp Turpentine-Red Gum Forest												
6	4046_Moderate	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	66	66.0	0.48	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		16
7	4046_Riparian	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	37.5	37.5	0.64	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		12
											Subtotal	28
											Total	450

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits
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<i>Litoria brevipalmata / Green-thighed Frog (Fauna)</i>									
4046_Riparian	37.5	37.5	0.64	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	9
								Subtotal	9
<i>Myotis macropus / Southern Myotis (Fauna)</i>									
3420_Good	61.5	61.5	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	20
3420_Moderate	51.6	51.6	3.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	88
3428_Low	24.2	24.2	0.63	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	8
3428_Moderate	39.4	39.4	1.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	37
4046_Moderate	66.0	66.0	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7

BAM Credit Summary Report

4046_Riparian	37.5	37.5	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	12
								Subtotal	172
<i>Ninox connivens / Barking Owl (Fauna)</i>									
3420_Good	61.5	61.5	0.91	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	28
3420_Moderate	51.6	51.6	3.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	95
3428_Low	24.2	24.2	1.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	13
3428_Moderate	39.4	39.4	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	24
4046_Moderate	66.0	66.0	0.32	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	11

BAM Credit Summary Report

4046_Riparian	37.5	37.5	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	12
								Subtotal	183
<i>Petaurus norfolcensis / Squirrel Glider (Fauna)</i>									
3420_Good	61.5	61.5	0.38	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	12
3420_Moderate	51.6	51.6	8.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	219
3420_Regen	28.8	28.8	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	18
								Subtotal	249
<i>Phascogale tapoatafa / Brush-tailed Phascogale (Fauna)</i>									
3420_Good	61.5	61.5	2.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	64

BAM Credit Summary Report

3420_Moderate	51.6	51.6	11.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	304
3420_Regen	28.8	28.8	1.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	26
3428_Low	24.2	24.2	1.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	15
3428_Moderate	39.4	39.4	3.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	63
4046_Moderate	66.0	66.0	0.48	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	16
4046_Riparian	37.5	37.5	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	12
								Subtotal	500

<i>Planigale maculata / Common Planigale (Fauna)</i>									
3420_Good	61.5	61.5	2.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	64
3420_Moderate	51.6	51.6	11.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	304
3420_Regen	28.8	28.8	1.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	26
3428_Low	24.2	24.2	1.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	15
3428_Moderate	39.4	39.4	3.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	63

BAM Credit Summary Report

4046_Moderate	66.0	66.0	0.48	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	16
4046_Riparian	37.5	37.5	0.64	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	12
								Subtotal	500

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00040375/BAAS17051/24/00046692	Richmond valley solar scattered trees	14/03/2024
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	03/05/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	03/05/2024
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
3420-Clarence Lowland Ironbark-Spotted Gum Grassy Forest			
3	True	4.0	4
			4
3428-Northern Lowland Red Gum-Swamp Turpentine Grassy Forest			
3	False	4.0	3
3	True	3.0	3
3	False	1.0	1
3	False	3.0	2
3	True	1.0	1
2	False	1.0	1
			11
4046-Northern Lowland Swamp Turpentine-Red Gum Forest			
3	True	9.0	9
3	False	1.0	1
2	True	1.0	1
			11
			26

Species credits for threatened species

Nil



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00040375/BAAS17051/23/00040376	Richmond Valley Solar Farm Impacts	14/03/2024
Assessor Name	Assessor Number	BAM Data version *
Mitchell Palmer	BAAS17051	67
Proponent Names	Report Created	BAM Case Status
	03/05/2024	Finalised
Assessment Revision	Assessment Type	Date Finalised
6	Major Projects	03/05/2024

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

BAM Biodiversity Credit Report (Like for like)

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3420-Clarence Lowland Ironbark-Spotted Gum Grassy Forest	Not a TEC	15.7	322	22	344
3428-Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	4.5	78	0	78
4046-Northern Lowland Swamp Turpentine-Red Gum Forest	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	1.1	16	12	28

3420-Clarence Lowland Ironbark-Spotted Gum Grassy Forest	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	Clarence Dry Sclerophyll Forests This includes PCT's: 3420, 3425, 3427, 3428	Clarence Dry Sclerophyll Forests >=50% and <70%	3420_Good	Yes	56	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Clarence Dry Sclerophyll Forests This includes PCT's: 3420, 3425, 3427, 3428	Clarence Dry Sclerophyll Forests >=50% and <70%	3420_Moderate	Yes	266	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Clarence Dry Sclerophyll Forests This includes PCT's: 3420, 3425, 3427, 3428	Clarence Dry Sclerophyll Forests >=50% and <70%	3420_Regen	No	22	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

3428-Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	3428_Low	Yes	15	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	3428_Moderate	Yes	63	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

4046-Northern Lowland Swamp Turpentine-Red Gum Forest	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	4046_Moderate	Yes	16	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	4046_Riparian	No	12	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Litoria brevipalmata / Green-thighed Frog	4046_Riparian	0.6	9.00
Myotis macropus / Southern Myotis	3420_Good, 3420_Moderate, 3428_Low, 3428_Moderate, 4046_Moderate, 4046_Riparian	7.4	172.00
Ninox connivens / Barking Owl	3420_Good, 3420_Moderate, 3428_Low, 3428_Moderate, 4046_Moderate, 4046_Riparian	7.9	183.00
Petaurus norfolcensis / Squirrel Glider	3420_Good, 3420_Moderate, 3420_Regen	10.1	249.00
Phascogale tapoatafa / Brush-tailed Phascogale	3420_Good, 3420_Moderate, 3420_Regen, 3428_Low, 3428_Moderate, 4046_Moderate, 4046_Riparian	21.3	500.00
Planigale maculata / Common Planigale	3420_Good, 3420_Moderate, 3420_Regen, 3428_Low, 3428_Moderate, 4046_Moderate, 4046_Riparian	21.3	500.00

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Like for like)

Litoria brevipalmata / Green-thighed Frog	Spp	IBRA subregion
	Litoria brevipalmata / Green-thighed Frog	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascogale tapoatafa / Brush-tailed Phascogale	Spp	IBRA subregion
	Phascogale tapoatafa / Brush-tailed Phascogale	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00040375/BAAS17051/24/00046692	Richmond valley solar scattered trees	14/03/2024
Assessor Name	Assessor Number	BAM Data version *
Mitchell Palmer	BAAS17051	67
Proponent Names	Report Created	Date Finalised
	03/05/2024	03/05/2024
Assessment Revision	Assessment Type	BAM Case Status
0	Scattered Trees	Finalised
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
Major Project		

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

Assessment Id	Proposal Name	Page 1 of 4
00040375/BAAS17051/24/00046692	Richmond valley solar scattered trees	

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	HBT Cr	No HBT Cr	Credits
4046-Northern Lowland Swamp Turpentine-Red Gum Forest	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	10	1	11
3428-Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	4	7	11
3420-Clarence Lowland Ironbark-Spotted Gum Grassy Forest	Not a TEC	4	0	4

Credit classes for 3420	Like-for-like options				
	Class	Trading group	HBT	Credits	IBRA region
	Clarence Dry Sclerophyll Forests	Clarence Dry Sclerophyll Forests >=50% and <70%	Yes	4	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 3428	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	-	Yes	4	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	-	No	7	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 4046	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region
	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	-	Yes	10	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	-	No	1	Clarence Lowlands, Clarence Sandstones, Scenic Rim, Woodenbong and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



Scattered Tree Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00040375/BAAS17051/24/00046692	Richmond valley solar scattered trees	14/03/2024
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	03/05/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	03/05/2024
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	Major Project

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Scattered Trees

PCT code	PCT name	No. of trees	Species	DBHOB Category	Contain hollows	Class	Assessment required
3420	Clarence Lowland Ironbark-Spotted Gum Grassy Forest	4	Corymbia henryi	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Scattered Tree Report

3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	4	Corymbia henryi	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	3	Eucalyptus tereticornis	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	1	Corymbia intermedia	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	3	Eucalyptus siderophloia	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	1	Eucalyptus propinqua	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
3428	Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	1	Corymbia intermedia	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Scattered Tree Report

4046	Northern Lowland Swamp Turpentine-Red Gum Forest	9	Eucalyptus tereticornis	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
4046	Northern Lowland Swamp Turpentine-Red Gum Forest	1	Lophostemon suaveolens	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
4046	Northern Lowland Swamp Turpentine-Red Gum Forest	1	Eucalyptus siderophloia	>= 20cm and <50cm	True	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

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Appendices

Appendix 1 Survey methods

Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, Harden 2000, Harden 2002). All doubtful species names were verified with the online Australian Plant Name Index (Australian National Botanic Gardens & Australian National Herbarium 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the DCCEEW (DSEWPaC 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by DPIE (SL100758, expiry date 30 June 2024). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Mitchell Palmer (BAAS17051).

Appendix 1.3 Limitations

Field surveys were undertaken in accordance with the BAM (DPIE 2020a). Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site. The field survey was conducted in winter, spring and summer which is considered a suitable time to determine the presence of most threatened species.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein regarding this and all other species' likelihood of occurrence within the Subject Land.

Database searches, and associated conclusions on the likelihood of species to occur within the Assessment Area, are reliant upon external data sources and information managed by third parties.

Appendix 2 BAM Candidate species assessment

Table A 1 Threatened flora species assessment

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Arthraxon hispidus</i> Hairy-joint Grass	VU	VU	Yes	Creeping perennial grass with a distribution spanning from the northern tablelands to the north coast of NSW. Grows in moist, shaded areas within the vicinity of rainforest and wet sclerophyll woodland, often close to waterbodies.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Habitat is broadly represented by PCT 4046, 4001 and 3428. Species not recorded during targeted surveys.
<i>Cyperus aquatilis</i> Water Nutgrass		EN	Yes	Sedge known from only a few sites north from Grafton. Grows in ephemeral depressions, ditches and seepage areas near cliffs in Coastal Valley Grassy Woodlands. Grows in areas dominated by sandstone geology.	Medium	No	Excluded – Habitat degraded	Low	A small number of records (10) occur within the locality. Habitat is unsuitable as there are no cliffs within the Subject Land, and associated habitat along waterways occurs in a degraded state due to historical plantation activities.
<i>Eucalyptus glaucina</i> Slaty Red Gum	VU	VU	Yes	Medium sized tree, confined to the north coast of NSW at Casino as well as Taree to Broke, west of Maitland. Grows in a variety of communities including Hunter - Macleay Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Northern Hinterland Wet Sclerophyll Forests and Coastal Valley	High	Yes	Included – Survey undertaken	Low	238 records occur within 10 km of the Subject Land, with the closest 74 m away. Broadly associated with PCT 3420 and 4046, with potential habitat available within the Subject Land. Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Grassy Woodlands. Grows on deep, moderately fertile, well-watered soils.					
<i>Indigofera baileyi</i> Bailey's Indigo		EN	Yes	Erect, perennial herb restricted to the north-east corner of NSW between Wylie Creek and Inverell including surrounds. Grows in open woodland situations in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Escarpment Wet Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows on soils derived from granite or basalt.	High	Yes	Included – Survey undertaken	Low	A small number of records (24) occur within 10 km of the Subject Land. Broadly associated with PCT 3420 and 3428 with potential habitat available within the Subject Land. Species not recorded during targeted surveys.
<i>Lindernia alsinoides</i> Noah's False Chickweed		EN	Yes	Erect annual herb found growing coastal areas from Bulahdelah to Coopers Creek including occurrences north at Shannon's Creek west of Coutts Crossing and at Bungawalbyn. Grows in swampy sites and wetlands along coastal and hinterland creeks in Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons and Coastal Valley Grassy Woodlands.	Medium	No	Excluded – Habitat degraded	Low	Small number (two) of records within the locality. Broadly associated with PCT 3428 and 4046. However, habitat along waterways has been heavily trampled and modified through long-term grazing and historical plantation activities.
<i>Lindsaea incisa</i> Slender Screw Fern		EN	Yes	Small lithophytic fern restricted to a few locations between Woombah and just south of Coffs Harbour in NSW. Grows in damp areas in Clarence Dry Sclerophyll Forests, Coastal Dune Dry Sclerophyll Forests, North Coast Dry	Medium	Yes	Included – Survey undertaken	Low	Small number of records (eight) over 15 years old occur over 8km from the Subject Land. Broadly associated with PCT 3420, 3228, 4046 and 4001, habitat available within Project

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Sclerophyll Forests, Coastal Swamp Forests, Coastal Valley Grassy Woodlands, Northern Montane Heaths and North Coast Wet Sclerophyll Forests. Grows in waterlogged or poorly drained sandy soils and metasediments on sandstone substrates.					Area along ephemeral waterways, habitat modified through grazing. Species not recorded during targeted surveys.
<i>Maundia triglochinos</i>		VU	Yes	Perennial sedge restricted to coastal NSW from Wyong extending northwards to southern Queensland. Grows in shallow freshwater channels, lagoons, creeks, dams or swamps in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons, Coastal Heath Swamps and Coastal Valley Grassy Woodlands. Grows in heavy clay, low nutrient soils.	Medium	No	Excluded – Habitat degraded	Low	Small number of records (two) over nine km from Subject Land. Broadly associated with PCT 3228, 4046 and 4001, however potential habitat within/surrounding waterways and dams has been modified through heavy trampling and grazing and historical plantation activities.
<i>Melaleuca irbyana</i> Weeping Paperbark		EN	Yes	Large shrub or small tree confined to a few sites near Coraki, Casino and Coutts Crossing north of Grafton. Additional populations occur near Ipswich in south-east Queensland. Grows in poorly drained soils in Clarence Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests. Grows in clay, sandstone or alluvial soils.	Medium	Yes	Included – Survey undertaken	Low	A number of records (54) occur over five km from Subject Land. Broadly associated with PCT 3420, 3228, 4046 and 4001 along ephemeral waterways, however habitat modified through clearing, heavy trampling and grazing. Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Oldenlandia galioides</i> Sweet False Galium		EN	Yes	Delicate annual herb found growing in north-east NSW from Whiporie State Forest south of Casino, the Tweed district and throughout the north-west plains of NSW. Grows along the margins of ephemeral wetlands within paperbark swamps and Forest Red Gum Eucalyptus tereticornis woodlands in Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons, Coastal Heath Swamps and Coastal Valley Grassy Woodlands.	Medium	Yes	Included – Survey undertaken	Low	Small number (three) of records occur over seven km from Subject Land and are over 20 years old. Broadly associated with PCT's 3428 and 4046, with potential habitat along wetland areas in the south-east. Majority of these areas will be avoided. Species not recorded during targeted surveys.
<i>Owenia cepiodora</i> Onion Cedar	VU	VU	No	Tall, evergreen tree with a distribution extending north from the Richmond River in north-east NSW to the Queensland border. Found growing in Dry Rainforests, Subtropical Rainforests, Northern Hinterland Wet Sclerophyll Forests, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests. Grows near soils derived from basalt.	Negligible	No	Not required (not BAM candidate)	Negligible	One record occurs over five km from the Subject Land, recorded over 70 years ago. Broadly associated with PCT 3420, however habitat is unsuitable given the species is generally found in wetter areas such as rainforests and wet sclerophyll forests.
<i>Paspalidium grandispiculatum</i>	VU	VU	Yes	Tufted perennial grass with a distribution confined to north-east NSW from the north of Grafton in the vicinity of Mount Neville, Gibberagee and Doubleduke. Found growing on topography ranging from undulating hills to ridges in North Coast Dry	Medium	Yes	Excluded – habitat degraded	Low	Small number of records (two), occur over nine km from the Subject Land. Broadly associated with PCT 3420, Project Area relatively flat with absence of ridges, and the species occurs further to the

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Sclerophyll Forests. Grows on sandstone in poor sandy soils.					south and south-east from Doubleduke to Whiporie. Microhabitat effected by historical plantation activities.
<i>Persicaria elatior</i> Knotweed, Tall Knotweed	VU	VU	Yes	Erect herb found growing in south-eastern NSW at Mountain Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 4001, however habitat has been degraded through heavy trampling and grazing. Species not recorded during targeted surveys.
<i>Phaius australis</i> Lesser Swamp-orchid	EN	E1	Yes	Terrestrial orchid with a distribution spanning from Queensland to Coffs Harbour in north-east NSW. Grows in coastal areas in swamps dominated by Broad-leaved Paperbark Melaleuca quinquenervia and swampy forest situated at sea level in Coastal Dune Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Wallum Sand Heaths, Dry	Low	Yes	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3428, however potential habitat is degraded, having been heavily trampled and grazed and by historical plantation activities.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Rainforests, Littoral Rainforests, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests.					
<i>Polygala linariifolia</i> Native Milkwort		EN	Yes	Small annual or perennial herb found growing north from Copeton Dam and the Warialda area to Southern Queensland, also found on the north coast near Casino and Kyogle and in far western NSW near Weebah Gate, west of Hungerford. Grows in a variety of communities including Pilliga Outwash Dry Sclerophyll Forests, New England Grassy Woodlands, North-west Alluvial Sand Woodlands, Coastal Swamp Forests, Northern Tablelands Wet Sclerophyll Forests, Fuzzy Box Woodland, White Cypress Pine-Bulloak-Ironbark Woodland, Rough-barked Apple riparian forb-grass open forest, Ironbark-Brown Bloodwood Shrubby Woodland. Grows on granite substrates in dark sandy loam, yellow podsolic or sandy soils.	High	Yes	Included – Survey undertaken	Low	29 records occur within 200 m of the Subject Land. Broadly associated with PCT's 4046, 3428, 3420 and potentially habitat available in grassy forests. Species not recorded during targeted surveys.
<i>Pterostylis</i> spp. Greenhood	EN	EN	No	Deciduous terrestrial orchid with a disjunct distribution from the Milbrodale in the Hunter Region, Albion Park and Yallah in the Illawarra Region and Nowra in the Shoalhaven Region. Found growing amongst grasses on flat or gently sloping land	Low	No	Not required (not BAM candidate)	Low	Small number (11) of records within 3km of the Subject Land. Broad habitat available (dry sclerophyll forest with presence of associated species <i>E. tereticornis</i>).

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				with poor drainage in woodland dominated by Forest Red Gum <i>Eucalyptus tereticornis</i> , Woollybutt <i>E. longifolia</i> , and White Feather Honey-myrtle <i>Melaleuca decora</i> . In Nowra, the orchid can be found growing in association with Spotted Gum <i>Corymbia maculata</i> , Forest Red Gum and Grey Ironbark <i>E. paniculata</i> . In the Hunter Region, the orchid is associated with Narrow-leaved Ironbark <i>E. crebra</i> , Forest Red Gum and Black Cypress Pine <i>Callitris endlicheri</i> . Grows in red brown loam soils.					
<i>Rhodamnia rubescens</i> Scrub Turpentine	CE	CR	Yes	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Low	Yes	Included – Survey undertaken	Low	Not recorded during targeted surveys. One record occurs over 9km from the Subject Land. Broadly associated with PCTs 4046 and 4001, however the species is generally found in littoral rainforest or wet sclerophyll forest. Small degraded patches of habitat were surveyed during the targeted flora surveys, however the species was not recorded.
<i>Rhodomyrtus psidioides</i> Native Guava	CR	CR	Yes	Shrub or small tree which typically grows to 12 m high. Populations are typically restricted to coastal regions of low elevation between Sydney and	Low	Yes	Included – Survey undertaken	Low	Not recorded during targeted surveys. Small number (two) of records within the locality. Broadly associated with PCTs 4046, 4001, and 3428, however

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Maryborough, Queensland. Often found in littoral, warm temperate and subtropical rainforests and wet sclerophyll forests near creeks and drainage lines. This species is known to be particularly susceptible to myrtle rust.					the species is generally found in littoral rainforest or wet sclerophyll forest. Small degraded patches of habitat were surveyed during the targeted flora surveys, however the species was not recorded.
<i>Rotala tripartita</i>		EN	Yes	Annual or short lived perennial herb restricted to two locations in NSW, one in the Casino district and one in the south Grafton area. Found growing in free standing water amongst sedges in Coastal Floodplain Wetlands, Coastal Freshwater Lagoons and Coastal Valley Grassy Woodlands. Grows in exposed silt clay soils.	Medium	Yes	Included – Survey undertaken	Low	Small number of records (4) within 200m of Subject Land. Broadly associated with PCT's 3420 and 3428, however potential habitat within waterbodies such as wetlands and farm dams are modified due to heavy trampling and grazing. Species not recorded during targeted surveys.
<i>Ancistrachne maidenii</i>		VU	Yes	Habitat requirements appear to be specific, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury and Watagan soil landscapes. Flowers in summer. Grows in dry sclerophyll forest on skeletal sandstone-derived soils.	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, potential habitat present (dry sclerophyll forest), habitat subject to disturbance. Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Angophora robur</i> Sandstone Rough-barked Apple	VU	VU	Yes	Dry open forest in sandy or skeletal soils on sandstone, or occasionally granite, with frequent outcrops of rock.	High	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3428 and 3420. Potential habitat present (dry sclerophyll forest). Species not recorded during targeted surveys.
<i>Acacia ruppii</i>	EN	EN	Yes	Dry open forest and shrubland in sandstone areas, often near creeks and lower slopes. Grows in the understorey below Needlebark Stringybark <i>Eucalyptus planchoniana</i> , Red Bloodwood <i>Corymbia gummifera</i> and Smudgy Apple <i>Angophora woodsiana</i> .	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, potential habitat present (dry sclerophyll forest). Species not recorded during targeted surveys.
<i>Belvisia mucronata</i> Needle-leaf Fern		EN	Yes	Fern forming small clumps on trees or rocks in dry rainforest or along creeks in moist open forest. In NSW, it is known from only five locations on the far north coast, north from Conglomerate State Forest, near Coffs Harbour.	Low	No	Excluded – Habitat constraints	Low	No records within the locality. Broadly associated with PCT 3420, however the species is generally found in dry rainforest or moist open forest on cliffs and escarpments which are not present within the Subject Land.
<i>Callistemon linearifolius</i> Netted Bottle Brush		VU	Yes	Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	Low	Yes	Included – Survey undertaken	Low	Predicted distribution only. No records within the locality. Broadly associated with PCT 3428, potential habitat (dry sclerophyll forest). Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Centranthera cochinchinensis</i> Swamp Foxglove		EN	Yes	Uncommon in swampy areas and other moist sites.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3420, 3428, and 4046. It can occur in moist sites but is uncommon. Wetland habitat within the Subject Land is modified due to heavy trampling and grazing and by historical plantation activities.
<i>Coatesia paniculata</i> Axe-Breaker		EN	Yes	Axe-Breaker is found in dry subtropical rainforest and vine scrub, often along rivers.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3428 and 4046, habitat not suitable (absence of dry subtropical rainforest and vine scrub along rivers).
<i>Desmodium acanthocladum</i> Thorny Pea	VU	VU	Yes	Dry rainforest and fringes of riverine subtropical rainforest. On basalt-derived soils at low elevations. Much of its habitat has been cleared for agriculture.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3428 and 4046, however habitat not suitable. This species is generally found in dry rainforest and fringes of riverine subtropical rainforest. Species not recorded during targeted surveys.
<i>Eleocharis tetraquetra</i> Square-stemmed Spike-rush		EN	Yes	Found in damp locations on stream edges and in and on the margins of freshwater swamps.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3420, 3428 and 4046, potential habitat available (damp areas and wetlands), however these

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									areas are modified from heavy trampling, grazing and by historical plantation activities.
<i>Endiandra hayesii</i> Rusty Rose Walnut	VU	VU	Yes	Sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils. The species occurs in regrowth and highly modified forms of these habitats. Flowers have been recorded on the Rusty Rose Walnut in spring and in March, October and November, with fruits recorded in March and May.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 4001 and 4046, however habitat is unsuitable as the species generally occurs in sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils.
<i>Eucalyptus tetrapleura</i> Square-fruited Ironbark	VU	VU	Yes	Dry or moist eucalypt forest and woodlands on sandstone to clay soils.	High	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428 and 4046, potential habitat available (damp areas and wetlands). Species not recorded during targeted surveys.
<i>Geodorum densiflorum</i> Pink Nodding Orchid		EN	Yes	Dry eucalypt forest and coastal swamp forest at lower altitudes, often on sand.	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, potential habitat (dry Eucalypt forest and coastal swamp forest). Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Grevillea masonii</i> Masons Grevillea	EN	EN	Yes	Occurs on gravelly loam soils and in sand in open eucalypt woodland. Resprouts from its lignotuber following disturbance; also regenerates from seed after fire. Flowering usually commences from two to three years of age. Sets plentiful seed and the seed morphology suggests that wind, gravity and ant dispersal; seeds germinate after fire.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420 and 3428, potential habitat (Eucalypt forest, sandy soils). Species not recorded during targeted surveys.
<i>Grevillea banyabba</i> Banyabba Grevillea	VU	VU	Yes	Shrubby open eucalypt forest growing on low ridges and slopes with poor sandy soil. Often growing in association with Bastard White Mahogany <i>Eucalyptus psammitica</i> , Sandstone Rough-barked Apple <i>Angophora robur</i> and Pink Bloodwood <i>Corymbia intermedia</i> .	Low	No	Excluded – Geographic limitations	Negligible	No records within the locality. Broadly associated with PCT 3420 and 3428, potential habitat (Eucalypt forest, sandy soils) however this species is generally restricted to low ridges and slopes within Banyabba Nature Reserve or within a 10 km buffer of the reserve.
<i>Gossia fragrantissima</i> Sweet Myrtle	EN	EN	Yes	Dry subtropical and riverine rainforest. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3428 and 4046, however it is generally found in dry subtropical and riverine rainforest.
<i>Marsdenia longiloba</i> Slender Marsdenia	VU	EN	Yes	Subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, potential habitat available

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				outcrops. Associated species include <i>Eucalyptus crebra</i> , <i>E. microcorys</i> , <i>E. acmenoides</i> , <i>E. saligna</i> , <i>E. propinqua</i> , <i>Corymbia intermedia</i> and <i>Lophostemon confertus</i> . Flowering occurs in summer.					(open eucalypt forest, associated species such as <i>Corymbia intermedia</i>). Species not recorded during targeted surveys.
<i>Melichrus gibberagee</i> Narrow-leaf Melichrus	EN	EN	Yes	Low-altitude dry eucalypt forest on gentle slopes. Found mainly in grassy forests under tall spotted gum and Ironbarks.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420 and 4046, potential habitat available (dry sclerophyll forest), only known from one population 30 km from Project Area. Species not recorded during targeted surveys.
<i>Melichrus hirsutus</i> Hairy Melichrus	EN	EN	Yes	Dry eucalypt forest with a shrubby understorey with sandstone rock outcrops. Found at low altitudes (20 to 150 m) in sandy soils. Flowers occur from March to August, and fruits from August to November.	Low	No	Excluded – Geographic limitations	Negligible	No records within the locality. Broadly associated with PCT 3428, potential habitat (dry eucalypt forest) however the species is generally restricted to the south of Pillar Valley south of the Subject Land.
<i>Myrsine richmondensis</i> Ripple-leaf Muttonwood	EN	EN	Yes	Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil and alluvial deposits. Flowers have been recorded in October and November, fruits have been observed from December to March.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3428 in swamp and creek flats, however potential habitat is modified from heavy trampling, grazing and by historical plantation activities.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Oberonia complenata</i> Yellow-flowered King of the Fairies		EN	Yes	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves.	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 4046, potential habitat (dry eucalypt forest). Species not recorded during targeted surveys.
<i>Olox angulata</i> Square-stemmed Olax	VU	VU	Yes	Dry Coastal sand dune heaths and heathy woodlands on sandy soils, often in association with Wallum Banksia <i>Banksia aemula</i> . Dry sandstone Sclerophyll Forests and woodlands.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, potential habitat (dry eucalypt forest). Species not recorded during targeted surveys.
<i>Prostanthera palustris</i> Swamp Mint-bush	VU	VU	Yes	Grows in in wet shrubland to heathland subject to extended waterlogging in poorly drained white siliceous sandy soil with a high organic content. Flowers from February to June. Fruit has been recorded in February. Recruits predominantly by seed post fire 20% of plants resprouts from basal stem buds after fire.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 3420, 3428 and 4046, however the species is generally found in wet shrubland and heathland which is not present within the Subject Land.
<i>Prostanthera sejuncta</i>		VU	Yes	It grows in woodlands and open forests areas dominated by Eucalyptus bancroftii, Lophostemon suaveolens, Angophora subvelutina, Eucalyptus pilularis, with a mid-layer of Allocasuarina littoralis, Leptospermum brachyandrum, and Banksia oblongifolia. It less commonly occurs in Blackbutt Wet Sclerophyll	High	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428 and 4046, potential habitat available (open forest, associated species such as I. suaveolens, a. littoralis) Species not recorded during targeted surveys.

Species Common Name	Status		BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Forests on sheltered slopes and also drier rocky woodlands. Flowers present all year.					

Table A 2: Threatened fauna species assessment

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN	EN		No	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	Medium	No	Not required (not BAM candidate)	Low	One record occurs within 200m of the Subject Land. Broadly associated with PCT 4046 and 4001 in wetland areas. However majority of these areas have been avoided by the Project.
<i>Ninox connivens</i> Barking Owl		VU		Yes	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	High	Yes	Included – Survey undertaken	Medium	Recorded within Project Area during targeted surveys. Suitable habitat within Subject Land includes large hollows within open farmland and PCTs 4046, 4001 3420 and 3428.
<i>Limosa lapponica baueri</i> Bar-tailed Godwit (baueri)	VU			Yes	It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms. It often occurs around beds of	Low	No	Excluded – species is vagrant	Negligible	No records within the locality. The Subject Land is unlikely to provide suitable habitat for this species given the distance from coastal areas, and that very few records occur inland.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas. It forages at low to mid tide in shallow water or along the water's edge on sandy substrates on intertidal flats, banks and beaches or on soft mud substrates. Its diet consists of worms, molluscs, crustaceans, insects and some plant material. In NSW, its high tide roost areas on sandy beaches, sandbars, spits and near-coastal saltmarsh are frequently shared with other shorebirds. It is rarely found on inland wetlands or in areas of short grass such as farmland, paddocks and airstrips. In large part, the observed decline in Bar-tailed Godwit (Western Alaskan) numbers across Australia stems from ongoing loss of intertidal mudflat habitat at key migration staging sites in the Yellow Sea.					
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	VU	VU		Yes	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.	Medium	No	Not required (not BAM candidate)	Low	107 records occur within 200 m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001 with potential habitat in eucalypt woodland with an open understorey. SIC assessment undertaken and concluded low potential for impact due to highly mobile species and availability of habitat within adjacent areas.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidat e species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale		VU		Yes	The Brush-tailed Phascogale had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. Nests and shelters in tree hollows, tree stumps and occasionally birds' nests, and can use more than 40 nests in a year.	High	Yes	Included – assumed present	Medium	29 records occur within 200m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001 with potential habitat in eucalypt woodland with an open understorey. General habitat survey undertaken. Species assumed present.
<i>Petalura litorea</i> Coastal petaltail		EN		Yes	The Coastal Petaltail occupies a variety of permanent to semi-permanent coastal freshwater wetlands. Adults emerge from late October to late January and probably live for no more than three months. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt flying insects on the wing over the swamp and around its margins. Immediately after mating, females lay eggs into suitable egg laying sites within the swamp. Larvae dig long branching burrows under the swamp. They are slow growing and the larval stage lasts at least 10 years. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation.	Low	No	Excluded – Habitat degraded	Negligible	No records within the locality. Suitable habitat may include forested wetland, much of which has been avoided by the project to the south east of the Subject Land. Forested wetland remaining within the Subject Land has been heavily disturbed from cattle grazing and by historical plantation activities, and is unlikely to support the species. The Subject Land is also a considerable distance from the coast.
<i>Planigale</i>		VU		Yes	Common Planigales inhabit rainforest, eucalypt	Medium	Yes	Included –	Medium	A small number (three) of

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidat e species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>maculata</i> Common Planigale					forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. They are fierce carnivorous hunters and agile climbers, preying on insects and small vertebrates, some nearly their own size. They breed from October to January. The female builds a nest lined with grass, eucalypt leaves or shredded bark.			Assumed present		records occur within 600 m of the Subject Land. Broadly associated with Eucalypt forest in PCT's 3420, 3428, 4046, 4001, however the species is generally found in rocky habitat or hollow logs which were absent in the Subject Land. Assumed present.
<i>Nettapus coromandelianus</i> Cotton Pygmy- Goose		EN		Yes	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. The Cotton Pygmy-goose uses tall standing dead trees with hollows located close to water for roosting and breeding. Nesting occurs between November and April. Goslings remain with the female until approximately six months old. Birds may move according to local feed supply.	Medium	Yes	Included – survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428, 4046 and 4001 with potential habitat available in freshwater swamp and wetland areas. Not recorded during targeted surveys.
<i>Calidris ferruginea</i> Curlew Sandpiper	CR, Mi	E1		Yes	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Low	No	Excluded – Habitat constraints (no important mapped area)	Negligible	No records within the locality. Broadly associated with PCT's 4046 and 4001 with potential habitat present in wetland and swampy areas, however no important mapped area within Subject Land and considerable distance from the coast.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>Stagonopleura guttata</i> Diamond Firetail	VU	VU		No	The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses. Feeds exclusively on the ground on ripe grass and herb seeds, green leaves and insects.	Known	No	Not required (not BAM candidate)	Medium	Previously recorded within the Subject Land. Broadly associated with PCT's 3420, 3428, 4001 with potential habitat present (eucalypt forest).
<i>Vespadelus troughtoni</i> Eastern Cave Bat		VU		Yes	Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428 and 4001, with potential habitat available (dry open forest and woodland) however no caves, cliff lines or rocky overhangs within the Subject Land. Not recorded during targeted surveys.
<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat		VU		No	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in human-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	Known	No	Not required (not BAM candidate)	Medium	Recorded incidentally within Subject Land during targeted surveys. Broadly associated with PCT 3420 and 4001, Foraging and roosting habitat available includes suitable hollows and sclerophyll forest.
<i>Pandion cristatus</i> Eastern		VU		Yes	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent,	Low	No	Excluded – Habitat constraints	Negligible	One record the locality approximately 7.6 km from Subject Land. Broadly associated with PCT's 3420,

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
Osprey					hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.					3428, 4001, wetland present, however the species is generally found in coastal areas. No stick nests found within the Subject Land.
<i>Cercartetus nanus</i> Eastern Pygmy Possum		VU		Yes	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.	High	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428, 4046 and 4001, with potential habitat available (hollows, Eucalypt sclerophyll forest), however the midstorey is generally sparse throughout the Subject Land. Not recorded during targeted surveys.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidat e species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum <i>Pseudocheirus peregrinus</i> dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 ha and females about 0.35 ha. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.					
<i>Dromaius novaehollandiae</i> Emu		E2		Yes	Emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area occurs in open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	High	Yes	Included – Surveys undertaken	Low	147 records occur within 200m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001 with potential habitat present (tea tree plantations, open farmland). Not recorded during targeted surveys.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>Mixophyes iteratus</i> Giant Barred Frog	EN	EN		Yes	Occurs along coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. Found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m, often hiding in leaf litter near permanent fast-flowing streams. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. When not breeding the frogs disperse hundreds of m away from streams.	Medium	Yes	Included – Surveys undertaken	Low	A small number of records (7) recorded approximately 6 km from the Subject Land. Broadly associated with PCT's 4046, 4001, 3428, and 3420, potential habitat (waterways, dams), however habitat is degraded and dominated by Cane Toads. Not recorded during targeted surveys.
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo	VU	VU		Yes	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	High	Yes	Included – Surveys undertaken	Low	65 records within 800 m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046 and 4001 with potential habitat present (<i>Allocasuarina</i> spp. and medium and large hollows). Not recorded during targeted surveys.
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat		VU		No	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and	Known	No	Not required (not BAM candidate)	Medium	Recorded incidentally within Subject Land during targeted survey. Broadly associated with PCT 3420, 4046 and 4001, and foraging and roosting habitat available (dry sclerophyll forest, hollows, waterways).

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidat e species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.					
<i>Litoria aurea</i> Green and Golden Bell Frog	EN	VU		Yes	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes <i>Typha</i> spp. or spikerushes <i>Eleocharis</i> spp. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow <i>Gambusia holbrooki</i> , have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428, 4046, and 4001, with potential habitat available in swampy areas/wetlands/streams and adjacent to grassy areas with <i>Eleocharis</i> spp. However habitat is degraded and dominated by Cane Toads. Not recorded during targeted survey.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					other frogs. Preyed upon by various wading birds and snakes.					
<i>Litoria brevipalmata</i> Green-thighed Frog		VU		Yes	The majority of records for the species are in the NSW North Coast. There are disjunct records near Bulahdelah and in the ranges behind the Central Coast. Populations in NSW have declined over the last century. The Green Thighed Frog occurs within wet forests (swamp forests, wet sclerophyll forest and rainforest) , although records from dry sclerophyll forest have been reported within the northern part of its range. Habitat of the species is poorly known however, the species is thought to forage and shelter in areas of deep leaf litter, dense low vegetation, or both, during non-breeding times. Breeding occurs in flooded paddocks or waterholes next to forest (Barker, 1995 272 /id). The Green Thighed Frog is also considered to be partially arboreal, where it is thought to utilise trees and vegetation within only a few m of the ground.	Medium	Yes	Included – Assumed present	Medium	32 records occur within 800 m of the Subject Land. Broadly associated with PCT's 4046, 4001, 3428 and 3420, with potential habitat (forested wetland). However habitat is degraded and dominated by Cane Toads. Assumed present in small areas of more optimal habitats and absence of cane toads.
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (eastern		VU		No	The eastern sub-species occurs on the western slopes of the Great Dividing Range, the western plains, woodlands in the Hunter Valley and locations on the north coast of NSW. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine, open Box Woodlands on alluvial plains and woodlands on fertile soils in	Known	No	Not required (not BAM candidate)	Medium	Observed during field investigation. Suitable habitat within PCT 4046, 3428, 3420 and 4001 in Eucalypt forests.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
subspecies)					coastal regions. Feeds on invertebrates and builds dome-shaped nests.					
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	VU	VU		Yes	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	High	No	Excluded – Habitat constraints	Low	Previously recorded within Project Area. Broadly associated with PCT's 3420, 3428, 4046, 4001, with potential habitat including flowering myrtaceous species. No breeding camps occur within Subject Land.
<i>Chalinolobus nigrogriseus</i> Hoary Wattled Bat		VU		No	Predominantly a northern species, but occurs in north-eastern NSW to the lower Clarence and Richmond River areas in dry open eucalypt forests, particularly those dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Prefers open habitat types and roosts mainly in tree hollows, but sometimes in rock crevices or buildings.	Known	No	Survey undertaken	Low	Recorded within Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001, and suitably sized hollows. No rock crevices or suitable buildings present.
<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern	EN	VU		No	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.	Medium	No	Not required (not BAM candidate)	Low	A small number (9) of records occur within 3.5 km of the Subject Land, with the most recent record being over 20 years old. Broadly associated with PCT's 3420, 3428, 4001, with potential habitat present (eucalypt forest).

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	EPBC	BC								
form)										
<i>Phascolarctos cinereus</i> Koala	EN	VU, E2		Yes	In NSW, the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges.	High	Yes	Included – Survey undertaken	Medium	854 records occur within 10 km of the Subject Land, with the closest immediately adjacent. Broadly associated with PCT's 3420, 3428, 4046, 4001, with feed trees (<i>E. tereticornis</i>) present. Not recorded during targeted surveys.
<i>Argynnis hyperbius</i> Laced Fritillary	CR	EN		Yes	A butterfly species which occurs in open swampy coastal habitat. Eggs are laid singly on a leaf of the caterpillar's food plant a native Violet, <i>Viola betonicifolia</i> . The Australian Fritillary is restricted to south-east Queensland and north-east NSW in open swampy coastal areas where the larval food plant Arrowhead Violet <i>Viola betonicifolia</i> occurs. Populations have declined dramatically and are now restricted to a few widely separated localities from Port Macquarie to Gympie. The most recent observations of the Australian Fritillary in NSW have been from the Port Macquarie area.	Low	Now	Excluded – Habitat constraints and geographic constraints	Negligible	Outside known distribution, and Subject Land is more than 15 km from the coast. No records within the locality. Broadly associated with PCT's 3428 and 4046, no <i>Viola betonicifolia</i> present within Subject Land.
<i>Miniopterus orianae oceanensis</i>		VU		Yes	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other human-made structures.	Known	Yes	Included – Survey undertaken	Low	Recorded during targeted surveys. Broadly associated with PCT's 3420, 3428, 4046, 4001, with suitable foraging

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
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Large Bent-winged Bat					Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.					habitat available. However no breeding habitat (caves, tunnels, mines and culverts) present.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	VU	VU		Yes	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420 and 3428 with potential foraging habitat. However no breeding habitat within Subject Land (caves, rocky cliffs or overhangs) or within a 2km radius. Not recorded during targeted surveys.
<i>Miniopterus</i>		VU		Yes	Occurs from Victoria to Queensland, on both	Known	Yes	Included –	Low	Recorded during targeted

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	EPBC	BC								
<i>australis</i> Little Bent-winged Bat					sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred km to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.			Survey undertaken		surveys. Broadly associated with PCT's 3420, 3428, 4046, 4001, with foraging habitat (eucalypt forest). However no breeding habitat available (caves, tunnels, mines, culverts).
<i>Hieraaetus morphnoides</i> Little Eagle		VU		Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	High	Yes	Included – Survey undertaken	Low	Small number of records (six) with closest within 900 m of Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001 potential habitat present (forested areas and adjacent open farmland/cropping). However no large stick nests observed. Species not recorded during targeted surveys.
<i>Potorous tridactylus</i> Long-nosed Potoroo (northern)	VU	VU		Yes	Usually found within 50 km of the coast. Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT's 3420 and 4046 with potential habitat in dry sclerophyll forests. However lack of thick groundstorey from disturbance

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					Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue.					from fire and cattle grazing. Not recorded during targeted survey.
<i>Lichenostomus fasciularis</i> Mangrove Honeyeater		VU		Yes	The primary habitat of the species is mangrove woodlands and shrublands but Mangrove Honeyeaters also range into adjacent forests, woodlands and shrublands, including casuarina and paperbark swamp forests and associations dominated by eucalypts or banksias. They occasionally forage in parks and gardens of coastal towns and villages. Mangrove Honeyeaters eat nectar, from flowers, and invertebrates, including marine snails and crabs. They generally forage in mangroves, mainly taking food from among the foliage but also feeding at flowers, and from the trunks and roots. They also sometimes forage among flowering trees and shrubs in adjacent habitats. Breed in late winter and early summer, from about August to December, nearly always building their nests in a densely foliated mangrove tree.	Low	No	Excluded – Geographic constraints	Negligible	Not recorded within the locality. Broadly associated with PCT 4001, however habitat not suitable (does not contain mangroves or vegetation adjacent to mangroves which the species generally forage on). Subject Land located >10 km from coast.
<i>Tyto novaehollandiae</i> Masked Owl		VU		Yes	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	High	Yes	Included – Survey undertaken	Low	24 records occur within 10 km radius, with the closest record within two km of Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001 with potential habitat for foraging (Eucalypt forest). Not recorded during targeted surveys.

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<i>Thersites mitchellae</i> Mitchell's Rainforest Snail	CR	EN		Yes	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat. Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees. Active at night and feeds on leaf litter, fungi and lichen.	Low	Yes	Excluded – Habitat degraded	Negligible	No records within the locality. Broadly associated with PCT 3428, 4046, and 4001, however habitat is unlikely suitable (absence of subtropical rainforest) and swamp forest areas are sparse and subject to disturbance from grazing and clearing within the understorey.
<i>Pseudomys novaehollandiae</i> New Holland Mouse	VU			No	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it	Low	No	Not required (not BAM candidate)	Low	A small number (three) of records approximately three km of the Subject Land, with the most recent record from 1995 (over 20 years old). Broadly associated with PCT's 3420, 4046. However the species is generally found in heathlands and sand dunes.

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					to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.					
<i>Litoria olongburensis</i> Olongburra Frog	VU	VU		Yes	The Olongburra Frog is an "acid" frog confined to the coastal sandplain wallum swamps. Their life-cycle is adapted to the acidic pH (2.8-5.5) of these wetlands. Frogs are highest in abundance in relatively undisturbed wallum swamps. Breeding habitat is characterised by the presence of emergent sedges, with upright species such as <i>Baumea</i> spp. and <i>Schoenus</i> spp. preferred by adult frogs for perching. Frogs can be found in breeding habitat all year. However, little is known about habitat use when breeding is not occurring and drier areas adjacent to primary habitat may also be utilised. Breeding occurs mainly in spring, summer and autumn after rain. Eggs are laid singly in water at the base of sedges.	Low	No	Excluded – Geographic limitations	Negligible	No records within the locality. Broadly associated with PCT 4046, however habitat not likely suitable (absence of acidic coastal sandplain wallum swamps) and the Subject Land is >10 km from the coast.
<i>Hoplocephalus bitorquatus</i> Pale-headed Snake		VU		Yes	Found in a variety of habitats from wet sclerophyll forest to dry eucalypt forest on the western slopes of NSW. Feeds largely on frogs and lizards.	Medium	Yes	Excluded – Habitat degraded	Low	A small number (two) of records occur approximately 4 km from the Subject Land (over 20 years old). Broadly associated with PCT's 3420, 3428, 4046, with potential habitat (eucalypt forest).

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										Minimal habitat trees present. Bias towards dense number of habitat trees within or adjacent to riparian and floodplain habitats which is largely absent from the Subject Land.
<i>Ninox strenua</i> Powerful Owl		VU		Yes	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both unlogged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	High	Yes	Included – Survey undertaken	Low	33 records occur within the locality, with the closest within 400 m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4001, with potential habitat present (eucalypt forest and farmland), and large hollows. Species not recorded during targeted surveys.
<i>Erythrotriorchis radiatus</i> Red Goshawk	EN	CR		Yes	Occur in forest and woodland habitat near permanent water. In NSW prefer Melaleuca swamp forest and open eucalypt woodland. Require greater than 20 m tall trees for nesting.	Low	Yes	Included – Survey undertaken	Low	One record approximately 4 km from the Subject Land and over 20 years old. Broadly associated with PCT's 3420, 3428, 4046, 4001 with potential habitat present (eucalypt forest, wetland/swampy area). However no large stick nests

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										observed within the Subject Land. Species not recorded during targeted surveys.
<i>Calidris canutus</i> Red Knot	EN			Yes	In NSW, the Red Knot mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. It usually forages near the water's edge, with feeding activity regulated by the tide as birds closely follow the tide-edge. The diet consists of worms, bivalves, gastropods, crustaceans and echinoderms. The birds roost on sandy beaches, spits, islets and mudflats close to feeding grounds, usually in open areas. It is rarely found on inland lakes or swamps.	Low	No	Excluded – Habitat constraints (no important area mapped)	Negligible	No records within the locality. Broadly associated with PCT 4001, however habitat is unsuitable, given considerable distance from coastal areas and does not contain bay, inlets, lagoons, harbours or sandflats (rare visitor to terrestrial freshwater swamps). Wetland habitat subject to disturbance (grazing) and the Subject Land does not contain mapped important areas.
<i>Turnix maculosus</i> Red-backed Button-quail		VU		Yes	Over their Australian range, Red-backed Button-quail inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420 and 4001 with potential habitat available (grassland, pasture and crops such as blady grass and sorghum). Species not recorded during

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
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					prefer sites close to water, especially when breeding. The species has been observed associated with the various grasses (in various vegetation formations). Populations in other parts of its range suggest the species prefers sites near water, including grasslands and sedgelands near creeks, swamps and springs, and wetlands. Red-backed Button-quail usually breed in dense grass near water, and nests are made in a shallow depression sparsely lined with grass and ground litter. The timing of breeding is not well known. In NSW, clutches recorded October to mid-February, but elsewhere in Australia, clutches recorded from late November to as late as May-June. It appears only the male incubates the clutch and tends the young, which are precocial. Red-backed Button-quail are nocturnal and crepuscular in their activity, and forage on the ground. They eat seeds and insects, but little is known of their diet.					targeted survey.
<i>Calyptorhynchus banksii</i> Red-tailed Black-Cockatoo		CR		Yes	Occur in a wide variety of habitats, but prefer eucalypt forest and woodland, and often in adjacent Acacia or casuarina woodland or proteaceous woodland or shrubland, especially if recently burnt. Fertile riparian flats and floodplains	Medium	Yes	Included – Survey undertaken	Low	One record occurs approximately 4 km from the Subject Land from over 20 years ago. Broadly associated with PCT's 3420, 3428, 4046, with potential habitat present

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(coastal subspecies)										(eucalypt forest, Allocasuarinas and recently burnt areas). Species not recorded during targeted surveys.
<i>Anthochaera phrygia</i> Regent Honeyeater	CE	CR		Yes	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.	Low	No	Excluded – No important mapped habitat	Negligible	Small number (four) of records occur approximately 5.5 km from Subject Land recorded over 20 years ago. Broadly associated with PCT's 3420, 3428 and 4046, however the species is usually found within box-ironbark forests and wet coastal forests. The Subject Land does not contain mapped important areas.
<i>Aepyprymnus rufescens</i> Rufous Bettong		VU		Yes	The original range from Coen in north Queensland to central Victoria has been reduced to a patchy distribution from Cooktown, Queensland, to north-eastern NSW as far south as Mt Royal National Park. In NSW it has largely vanished from inland areas but there are sporadic, unconfirmed records from the Pilliga and Torrington districts. Occurs in a variety of habitats for coastal eucalypt forest, through tall, wet sclerophyll, to low, dry open woodland. Only occurs in areas with a sparse or grassy	Medium	Yes	Included – Survey undertaken	Low	60 records occur within the locality, with the closest within 100 m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001, with potential habitat (eucalypt forest, sparse/grassy understorey) disturbed. Species not recorded during targeted surveys.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
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					understorey, adjacent to areas of dense undergrowth.					
<i>Rhipidura rufifrons</i> Rufous Fantail	Mi			No	Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts, usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (<i>Eucalyptus maculata</i>), Yellow Box (<i>E. melliodora</i>), ironbarks or stringybarks, often with a shrubby or heath understorey.	Low	No	Not required (not BAM candidate)	Low	Five records within the locality, with closest approximately 1.7km of the Subject Land. Broad potential habitat in Eucalypt forest and regenerating areas, however habitat would likely be marginal only, as the species is usually found to occur within wet sclerophyll forest and rainforests.
<i>Calidris alba</i> Sanderling		VU		Yes	Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. Generally occurs in small flocks, however, may associate freely with other waders. Individuals run behind receding waves, darting after insects, larvae and other small invertebrates in the sand, then dart back up the beach as each wave breaks. Also feeds on plants, seeds, worms, crustaceans, spiders, jellyfish and fish, foraging around rotting heaps of kelp, at the edges of shallow pools on	Low	No	Excluded – Habitat constraints and geographic constraints	Negligible	No records within the locality. Broadly associated with PCT 4001, however habitat is subject to disturbance (grazing) and is considerable distance from coastal areas (tidal flats/dunes) (>2km). The Subject Land does not contain mapped important areas.

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					sandspits and on nearby mudflats. Roosts on bare sand, behind clumps of beach-cast kelp or in coastal dunes. Breeding occurs in the Northern Hemisphere.					
<i>Tyto tenebricosa</i> Sooty Owl		VU		No	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees, mainly eucalypts often located in gullies.	Medium	No	Not required (not BAM candidate)	Low	One record approximately 6 km from the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001, potential habitat (eucalypt forest, hollows), however the Subject Land does not occur near escarpment.
<i>Petauroides volans</i> Southern Greater Glider	EN	EN		Yes	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	High	Yes	Included – Survey undertaken	Low	80 records occur within with the locality, with the closest record in close proximity to the Subject Land (<100 m). Broadly associated with PCT's 3420, 3428, 4046, 4001, with potential habitat in eucalypt forests and large hollows. Species not recorded during targeted surveys.
<i>Myotis macropus</i> Southern Myotis		VU		Yes	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in	Known	Yes	Included – Survey undertaken	Medium	Recorded within Subject Land during targeted surveys. Broadly associated with PCT's 3420, 3428, 4046, 4001, with

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
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					dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.					foraging habitat within Eucalypt forest and waterways such as Physics Creek and farm dams.
<i>Phyllodes imperialis</i> southern subspecies Southern Pink Underwing Moth	EN	EN		Yes	The Southern Pink Underwing Moth is found in subtropical rainforest below about 600 m elevation. Potential breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, <i>Carronia multisepealea</i> , occurs in subtropical rainforest. Adult Southern Pink Underwing Moths require the low light conditions of the rainforest in order to breed.	Low	No	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT 4046, however habitat is unlikely to be suitable as the species is generally found in subtropical rainforest and where there is a presence of feed vine <i>Carronia multisepealea</i> – neither of which are present within the Subject Land.
Mogurnda adspersa Southern Purple Spotted Gudgeon		EN	EN	No	This gudgeon is present in coastal streams of northern NSW and Qld as well as the Murray-Darling Basin. The species can be found in a variety of habitats such as rivers, creeks, streams and billabongs with slow-flowing or still waters. Cover in the form of aquatic vegetation, overhanging vegetation from river banks, leaf litter, rocks or snags are important for the species.	Medium	No	Not required (not BAM candidate)	Low	Not recorded during field investigations. Mapped habitat for this species occurs within the Subject Land along Physics Creek and its tributaries. However given the ephemeral nature of these tributaries and degradation from grazing and trampling they are unlikely to provide habitat for the species.
<i>Dasyurus</i>	EN	VU		No	Occurs along the east coast of Australia and the	Medium	No	Not	Low	One record occurs

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<i>maculatus</i> Spotted-tailed Quoll					Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.			required (not BAM candidate)		approximately 6 km from the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, 4001, with potential habitat (eucalypt forest). The Subject Land does not contain caves, crevices or hollow logs.
<i>Lophoictinia isura</i> Square-tailed Kite		VU		Yes	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located	Known	Yes	Included – survey undertaken	Low	Observed during field investigation. Broadly associated with PCT's 3420, 3428, 4046, 4001, with potential foraging habitat available (eucalypt forest), however no stick nests observed.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					along or near watercourses, in a tree fork or on large horizontal limbs.					
<i>Petaurus norfolcensis</i> Squirrel Glider		VU		Yes	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Known	Yes	Included – Survey undertaken	Low	Recorded during targeted surveys. Broadly associated with PCT's 3420, 3428, 4001 and 4046, with suitable habitat in Eucalypt forest and suitably sized hollows.
<i>Hoplocephalus stephensii</i> Stephens' Banded Snake		VU		Yes	Rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Stephens' Banded Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day. At night it hunts frogs, lizards, birds and small mammals.	Low	Yes	Included – Survey undertaken	Low	No records within the locality. Potential habitat along waterways within Eucalypt forest within the Subject Land. Species not recorded during targeted surveys.
<i>Lathamus discolor</i> Swift Parrot	CE	EN		No	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red	Low	No	Excluded – No important mapped habitat	Low	A small number of records (two) occur within 200 m of the Subject Land. No associated PCT's within Subject Land. Foraging habitat broadly available (presence of <i>E. moluccana</i>), however the species is unlikely to use the Subject Land for more than marginal habitat.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
					Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.					
<i>Xenus cinereus</i> Terek Sandpiper		VU		Yes	In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves or dead trees, often with related wader species. Breaks up into smaller flocks or even solitary birds when feeding in open intertidal mudflats. The diet includes worms, crabs and other crustaceans, small shellfish and the adults and larvae of various flies, beetles and water-bugs. Feeding is undertaken by moving rapidly and erratically over soft, wet mud, pecking or probing at the surface.	Low	No	Excluded – Habitat and geographic constraints	Negligible	No records within the locality. Broadly associated with PCT 4001, however habitat is unsuitable (no mangroves and no tidal influenced waterbodies within 15 km of the coast). No mapped important areas occur within the Subject Land.
<i>Coeranoscincus reticulatus</i> Three-toed Snake-tooth	VU	VU		Yes	The Three-toed Snake-tooth Skink occurs in the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. It is very uncommon south of Grafton. Its habitat includes	Low	Yes	Excluded – Habitat degraded	Low	No records within the locality. Broadly associated with PCT's 3420 and 3428, however this species is generally found in

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
Skink					rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The Three-toed Snake-tooth Skink lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs.					rainforest and moist eucalypt forest which are absent from the Subject Land. The understorey of Dry sclerophyll forest is subject to disturbance (grazing and trampling).
<i>Crinia tinnula</i> Wallum Froglet		VU		Yes	The Wallum Froglet is a coastal species, confined to acid, paperbark swamps and sedge swamps of the "wallum" country. The species occurs from near Noosa in southern Queensland south to the central coast of NSW, with a disjunct population on Kurnell Peninsula. The species is a late winter breeder and males call in choruses from within sedge tussocks or at the water edge.	Medium	No	Excluded – Geographic constraints	Low	A number of records (15) occur within 7 km of the Subject Land. Broadly associated with PCT's 3420, 4046 and 4001, however potential habitat (wetland) is disturbed from grazing and trampling and invasive species Cane Toad. Subject Land is > 30 km from coast.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle		VU		Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Medium	Yes	Included – Survey undertaken	Low	A small number (six) of records occur within 400 m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046 and 4001, however potential habitat present (wetland areas) is subject to disturbance (grazing, trampling and clearing), and no large stick nests observed.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidate species	Survey required/undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>Cacophis harriettae</i> White-crowned Snake		VU		Yes	Favours low to mid-elevation dry eucalypt forest and woodland, particularly areas with a varied and well-developed litter layer, where their prey of small lizards may be more abundant. Also occasionally found in moist eucalypt forest and coastal heathland.	Medium	Yes	Included – Survey undertaken	Low	No records within the locality. Broadly associated with PCT 3420, 3428, 4046, and 4001, with potential habitat available (high condition dry sclerophyll forest with developed leaf litter layer). Species not recorded during targeted surveys.
<i>Hirundapus caudacutus</i> White-throated Needle-tail	VU, Mi			No	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. This species roosts in trees in forests and woodlands and feeds on insects. The White-throated Needle-tail breeds in forests and sparse hills in Asia.	Low	No	Not required (not BAM candidate)	Low	Small number (five) records approximately four km from the Subject Land, with the most recent record over 20 years old. Broadly associated with PCT's 3420, 3428, 4046 and 4001, however habitat is subject to disturbance (clearing, recent fire).
<i>Petaurus australis</i> Yellow-bellied Glider	VU	VU		No	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.	Medium	No	Not required (not BAM candidate)	Low	75 records occur within the locality, with the closest being within 500m of the Subject Land. Broadly associated with PCT's 3420, 3428, 4046, with suitable hollows present.
<i>Saccolaimus</i>		VU		No	Found throughout NSW in habitats including wet	Known	No	Survey	Low	Recorded within Subject Land.

Species	Status		FM Act	BAM predicted SCS	Habitat Description	Potential occurrence in Subject Land	BAM Candidat e species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC								
<i>flaviventris</i> Yellow- bellied Sheathtail- bat					and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Forages for insects above the canopy in forests.			undertaken		Broadly associated with PCT's 3420, 3428, 4001, eucalypt forest, and suitably sized hollows. No suitable buildings present.

[illegible]

[illegible]

[illegible]



Family	Scientific name	Common name	RV_01		RV_02		RV_03		RV_04		RV_05		RV_06		RV_07		RV_08		RV_09		RV_10		RV_11		RV_12		RV_13		RV_14		RV_15		RV_16		RV_17		RV_18		RV_19		RV_20		RV_21		RV_22		RV_23		RV_24		RV_25		RV_26																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Table A 4: BAM plot summary

Plot ID	PCT	Area (Ha)	Patch size	Condition	Zone	Easting	Northing	Bearing	Comp. Tree	Comp. Shrub	Comp. Grass	Comp. Forbs	Comp. Ferns	Comp. Other	Struc. Tree	Struc. Shrub	Struc. Grass	Struc. Forbs	Stuc. Ferns	Stuc. Other
RV_01	3428			Low	56	502540	6780867	283	1	1	4	1	0	0	10.0	0.2	36.1	0.1	0.0	0.0
RV_02	3420			Good	56	502590	6780959	258	3	1	8	1	0	1	35.1	0.3	60.6	0.1	0.0	0.1
RV_03	3420			Good	56	502203	6781044	288	4	2	6	0	0	1	37.1	0.2	46.2	0.0	0.0	0.1
RV_04	3420			Other	56	501872	6782739	299	4	5	4	2	0	4	36.1	2.8	56.0	0.2	0.0	0.5
RV_05	3420			Other	56	501954	6782076	358	2	2	7	3	0	1	8.3	5.1	84.0	0.4	0.0	0.2
RV_06	3420			Moderate	56	502008	6781851	73	3	1	6	1	0	2	45.3	0.1	56.2	0.1	0.0	0.5
RV_07	3420			Other	56	501917	6781648	355	1	1	5	1	0	2	0.6	0.1	25.3	0.2	0.0	0.3
RV_08	3420			Moderate	56	501939	6781608	344	3	2	7	1	0	3	35.2	2.1	25.2	0.1	0.0	0.4
RV_09	3420			Moderate	56	502637	6781399	85	5	2	5	0	0	2	47.1	0.3	30.6	0.0	0.0	0.4
RV_10	3420			Moderate	56	502724	6781239	277	3	2	7	1	0	2	12.1	8.2	41.1	0.1	0.0	0.3
RV_11	3428			Moderate	56	504353	6780927	53	4	0	3	0	0	0	37.0	0.0	31.1	0.0	0.0	0.0
RV_12	3428			Moderate	56	504520	6780979	66	3	0	2	1	0	1	27.0	0.0	20.5	0.1	0.0	0.2
RV_13	4046			Moderate	56	505299	6781626	272	4	1	3	2	0	2	16.0	0.1	45.1	0.2	0.0	0.2
RV_14	3428			Low	56	506482	6781117	297	2	0	3	1	0	2	35.0	0.0	10.2	0.2	0.0	0.3
RV_15	4046			Moderate	56	506564	6779880	190	4	3	7	2	1	4	58.4	5.9	24.1	0.3	1.0	1.6
RV_16	4001			Low	56	507949	6779275	118	1	1	3	7	0	0	0.2	0.5	26.0	10.7	0.0	0.0
RV_17	4046			Other	56	507741	6778956	233	4	0	3	4	1	0	30.0	0.0	28.0	0.9	0.1	0.0
RV_18	4046			Other	56	507455	6778797	245	3	0	8	6	0	0	17.1	0.0	65.1	1.1	0.0	0.0
RV_19	4046			Riparian	56	507583	6779049	257	0	0	5	3	1	0	0.0	0.0	79.0	0.4	0.1	0.0
RV_20	4046			Moderate	56	505715	6780458	168	3	1	6	5	1	1	22.1	0.1	76.0	0.7	0.1	0.1
RV_21	4046			Moderate	56	505987	6780556	65	3	1	6	3	1	6	15.4	0.3	62.2	0.3	2.0	1.1
RV_22	3428			Low	56	502415	6780665	7	4	0	3	0	0	1	22.0	0.0	20.6	0.0	0.0	0.1
RV_23	3428			Moderate	56	503307	6781924	275	4	3	4	3	0	1	19.1	1.5	26.3	0.8	0.0	0.2
RV_24	3428			Moderate	56	504864	6781031	255	5	0	8	3	0	0	20.0	0.0	30.3	1.0	0.0	0.0
RV_25	0			Cat1	56	502352	6781132	350	0	0	2	3	0	0	0.0	0.0	0.4	0.3	0.0	0.0
RV_26	3420			Moderate	56	502375	6781444	90	3	2	6	6	1	2	25.4	1.1	30.5	0.7	0.1	0.2
Plot ID	PCT	Area (Ha)	Patch size	Condition	Zone	Easting	Northing	Bearing	Funn. Large Trees	Fun. Hollow Trees	Fun. Litter Cover	Fun Len. Fallen Logs	Fun. Tree Stem 5to9	Fun. Tree Stem 10to19	Fun. Tree Stem 20to29	Fun. Tree Stem 30to49	Fun. Tree50to79	Fun. Tree Regen	Fun. High Threat Exotic	



RV_01	3428			Low	56	502540	6780867	283	0	2	14.8	6	0	0	0	0	3	1	10.1
RV_02	3420			Good	56	502590	6780959	258	1	1	25	4	1	1	1	3	2	1	0.2
RV_03	3420			Good	56	502203	6781044	288	1	1	35	14	1	1	1	4	3	1	15.1
RV_04	3420			Other	56	501872	6782739	299	1	1	50	36	1	1	1	2	1	1	0.0
RV_05	3420			Other	56	501954	6782076	358	1	0	9.2	3	1	1	0	0	0	1	9.2
RV_06	3420			Moderate	56	502008	6781851	73	1	0	75	30	1	1	1	1	0	1	1.0
RV_07	3420			Other	56	501917	6781648	355	0	0	6	0	1	0	0	0	0	1	10.0
RV_08	3420			Moderate	56	501939	6781608	344	1	0	54	35	1	1	1	1	0	1	5.0
RV_09	3420			Moderate	56	502637	6781399	85	1	1	30	6	1	1	1	9	1	1	35.0
RV_10	3420			Moderate	56	502724	6781239	277	1	1	25	8	1	1	1	5	1	1	40.0
RV_11	3428			Moderate	56	504353	6780927	53	1	1	31	19	1	1	1	4	1	1	1.7
RV_12	3428			Moderate	56	504520	6780979	66	1	0	44	25	1	1	1	7	1	1	0.1
RV_13	4046			Moderate	56	505299	6781626	272	1	1	26.6	24	0	1	1	6	3	0	2.0
RV_14	3428			Low	56	506482	6781117	297	1	0	18.2	12	0	1	1	13	0	0	25.0
RV_15	4046			Moderate	56	506564	6779880	190	1	2	52	18	1	1	1	8	2	0	5.7
RV_16	4001			Low	56	507949	6779275	118	0	0	6.8	0	1	0	0	0	0	0	0.3
RV_17	4046			Other	56	507741	6778956	233	1	0	21.2	0	1	1	1	0	0	1	0.0
RV_18	4046			Other	56	507455	6778797	245	1	0	4.6	10	1	1	0	0	0	0	10.1
RV_19	4046			Riparian	56	507583	6779049	257	0	0	2	5	0	0	0	0	0	0	0.1
RV_20	4046			Moderate	56	505715	6780458	168	1	0	19	35	0	1	1	2	0	1	0.6
RV_21	4046			Moderate	56	505987	6780556	65	1	1	19	20	1	1	1	5	0	0	0.5
RV_22	3428			Low	56	502415	6780665	7	0	0	7.2	5	0	0	0	4	1	1	30.1
RV_23	3428			Moderate	56	503307	6781924	275	1	0	42	14	1	1	1	3	1	1	41.3
RV_24	3428			Moderate	56	504864	6781031	255	1	0	66	18	1	1	1	4	0	1	2.1
RV_25	0			Cat1	56	502352	6781132	350	0	0	7	0	0	0	0	0	0	0	9.1
RV_26	3420			Moderate	56	502375	6781444	90	1	0	52	43	1	1	1	1	1	1	0.1

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	11/12/2023	Richmond Valley SF		Low	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_01	Plot dimensions	50x20	Orientation of middle 283
Easting 502540	Northing 6780867	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3428			EEC: Y	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	1	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	1
	Grasses etc.	4	50 - 79 cm	3
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	10	5 - 9 cm	0
	Shrubs	0.2	< 5 cm	1
	Grasses etc.	36.1	Length of logs (m)	6
	Forbs	0.1	No. trees with hollows	2
	Ferns	0		
	Other	0		
High Threat Weed cover		10.1		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	4	20	10	15	25
Average of the 5 subplots	14.8				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	1	Soil Surface Texture Loam
Soil Colour	Grey brown	Site Drainage	1	Distance to nearest water

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	11/12/2023	Richmond Valley SF	RV_01	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.2	7	
FG	Centella asiatica	N	0.1	10	
GG	Cynodon dactylon	N	15		
	Eragrostis curvula	HTE	10		
TG	Eucalyptus tereticornis	N	10		
GG	Imperata cylindrica	N	15		
GG	Lomandra spp.	N	0.1	3	
GG	Microlaena stipoides	N	6		
	Senecio madagascariensis	HTE	0.1	4	
	Setaria sphacelata	E	15		
	Sporobolus africanus	E	20		

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	11/12/2023	Richmond Valley SF	Good	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_02	Plot dimensions	50x20
				Orientation of middle	258
Easting 502590	Northing 6780959	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		3420		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	1
	Grasses etc.	8	50 - 79 cm	2
	Forbs	1	30 - 49 cm	3
	Ferns	0	20 - 29cm	1
	Other	1	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	35.1	5 - 9 cm	1
	Shrubs	0.3	< 5 cm	1
	Grasses etc.	60.6	Length of logs (m)	4
	Forbs	0.1	No. trees with hollows	1
	Ferns	0		
Other	0.1			
High Threat Weed cover		0.2		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	25	40	30	15
Average of the 5 subplots	25				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Loam
Soil Colour	Reddish brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	1		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	11/12/2023	Richmond Valley SF	RV_02	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.3	30	
TG	Alphitonia excelsa	N	0.1	1	
FG	Centella asiatica	N	0.1	3	
TG	Corymbia henryi	N	25		
GG	Cynodon dactylon	N	15		
GG	Entolasia marginata	N	0.5	800	
GG	Eragrostis brownii	N	7		
GG	Eragrostis leptostachya	N	15		
TG	Eucalyptus tereticornis	N	10		
GG	Fimbristylis dichotoma	N	0.1	20	
OG	Glycine spp.	N	0.1	2	
GG	Imperata cylindrica	N	6		
GG	Microlaena stipoides	N	7		
	Senecio madagascariensis	HTE	0.2	40	
	Setaria sphacelata	E	10		
	Sida rhombifolia	E	0.1	1	
GG	Sporobolus elongatus	N	10		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	11/12/2023	Richmond Valley SF	Good	BJT KK		
Zone 56	Datum GDA94	Plot ID	RV_03	Plot dimensions	50x20	Orientation of middle 288
Easting 502203	Northing 6781044	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	3
	Grasses etc.	6	50 - 79 cm	3
	Forbs	0	30 - 49 cm	4
	Ferns	0	20 - 29cm	1
	Other	1	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	37.1	5 - 9 cm	1
	Shrubs	0.2	< 5 cm	1
	Grasses etc.	46.2	Length of logs (m)	14
	Forbs	0	No. trees with hollows	1
	Ferns	0		
	Other	0.1		
High Threat Weed cover		15.1		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	20	30	35	50
Average of the 5 subplots	35				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Loam
Soil Colour	Greyish brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	11/12/2023	Richmond Valley SF	RV_03 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.1	1	
TG	Alphitonia excelsa	N	0.1	4	
GG	Bothriochloa spp.	N	6		
TG	Corymbia henryi	N	30		
GG	Cynodon dactylon	N			
	Eragrostis curvula	HTE	15		
TG	Eucalyptus moluccana	N	4	1	
TG	Eucalyptus tereticornis	N	3	1	
OG	Eustrephus latifolius	N	0.1	6	
	Gomphocarpus spp.	E	0.1	1	
GG	Imperata cylindrica	N	25		
GG	Juncus spp.	N	0.1	3	
SG	Leptospermum spp.	N	0.1	1	
GG	Lomandra spp.	N	0.1	1	
	Senecio madagascariensis	HTE	0.1	1	
	Setaria sphacelata	E	10		
	Sida rhombifolia	E	0.1	4	
	Sporobolus africanus	E	3	500	
GG	Sporobolus elongatus	N	15		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF		Other	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_04	Plot dimensions	50x20	Orientation of middle 299
Easting 501872	Northing 6782739	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence H

BAM Attribute (400m2 plot)			Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4		DBH	# Tree Stems Count
	Shrubs	5		80+ cm	1
	Grasses etc.	4		50 - 79 cm	1
	Forbs	2		30 - 49 cm	2
	Ferns	0		20 - 29cm	1
	Other	4		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	36.1		5 - 9 cm	1
	Shrubs	2.8		< 5 cm	1
	Grasses etc.	56		Length of logs (m)	36
	Forbs	0.2		No. trees with hollows	1
	Ferns	0			
	Other	0.5			
High Threat Weed cover		0			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	45	25	35	85
Average of the 5 subplots	50				

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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	3	Soil Surface Texture	Loam
Soil Colour	Grey	Site Drainage	3	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	0		
Fire damage	2	NR	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_04	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia falcata	N	2	300	
TG	Allocasuarina spp.	N	0.1	1	
SG	Breynia oblongifolia	N	0.1	1	
TG	Corymbia henryi	N	25		
FG	Dianella spp.	N	0.1	1	
GG	Entolasia marginata	N	25		
GG	Eragrostis leptostachya	N	10		
SG	Eremophila debilis	N	0.1	1	
TG	Eucalyptus moluccana	N	10		
TG	Eucalyptus siderophloia	N	1	1	
OG	Eustrephus latifolius	N	0.2	50	
OG	Glycine clandestina	N	0.1	1	
GG	Imperata cylindrica	N	20		
OG	Jasminum suavisissimum	N	0.1	10	
	Lantana spp.	E	0.1	1	
GG	Lomandra spp.	N	1	500	
FG	Murdannia graminea	N	0.1	5	
OG	Parsonsia straminea	N	0.1	1	
SG	Phyllanthus gunnii	N	0.1	1	
SG	Pultenaea spinosa	N	0.5	2	

BAM Plot Data Sheet					Site Sheet no:1 of 2	
		Survey Name		Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF		Other	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_05	Plot dimensions	50x20	Orientation of middle 358
Easting 501954	Northing 6782076	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	2		DBH	# Tree Stems Count
	Shrubs	2		80+ cm	0
	Grasses etc.	7		50 - 79 cm	0
	Forbs	3		30 - 49 cm	0
	Ferns	0		20 - 29cm	0
	Other	1		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	8.3		5 - 9 cm	1
	Shrubs	5.1		< 5 cm	1
	Grasses etc.	84		Length of logs (m)	3
	Forbs	0.4		No. trees with hollows	0
	Ferns	0			
	Other	0.2			
High Threat Weed cover		9.2			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	5	20	1	5
Average of the 5 subplots	9.2				

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Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	0	Soil Surface Texture Clay
Soil Colour	Greyish red	Site Drainage	0	Distance to nearest water

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (Identify native/livestock	2		
Fire damage	2	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_05	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia falcata	N	5		
TG	Alphitonia excelsa	N	0.3	2	
GG	Bothriochloa spp.	N	3	2000	
FG	Centella asiatica	N	0.1	2	
FG	Commelina cyanea	N	0.1	1	
TG	Corymbia henryi	N	8		
	Cyanthillium cinereum var.		0.2	100	
GG	Eragrostis brownii	N	5		
	Eragrostis curvula	HTE	7		
GG	Eragrostis leptostachya	N	10		
OG	Eustrephus latifolius	N	0.2	10	
GG	Imperata cylindrica	N	40		
	Maekawaea rhytidophylla		0.3	5	
GG	Microlaena stipoides	N	8		
FG	Murdannia graminea	N	0.2	100	
	Paspalum dilatatum	HTE	2	2000	
SG	Phyllanthus gunnii	N	0.1	1	
	Senecio madagascariensis	HTE	0.2	30	
GG	Setaria spp.	N	8		
	Sporobolus africanus	E	7		
GG	Sporobolus elongatus	N	10		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_06	Plot dimensions	50x20	Orientation of middle
Easting 502008	Northing 6781851	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	6	50 - 79 cm	0
	Forbs	1	30 - 49 cm	1
	Ferns	0	20 - 29cm	1
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	45.3	5 - 9 cm	1
	Shrubs	0.1	< 5 cm	1
	Grasses etc.	56.2	Length of logs (m)	30
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0.5		
High Threat Weed cover		1		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	75	85	95	60
Average of the 5 subplots	75				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	2	Soil Surface Texture	Clay
Soil Colour	Greyish brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	R	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0	R	
Grazing (Identify native/livestock	1	R	
Fire damage	2	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_06 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Alphitonia excelsa	N	0.1	1	
FG	Commelina cyanea	N	0.1	1	
TG	Corymbia henryi	N	45		
GG	Cynodon dactylon	N	5		
SG	Daviesia ulicifolia	N	0.1	1	
GG	Entolasia marginata	N	35		
	Eragrostis curvula	HTE	1	1000	
TG	Eucalyptus siderophloia	N	0.2	1	
OG	Eustrephus latifolius	N	0.3	10	
GG	Fimbristylis dichotoma	N	0.1	1	
OG	Hardenbergia violacea	N	0.2	3	
GG	Imperata cylindrica	N	15		
GG	Juncus spp.	N	0.1	1	
GG	Lomandra multiflora subsp.	N	1	1000	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF	Other	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_07	Plot dimension s	50x20
Easting 501917	Northing 6781648	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		3420		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	1	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	5	50 - 79 cm	0
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	2	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	0.6	5 - 9 cm	1
	Shrubs	0.1	< 5 cm	1
	Grasses etc.	25.3	Length of logs (m)	0
	Forbs	0.2	No. trees with hollows	0
	Ferns	0		
	Other	0.3		
High Threat Weed cover		10		

BAM Attributte (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	1	5	15	5	4
Average of the 5 subplots	6				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	1	Soil Surface Texture	Sandy clay
Soil Colour	Greyish yellow	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	NR	
Cultivation (inc. pasture)	0		
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	2	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet	Survey Name	Plot ID	Recorders
2 of 2			
Date	12/12/2023	Richmond Valley SF	RV_07 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Bothriochloa spp.	N	5		
FG	Centella asiatica	N	0.2	200	
TG	Corymbia henryi	N	0.6	30	
	Cyanthillium cinereum var.		0.1	3	
GG	Eragrostis brownii	N	10		
	Eragrostis curvula	HTE	10		
SG	Eremophila debilis	N	0.1	1	
OG	Eustrephus latifolius	N	0.1	1	
OG	Glycine cyrtoloba	N	0.2	50	
GG	Imperata cylindrica	N	5		
GG	Lomandra multiflora subsp.	N	0.3	2	
	Setaria sphacelata	E	10		
GG	Sporobolus elongatus	N	5		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	12/12/2023	Richmond Valley SF	Moderate	BJT KK		
Zone 56	Datum GDA94	Plot ID	RV_08	Plot dimensions	50x20	Orientation of middle 344
Easting 501939	Northing 6781608	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	0
	Grasses etc.	7	50 - 79 cm	0
	Forbs	1	30 - 49 cm	1
	Ferns	0	20 - 29cm	1
	Other	3	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	35.2	5 - 9 cm	1
	Shrubs	2.1	< 5 cm	1
	Grasses etc.	25.2	Length of logs (m)	35
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0.4		
High Threat Weed cover		5		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	80	60	55	50	25
Average of the 5 subplots	54				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay loam
Soil Colour	Grey brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	2	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_08 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	2	200	
TG	Alphitonia excelsa	N	0.2	1	
TG	Corymbia henryi	N	30		
GG	Cynodon dactylon	N	5		
GG	Dichanthium spp.	N	0.1	1	
GG	Entolasia marginata	N	6	2000	
GG	Eragrostis brownii	N	5		
	Eragrostis curvula	HTE	5		
SG	Eremophila debilis	N	0.1	1	
TG	Eucalyptus moluccana	N	5		
OG	Eustrephus latifolius	N	0.2	30	
OG	Glycine clandestina	N	0.1	10	
GG	Imperata cylindrica	N	7		
OG	Jasminum suavissimum	N	0.1	1	
FG	Lobelia purpurascens	N	0.1	8	
GG	Lomandra multiflora subsp.	N	0.1	1	
	Maekawaea rhytidophylla		0.1	1	
GG	Sporobolus elongatus	N	2	2000	
	Verbena bonariensis	E	0.1	5	

BAM Plot Data Sheet					Site Sheet no:1 of 2	
		Survey Name		Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GD94	Plot ID	RV_09	Plot dimensions	50x20	Orientation of middle 85
Easting 502637	Northing 6781399	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3420			EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	5	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	0
	Grasses etc.	5	50 - 79 cm	1
	Forbs	0	30 - 49 cm	9
	Ferns	0	20 - 29cm	1
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	47.1	5 - 9 cm	1
	Shrubs	0.3	< 5 cm	1
	Grasses etc.	30.6	Length of logs (m)	6
	Forbs	0	No. trees with hollows	1
	Ferns	0		
	Other	0.4		
High Threat Weed cover		35		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	25	30	45	30	20
Average of the 5 subplots	30				

Notes				
Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	2	Soil Surface Texture Loam
Soil Colour	Brown	Site Drainage	2	Distance to nearest water

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	1	NR	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_09	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.2	3	
TG	Allocauarina spp.	N	4	2	
TG	Alphitonia excelsa	N	0.1	1	
SG	Breynia oblongifolia	N	0.1	1	
	Cirsium vulgare	E	0.1	1	
TG	Corymbia gummifera	N	10		
GG	Entolasia marginata	N	15		
	Eragrostis curvula	HTE	35		
GG	Eragrostis leptostachya	N	10		
TG	Eucalyptus siderophloia	N	30		
TG	Eucalyptus tereticornis	N	3	1	
OG	Eustrephus latifolius	N	0.2	10	
OG	Glycine spp.	N	0.2	10	
	Gomphocarpus spp.	E	0.1	1	
GG	Imperata cylindrica	N	5		
GG	Juncus spp.	N	0.1	2	
GG	Lomandra multiflora subsp.	N	0.5	50	
	Maekawaea rhytidophylla		0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	12/12/2023	Richmond Valley SF	Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_10	Plot dimensions	50x20
				Orientation of middle	277
Easting 502724	Northing 6781239	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		3420		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	1
	Grasses etc.	7	50 - 79 cm	1
	Forbs	1	30 - 49 cm	5
	Ferns	0	20 - 29cm	1
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	12.1	5 - 9 cm	1
	Shrubs	8.2	< 5 cm	1
	Grasses etc.	41.1	Length of logs (m)	8
	Forbs	0.1	No. trees with hollows	1
	Ferns	0		
Other	0.3			
High Threat Weed cover		40		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	15	20	30	40
Average of the 5 subplots	25				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	3	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	3	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	12/12/2023	Richmond Valley SF	RV_10	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.2	3	
TG	Alphitonia excelsa	N	0.1	1	
GG	Bothriochloa spp.	N	1	500	
TG	Corymbia henryi	N	6		
GG	Cynodon dactylon	N	5		
GG	Entolasia marginata	N	5		
	Eragrostis curvula	HTE	40		
GG	Eragrostis leptostachya	N	10		
TG	Eucalyptus siderophloia	N	6	1	
OG	Eustrephus latifolius	N	0.2	10	
OG	Glycine spp.	N	0.1	20	
GG	Imperata cylindrica	N	10		
GG	Oplismenus spp.	N	0.1	5	
SG	Rubus moluccanus	N	8	1	
	Sida rhombifolia	E	0.1	1	
GG	Sporobolus elongatus	N	10		
FG	Tricoryne spp.	N	0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF	Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID RV_11	Plot dimensions 50x20	Orientation of middle	53
Easting 504353	Northing 6780927	IBRA region South Eastern Queensland	Photo #		
Plant Community Type		3428		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	1
	Grasses etc.	3	50 - 79 cm	1
	Forbs	0	30 - 49 cm	4
	Ferns	0	20 - 29cm	1
	Other	0	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	37	5 - 9 cm	1
	Shrubs	0	< 5 cm	1
	Grasses etc.	31.1	Length of logs (m)	19
	Forbs	0	No. trees with hollows	1
	Ferns	0		
	Other	0		
High Threat Weed cover		1.7		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	75	10	35	20	15
Average of the 5 subplots	31				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Grey brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	1	R	
Firewood/CWD removal	1	R	
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_11	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Cenchrus clandestinus	HTE	1	200	
TG	Corymbia henryi	N	10		
GG	Cynodon dactylon	N	30		
GG	Eragrostis brownii	N	0.5	300	
	Eragrostis curvula	HTE	0.5	300	
TG	Eucalyptus fibrosa	N	20		
TG	Eucalyptus seeana	N	2	1	
TG	Eucalyptus tereticornis	N	5		
GG	Juncus spp.	N	0.6	70	
	Paspalum dilatatum	HTE	0.1	1	
	Senecio madagascariensis	HTE	0.1	1	
	Sida rhombifolia	E	0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF	Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_12	Plot dimensions	50x20
				Orientation of middle	66
Easting 504520	Northing 6780979	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		3428		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	1
	Grasses etc.	2	50 - 79 cm	1
	Forbs	1	30 - 49 cm	7
	Ferns	0	20 - 29cm	1
	Other	1	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	27	5 - 9 cm	1
	Shrubs	0	< 5 cm	1
	Grasses etc.	20.5	Length of logs (m)	25
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0.2		
High Threat Weed cover		0.1		

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	70	25	15	50	60
Average of the 5 subplots	44				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	0	Soil Surface Texture
				Loam
Soil Colour	Brown	Site Drainage	0	Distance to nearest water

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_12	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Centella asiatica	N	0.1	20	
TG	Corymbia henryi	N	5		
GG	Cynodon dactylon	N	20		
TG	Eucalyptus fibrosa	N	15		
TG	Eucalyptus tereticornis	N	7		
	Gomphocarpus spp.	E	0.1	2	
GG	Juncus spp.	N	0.5	100	
OG	Parsonsia straminea	N	0.2	1	
	Senecio madagascariensis	HTE	0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	13/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_13	Plot dimensions	50x20	Orientation of middle 272
Easting 505299	Northing 6781626	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		4046			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	3	50 - 79 cm	3
	Forbs	2	30 - 49 cm	6
	Ferns	0	20 - 29cm	1
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	16	5 - 9 cm	0
	Shrubs	0.1	< 5 cm	0
	Grasses etc.	45.1	Length of logs (m)	24
	Forbs	0.2	No. trees with hollows	1
	Ferns	0		
	Other	0.2		
High Threat Weed cover		2		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	30	30	18	35
Average of the 5 subplots	26.6				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	1	Soil Surface Texture	Clay loam
Soil Colour	Brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	1		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_13 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.1	1	
TG	Corymbia henryi	N	3	1	
TG	Corymbia intermedia	N	2	1	
GG	Cynodon dactylon	N	40		
GG	Eragrostis brownii	N	5		
	Eragrostis curvula	HTE	2	1000	
TG	Eucalyptus seeana	N	8		
TG	Eucalyptus tereticornis	N	3	1	
OG	Glycine spp.	N	0.1	1	
	Gomphocarpus spp.	E	0.2	7	
GG	Juncus spp.	N	0.1	5	
FG	Lobelia purpurascens	N	0.1	1	
OG	Parsonia straminea	N	0.1	1	
	Sida rhombifolia	E	0.1	1	
FG	Tricoryne spp.	N	0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF	Low	BJT KK	
Zone 56	Datum GDA94	Plot ID RV_14	Plot dimensions 50x20	Orientatio n of middle	297
Easting 506482	Northing 6781117	IBRA region South Eastern Queensland	Photo #		
Plant Community Type		3428	EEC: None		Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	2	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	3	50 - 79 cm	0
	Forbs	1	30 - 49 cm	13
	Ferns	0	20 - 29cm	1
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	35	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	10.2	Length of logs (m)	12
	Forbs	0.2	No. trees with hollows	0
	Ferns	0		
	Other	0.3		
High Threat Weed cover		25		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	1	20	5	30	35
Average of the 5 subplots	18.2				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Sandy clay
Soil Colour	Grey brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	R	
Cultivation (inc. pasture)	1	R	
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	3	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_14	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Chloris gayana	HTE	20		
GG	Cynodon dactylon	N	5		
FG	Einadia spp.	N	0.2	3	
	Eragrostis curvula	HTE	5		
TG	Eucalyptus siderophloia	N	30		
TG	Eucalyptus tereticornis	N	5		
OG	Eustrephus latifolius	N	0.2	20	
GG	Juncus spp.	N	0.2	10	
OG	Parsonsia straminea	N	0.1	1	
	Sida rhombifolia	E	0.1	5	
GG	Sporobolus elongatus	N	5		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_15	Plot dimension s	50x20	Orientation of middle 190
Easting 506564	Northing 6779880	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		4046			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4		DBH	# Tree Stems Count
	Shrubs	3		80+ cm	0
	Grasses etc.	7		50 - 79 cm	2
	Forbs	2		30 - 49 cm	8
	Ferns	1		20 - 29cm	1
	Other	4		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	58.4		5 - 9 cm	1
	Shrubs	5.9		< 5 cm	0
	Grasses etc.	24.1		Length of logs (m)	18
	Forbs	0.3		No. trees with hollows	2
	Ferns	1			
	Other	1.6			
High Threat Weed cover		5.7			

BAM Attribute (1 x 1m plots)	Litter cover (%)			
Subplot score (% in each)	25	85	90	30
Average of the 5 subplots	52			

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Sandy
Soil Colour	Reddish grey	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	1	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_15	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.5	100	
TG	Alphitonia excelsa	N	0.4	200	
TG	Angophora subvelutina	N	15		
	Bidens pilosa	HTE	0.1	1	
SG	Breynia oblongifolia	N	5		
GG	Carex spp.	N	0.1	1	
	Chloris gayana	HTE	5		
FG	Commelina cyanea	N	0.2	50	
	Conyza bonariensis	E	0.2	50	
GG	Cynodon dactylon	N	5		
TG	Eucalyptus tereticornis	N	3	1	
OG	Eustrephus latifolius	N	0.3	200	
OG	Glycine spp.	N	0.2	300	
GG	Imperata spp.	N	3	5000	
GG	Juncus spp.	N	0.3	300	
	Lantana camara	HTE	0.3	7	
GG	Lomandra multiflora subsp.	N	0.4	200	
TG	Lophostemon suaveolens	N	40		
GG	Microlaena stipoides	N	15		
GG	Opismenus aemulus	N	0.3	300	
OG	Parsonsia straminea	N	0.1	1	
	Paspalum dilatatum	HTE	0.2	10	
EG	Pteridium esculentum	N	1	200	
	Senecio madagascariensis	HTE	0.1	1	
	Sida rhombifolia	E	0.1	6	
OG	Stephania japonica var. discolor	N	1	1000	
FG	Veronica plebeia	N	0.1	4	
SG	Wikstroemia indica	N	0.4	100	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF	Low	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_16	Plot dimensions	50x20
				Orientation of middle	118
Easting 507949	Northing 6779275	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		4001		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	1	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	3	50 - 79 cm	0
	Forbs	7	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	0.2	5 - 9 cm	1
	Shrubs	0.5	< 5 cm	0
	Grasses etc.	26	Length of logs (m)	0
	Forbs	10.7	No. trees with hollows	0
	Ferns	0		
Other	0			
High Threat Weed cover		0.3		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	2	5	15	2
Average of the 5 subplots	6.8				

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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	0	Soil Surface Texture	Sandy clay
Soil Colour	Grey brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	2	R	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_16	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Aster subulatus	E	0.1	1	
FG	Centella asiatica	N	0.1	1	
	Conyza bonariensis	E	0.1	1	
GG	Cynodon dactylon	N	5		
FG	Einadia spp.	N	0.1	1	
FG	Epaltes australis	N	0.2	5	
FG	Isotoma armstrongii	N	0.1	5	
GG	Juncus spp.	N	1	1000	
SG	Melaleuca alternifolia	N	0.5	2	
TG	Melaleuca quinquenervia	N	0.2	1	
	Paspalum dilatatum	HTE	0.2	1	
GG	Paspalum distichum	N	20		
FG	Persicaria decipiens	N	0.1	1	
FG	Philydrum lanuginosum	N	10		
	Senecio madagascariensis	HTE	0.1	1	
	Setaria sphacelata	E	5		
FG	Wahlenbergia spp.	N	0.1	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2			
		Survey Name		Veg Zone ID	Recorders		
Date	13/12/2023	Richmond Valley SF		Other	BJT KK		
Zone 56	Datum GDA94	Plot ID	RV_17	Plot dimensions	50x20	Orientation of middle	233
Easting 507741	Northing 6778956	IBRA region	South Eastern Queensland	Photo #			
Plant Community Type		4046			EEC: None Confidence H		

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4		DBH	# Tree Stems Count
	Shrubs	0		80+ cm	0
	Grasses etc.	3		50 - 79 cm	0
	Forbs	4		30 - 49 cm	0
	Ferns	1		20 - 29cm	1
	Other	0		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	30		5 - 9 cm	1
	Shrubs	0		< 5 cm	1
	Grasses etc.	28		Length of logs (m)	0
	Forbs	0.9		No. trees with hollows	0
	Ferns	0.1			
	Other	0			
High Threat Weed cover		0			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	65	20	14	5	2
Average of the 5 subplots	21.2				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	0	Soil Surface Texture
Soil Colour	Reddish grey	Site Drainage	0	Distance to nearest water
				Sandy loam clay

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	R	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	1	R	
Storm damage	0		
Weediness	1		
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_17	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.5	200	
	Aster subulatus	E	0.1	1	
TG	Casuarina glauca	N	10	2	
FG	Centella asiatica	N	0.2	10	
	Conyza bonariensis	E	0.1	1	
GG	Cynodon dactylon	N	20		
FG	Epaltes australis	N	0.1	1	
TG	Eucalyptus tereticornis	N	10		
GG	Juncus spp.	N	3	50	
GG	Lachnagrostis filiformis	N	5		
TG	Lophostemon suaveolens	N	5		
EG	Marsilea spp.	N	0.1	10	
TG	Melaleuca quinquenervia	N	5		
FG	Persicaria hydropiper	N	0.1	1	
	Setaria sphacelata	E	7		
	Sida rhombifolia	E	0.1	1	

BAM Plot Data Sheet					Site Sheet no:1 of 2	
		Survey Name		Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF		Other	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_18	Plot dimensions	50x20	Orientation of middle 245
Easting 507455	Northing 6778797	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		4046			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3		DBH	# Tree Stems Count
	Shrubs	0		80+ cm	0
	Grasses etc.	8		50 - 79 cm	0
	Forbs	6		30 - 49 cm	0
	Ferns	0		20 - 29cm	0
	Other	0		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	17.1		5 - 9 cm	1
	Shrubs	0		< 5 cm	0
	Grasses etc.	65.1		Length of logs (m)	10
	Forbs	1.1		No. trees with hollows	0
	Ferns	0			
	Other	0			
High Threat Weed cover		10.1			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	8	4	1	5
Average of the 5 subplots	4.6				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone				
Landform Pattern		Slope	0	Soil Surface Texture Sandy
Soil Colour	Grey	Site Drainage	0	Distance to nearest water

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	0	NR	
Firewood/CWD removal	0		
Grazing (Identify native/livestock	2	R	
Fire damage	1	NR	
Storm damage	0		
Weediness	1		
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_18	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Casuarina glauca	N	0.1	1	
FG	Centella asiatica	N	0.3	20	
	Cuphea carthagenensis	E	0.6	500	
GG	Cynodon dactylon	N	10		
GG	Digitaria spp.	N	5		
GG	Eragrostis brownii	N	5		
TG	Eucalyptus tereticornis	N	15		
FG	Euchiton sphaericus	N	0.1	2	
GG	Fimbristylis dichotoma	N	0.1	3	
	Gomphocarpus spp.	E	0.1	1	
GG	Hemarthria uncinata	N	5		
FG	Isotoma armstrongii	N	0.1	1	
GG	Juncus spp.	N	5		
GG	Lachnagrostis filiformis	N	5		
TG	Lophostemon suaveolens	N	2	1	
	Paspalum dilatatum	HTE	10		
FG	Persicaria hydropiper	N	0.1	3	
FG	Philydrum lanuginosum	N	0.4	30	
FG	Ranunculus spp.	N	0.1	20	
	Senecio madagascariensis	HTE	0.1	10	
	Setaria sphacelata	E	30		
GG	Setaria spp.	N	30		

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF	Riparian	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_19	Plot dimension s	50x20
Easting 507583	Northing 6779049	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		4046		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	5	50 - 79 cm	0
	Forbs	3	30 - 49 cm	0
	Ferns	1	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	79	Length of logs (m)	5
	Forbs	0.4	No. trees with hollows	0
	Ferns	0.1		
	Other	0		
High Threat Weed cover		0.1		

BAM Attributte (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	1	1	1	5	2
Average of the 5 subplots	2				

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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	0	Soil Surface Texture	Sandy
Soil Colour	Grey brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging	2	R	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_19	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Aster subulatus	E	0.1	1	
	Conyza bonariensis	E	0.1	1	
	Cuphea carthagenensis	E	0.5	400	
GG	Cynodon dactylon	N	5		
FG	Epaltes australis	N	0.2	20	
GG	Juncus spp.	N	2	100	
GG	Lachnagrostis filiformis	N	2	500	
FG	Ludwigia peploides subsp.	N	0.1	1	
EG	Marsilea spp.	N	0.1	10	
GG	Paspalum distichum	N	65		
FG	Persicaria hydropiper	N	0.1	1	
	Senecio madagascariensis	HTE	0.1	2	
GG	Setaria spp.	N	5		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	13/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_20	Plot dimension s	50x20	Orientation of middle 168
Easting 505715	Northing 6780458	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		4046			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3		DBH	# Tree Stems Count
	Shrubs	1		80+ cm	0
	Grasses etc.	6		50 - 79 cm	0
	Forbs	5		30 - 49 cm	2
	Ferns	1		20 - 29cm	1
	Other	1		10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	22.1		5 - 9 cm	0
	Shrubs	0.1		< 5 cm	1
	Grasses etc.	76		Length of logs (m)	35
	Forbs	0.7		No. trees with hollows	0
	Ferns	0.1			
	Other	0.1			
High Threat Weed cover		0.6			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	5	15	35	20
Average of the 5 subplots	19				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Sandy loam
Soil Colour	Brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	1	NR	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/12/2023	Richmond Valley SF	RV_20	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.1		
	Aster subulatus	E	0.1	10	
	Axonopus compressus	E	10		
FG	Centella asiatica	N	0.2	20	
	Conyza bonariensis	E	0.1		
TG	Corymbia intermedia	N	2	1	
	Cyanthillium cinereum	N	0.1	10	
	CyclospERMUM leptophyllum	E	0.1	5	
GG	Cynodon dactylon	N	55	1000	
	Cyperus eragrostis	HTE	0.5	50	
OG	Eustrephus latifolius	N	0.1	1	
	GamoChaeta spp.	E	0.1		
GG	Imperata cylindrica	N	1	100	
GG	Juncus spp.	N	2	30	
GG	Lachnagrostis filiformis	N	1	90	
FG	Lobelia purpurascens	N	0.1	5	
TG	Lophostemon suaveolens	N	20	5	
TG	Melaleuca quinquenervia	N	0.1	1	
GG	Microlaena stipoides	N	7		
FG	Murdannia graminea	N	0.1	1	
FG	Oxalis perennans	N	0.2	100	
GG	Paspalum distichum	N	10	1000	
EG	Pteridium esculentum	N	0.1	10	
FG	Ranunculus acrophilus	N	0.1	20	
	Senecio madagascariensis	HTE	0.1	20	
	Setaria sphacelata	E	2	100	
	Sida rhombifolia	E	0.1	5	
	Sporobolus africanus	E	3	300	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	14/12/2023	Richmond Valley SF	Moderate	BJT KK		
Zone 56	Datum GDA94	Plot ID	RV_21	Plot dimensions	50x20	Orientation of middle 65
Easting 505987	Northing 6780556	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type	4046			EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	6	50 - 79 cm	0
	Forbs	3	30 - 49 cm	5
	Ferns	1	20 - 29cm	1
	Other	6	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	15.4	5 - 9 cm	1
	Shrubs	0.3	< 5 cm	0
	Grasses etc.	62.2	Length of logs (m)	20
	Forbs	0.3	No. trees with hollows	1
	Ferns	2		
	Other	1.1		
High Threat Weed cover	0.5			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	15	10	35	15
Average of the 5 subplots	19				

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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	2	Soil Surface Texture	Sandy
Soil Colour	Greyish yellow	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (Identify native/livestock	2	R	
Fire damage	1	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet	Survey Name	Plot ID	Recorders
2 of 2			
Date	14/12/2023	Richmond Valley SF	RV_21 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Alphitonia excelsa	N	0.1	1	
TG	Angophora subvelutina	N	15		
	Axonopus compressus	E	0.3	50	
	Bidens pilosa	HTE	0.1	1	
SG	Breynia oblongifolia	N	0.3	30	
FG	Commelina cyanea	N	0.1	1	
	Coryza bonariensis	E	0.3	50	
GG	Cynodon dactylon	N	30		
	Cyperus aggregatus	E	0.1	10	
GG	Eragrostis leptostachya	N	5		
OG	Eustrephus latifolius	N	0.3	50	
	Gamochaeta spp.	E	0.1	10	
OG	Glycine spp.	N	0.2	100	
OG	Hibbertia scandens	N	0.2	1	
FG	Hybanthus stellarioides	N	0.1	1	
GG	Imperata cylindrica	N	2	2000	
OG	Jasminum suavisissimum	N	0.1	5	
GG	Juncus spp.	N	0.2	100	
	Lantana camara	HTE	0.2	1	
TG	Lophostemon suaveolens	N	0.3	1	
	Maekawaea rhytidophylla		0.5	200	
GG	Microlaena stipoides	N	20		
FG	Murdannia graminea	N	0.1	3	
OG	Passiflora herbertiana subsp.	N	0.1	1	
EG	Pteridium esculentum	N	2	200	
	Richardia brasiliensis	E	0.3	100	
	Ricinus communis	HTE	0.1	1	
	Senecio madagascariensis	HTE	0.1	3	
	Setaria sphacelata	E	0.1	1	
	Sida rhombifolia	E	0.1	30	
	Sporobolus africanus	E	7		
GG	Sporobolus elongatus	N	5		
OG	Stephania japonica var. discolor	N	0.2	20	
	Tagetes minuta	E	0.2	200	
	Taraxacum officinale	E	0.1	5	

BAM Plot Data Sheet				Site Sheet no:1 of 2			
		Survey Name		Veg Zone ID	Recorders		
Date	14/12/2023	Richmond Valley SF		Low	BJT KK		
Zone 56	Datum GDA94	Plot ID	RV_22	Plot dimensions	50x20	Orientation of middle	7
Easting 502415	Northing 6780665	IBRA region	South Eastern Queensland	Photo #			
Plant Community Type		3428			EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	3	50 - 79 cm	1
	Forbs	0	30 - 49 cm	4
	Ferns	0	20 - 29cm	0
	Other	1	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	22	5 - 9 cm	0
	Shrubs	0	< 5 cm	1
	Grasses etc.	20.6	Length of logs (m)	5
	Forbs	0	No. trees with hollows	0
	Ferns	0		
	Other	0.1		
High Threat Weed cover		30.1		

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	2	5	8	6	15
Average of the 5 subplots	7.2				

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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	4	Soil Surface Texture	Loam
Soil Colour	Reddish brown	Site Drainage	4	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	NR	
Cultivation (inc. pasture)	1	R	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	3	R	
Fire damage	1	R	
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	14/12/2023	Richmond Valley SF	RV_22 BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia melanoxylon	N	2	1	
	Axonopus compressus	E	1	800	
	Cirsium vulgare	E	0.1	1	
	Conyza bonariensis	E	0.1	20	
TG	Corymbia intermedia	N	10		
GG	Cynodon dactylon	N	20		
	Eragrostis curvula	HTE	30		
TG	Eucalyptus siderophloia	N	7		
TG	Eucalyptus tereticornis	N	3	1	
OG	Glycine spp.	N	0.1	1	
	Gomphocarpus spp.	E	0.2	20	
GG	Imperata cylindrica	N	0.5		
GG	Lomandra multiflora subsp.	N	0.1	1	
	Senecio madagascariensis	HTE	0.1	10	
	Sida rhombifolia	E	0.2	100	
	Sporobolus africanus	E	15		

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders	
Date	14/12/2023	Richmond Valley SF		Moderate	BJT KK	
Zone 56	Datum GDA94	Plot ID	RV_23	Plot dimensions	50x20	Orientation of middle 275
Easting 503307	Northing 6781924	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3428			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	4		DBH	# Tree Stems Count
	Shrubs	3		80+ cm	0
	Grasses etc.	4		50 - 79 cm	1
	Forbs	3		30 - 49 cm	3
	Ferns	0		20 - 29cm	1
	Other	1		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	19.1		5 - 9 cm	1
	Shrubs	1.5		< 5 cm	1
	Grasses etc.	26.3		Length of logs (m)	14
	Forbs	0.8		No. trees with hollows	0
	Ferns	0			
	Other	0.2			
High Threat Weed cover		41.3			

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	85	20	30	45	30
Average of the 5 subplots	42				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (Identify native/livestock	1	R	
Fire damage	1	R	
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	14/12/2023	Richmond Valley SF	RV_23	BJT KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia leiocalyx subsp. leiocalyx	N	0.4	1	
TG	Alphitonia excelsa	N	0.1	1	
	Aster subulatus	E	0.1	1	
	Bidens pilosa	HTE	0.1	3	
SG	Breynia oblongifolia	N	0.1	1	
FG	Centella asiatica	N	0.5	2000	
	Conyza bonariensis	E	0.1	1	
	Cuphea carthagenensis	E	0.5	1000	
GG	Cynodon dactylon	N	20		
FG	Eclipta platyglossa	N	0.2	30	
	Eragrostis curvula	HTE	1	200	
TG	Eucalyptus seeana	N	8		
TG	Eucalyptus tereticornis	N	6		
GG	Imperata cylindrica	N	5		
GG	Juncus spp.	N	0.3	50	
TG	Lophostemon suaveolens	N	5		
SG	Melaleuca alternifolia	N	1		
FG	Murdannia graminea	N	0.1	1	
OG	Parsonsia straminea	N	0.2	1	
	Paspalum dilatatum	HTE	40		
	Senecio madagascariensis	HTE	0.2	200	
	Setaria sphacelata	E	5		
GG	Themeda triandra	N	1	2000	

BAM Plot Data Sheet					Site Sheet no:1 of 2	
		Survey Name		Veg Zone ID	Recorders	
Date	18/01/2024	Richmond Valley		Moderate	KK and DM	
Zone 56	Datum GDA94	Plot ID	RV_24	Plot dimensions	50x20	Orientation of middle 255
Easting 504864	Northing 6781031	IBRA region	South Eastern Queensland	Photo #		
Plant Community Type		3428			EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	5		DBH	# Tree Stems Count
	Shrubs	0		80+ cm	0
	Grasses etc.	8		50 - 79 cm	0
	Forbs	3		30 - 49 cm	4
	Ferns	0		20 - 29cm	1
	Other	0		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	20		5 - 9 cm	1
	Shrubs	0		< 5 cm	1
	Grasses etc.	30.3		Length of logs (m)	18
	Forbs	1		No. trees with hollows	0
	Ferns	0			
	Other	0			
High Threat Weed cover		2.1			

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	70	80	80	30	70
Average of the 5 subplots	66				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Dark brown	Site Drainage	Moderate	Distance to nearest water	280 metres

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2	Survey Name	Plot ID	Recorders
Date	18/01/2024	Richmond Valley	RV_24 KK and DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Angophora subvelutina	N	1	2	
	Axonopus compressus	E	1	1000	
FG	Centella asiatica	N	0.1	200	
GG	Cynodon dactylon	N	2		
GG	Digitaria spp.	N	1		
FG	Epaltes australis	N	0.8	2000	
	Eragrostis curvula	HTE	0.1	100	
GG	Eragrostis elongata	N	0.5	100	
GG	Eragrostis leptostachya	N	0.4	400	
TG	Eucalyptus moluccana	N	2	2	
TG	Eucalyptus siderophloia	N	10	2	
TG	Eucalyptus tereticornis	N	4	2	
GG	Juncus spp.	N	0.3	30	
GG	Lachnagrostis filiformis	N	0.1	10	
TG	Lophostemon suaveolens	N	3	3	
FG	Murdannia graminea	N	0.1	1	
GG	Paspalidium distans	N	1	5000	
	Paspalum dilatatum	HTE	2		
GG	Paspalum distichum	N	25		

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	19/01/2024	Richmond Valley Solar	Cat1	KK & DM	
Zone 56	Datum GDA94	Plot ID	RV_25	Plot dimensions	50x20
Easting 502352	Northing 6781132	IBRA region	South Eastern Queensland	Photo #	
Plant Community Type		0		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	2	50 - 79 cm	0
	Forbs	3	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	0.4	Length of logs (m)	0
	Forbs	0.3	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		9.1		

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	5	5	10	5
Average of the 5 subplots	7				

Notes	
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Physiography + site features that may help in determining PCT and Management Zone					
Landform Pattern		Slope	1 degree N aspect	Soil Surface Texture	Clay loam
Soil Colour	Dark brown	Site Drainage	Moderate	Distance to nearest water	190 metres

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging	3	O	Cleared paddock surrounded by remnant veg
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)	3	R	Evidence of cattle grazing
Fire damage			
Storm damage			
Weediness	3	R	Weeds in plot
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	19/01/2024	Richmond Valley Solar	RV_25	KK & DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Axonopus compressus	E	75		
FG	Centella asiatica	N	0.1	100	
GG	Cynodon dactylon	N	0.2	200	
	Eragrostis curvula	HTE	2	2000	
GG	Eragrostis leptostachya	N	0.2	200	
FG	Oxalis perennans	N	0.1	100	
	Paspalum dilatatum	HTE	2		
	Paspalum notatum	HTE	5	5000	
FG	Phyllanthus virgatus	N	0.1	100	
	Senecio madagascariensis	HTE	0.1		
	Setaria sphacelata	E	5		
	Sporobolus africanus	E	5	5000	

BAM Plot Data Sheet				Site Sheet no:1 of 2			
		Survey Name		Veg Zone ID	Recorders		
Date	18/01/2024	Richmond Valley Solar		Moderate	KK & DM		
Zone 56	Datum GDA94	Plot ID	RV_26	Plot dimensions	50x20	Orientation of middle	90
Easting 502375	Northing 6781444	IBRA region	South Eastern Queensland	Photo #			
Plant Community Type		3420			EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values		BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3		DBH	# Tree Stems Count
	Shrubs	2		80+ cm	0
	Grasses etc.	6		50 - 79 cm	1
	Forbs	6		30 - 49 cm	1
	Ferns	1		20 - 29cm	1
	Other	2		10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	25.4		5 - 9 cm	1
	Shrubs	1.1		< 5 cm	1
	Grasses etc.	30.5		Length of logs (m)	43
	Forbs	0.7		No. trees with hollows	0
	Ferns	0.1			
	Other	0.2			
High Threat Weed cover		0.1			

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	70	50	30	50
Average of the 5 subplots	52				

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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1 degree SE aspect	Soil Surface Texture	Loam
Soil Colour	Dark red brown	Site Drainage	Moderate	Distance to nearest water	110 metres

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal	1	R	Sawn logs
Grazing (Identify native/livestock			
Fire damage	2	NR	Burnt trees and regrowth present
Storm damage			
Weediness	1	R	
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	18/01/2024	Richmond Valley Solar	RV_26	KK & DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Other		0.1	30	
SG	Acacia leiocalyx subsp. leiocalyx	N	1	20	
TG	Alphitonia excelsa	N	0.4	4	
SG	Breynia oblongifolia	N	0.1	10	
FG	Brunoniella australis	N	0.1	10	
EG	Cheilanthes austrotenuifolia	N	0.1	5	
TG	Corymbia henryi	N	20	5	
	Cyperus eragrostis	HTE	0.1	4	
FG	Dichondra repens	N	0.2	200	
GG	Entolasia marginata	N	2	3000	
GG	Eragrostis leptostachya	N	0.5	200	
TG	Eucalyptus siderophloia	N	5	3	
OG	Eustrephus latifolius	N	0.1	10	
OG	Glycine clandestina	N	0.1	10	
FG	Hybanthus stellarioides	N	0.1	10	
GG	Imperata cylindrica	N	10	1000	
GG	Lachnagrostis filiformis	N	10	2000	
FG	Lobelia purpurascens	N	0.1	40	
GG	Microlaena stipoides	N	5	5000	
FG	Murdannia graminea	N	0.1	5	
FG	Phyllanthus virgatus	N	0.1	20	
GG	Sporobolus creber	N	3	100	
	Verbena bonariensis	E	0.1	5	

Appendix 4 Fauna

Table A 5: Fauna species recorded at the Subject Land

Scientific Name	Common Name	EPBC Act status	NSW status
Birds			
<i>Falco longipennis</i>	Australian Hobby		
<i>Cracticus tibicen</i>	Australian Magpie		
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar		
<i>Corvus coronoides</i>	Australian Raven		
<i>Ninox connivens</i>	Barking Owl		VU
<i>Milvus migrans</i>	Black Kite		
<i>Elanus axillaris</i>	Black-shouldered Kite		
<i>Coturnix ypsilophora</i>	Brown Quail		
<i>Ocyphaps lophotes</i>	Crested Pigeon		
<i>Tyto javanica</i>	Eastern Barn Owl		
<i>Ardea modesta</i>	Eastern Great Egret		
<i>Platycercus eximius</i>	Eastern Rosella		
<i>Rhipidura albiscapa</i>	Grey Fantail		
<i>Dacelo novaeguineae</i>	Laughing Kookaburra		
<i>Meliphaga lewinii</i>	Lewin's Honeyeater		
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant		
<i>Grallina cyanoleuca</i>	Magpie-lark		
<i>Vanellus miles</i>	Masked Lapwing		
<i>Falco cenchroides</i>	Nankeen Kestrel		
<i>Philemon corniculatus</i>	Noisy Friarbird		
<i>Manorina melanocephala</i>	Noisy Miner		
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet		
<i>Neochmia temporalis</i>	Red-browed Finch		
<i>Myiagra inquieta</i>	Restless Flycatcher		
<i>Pachycephala rufiventris</i>	Rufous Whistler		
<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet		
<i>Ninox novaeseelandiae</i>	Southern Boobook		
<i>Lophoictinia isura</i>	Square-tailed Kite		VU
<i>Threskiornis spinicollis</i>	Straw-necked Ibis		
<i>Podargus strigoides</i>	Tawny Frogmouth		
<i>Aquila audax</i>	Wedge-tailed Eagle		
<i>Phylidonyris niger</i>	White-cheeked Honeyeater		
<i>Ardea pacifica</i>	White-necked Heron		
<i>Eurostopodus mystacalis</i>	White-throated Nightjar		
<i>Rhipidura leucophrys</i>	Willie Wagtail		
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo		

<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)		VU
Mammals			
<i>Antechinus stuartii</i>	Brown Antechinus		
<i>Rattus fuscipes</i>	Bush Rat		
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat		
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat		VU
<i>Vespadelus pumilus</i>	Eastern Forest Bat		
<i>Mormopterus ridei</i>	Eastern Free-tailed Bat		
<i>Phoniscus papuensis</i>	Golden-tipped Bat		
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat		
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat		
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat		VU
<i>Miniopterus australis</i>	Little Bent-winged Bat		VU
<i>Scotorepens greyii</i>	Little Broad-nosed Bat		
<i>Myotis macropus</i>	Southern Myotis		VU
<i>Petaurus norfolcensis</i>	Squirrel Glider		VU
Reptiles			
<i>Pseudonaja textilis</i>	Eastern Brown Snake		
<i>Antaresia maculosa</i>	Spotted Python		
Frogs			
<i>Litoria latopalmata</i>	Broad-palmed Frog		
<i>Limnodynastes peronii</i>	Brown-striped Frog		
<i>Rhinella marina</i>	Cane Toad		
<i>Crinia signifera</i>	Common Eastern Froglet		
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog		
<i>Litoria nasuta</i>	Rocket Frog		
<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog		
Fish			
<i>Anguilla reinhardtii</i>	longfin eel		
Insects			
<i>Euploea core</i>	Common Crow		

Appendix 5 Significant Impact Criteria assessments

Subtropical Eucalypt Floodplain Forest and Woodland of the New South Wales North Coast and South East Queensland bioregions

Subtropical Eucalypt Floodplain Forest and Woodland is listed as Endangered under the EPBC Act. The structure of the ecological community, in its undisturbed state, varies from tall open forest to woodland, although partial clearing may have reduced the canopy to scattered trees in some areas. Elsewhere, there may be localised areas of denser closed forest and/or low forest, often associated with other disturbance (including flooding). It tends to be shorter and less dense on the wider floodplains, and taller and denser on the more confined floodplains. The tree canopy is dominated by eucalypts and/or other myrtaceous trees (specifically from the Angophora, Corymbia, Lophostemon and Syncarpia genera), often as a mixture of species. A mid-layer or sub-canopy of small trees may be present – with scattered to dense shrubs. For example, Melaleuca, Leptospermum and related genera may form dense thickets beneath the main canopy, or in gaps between canopy trees. Its groundcover typically includes grasses, forbs, ferns, sedges and scramblers (Cth DCCEEW 2022a).

The main threats to subtropical eucalypt floodplain forest and woodland include; clearing and the selective harvesting of the dominant canopy tree species; altered fire and hydrological regimes; livestock grazing; weeds; invasive fauna (pests); climate change; disease, pathogens and dieback (e.g., bell miner associated dieback (BMAD)); and human disturbance.

A referral under the EPBC Act as lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities (including Subtropical Eucalypt Floodplain Forest) as the relevant controlling provisions. The Project design has since been subject to further refinement and is deemed unlikely to have a significant impact on this community.

This endangered ecological community (EEC) is consistent with PCT 4046 and 3428. Approximately 4.57 hectares of the community consistent with these PCTs will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 58 SIC assessment for Subtropical eucalypt floodplain forest and woodland

SIC assessment for critically endangered and endangered ecological community
Reduce the extent of an ecological community.
The Project will directly impact 4.57 ha of the EPBC Subtropical Eucalypt Floodplain Forest and Woodland EEC. The remaining 66.98 ha of the EEC has been avoided within the remainder of the Subject Land. The region was subject to intense bushfire impacts in 2019/2020, to which impacts, and recovery, is clearly evident. Both unburnt and burnt areas for this EEC occur in the Subject Land, with several patches of unburnt areas avoided and retained. The total extent of the EEC within the Subject Land is approximately 71.55 ha, which includes 4.57 ha within the Development Footprint. The removal of 4.57 ha constitutes a reduction of approximately 6% of Subtropical eucalypt floodplain EEC within the Subject Land, 3% within the Project Area, and <1% within the broader locality, and is therefore not considered to be a substantial reduction.

SIC assessment for critically endangered and endangered ecological community

This community is located in the north-western and southern sections of the Subject Land through well connected native vegetation, along and adjacent to periodically inundated riparian areas, bordered by good quality PCT 3420 and regenerating PCT 3428. However, it should be noted this area is currently subjected to a Private Native Forestry Plan (PNFP) so regular disturbance currently exists. Additionally, fragmented patches of this community occur throughout the eastern portions of the Subject Land. The moderate condition vegetation accommodates a better structure and floristic diversity, and a reduced occupancy of weeds. The regenerating vegetation is likely acting as a buffer between this EEC and the transmission line utilised within the Subject Land, such that the good and moderate patches of the EEC have not been significantly modified by weed invasion or edge effects.

Given the small reduction (6%) of the EEC within the Subject Land and <1% within the broader locality, and considering the majority of the community will be retained, including unburnt patches, the Project is considered unlikely to lead to a significant reduction in the extent of the ecological community.

Fragment or increase fragmentation of an ecological community.

The Project will result in the removal of 4.57 ha of the EEC. While this vegetation removal will result in the creation of some localised fragmentation, resulting in the creation of smaller patches, approximately 66.98 ha will be retained within the remainder of the Subject Land, and a further 71.53 ha within the broader Project Area. Mitigation measures will be implemented through a CEMP to reduce indirect impacts arising from the Project including weed ingress, pollutants, and sedimentation and erosion to the remaining areas surrounding the transmission line.

Given the broadscale retention of the EEC within the Subject Land, and that localised disturbance adjacent to the EEC resulting in indirect impacts that will be mitigated it is unlikely that the Project will lead to increased fragmentation of the community to the degree that it places the local occurrence or community as a whole at risk of decline.

Adversely affect habitat critical to the survival of an ecological community.

Within the Subject Land, this vegetation occupies an area surrounding periodically inundated areas and riparian corridors surrounding tributaries, which are characteristic of the preferred landscape for this community. In addition, the patch occurs within a larger area of good quality vegetation, which likely constitutes habitat critical to the survival of the community.

The Project requires removal of 4.57 ha of EEC vegetation, with 66.98 ha to be retained within the Subject Land and a further 71.53 ha within the Project Area. This constitutes a reduction of 3% of habitat considered critical to the survival of the community, which is not considered to be a substantial amount, when considered in relation to the size of the patch to be impacted, and that it is currently subject to a low level of edge effects from the existing easement. While indirect impacts such as weed ingress, sedimentation and erosion and pollutants have the potential to arise as a result of the Project, these impacts will be mitigated, and will not adversely affect critical habitat for the EEC in a manner that would cause it to significantly decline in the locality or as a whole.

Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

The Project may result in localised disturbance to soil and hydrology, with an increase of edge effects (such as increased light, weed ingress or changes to hydrology), however this is not expected to result in the modification of abiotic factors. Implementation of measures such as erosion and sedimentation will be implemented to ensure indirect impacts resulting from the Project will be mitigated. The Project is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the EEC.

Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.

The 4.57 ha of the EEC proposed for removal occurs in various condition states, with riparian areas lacking floristic

SIC assessment for critically endangered and endangered ecological community

diversity within the understorey, and with a higher percentage of exotic species. Moderate condition patches are comprised of key species such as Forest Red Gum, *Eucalyptus seeana*, Pink Bloodwood *Corymbia intermedia*, Grey Ironbark *Eucalyptus siderophloia* and Swamp Mahogany *Lophostemon suaveolens* and midstorey species *Melaleuca alternifolia* and *Acacia concurrens* well represented, with a higher level of floristic diversity, and a lower number of exotic species.

The Project will not result in regular burning or flora and fauna harvesting of the EEC. While the Project will result in the removal of 4.57 ha of the EEC, it is not anticipated that this will result in the removal of functionally important species such as canopy *Eucalypts* or *Corymbias* as this area constitutes 6% of the total occurrence within the Subject Land and 3% within the Project Area, and intact patches containing key species will remain and continue the dispersal of genetic material through the Subject Land and broader landscape. Therefore, the Project is unlikely to cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:

- **Assisting invasive species establishment**
- **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

While the Project will result in the removal of 4.57 ha of the EEC, invasive species are currently present in low-moderate densities within the community, particularly in riparian conditional zones that have been recently subject to disturbance from cattle grazing and erosion, and the fringes of moderate condition PCT 3428 from 2019/2020 fires or the PNFP. Their prevalence, along with other exotic species, is indicative of increased disturbance and nutrient levels associated with pasture improvement and livestock grazing in surrounding areas. While the Project will result in soil disturbance which may lead to the establishment of new plants via stimulation the weed seed bank, it is unlikely to result in the introduction of new species or exacerbate existing pressures in a manner that is likely to cause the EEC to decline in the locality or as a whole. Mitigation measures including good hygiene practices will be implemented to further reduce impacts to the retained areas of the EEC.

Interfere with the recovery of an ecological community.

There is currently no recovery plan for subtropical eucalypt floodplain forest and woodland, however the Conservation Advice (Cth DCCEEW 2022a) identifies four priority conservation actions in order to support the recovery of this EEC, they are:

- Protect the ecological community;
- Conserve remaining patches;
- Manage actions to minimise impacts;
- Apply buffer zones.

While the Project will result in the removal of 4.57 ha of the EEC, 66.98 ha has been actively avoided within the Subject Land, and a further 71.53 ha within the broader Project Area through the design, and will be retained. The Project will implement actions to minimise impacts such as weed ingress through vehicle hygiene and biosecurity protocols, protecting against the spread of weeds and pathogens into and from the site (given the abundance of weed propagules and potential presence of waterborne contaminants and pathogens within the surrounding landscape).

Given the Project will result in the removal of a small area (6%) of the EEC within the Subject Land and 3% within the Project Area, and that management actions will be employed to reduce indirect impacts to retained patches, it is considered unlikely to significantly interfere with the recovery of the ecological community in the locality or as a whole.

Conclusion.

Based on the above assessment, the Project is not likely to have a significant impact Subtropical Eucalypt Floodplain Forest and Woodland EEC, due to:

SIC assessment for critically endangered and endangered ecological community

- A small amount (6%) of the EEC will be removed as part of the works. The remainder of the EEC within the Subject Land (66.98 ha) and an additional 71.53 ha in the Project Area, has been avoided in the design, and will be retained.
- Unlikely to contribute to substantial fragmentation of the community in the locality.
- Unlikely to result in impacts that modify or destroy abiotic factors necessary for the survival of the EEC.
- Unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the EEC.
- Unlikely to increase invasive species establishment and mobilise chemicals such as fertilisers or herbicides.

Rupp's Wattle *Acacia ruppia*

Rupp's wattle is listed as Endangered under the EPBC Act. Rupp's Wattle is an erect, open shrub, 1–3 metres in height and spread, with spindly arching branches. It has smooth grey bark and densely hairy branchlets. The leaves are crowded, about 0.8–2 cm long and 1–2 mm wide, with fine hairs especially on margins and near base and an acute mucro at the apex. The round flower heads are golden yellow and are followed by flat seed pods 4–11 cm long. Rupp's Wattle occurs in an area from Grafton north to Mount Neville Nature Reserve and inland of the Great Dividing Range between Glen Innes and Stanthorpe (Department of Agriculture, Water and the Environment 2021).

The main threats to Rupp's Wattle include high frequency fire, road maintenance activities, clearing of habitat for agriculture and browsing by stock or introduced herbivores (Department of Agriculture, Water and the Environment 2021).

No records of Rupp's Wattle have been detected within the Subject Land to date, and the species was not detected during targeted surveys. In addition, no records of Rupp's Wattle occur within 10 kilometres of the Subject Land, with the closest record occurring approximately 24 kilometres to the south-east in vegetation comprising Mount Neville Nature Reserve. Potential habitat for the species is represented by PCT 3428 and 4046 within the Subject Land. Approximately 5.6 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 59 Significant Impact Criteria for Scrub Turpentine

Significant Impact Criteria (Critically endangered and endangered species)
Lead to a long-term decrease in the size of a population. No populations of Rupp's Wattle are known to occur within a 10-kilometre radius of the Subject Land. The closest population occurs approximately 24 km to the south-east in intact bushland comprising Mount Neville Nature Reserve. No individuals were encountered during targeted surveys. Given the species is broadly associated with dry open forests and fringing drainage lines, the Subject Land may provide marginal habitat, represented by PCT 3428 and 4046. Potential impacts to the local population of the species, associated with the Project, are considered localised in nature. Although there is potential for the species to occur in the 5.6 ha of PCT 3428 and PCT 4046 to be impacted, this potential habitat is subject to a low-moderate degree of edge effects such as a weed ingress, from the existing easement and transmission line in the far eastern corner of the Subject Land, and occurs in a contiguous manner with vast tracts of intact bushland to the north and west. With this in consideration, it is unlikely that there will be a long-term decrease in the size of a population of a species able to re-colonise the area after disturbance, if present within or adjacent to the Subject Land.
Reduce the area of occupancy of the species. The removal of 5.6 ha of potential habitat for Rupp's Wattle has the potential to reduce the area of habitat available. The closest known population occurs over 20 km to the south-east, however, is unlikely to reduce the available habitat for the species as a whole. In addition, large patches of similar and better-quality habitat are present within and adjacent to the Subject Land and Project Area, and across the broader landscape. An area of 140.36 ha of PCT 3428 and 4046 will be retained within the Project Area, including 66.62 ha within the Subject Land. As such, the removal of 5.6 ha of potential habitat as a result of the Project is not considered substantial enough to result in a significant reduction to the area of occupancy of the species.
Fragment an existing population into two or more populations. Rupp's Wattle is not known to occur within a 10-kilometre radius of the Subject Land, and was not recorded within the Subject Land during the targeted surveys. The Project requires the removal of 5.6 ha of potential habitat for Rupp's Wattle within the Subject Land, represented by PCT 3428 and PCT 4046, which will be further reduced. Potential habitat for the species in the Subject Land occurs in various conditions, with the majority of vegetation (3.69 ha) to be removed occurring in moderate condition. However, the remaining vegetation is subject to some level of fragmentation and edge effects from existing easements and transmission lines, as well as adjacent agricultural land use. Although this removal will decrease the amount of native vegetation within the Subject Land and result in some localised fragmentation, the Subject Land occurs adjacent to large tracts of similar and higher quality vegetation both within and adjacent to the Subject Land to the north and west, which will be retained. While final impacts are uncertain, the localised fragmentation will be expected to significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of Rupp's Wattle will be exposed to any substantial fragmentation, given large areas of habitat will be avoided.
Adversely affect habitat critical to the survival of a species. Due to the highly restricted range and small population size of the species, all habitat for Rupp's Wattle is considered critical habitat under the approved conservation advice (Department of Agriculture, Water and the Environment 2021). Therefore, 5.6 ha of potential habitat represented by PCT 3428 and PCT 4046 to be removed by the Project meets the criteria for critical habitat for the species. While the works will result in the removal of 5.6 ha of critical habitat for the species, 1.91 ha of the habitat to be removed is subject to edge effects and weed ingress resulting from previous clearing and agricultural land uses. The remainder of habitat to be removed occurs in a contiguous manner with a large area of vegetation which will be retained within the Subject Land, as well as large tracts of vegetation immediately adjacent to the north and west of the Subject Land (>9000

Significant Impact Criteria (Critically endangered and endangered species)

ha).

As the species was not detected within the Subject Land and no known population occur within a 10 km radius, it is unlikely the removal of 5.6 ha of potential habitat would adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of a population.

Rupp's Wattle was not detected during targeted surveys. The flowering period of Rupp's Wattle is from July to September. Wattle species are mostly pollinated by insects, particularly bees, and offer only pollen as a reward. Little is known about longevity or generation length of Rupp's Wattle, although like many Wattles, Rupp's Wattle plants probably have relatively short lifespans of around 20-40 years (Department of Agriculture, Water and the Environment 2021).

The Project will result in the removal of 5.6 ha of PCT 3428 and 4046 representing potential habitat for Rupp's Wattle, however the Project is not expected to impact on the availability of suitable pollinators. Further, given there is a large proportion of native vegetation within the Subject Land that will be retained under the Project (approximately 92 %), any unknown populations of Rupp's Wattle within the broader Subject Land may continue to persist and genetic material will continue to be dispersed. Therefore, the Project is unlikely to disrupt the breeding cycle of the population.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The species was not recorded in the Subject Land during targeted surveys, and is not known to occur within a 10-kilometre radius. The Project will remove 5.6 ha of potential habitat for the species, subject to further decrease, which constitutes approximately 8% of potential habitat for Rupp's Wattle within the Subject Land, however, constitutes a smaller area (4%) in the context of available habitat within the Project Area, and 1% in the broader locality (>9000 ha within 10 km of the Subject Land). This local scale loss of habitat within the Subject Land is not considered to cause the species to decline considering there is an abundance of similar higher quality patches of habitat available in the region that comprise a local string of reserves.

Result in invasive species that are harmful to critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat.

The Project will not increase invasive fauna species. Invasive weeds are not known to directly impact Rupp's Wattle, however they do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of the species through habitat modification. The Subject Land and vegetation to be removed is currently subject to a low-moderate level of weed invasion, including from priority species such as Lantana. The risk of introduction and spread of weed species will be mitigated through the implementation of good soil transportation and hygiene practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the Rupp's Wattle to decline. Appropriate vehicle hygiene methods should be implemented to reduce the potential spread of pathogens and disease into, or out from the Subject Land as a result of the Project.

Interfere substantially with the recovery of the species.

A recovery plan has been prepared for Rupp's Wattle (Cth DCCEW 2010). The plan lists objectives to aid in the recovery of several species within the Northern Rivers Region. Those objectives that relate to the Project include:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of weeds.
- Protect the Region from the impact of pests.
- Protect the Region from the impact of disease and pathogens.

Significant Impact Criteria (Critically endangered and endangered species)

The Project will result in the removal of 5.6 ha of PCT 3428 and PCT 4046, representing potential habitat for Rupp's Wattle. While this will result in some localised habitat loss for the species, it is not anticipated to adversely reduce or fragment the habitat available for a local population or the species as a whole. The Project will not increase inappropriate fire regimes, and the risk of introduction and spread of weeds will be mitigated through hygiene measures implemented during the works, such as good wash-down and soil transportation methods, and it is therefore unlikely to interfere substantially with the listed recovery actions for the species.

Conclusion

Considering the above factors, and that the species was not detected during targeted surveys, it is unlikely that the Project will impose a significant impact on Rupp's Wattle or their habitat.

It is therefore concluded that the Project will not lead to a significant impact on the Rupp's Wattle.

Paspalidium grandispiculatum

Paspalidium grandispiculatum is listed as vulnerable under the EPBC Act. It is a tufted grass that can be distinguished from other Australian *Paspalidium* by its large spikelets, 3.5–4.8 mm long and characteristic woody culms arising from robust woody rhizomes. *Paspalidium grandispiculatum* occurs in south-east Queensland in a band from Canungra to Kingaroy, over a range of approximately 100 kilometres. It occurs in mixed Eucalyptus forest, mixed open forest, and native pasture occurring as a result of land clearing for agriculture. One population occurs in the Crows Nest Falls National Park, the remaining known populations occur in either state forest or on private land. Most populations occur in areas of remnant vegetation as defined under the Vegetation Management Act 1999 (Queensland) and are therefore protected from broad-scale clearing (Department of the Environment, Water, Heritage and the Arts 2008a).

The main identified threats to *Paspalidium grandispiculatum* include destruction of habitat by clearing; habitat disturbance by timber harvesting; inappropriate grazing regimes; and inappropriate fire regimes. Most known populations are on private land and those within state forests are threatened by illegal grazing, which is difficult to exclude because of insufficient fencing. The above ground parts are killed by fire but the species is capable of regenerating from the rhizome.

No individuals of *Paspalidium grandispiculatum* have been recorded within the Subject Land during field work, and the Subject Land lies outside the area where the species is generally known to occur (between Doubleduke and Whiporie National Parks), and was therefore excluded from targeted survey. Two records of *Paspalidium grandispiculatum* occur within 10 kilometres of the Subject Land, with the closest record occurring approximately 9 kilometres to the south-east in vegetation comprising Doubleduke State Forest. Potential habitat for the species is represented by PCT 3420. Approximately 15.67 hectares of this PCT will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 60 SIC assessment for *Paspalidium grandispiculatum***SIC assessment for vulnerable species*****Lead to the long-term decrease in the size of an important population of a species.***

No important populations have been declared for *Paspalidium grandispiculatum* within the Approved Conservation listing (Department of the Environment, Water, Heritage and the Arts 2008a).

No records have been detected within the Subject Land during field work, and the species was excluded from targeted surveys as the Subject Land is outside the known distribution. Two records are located approximately nine km south-east of the Subject Land within intact vegetation comprising Doubleduke National Park. Within the Subject Land, potential habitat is present in the form of 64.25 ha of PCT 3420, with an additional 330.75 ha within the Project Area. The Project will result in the removal of 15.67 ha of this PCT for the transmission line and associated solar infrastructure.

Vegetation to be impacted occurs in a contiguous manner with similar and higher quality habitat in adjoining areas immediately north and north-west of the Subject Land (>9000ha), that will continue to support the movement of genetic material and dispersal. As such, while impacts are yet to be finalise, the removal of 15.67 ha associated with the Project is not considered significant in the context of available habitat within the Subject Land and broader locality. It is therefore considered unlikely that there will be a long-term decrease in the size of the local population of *Paspalidium grandispiculatum*.

Reduce the area of occupancy of an important population.

Two records of *Paspalidium grandispiculatum* are known within a 10 km radius of the Subject Land. The closest record of the species occurs approximately 9 km to the south-east of the Subject Land, with a large number of records condensed approximately 11 km to the east. No important populations for the species have been declared within the approved conservation advice (Department of the Environment, Water, Heritage and the Arts 2008a). The species was not detected during targeted surveys.

The Project will remove 15.67 ha of vegetation comprising PCT 3420 that represents potential habitat for the species. Approximately 1.78 ha of vegetation to be removed is currently subject to some edge effects and disturbance from previous clearing for an existing easement. Vegetation to be removed exists in a contiguous manner with similar and higher quality vegetation within the Subject Land and in areas immediately adjacent to the Subject Land that are >9000 ha in size.

Given the species is generally found between Doubleduke and Whiporie National Parks, and the Subject Land lies outside this area, and the amount of habitat to be removed in relation to contiguous vegetation to be retained both within the Subject Land and in the immediate vicinity, it is considered unlikely that there will be a long-term decrease in the local population of *Paspalidium grandispiculatum*.

Fragment an existing important population into two or more populations.

Two records of *Paspalidium grandispiculatum* occur within the locality, however no important populations have been declared for the species. As the species is broadly associated with PCT 3420, patches of this community within the northern portion of the Subject Land, designated for removal may provide broad dispersal habitat for the species. Broadly, the Subject Land is currently subject to a moderate level of fragmentation from previous land clearing for agricultural purposes and historical grazing practices. However, patches of PCT 3420 to be removed occur in a contiguous manner with larger patches of similar and higher quality vegetation within and adjacent to the Subject Land, which will be retained.

The Project to impact 15.67 ha of native vegetation for the installation of a transmission line and associated solar infrastructure will not result in any new barrier to the movement of genetic material for the local occurrence of species, or fragment an existing population into two or more populations.

SIC assessment for vulnerable species

Adversely affect habitat critical to the survival of a species.

Critical habitat has not yet been declared for *Paspalidium grandispiculatum* (Department of the Environment, Water, Heritage and the Arts 2008a). However, 13.89 ha of PCT 3420 in good and moderate condition to be impacted likely constitutes good-quality habitat that is likely to provide important resources for recovery of the species. However, it is noted that a portion (1.78 ha) of habitat to be removed is subject to some edge effects within the far eastern section of the Subject Land, and is contiguous to larger areas of similar and better quality habitat that will be retained, both within and adjacent to the Subject Land. Considering the above factors, it is unlikely that the removal of 15.67 ha of PCT 3420 will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population.

No important populations have been declared for the species. Little information exists on the reproductive biology of the species, however the species is known to flower and fruit from January–May. Activities likely to threaten its reproductive cycle include clearing, trampling and grazing, illegal grazing and altered fire regimes.

The Project will include vegetation removal of 15.67 ha for the proposed transmission line. However, given the Subject Land is outside the known distribution for the species, the availability of resources within the immediate locality, including large tracts of intact vegetation that form a matrix of State Forests, areas of habitat to be removed are currently subject to edge effects, and that mitigation measures to minimise further soil erosion or disturbance will be implemented for the duration of works, it is unlikely disturbance to potential habitat for the local occurrence for the species will disrupt the breeding cycle of the local population. The Project is not expected to increase grazing pressure or increase the frequency of fire regimes.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Approximately 15.67 ha of potential habitat comprising PCT 3420 for this species will be removed as a result of the Project, subject to further reduction.

Approximately 1.78 ha of the habitat is currently subject to some level of disturbance and modification from edge effects and weed disturbance within the understorey surrounding the existing easement and in the eastern most portion of the Subject Land. In addition, vegetation to be impacted occurs in a contiguous nature with a larger patch of similar and higher quality habitat both within the Subject Land, and directly adjacent to it, that will continue to support the movement of genetic material and dispersal for the species. Given the above factors, it is considered unlikely that the Project will modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the local population or species is likely to decline. In addition, mitigation measures outlined within the report will ensure further weed invasion is minimised.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species. Invasive weeds are not known to directly impact *Paspalidium grandispiculatum*, however they do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of *Paspalidium grandispiculatum*, through habitat modification. The risk of introduction and spread of weed species will be mitigated through the implementation of good soil transportation and hygiene practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

SIC assessment for vulnerable species

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the *Paspalidium grandispiculatum* to decline. Appropriate vehicle hygiene methods should be implemented to reduce the potential spread of pathogens and disease into, or out from the Subject Land as a result of the Project.

Interfere substantially with the recovery of the species.

A recovery plan has not been prepared for *Paspalidium grandispiculatum*. However, the approved conservation advice lists several actions to aid in the recovery of the species:

Habitat Loss, Disturbance and Modification

- Monitor known populations to identify key threats.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Identify populations of high conservation priority.
- Ensure road widening and maintenance activities or other infrastructure or development activities involving substrate or vegetation disturbance in areas where *P. grandispiculatum* occurs do not adversely impact on known populations.
- Minimise adverse impacts from land use at known sites.
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate inclusion in reserve tenure if possible.

Trampling, Browsing or Grazing

- Develop and implement a stock management plan for roadside verges and travelling stock routes.
- Manage known sites to ensure appropriate grazing regimes occur.
- Prevent grazing pressure at known sites through exclusion fencing or other barriers.

Fire

- Develop and implement a suitable fire management strategy for *P. grandispiculatum*.
- Provide maps of known occurrences to local and state Rural Fire Services and land managers and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operation maps.

Conservation Information

- Raise awareness of *P. grandispiculatum* within the local community.

Enable Recovery of Additional Sites and/or Populations

- Undertake appropriate seed collection and storage.
- Investigate options for linking, enhancing or establishing additional populations.
- Implement national translocation protocols if establishing additional populations is considered necessary and feasible.

The Project will result in the removal of up to 15.67 ha of PCT 3420, representing potential habitat for *Paspalidium grandispiculatum*, however the Subject Land falls outside the known distribution of the species. While this will result in some localised habitat loss for the species, it is not considered to adversely reduce or fragment the habitat available for an important population, the local population or the species as a whole. The Project will not increase trampling, grazing and browsing by livestock, or inappropriate fire regimes, and the risk of introduction and spread of weeds will be mitigated through hygiene measures implemented during the works, such as good wash-down and soil transportation methods, and it is therefore unlikely to interfere substantially with the listed recovery actions for the species.

SIC assessment for vulnerable species

Conclusion.

Based on the assessment above, it is concluded that *Paspalidium grandispiculatum* is unlikely to be significantly impacted by the Project. This conclusion was made on the basis that the Project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – Project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere with the recovery of the species.

Sandstone Rough-barked Apple *Angophora robur*

Sandstone Rough-barked Apple *Angophora robur* is listed as Vulnerable under the EPBC Act. It is a small straggly tree growing to 10 metres tall. It has persistent rough grey bark on the trunk and branches. Leaves are opposite to one another along stems, and unusually large, up to 18 cm long and 7.5 cm wide. The petioles (leaf stalks) are absent or up to 1 mm long. Flowers are white or cream coloured. Fruits are large, up to 1.6 cm long and wide, and cup-shaped with longitudinal ribs. Sandstone Rough-barked Apple is locally frequent, but restricted to the sandstone belt running from north-west of Coffs Harbour, near Glenreagh, to the Coaldale district, north-west of Grafton, NSW. Sandstone Rough-barked Apple is restricted to dry sclerophyll woodland on sandy or skeletal soils on sandstone, or occasionally granite (Department of the Environment, Water, Heritage and the Arts 2008b).

The main identified threats to Sandstone Rough-barked Apple are clearing of habitat for development or agriculture; too frequent fires, which may suppress regeneration; widening of roads; and timber harvesting.

No individuals of Sandstone Rough-barked Apple have been recorded within the Subject Land during targeted survey undertaken in Spring 2023. No records of Rough-barked Apple occur within 10 kilometres of the Subject Land, with the closest record occurring approximately 40 kilometres to the south-west in vegetation comprising Fortis Creek National Park. Potential habitat for the species is represented by PCT 3420 and 3428, which comprise dry sclerophyll woodland. Approximately 20.14 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 61 SIC assessment for Sandstone Rough-barked Apple

SIC assessment for vulnerable species

Lead to the long-term decrease in the size of an important population of a species.

No important populations have been declared for Sandstone Rough-barked Apple within the approved conservation listing (Department of the Environment, Water, Heritage and the Arts 2008c).

No populations occur within the Subject Land or locality, and the species was not recorded during targeted surveys. Within the Project Area, potential habitat is present in the form of 378.37 ha of PCT 3428 and 3420, including 80.95 ha within the Subject Land. The Project will result in the removal of a total of 20.14 ha of these PCT's for the transmission line and associated solar infrastructure.

SIC assessment for vulnerable species

In addition, vegetation to be impacted occurs in a contiguous manner with similar and higher quality habitat in adjoining areas immediately north and north-west of the Subject Land, which will continue to support the movement of genetic material and dispersal. As such, the removal of 20.14 ha is not considered to be significant in the context of available habitat within the locality (>9000 ha) and the absence of local records of the species. It is therefore considered unlikely that there will be a long-term decrease in the size of the local population of Sandstone Rough-barked Apple.

Reduce the area of occupancy of an important population.

The species was not recorded within the Subject Land during targeted surveys. No local populations of Sandstone Rough-barked Apple are known within a 10 km radius of the Subject Land. The closest record of the species occurs approximately 40 km to the south-west of the Subject Land, within Fortis Creek National Park. No important populations for the species have been declared within the approved conservation advice (Department of the Environment, Water, Heritage and the Arts 2008c).

The Project will remove 20.14 ha of vegetation comprising PCT 3420 and PCT 3428 that represents potential habitat for Sandstone Rough-barked Apple. Vegetation to be removed is currently subject to some edge effects and disturbance from previous clearing for an existing easement, and exists in a contiguous manner with similar and higher quality vegetation within the Subject Land and in areas immediately adjacent to the Subject Land that are >9000 ha. The removal of up to 20.14 ha would constitute a reduction of approximately 5.3 % of the available habitat within the Subject Land and Project Area combined, and less and 1% available within the surrounding locality.

As the species has not been recorded, there being no known local populations within a 10-km radius of the Subject Land, and no important population for this species in the area, the amount of habitat to be removed in relation to contiguous vegetation to be retained both within the Subject Land and in the immediate vicinity, it is considered unlikely that there will be a long-term decrease in a population of Sandstone Rough-barked Apple.

Fragment an existing important population into two or more populations.

The species was not recorded during targeted surveys, and no known populations of Sandstone Rough-barked Apple occur within the locality, and no important populations have been declared for the species. As the species is broadly associated with PCT 3420 and 3428, patches of these communities within the northern portion of the Subject Land may provide broad dispersal habitat for the species.

Broadly, the Subject Land is currently subject to a moderate level of fragmentation from previous land clearing for agricultural purposes and historical grazing practices. However, patches of PCT 3420 and PCT 3428 to be removed occur in a contiguous manner with larger patches of similar and higher quality vegetation within and adjacent to the Subject Land, which will be retained.

Currently, the Project will impact 20.14 ha of native vegetation for the installation of a transmission line and associated solar infrastructure. Given no individuals were found within the Subject Land, works are unlikely to result in any new barrier to the movement of genetic material for the local occurrence of species, or fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species.

Critical habitat has not yet been declared for Sandstone Rough-barked Apple (Department of the Environment, Water, Heritage and the Arts 2008c). Approximately 17.81 ha of PCT 3420 and PCT 3428 in good and moderate condition to be impacted likely constitutes potential critical habitat that is likely to provide important resources for recovery of the species. However 3.05 ha of habitat to be removed is currently subject to some edge effects within the far western section of the Subject Land, as well as scattered trees, from surrounding agricultural land uses, existing easements and transmission lines. In addition, the habitat to be removed is contiguous to larger areas of similar and better quality habitat.

SIC assessment for vulnerable species

While impacts are yet to be finalised, considering these factors, it is unlikely that the removal of 20.14 ha of PCT 3420 and PCT 3428 will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population.

The species was not detected within the Subject Land, and no important populations have been declared for the species, and therefore the closest population approximately 40 km away is not considered to constitute an important population. Little information exists on the reproductive biology of the species, however the species is known to flower in December. Activities likely to threaten its reproductive cycle include clearing, timber harvesting, road construction and maintenance and altered fire regimes which inhibit regeneration.

The Project will include vegetation removal for the proposed transmission line. However, given the availability of resources within the immediate locality, including 358.23 ha of available habitat to be avoided within the Subject Land and Project Area, and large tracts of intact vegetation that form a matrix of State Forests adjacent to the Subject Land, the removal of 20.14 ha is not considered significant in the context of locally available habitat. Areas of habitat to be removed are currently subject to some edge effects, and mitigation measures to minimise further soil erosion or disturbance will be implemented for the duration of works. While impacts are yet to be finalised, it is unlikely disturbance resulting from the Project to potential habitat for the local occurrence for the species will disrupt the breeding cycle of the local population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The species was not recorded within the Subject Land. Approximately 20.14 ha of potential habitat comprising PCT 3420 and PCT 3428 for this species will be removed as a result of the Project.

The habitat to be removed consists of good, moderate, low and regenerating conditional states, with some areas currently subject to a low-moderate level of disturbance and modification from edge effects, previous clearing and weed disturbance within the understorey surrounding the existing easement and in the western most portion of the Subject Land adjacent to existing transmission lines. In addition, vegetation to be impacted occurs in a contiguous nature with larger patches of similar and higher quality habitat both within the Subject Land, and directly adjacent to the north, east and west, that will continue to support the movement of genetic material and dispersal for the species. While impacts are yet to be finalised, it is considered unlikely that the Project will modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the local population or species is likely to decline. In addition, mitigation measures outlined within the report will ensure further weed invasion is minimised.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species. Invasive weeds are not known to directly impact Sandstone Rough-barked Apple, however they do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Sandstone Rough-barked Apple through habitat modification. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation and hygiene practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

SIC assessment for vulnerable species

The Project is unlikely to introduce a disease that causes the Sandstone Rough-barked Apple to decline. Appropriate vehicle hygiene methods should be implemented to reduce the potential spread of pathogens and disease into, or out from the Subject Land as a result of the Project.

Interfere substantially with the recovery of the species.

A recovery plan has been prepared for Sandstone Rough-barked Apple (Cth DCCEEW 2010). The plan lists objectives to aid in the recovery of several species within the Northern Rivers Region. Those objectives that relate to the Project include:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of weeds.
- Protect the Region from the impact of pests.
- Protect the Region from the impact of disease and pathogens.

The Project will result in the removal of 20.14 ha of PCT 3420 and PCT 3428, representing potential habitat for Sandstone Rough-barked Apple. However as the species was not recorded during targeted surveys, It is not considered to adversely reduce or fragment the habitat available for an important population, the local population or the species as a whole, considering at least 358.23 ha will be retained within the Subject Land and Project Area, and a further area of >9000 ha of potential habitat occurs in the immediate vicinity. The Project will not increase inappropriate fire regimes, and the risk of introduction and spread of weeds will be mitigated through hygiene measures implemented during the works, such as good wash-down and soil transportation methods, and it is therefore unlikely to interfere substantially with the listed recovery actions for the species.

Conclusion.

Based on the assessment above, it is concluded that Sandstone Rough-barked Apple is unlikely to be significantly impacted by the Project. This conclusion was made on the basis that the Project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – Project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere will the recovery of the species.

Slaty Red Gum *Eucalyptus glaucina*

Slaty Red Gum is listed as vulnerable under the EPBC Act. It is a small to medium-sized woodland tree, often to 18 metres and sometimes to 30 metres high. The bark sheds over the whole trunk in large plates or flakes to leave a smooth or granular, mottled surface of white or various shades of grey. Slaty Red Gum was originally known from the Rappville district, south of Casino, and in a number of localities in the Taree, Stroud, Dungog and Paterson districts, NSW. Slaty Red Gum grows in a range of situations, from shallow soils or stony hillsides, but not on poor sandstones, to grassy woodland on deep, moderately fertile and well-watered soil, to gentle slopes near drainage lines in alluvial and clayey soils (DEWHA 2008).

The main threats to Slaty Red gum include clearing and fragmentation of habitat for agriculture and development, timber harvesting activities, and lack of regeneration through grazing pressure.

A referral under the EPBC Act as lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities (including Slaty Red Gum) as the relevant controlling provisions. The Project design has since been subject to further refinement, and targeted surveys have been undertaken, and is deemed unlikely to have a significant impact on this species.

No individuals of Slaty Red Gum have been recorded within the Subject Land during targeted surveys. A large population, approximately 238 records of Slaty Red Gum occur within 10 kilometres of the Subject Land, with the closest record recorded approximately 74 metres from the Subject Land, and the most recent record being from 2022. Habitat for the species is represented by PCT 3420 and PCT 4046. Approximately 16.79 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 62 SIC assessment for Slaty Red Gum

SIC assessment for Slaty vulnerable species
<i>Lead to the long-term decrease in the size of an important population of a species.</i> No important populations have been declared for Slaty Red Gum within the approved conservation listing (DEWHA 2008) and no individuals were recorded within the Subject Land during targeted surveys. Within the Subject Land, potential habitat is present in the form of 119.76 ha of PCT 3420 PCT 4046, and 429.09 ha within the Project Area. The Project will result in the removal of 16.79 ha of these communities for the proposed transmission line and associated solar infrastructure. While vegetation to be impacted occurs in a contiguous manner with similar and higher quality habitat in adjoining areas within and immediately north and north-west of the Subject Land, this species has a very high likelihood of occurrence within the Subject Land, given the proximity of records, availability of suitable habitat and similar resemblance to other species present within the site. The removal of up to 16.79 ha of potential habitat would result in a reduction of approximately 3.9% of available habitat within the Subject Land and broader Project Area. Given the species was not detected within the Subject Land, and the small reduction in the size of potential habitat, it is unlikely the Project would lead to the long-term decrease in the size of an important population of the species.
<i>Reduce the area of occupancy of an important population.</i> The species was not detected within the Subject Land during targeted surveys. The Project will remove 16.79 ha of vegetation comprising PCT 3420 and PCT 4046 that represents potential habitat for Slaty Red Gum. Vegetation to be removed is currently subject to a low-moderate level of edge effects and disturbance from previous clearing for existing easements and transmission lines, however, overall exists in a moderate – good condition. Vegetation to be removed also exists in a contiguous manner with similar and higher quality vegetation within the Subject Land and in areas immediately adjacent to the Subject Land that are >9000 ha. An area of approximately 412.3 ha will be retained within the Subject Land and Project Area. This small amount designated for removal is not considered to comprise a significant area and is not considered reduce the area of occupancy for the local population.
<i>Fragment an existing important population into two or more populations.</i> Approximately 238 records of Slaty Red Gum exist within a 10 km radius of the Subject Land, with the closest records approximately 74 m from the Subject Land and a large population to the north of the Subject Land. However no

SIC assessment for Slaty vulnerable species

important populations have been declared for the species. As the species is broadly associated with PCT 3420 and 4046, patches of this community within the northern portion of the Subject Land may provide broad dispersal habitat for the species. However, there were no individuals recorded during the targeted surveys.

Broadly, the Subject Land is currently subject to a low - moderate level of fragmentation from previous land clearing for existing easements, and historical grazing practices. Patches of PCT 3420 to be removed occur in a contiguous manner with larger patches of similar and higher quality vegetation within and adjacent to the Subject Land, which will be retained, and will remain connected to the local population of Slaty Red Gum to the north. While a small amount (16.79 ha) of vegetation will be cleared for the Project, the majority is along a transmission line that is already subject to edge effects and fragmentation. Therefore, the Project is unlikely to separate populations, or reduce the movement of genetic material.

Adversely affect habitat critical to the survival of a species.

Critical habitat has not yet been declared for Slaty Red Gum (DEWHA 2008). Approximately 16.79 ha of PCT 3420 and PCT 4046 will be impacted. Some of the habitat to be removed is subject to a low level of edge effects within the far western section of the Subject Land, and is contiguous to larger areas of similar and better quality habitat, which will remain connected to the local population of Slaty Red Gum. Therefore a reduction of approximately 3.9% within the Subject Land and broader Project Area is unlikely to adversely affect habitat critically to the survival of the species.

Disrupt the breeding cycle of an important population.

No individuals were detected within the Subject Land during targeted surveys, and therefore do not comprise part of an important population.

Little information exists on the reproductive biology of the species, however it is known to flower between August and December and is known to hybridise with other Red Gum species, which poses a threat to the long term viability of the species (OEH 2019).

The Project will include vegetation removal for the proposed transmission line (17.26 ha). Given there are similar resources available within the locality, a reduction of 3.9% of habitat within the Subject Land and Project Area is unlikely to disrupt the breeding cycle of the local population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Approximately 16.79 ha of potential habitat comprising PCT 3420 and 4046 for this species will be removed as a result of the Project.

The habitat to be removed is currently subject to a low-moderate level of disturbance and modification from edge effects and weed disturbance within the understorey, surrounding the existing easement and in the western most portion of the Subject Land. Vegetation to be impacted occurs in a contiguous nature with a larger patch of similar and higher quality habitat both within the Subject Land. The removal of 3.9% of available habitat for the species within the Subject Land and Project Area is unlikely to modify habitat and isolate populations of Slaty Red Gum within the Subject Land more than the current level of modification. Given these factors, it is considered unlikely that the Project will modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the local population or species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species. Invasive weeds are not known to directly impact Slaty Red Gum, however they do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to

SIC assessment for Slaty vulnerable species

harm the population of Slaty Red Gum through habitat modification. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation and hygiene practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the Slaty Red Gum to decline. Appropriate vehicle hygiene methods should be implemented to reduce the potential spread of pathogens and disease into, or out from the Subject Land as a result of the Project.

Interfere substantially with the recovery of the species.

There is no adopted/made recovery plan for Slaty Red Gum (DEWHA 2008). However, the approved conservation advice for the species lists the following regional recovery actions, including:

Habitat Loss, Disturbance and Modification

- Monitor known populations to identify key threats.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Identify populations of high conservation priority.
- Control the removal of Slaty Red Gum for firewood or fencing material (DECC, 2005).
- Ensure agriculture and timber harvesting activities (or other infrastructure or development activities involving substrate or vegetation disturbance) in areas where Slaty Red Gum occurs do not adversely impact on known populations.
- Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.

Trampling, Browsing or Grazing

- Develop and implement a stock management plan for roadside verges and travelling stock routes.
- Modify grazing in known stands of Slaty Red Gum to enhance regeneration. Fencing may be required (DECC, 2005).

Fire

- Develop and implement a suitable fire management strategy for Slaty Red Gum that includes avoiding frequent fires that may suppress regeneration (DECC, 2005).
- Identify appropriate intensity and interval of fire to promote vegetation regeneration.
- Provide maps of known occurrences to local and state rural fire services and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operation maps.

Conservation Information

- Raise awareness of Slaty Red Gum within the local community, especially among landholders.

Enable Recovery of Additional Sites and/or Populations

- Undertake appropriate seed collection and storage.
- Investigate options for linking, enhancing or establishing additional populations.
- Implement national translocation protocols

The Project is not likely to increase trampling and grazing pressures from livestock, or inappropriate fire regimes. The Project will result in the removal of 16.79 ha of PCT 3420 and 4046, representing potential habitat for Slaty Red Gum.

SIC assessment for Slaty vulnerable species

However, the species was not detected within the Subject Land during targeted surveys. Therefore, the removal of approximately 3.9% of potential habitat for the species within the Subject Land and Project Area would not be considered to adversely reduce or fragment the habitat available for the local population. Therefore, the current Project Development Footprint and associated works are considered unlikely to interfere substantially with the listed recovery actions for the species.

Conclusion.

Based on the assessment above, it is concluded that Slaty Red Gum is unlikely to be significantly impacted by the Project. This conclusion was made on the basis that the Project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – Project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere with the recovery of the species.

It is therefore concluded that the Project is unlikely to lead to a significant impact on the Slaty Red Gum.

Square-fruited Ironbark *Eucalyptus tetrapleura*

Square-fruited Ironbark is listed as Vulnerable under the EPBC Act. It is a medium tree growing to 30 m, usually with a straight trunk. The bark is very thick and furrowed, and moderately hard or somewhat flaky. The Square-fruited Ironbark is endemic to areas of coastal lowlands and coastal foothills in northern NSW, from near Glenreagh in the south to Casino in the north. Distribution is patchy but occurs over an area measuring approximately 100 kilometres in length and 40 kilometres in width. The Square-fruited Ironbark occurs in both dry and moist eucalypt forests, on soils of low to moderate fertility, but often with heavy clay substrate and poor drainage.

The main identified threats to Square-fruited Ironbark include loss of habitat through clearing for agriculture, timber harvesting activities, road construction and maintenance; grazing of young plants by domestic stock; and too-frequent fires that inhibit regeneration. The Square-fruited Ironbark is also under threat from Lantana (*Lantana camara*).

No individuals of Square-fruited Ironbark have been recorded within the Subject Land during targeted surveys. No records of Square-fruited Ironbark occur within 10 kilometres of the Subject Land, with the closest record occurring approximately 12 kilometres to the south. Habitat for the species is represented by PCT 3420 and 3428. Approximately 20.14 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 63 SIC assessment for Square-fruited Ironbark

SIC assessment for vulnerable species

Lead to the long-term decrease in the size of an important population of a species.

No important populations have been declared for Square-fruited Ironbark within the approved conservation listing (Department of the Environment, Water, Heritage and the Arts 2008c).

SIC assessment for vulnerable species

No populations occur the Subject Land or locality, and no individuals were detected during the targeted surveys. Within the Subject Land, potential habitat is present in the form of 80.95 ha of PCT 3420 and PCT 3428. The Project will result in the removal of 20.14 ha of these PCT's for the transmission line and associated solar infrastructure.

Vegetation to be impacted occurs in a contiguous manner with similar and higher quality habitat in adjoining areas immediately north and north-west of the Subject Land, which will continue to support the movement of genetic material and dispersal. In addition, approximately 358.23 ha of habitat will be retained through avoidance within the Subject Land and broader Project Area. As such, impacts associated with the Project are not considerable in the context of available habitat within the locality and the absence of local records of the species. It is therefore considered unlikely that there will be a long-term decrease in the size of the local population of Square-fruited Ironbark.

Reduce the area of occupancy of an important population.

No local populations of Square-fruited Ironbark are known within a 10 kilometre radius of the Subject Land. The closest record of the species occurs approximately 12 km to the south of the Subject Land, within vegetation comprising Whiporie State Forest. No individuals were detected during the targeted surveys, and no important populations for the species have been declared within the approved conservation advice (Department of the Environment, Water, Heritage and the Arts 2008c).

The Project will remove 20.14 ha of vegetation comprising PCT 3420 and PCT 3428 that represents potential habitat for Square-fruited Ironbark. Vegetation to be removed is currently subject to some edge effects and disturbance from previous clearing for an existing easement and exists in a contiguous manner with similar and higher quality vegetation within the Subject Land and in areas immediately adjacent to the Subject Land that are >9000 ha.

Given no individuals were detected, there being no known local populations within a 10-kilometre radius of the Subject Land, and no important population for this species in the area, given the amount of habitat to be removed in relation to contiguous vegetation to be retained both within the Subject Land and in the immediate vicinity, it is considered unlikely that there will be a long-term decrease in a population of Square-fruited Ironbark.

Fragment an existing important population into two or more populations.

No known populations of Square-fruited Ironbark occur within the locality, with no individuals detected during targeted surveys, and no important populations have been declared for the species. As the species is broadly associated with PCT 3420 and 3428, patches of these communities within the Subject Land may provide broad dispersal habitat for the species.

Broadly, the Subject Land is currently subject to a moderate level of fragmentation from previous land clearing for agricultural purposes and historical grazing practices. However, patches of PCT 3420 and PCT 3428 to be removed occur in a contiguous manner with larger patches of similar and higher quality vegetation within and adjacent to the Subject Land, which will be retained.

The Project will impact upon 20.14 ha of native vegetation for the installation of a transmission line and associated solar infrastructure, however much of the vegetation to be removed occurs along an existing transmission line and is currently subject to edge effects and fragmentation. Therefore, the Project is not expected to result in any new barrier to the movement of genetic material for the local occurrence of species, or fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species.

Critical habitat has not yet been declared for Square-fruited Ironbark (Department of the Environment, Water, Heritage and the Arts 2008c). Approximately 20.14 ha of PCT 3420 and PCT 3428 to be impacted likely constitutes potential high-quality habitat that is likely to provide important resources for recovery of the species, however no individuals were detected during targeted surveys.

SIC assessment for vulnerable species

The habitat to be removed occurs in a contiguous manner with a large area of vegetation which will be retained within the Subject Land, as well as large tracts of vegetation immediately adjacent to the north and west of the Subject Land (>9000 ha). Considering no known populations of the species occur within a 10-kilometre radius of the Subject Land, and the availability of similar and higher quality resources within the immediate locality, the removal of 20.14 ha of potential habitat is not considered likely to adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population.

No important populations are known to occur within the locality for the species. Little information exists on the reproductive biology of the species, however activities likely to threaten its reproductive cycle include clearing, timber harvesting, road construction and maintenance and altered fire regimes which inhibit regeneration.

The Project will result in the removal of 20.14 ha of PCT 3420 and 3428 representing potential habitat for Square-fruited Ironbark, however the Project is not expected to increase timber harvesting, or altered fire regimes. Further, given there is a large proportion of native vegetation within the Subject Land and Project Area that will be retained under the Project (approximately 94 %), any unknown populations of Square-fruited Ironbark within the broader locality will continue to persist and genetic material will continue to be dispersed. Therefore, the Project is unlikely to disrupt the breeding cycle of the population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The species was not recorded in the Subject Land, and is not known to occur within a 10-kilometre radius. The Project will remove 20.14 ha of potential habitat for the species, which constitutes approximately 5.3% of available habitat within the broader Project Area, however, constitutes a far smaller area (less than 1 %) in the context of available habitat within the broader locality (>9000 ha within 10 km of the Subject Land). This local scale loss of habitat within the Subject Land is not considered to cause the species to decline considering there is an abundance of similar higher quality patches of habitat available in the region that comprise a local string of reserves.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Square-fruited Ironbark is known to be threatened from invasion by priority weed species Lantana *Lantana camara* (Department of the Environment, Water, Heritage and the Arts 2008c).

The Project is not likely to increase invasive fauna species. The Project will include vegetation clearing and soil disturbance which has the potential to increase the spread or introduction of weed species such as Lantana which negatively impact the species through competition and habitat modification. Some level of invasion by Lantana amongst other weed species currently exists within the Subject Land. The risk of weed introduction and spread will be mitigated by the implementation of good soil transportation and hygiene practices throughout the works. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the Square-fruited Ironbark to decline. Appropriate vehicle hygiene methods should be implemented to reduce the potential spread of pathogens and disease into, or out from the Subject Land as a result of the Project.

SIC assessment for vulnerable species

Interfere substantially with the recovery of the species.

A recovery plan has been prepared for Square-fruited Ironbark (Cth DCCEEW 2010). The plan lists objectives to aid in the recovery of several species within the Northern Rivers Region. Those objectives that relate to the Project include:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of weeds.
- Protect the Region from the impact of pests.
- Protect the Region from the impact of disease and pathogens.

The Project will result in the removal of 20.14 ha of PCT 3420 and PCT 3428, representing potential habitat for Square-fruited Ironbark. While this will result in some localised habitat loss for the species, it is not considered to adversely reduce or fragment the habitat available for an important population, the local population or the species as a whole, as no individuals were detected during targeted surveys. The Project will not increase inappropriate fire regimes, and the risk of introduction and spread of weeds will be mitigated through hygiene measures implemented during the works, such as good wash-down and soil transportation methods, and it is therefore unlikely to interfere substantially with the listed recovery actions for the species.

Conclusion.

Based on the assessment above, it is concluded that Square-fruited Ironbark is unlikely to be significantly impacted by the Project. This conclusion was made on the basis that the Project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – Project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere with the recovery of the species.

Australasian Bittern *Botaurus poiciloptilus*

The Australasian Bittern is listed as Endangered under the EPBC Act. It is a large, stocky, thick-necked, heron-like bird and has a prominent black-brown stripe running down the side of the neck, the eyebrow is pale, and the chin and upper throat are white. In Australia, the Australasian Bittern occurs from south-east Queensland to south-east South Australia as far as the Adelaide Region, southern Eyre Peninsula, Tasmania and in the south-west of Western Australia (DEE 2019).

The Australasian Bittern has primarily been impacted by the loss of wetland habitat through the diversion of water away from wetlands; drainage of swamps; and clearing for urban and agricultural development. Habitat degradation due to factors such as reduced water quality, invasion by weeds, impacts from grazing animals and reduced water flows due to a changing climate are also impacting on Australasian Bittern survival and breeding success. Predation by introduced species may also be limiting survival but more research is required to determine the relative importance of this threat.

No records of Australasian Bittern have been found within the Subject Land. One record of Australasian Bittern occurs within 10 kilometres of the Subject Land, with the closest record recorded approximately 150

metres away from 2018. There is potential for the Subject Land to be used occasionally by this species for foraging, as well as breeding, given the presence of associated PCTs (PCT 4046 and 4001). Approximately 1.12 hectares of PCT 4046 will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 64 SIC assessment for Australasian Bittern

SIC assessment for Endangered species

Lead to the long-term decrease in the size of a population.

No Australasian Bittern populations were detected or are known to occur within the Subject Land. One record occurs within close proximity to the Subject Land approximately 150 m to the north. Approximately 1.12 ha of potential habitat will be removed as a result of the Project.

The majority of vegetation to be removed for the species is impacted by edge effects such as a weed ingress through previous clearing and ongoing agricultural land use, and when considered in relation to good-quality wetland habitat which occurs adjacent to vegetation which be retained, the species is more likely to utilise these areas. It is therefore unlikely the Project would lead to a long-term decrease in the size of the population of the mobile Australasian Bittern due to the removal of marginal habitat. Mitigation measures to protect trees to be retained adjacent to the Development Footprint, which will ensure any further impacts to Australasian Bittern are also minimised.

Reduce the area of occupancy of the species.

The 1.12 ha of PCT 4046 to be removed occurs in a highly modified state, having been heavily cleared and subjected to edge effects including a moderate level of ingress from exotic species due to pasture improvement. In addition, this area is not considered to be a large reduction when considered in relation to the amount of better quality habitat within the Project Area (114.46 ha) including 56.61 ha within the Subject Land, which constitutes < 1% of both PCT 4046 and PCT 4001.

Based on the above, the Project will not result in a further reduction of the area of occupancy for the Australasian Bittern, with consideration to the small area of 1.12 ha to be impacted relative to the larger tracts of remnant native vegetation within the vicinity. The species will continue to be able to forage and breed in retained habitat within and outside of the Subject Land and the Project will not represent a barrier to the movement of individuals.

Fragment an existing population into two or more populations.

Overall, the vegetation to be removed by the Project occurs in a modified state, including moderate, and riparian conditional states. While the Project will result in some level of fragmentation for the development of a transmission line and associated solar infrastructure, the majority of intact vegetation will be retained in the immediate vicinity, which and continue to provide better-quality habitat for Australasian Bittern. Therefore, impacts to 1.12 ha of PCT 4046, is unlikely to result in habitat becoming significantly fragmented or isolate the population more than the existing barriers such as the existing paddocks, easements and transmission line already provide.

Adversely affect habitat critical to the survival of a species.

Given that the Australasian Bittern is presumed to have undergone a severe reduction in numbers, based on historic habitat loss and degradation across the core part of its range, all natural habitat (including constructed wetlands with suitable habitat) in which the Australasian Bittern is known or likely to occur should be considered critical to the survival of the species (DEE 2019).

The Project will impact 1.12 ha of PCT 4046, which, given the above factors, is considered to form critical habitat for the

SIC assessment for Endangered species

species.

In the context of available, and better-quality resources within the Subject Land, including wetland areas which have been avoided through the Projects design, the Project will remove a relatively small area of vegetation, which constitutes < 1% of the total area of habitat available within the broader Project Area which includes the Subject Land. In addition, the vegetation to be removed is predominantly comprised of low riparian conditional states, which have been subject to modification through clearing and ingress by exotic species. It is likely these areas would provide sub-optimal habitat for Australasian Bittern only. Vegetation comprising PCT 4001 occurring across vegetated wetland areas in the far south-eastern section of the Subject Land is likely to constitute preferred habitat for the species, and these areas have been avoided and will be retained. Considering these factors, it is unlikely the Project will adversely affect habitat critical to the survival of the Australasian Bittern.

Disrupt the breeding cycle of a population.

The Australasian Bittern breeds from October to February in solitary pairs. However, sometimes several nests may be placed in close proximity to each other (Marchant & Higgins 1990). The species nests adjacent to relatively deep, densely vegetated freshwater swamps and pools, building its nests under dense cover over shallow water (Marchant & Higgins 1990). The species prefers to nest in vegetation that is up to 2.5 m tall and the nests are placed about 30 cm above the water level (Marchant & Higgins 1990). The nest is a shallow structure of dry or green reeds, within a clump of reeds in water or a swamp and is built on a platform of bent-over reeds.

The removal of 1.12 ha of PCT 4046 for the Project is considered small-scale in relation to high quality wetland habitat occurring within the south-east of the Subject Land and contiguously further east. Given the species favours permanent and seasonal freshwater habitats, particularly those with dense tall vegetation dominated by sedges, rushes and reed, sand requires shallow water for which to forage and nest in, and areas of PCT 4046 do not contain these aquatic elements, it is likely the 1.12 ha of PCT 4046 to be removed constitutes marginal habitat only.

While the Project would result in the removal of a small area of marginal habitat for this species within the locality, this is unlikely to reduce the local availability of resources such that the breeding cycle of a population would be disrupted.

Similarly, it is unlikely that short-term disturbance from noise or lighting associated with the construction of the transmission line and solar farm will substantially interfere with the species' ability to reproduce successfully. Australasian Bittern populations will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of an Australasian Bittern population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Impacts to 1.12 ha of Australasian Bittern habitat including PCT 4046, will reduce the availability of marginal resources within the immediate locality. However, given the vegetation to be removed within this community is relatively disturbed, being subject to edge effects and weed ingress, and the availability of better-quality habitat represented by adjacent vegetated wetlands, the impact is not considered significant. The Subject Land, including vegetation to be removed is currently subject to a low-moderate degree of weed ingress, including from priority weed species such as Lantana.

Mitigation measures such as good soil transportation and wash-down protocols implemented throughout the works will reduce the risk of weed introduction and spread. The Project is also not likely to isolate populations as the development will not substantially impact on the movement corridor and thus is not likely to constitute a barrier to movement and unlikely to result in the decline of the species as a whole.

Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.

SIC assessment for Endangered species

The Project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as Foxes and Cats which are known to have a negative impact on populations of Australasian Bittern. Invasive weeds species are not known to directly harm populations of Australasian Bittern, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Hooded Robin. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices throughout works.

Introduce disease that may cause the species to decline.

The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Australasian Bittern populations in or near the Project.

Interfere substantially with the recovery of the species.

A national recovery plan currently exists for Australasian Bittern. Actions outlined within the plan to aid in the recovery of the species relating to the Project include:

- Identify subpopulations of high conservation priority.
- Identify key locations that require habitat protection and improvement.
- Protect areas of 'habitat critical for survival' that are not currently managed for nature conservation.
- Develop and implement a range of voluntary incentives for protecting Australasian Bittern habitat on private land.
- Undertake wetland restoration activities, to create suitable habitats for Australasian Bittern.
- Monitor habitat subject to restoration and enhancement.

The Project will result in the removal of 1.12 ha of PCT 4046, representing marginal habitat for Australasian Bittern. While all potential habitat for the species is considered critical habitat, vegetation to be removed is small in relation to the available habitat and resources that have been actively avoided by the Projects design and will be retained. In addition, the habitat to be removed has been modified through previous clearing and agricultural practices, and in its current state provides marginal habitat, when considered in relation to good quality wetland habitat that occurs within the south-east of the Subject Land. The Project is not anticipated to interfere with restoration activities or modify habitat that is currently subject to restoration/enhancement measures. Measures to mitigate the risk of weed ingress will be implemented throughout the works, including wash-down procedures and good soil transportation, to eliminate indirect impacts to retained vegetation. Therefore, it is unlikely the Project will result in substantial interference with the recovery actions listed for the species.

Conclusion.

In consideration of the above significant impact criteria, the Project is not likely to significantly impact Australasian Bittern within the Subject Land or wider locality, as:

- The Project will result in impacts to 1.12 ha of marginal foraging and dispersal habitat. Given the availability of similar and better-quality resources within the Subject Land and broader locality, impacts to this vegetation is not considered to constitute a significant impact.
- The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of the Hooded Robin populations in or near the Project.
- The Project does not substantially interfere with recovery actions listed for Australasian Bittern.

Glossy Black Cockatoo *Calyptorhynchus lathami*

Glossy Black-Cockatoo is listed as Vulnerable under the EPBC Act. It is a medium-sized cockatoo with a diagnostic combination of black-brown head, neck and underbody, red or orange-red panel in tail, and otherwise black plumage. Adult females also exhibit extensive patches of yellow feathering on head and neck.

The species is closely associated with *Allocasuarina* spp. and *Casuarina* spp. dominated woodlands, or open sclerophyll forest where the middle stratum is *Allocasuarina* spp. They feed almost exclusively on the seed of *Allocasuarina* spp. but occasionally also take wood-boring insect larvae. The species is dependent on hollow-bearing trees for breeding habitat as they nest in the hollows formed in the trunk, stump, spout or limbs of eucalypt trees, living or dead (Higgins 1999, OEH 2024).

The main threat causing the decline of south-eastern glossy black cockatoo is a result of habitat loss, degradation, and fragmentation. Historic land clearance was the main cause of decline in the past, leading to the loss of both feeding and breeding habitats. Wildfires cause further habitat loss and degradation. The subspecies was severely affected by the 2019/2020 bushfires, with a significant portion of their known range burnt.

No individuals of Glossy Black Cockatoo were recorded within the Subject Land during targeted surveys undertaken in Winter 2023. Approximately 65 records of Glossy Black Cockatoo occur within 10 kilometres of the Subject Land, with the closest record recorded from within the Subject Land, and the most recent record being from 2019 (DPE 2022g). There is potential for the Subject Land to be used occasionally by this species for foraging, as well as breeding, given the presence of associated PCTs (3428 and 3420), as well as suitably sized hollows. No evidence has been found to date that breeding is occurring within the Subject Land. Up to 20.14 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 65 SIC assessment for Glossy Black Cockatoo

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No important populations have been identified for Glossy Black Cockatoo within the approved conservation advice for the species. No individuals were recorded during targeted surveys conducted in August 2023. The Project will result in the clearing of 20.14 ha of PCT 3420 and 3428 including sparse patches of <i>Casuarina</i> and <i>Allocasuarina</i> species and hollow-bearing trees with suitably sized hollows, representing potential foraging and breeding resources for the Glossy Black-Cockatoo. While the Project will result in the removal of potential foraging habitat, the total area of habitat to be retained both within and adjacent to the Subject Land in the Project Area is considerable (378.37 ha), and foraging habitat to be impacted is sparse and subject to edge effects from adjacent cleared areas. Given the expanse of native vegetation to be retained within the Subject Land and within the broader landscape, the removal of 20.14 ha is not expected to significantly reduce habitat for the highly mobile species. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of the highly mobile Glossy Black-Cockatoo important populations.
Reduce the area of occupancy of an important population.
It is considered that vegetation within the Subject Land constitutes known habitat to the foraging and breeding practices of the Glossy Black-Cockatoo. However, the overall context of the region and the extent of the vegetation connected to these areas, 20.14 ha expected to be cleared is unlikely to have a significant impact to the occupancy of an important population for this species. This area constitutes a reduction of approximately 5.3% of habitat available within the Subject Land and Project Area.

SIC assessment for vulnerable species

Given the size and connectivity available in the greater landscape, and the highly mobile nature of the species, it is unlikely that an important population would be negatively impacted by the Project. The species will continue to forage in retained habitat within the Subject Land and immediate surrounding landscape. As such, it is unlikely that Project will reduce the area of occupancy of the species' population.

Fragment an existing important population into two or more populations.

In the scope of the greater context of the surrounding land, the 20.14 ha of potential Glossy Black-Cockatoo habitat to be removed as a result of the proposed work represents 5.3% within the Project Area and less than 1 % of the native vegetation within 10 km of the locality (>9000 ha), a relatively small portion of land for the highly mobile species. While the works will result in some level of fragmentation within the immediate locality through the clearing of vegetation for the proposed transmission line, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing key Glossy Black-Cockatoo habitat. As such the Project will not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species.

Given the Subject Land contains both habitat necessary for foraging, roosting and breeding it is considered likely that the Subject Land comprises habitat critical to the survival of the species. However, large areas of habitat will be retained within the Subject Land and Project Area (358.23 ha) and surrounding locality (>9000 ha), which constitute approximately 94% and 99% of available habitat for the species respectively. Therefore, while the works will result in localised impacts to foraging, breeding and dispersal habitat, these are not expected to be significant in the context of available resources. Vegetation connectivity will be maintained throughout the landscape. Although native vegetation will be removed, the Project will not substantially impact upon any of the required Glossy Black-Cockatoo habitat, and thus will not adversely affect habitat critical for the species' survival.

Disrupt the breeding cycle of an important population.

Glossy black cockatoos are hollow nesters, utilising large hollows in both living and dead eucalypt trees (Higgins 1999). They have a clutch size of one, and females are entirely responsible for incubation and brooding. Males are present throughout the incubation and nestling period to feed the females. Fledglings becomes independent after around three months (Higgins 1999).

The Subject Land contains both foraging and breeding habitat represented by PCT 3420 and 3428 and suitably sized hollow-bearing trees. While the Project will result the loss of 21 hollow-bearing trees, seven of which contain suitable hollows for Glossy Black Cockatoo, within the Subject Land and therefore reduce the local availability of breeding resources, it is not anticipated that this will reduce the availability within the locality such that the breeding cycle of a population would be disrupted as a whole, given the amount of vegetation to be retained both within and adjacent to the Subject Land that contains similar and better quality resources including 21 suitably sized hollow-bearing trees. It is unlikely that indirect disturbance from noise or lighting associated with the construction for the Project will substantially interfere with the species' ability to reproduce successfully. The highly mobile Glossy Black-Cockatoo will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The Project includes the removal of 20.14 ha of PCT 3420 and 3428, and suitable hollow-bearing trees. The removal of this vegetation will reduce the availability of foraging resources within the immediate area. However, patches surrounding the existing easement and transmission line, smaller patches within paddocks and scattered trees are currently subject to a low-moderate level of modification through previous clearing and weed ingress. The majority of good condition vegetation to be removed is highly connected to larger areas of similar/good quality habitat that will be retained. The Subject Land will remain contiguous to vast areas of intact vegetation comprising multiple reserves and national parks. Given that the Project will not constitute a new barrier to the movement of individuals of the highly mobile species, and the contiguous nature of the vegetation with a large tract of good quality bushland with hollow-bearing trees to the west and south of the Subject Land, the removal of vegetation for the works is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. In addition,

SIC assessment for vulnerable species

mitigation methods outlined within the recommendations section of this report will be implemented to ensure that indirect impacts including weed establishment are minimised for the duration of the works.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species. Invasive weeds species are not known to directly harm populations of Glossy Black Cockatoo, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Glossy Black Cockatoo. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the Glossy Black-Cockatoo to decline.

Interfere substantially with the recovery of the species.

There is no National Recovery Plan for the Glossy Black-Cockatoo, however, Saving our Species (SoS) has developed a strategy to secure the species from extinction. Key management sites are being identified, located in various sites across NSW. The Subject Land is located outside the priority management sites. The Project will not impact on the recovery of the Glossy Black-Cockatoo or any areas mapped as priority management sites.

Habitat critical to survival for the species includes all foraging habitat during both the breeding and non-breeding season. Therefore, any habitat utilised by Glossy Black-Cockatoo is considered habitat critical to survival of the species and impacts to habitat may interfere with the recovery of the species. The area of habitat to be removed by the Project is surrounded by contiguous areas of suitable foraging habitat, both within the northern section of the Subject Land, and in adjacent areas to the north, east and west. Given these factors it is considered unlikely that the removal of 20.14 ha, which constitutes approximately 5.3% of the available of foraging habitat within the Subject Land and Project Area, will interfere with the recovery of the species.

Conclusion.

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Glossy Black-Cockatoo or their habitats as:

- The species was not recorded during targeted surveys.
- The Project will not introduce any diseases or invasive species of the Glossy Black-Cockatoo.
- The Project will not interfere with the recovery of the species or areas established by SoS as a priority management site.
- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species however as the Project will impact on only a very small area of potential habitat, surrounded by large swathes of habitat, it is not likely to significantly impact the species.

Based on the factors above, it is concluded that the Project is unlikely to lead to a significant impact on the Glossy Black-Cockatoo.

Greater Glider *Petauroides Volans*

Greater Glider (Southern and Central) is listed as endangered under the EPBC Act. It is the largest gliding possum in Australia, with a head and body length of 35 – 46 cm, and a tail measuring 45 – 60 cm (Menkhorst & Knight 2011). The species is arboreal and nocturnal and is mostly restricted to eucalypt forests and woodlands. It is typically found in highest abundance in tall, montane and moist eucalypt forests with old trees and abundant hollows. The species favours forests with a diversity of eucalypt species, due to the

seasonal variation in its preferred tree species. During the day Southern Greater Glider shelters in tree hollows, particularly those that are in large, old trees (McKay 2008).

The Greater Glider is found throughout eastern Australia, from the Windsor Tableland in north Queensland through to central Victoria. The broad extent of occurrence is unlikely to have changed substantially since European settlement, however the area of occupancy has decreased substantially, mostly due to land clearing (Threatened Species Scientific Committee 2016). This decline is most likely continuing due to further land clearing, fragmentation, fire and forestry activities. The species is considered to be particularly sensitive to forest clearance, logging and fire, and is slow to recover following major disturbance. The species is also considered to be sensitive to fragmentation due to a low dispersal ability, previously showing low persistence in small forest fragments (Threatened Species Scientific Committee 2016).

Greater Glider is threatened by a number of processes including loss and fragmentation of habitat through land-clearing, mortality on roads through habitat and movement areas, predation from cats, dogs and foxes. The Greater Glider is slow to respond to disturbance and therefore is at a higher susceptibility of population decline.

Southern Greater Glider populations throughout Australia are currently under increased pressure due to the 2019-2020 summer bushfires that occurred across the southern and eastern states of Australia. DCCEEW have provided several resources in response to these fires including analyses of listed species habitat within fire affected areas (DAWE 2020a), as well as provisional lists of fauna that require urgent management intervention (DAWE 2020b). Approximately 29 % of the known distribution for Southern Greater Glider has been identified as occurring within fire affected areas, and the species has been identified as requiring urgent management intervention. Given this context, any remaining areas of high quality Southern Greater Glider habitat are now of key importance in the conservation of the species. Southern Greater Glider is sensitive to wildfire, and it is slow to recover following major bushfire disturbances (Lunney 1987, Threatened Species Scientific Committee 2016). Home ranges for the species are typically small, ranging from 1-4 hectares (Pope, Lindenmayer, & Cunningham 2004), and thus reoccupation of burnt sites in subsequent years is likely to be slow as a result of the species' limited dispersal capabilities (Threatened Species Scientific Committee 2016).

No individuals of Greater Glider were recorded within the Subject Land during targeted surveys. However, 80 records of Greater Glider occur within 10 kilometres of the Subject Land, with the closest record being approximately 88 metres from the Subject Land, and the most recent record being from 2018 (DPE 2022g). There is potential for the Subject Land to be used occasionally by this species for foraging, as well as breeding, given the presence of associated PCTs (PCT 3428, 3420, 4046 and 4001) and suitably sized hollows. Approximately 21.27 hectares of PCTs 3428, 3420 and 4046 will be removed as a result of the Project. An assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 66 SIC assessment for Greater Glider

Significant impact criteria (Critically endangered and endangered species)
Lead to a long-term decrease in the size of a population
No Greater Glider populations were detected during targeted surveys or are known to occur within the Subject Land, however, known records occur within close proximity to the Subject Land approximately 88 m to the east within Bungwalbin State Forest. It is therefore presumed that these records form part of the local population of Greater Glider.
The Project will result in the removal of 21.27 ha of native vegetation within the Subject Land, including the removal of

Significant impact criteria (Critically endangered and endangered species)

PCT 3420, 3428, and 4046 which are all associated with the species. The vegetation within the Subject Land includes flowering perennial species and suitable hollow-bearing trees, which represent potential foraging breeding habitat for Greater Glider. Whilst works will reduce the availability of potential foraging and breeding resources within the immediate locality, approximately 471.56 ha of habitat will be retained within the Project Area, including 116.29 ha within the Subject Land, much of which is contiguous with large areas of highly connected, good-quality vegetation in the adjacent areas surrounding the Subject Land, which comprises >9000 ha within a 10-kilometre radius. It is therefore unlikely the Project would lead to a long-term decrease in the size of an important population of Greater Glider. Mitigation measures to protect trees to be retained adjacent to the Development Footprint will also be implemented, which will ensure any further impacts to Greater Glider are also minimised.

Reduce the area of occupancy of the species

The Project occurs on pre-disturbed, cleared areas that are currently utilised for cattle grazing, with areas of intact vegetation primarily occurring within the northern section of the Subject Land. The clearing of 21.27 ha of native vegetation will include pre-disturbed and regenerating areas.

The Project will result in the removal of 21.27 ha of potential habitat for Greater Glider, which includes foraging and breeding resources represented by flowering Eucalypts and suitably sized hollows.

Whilst the removal of native vegetation within the Development Footprint will result in localised reductions in species habitat, it is unlikely to result in a significant decrease in the area of occupancy over which the species ranges within the locality, constituting approximately a 4.3 % reduction within the Project Area which includes the area to be retained within the Subject Land. Furthermore, given the local population does not occur at the edge of the species range, with a high occurrence of the species across the locality as represented by records in the Bungwalbin National Park and State Forest, as well as Ellangowan and Carwong State forests, it is not considered that the local population meets the criteria of an important population. Given the quality and extent of the vegetation to be retained both within and contiguous to the Subject Land, which includes foraging and breeding habitat represented by the same vegetation community, the 21.27 ha to be cleared is unlikely to reduce the area of occupancy of the species.

Fragment an existing population into two or more populations

The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. This area also currently separates populations of Greater Glider which reside in the above reserves. The Subject Land itself is currently subject to a moderate level of fragmentation and edge effects through clearing of native vegetation and existing agricultural practices. While the Project will result in fragmentation of vegetation within the immediate locality for the proposed transmission line, the removal of 21.27 ha of vegetation will not create a barrier to the movement of these populations or further fragment vegetation within the Subject Land to the extent that it will fragment an existing population into two or more populations. Vegetation within the Subject Land will remain highly connected to similar and higher quality vegetation both within and adjacent to the Subject Land to both the south and west of the Subject Land, including protected land comprising Bungwalbin State Forest and National Park, and Carwong State forest. This vegetation exists in a contiguous manner to the vegetation to be removed and is considered to provide high quality habitat for Greater Glider.

The works to remove 21.27 ha are not expected to reduce connectivity at a landscape level, considering the high level of fragmentation that already exists and currently acts as a barrier to populations of Greater Glider, and as such, the Project will not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

Significant impact criteria (Critically endangered and endangered species)

Habitat critical to the survival of Southern Greater Glider includes large, mature trees with hollows (for sheltering and breeding), and large remnant vegetation patches. Southern Greater Glider are highly sensitive to fragmentation and are generally unable to persist in small vegetation patches.

Using the factors listed to broadly define critical habitat within the *Conservation Advice for Petauroides volans (greater glider (southern and central))* (Cth DCCEEW 2022b) it is likely critical habitat occurs within the Subject Land as the vegetation consist of large contiguous areas of Eucalypt Forest, which contains hollow-bearing trees that may facilitate the dispersal of the species. It is noted that no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

The current Project proposes the removal of 21.27 ha of Southern Greater Glider habitat, encompassing eucalypt woodland that contains potential foraging and breeding habitat for the species, represented by PCT 3420, 3428, and 4046 and suitable hollow-bearing trees. It is not considered likely that the removal of 21.27 ha of potential habitat for the species would adversely affect habitat critical to the survival of this species, given approximately 471.56 ha of vegetation will be retained within the Subject Land and Project Area, which contains similar and higher-quality vegetation.

Additionally, this species has not been recorded using the vegetation within the Subject Land to date. The Project footprint avoids and will retain larger contiguous areas of higher quality, intact and large patch size vegetation with abundant hollows, which is important habitat for this species.

Disrupt the breeding cycle of a population

The Greater Glider shelters in hollows during the day, with a particular preference for large hollows. Females give birth to a single young from March to June, with individuals living up to 15 years (Cth DCCEEW 2022b) and the species have relatively small home ranges (1-19 ha (DAWE 2016)). Impacts likely to have an adverse effect on the life cycle of this species include loss and fragmentation of habitat, loss of hollow bearing trees, too frequent or high severity fires (DPE 2022g).

There are a number of records of the species approximately 88 m south and south-east of the Subject Land, however no Greater Glider populations were recorded during targeted surveys or are known to occur within the Subject Land. The Project is not expected to increase fire regimes. In addition, the removal of 21.27 ha of vegetation for the Project is not considered to be significant in relation to the 471.56 ha of vegetation to be retained within the Subject Land and Project Area, and high quality bushland occurring in a contagious manner to the Subject Land, providing similar/better quality foraging and breeding habitat including hollow-bearing trees.

Given this, it is unlikely the works will reduce the local availability of resources such that the breeding cycle of a population would be disrupted. Similarly, it is unlikely that short-term indirect disturbance from noise or lighting associated with the construction will substantially interfere with the species' ability to reproduce successfully. Greater Glider will be able to continue to breed in areas to be retained within the Subject Land, and as a result the breeding cycle of a Greater Glider population will not be disrupted.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The current Project proposes the removal of 21.27 ha of potential Greater Glider habitat, encompassing eucalypt woodland, and suitably sized hollow-bearing trees. Due to the large number of Greater Glider recorded in close proximity to the Subject Land, this habitat appears to be highly suitable for the species. A portion of the vegetation to be removed consist of low condition and regenerating vegetation as well as scattered trees, which occur in a modified state due to

Significant impact criteria (Critically endangered and endangered species)

previous fires and clearing activities which have resulted in the presence of a high cover of exotic pasture species within the understorey. Good condition PCT 3420 and 3428 to be removed is also subject to a low level of edge effects from the existing cleared easements and transmission line. However, majority of this vegetation will be retained within the Subject Land and in the immediate vicinity.

Additionally, large tracts of intact vegetation occur directly adjacent to the Development Footprint, and are likely to provide better quality habitat for the species. As Greater Glider require relatively small home ranges (1-19 ha), it is considered that there is adequate habitat within the nearby reserves and within retained habitat within the Development Footprint to support the local population of Greater Gliders, and that the Project would not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that it would cause the species to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Project will not increase invasive fauna species. Invasive weeds species are not known to directly harm populations of Greater Glider, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Greater Glider. The Subject Land is currently subject to a low-moderate level of weed ingress, including by priority species such as Lantana. The risk of introduction and spread of weed species will be mitigated by:

- Implementation of appropriate weed control and weed disposal in accordance with Biosecurity protocols.
- Any soil or other materials imported to the site for use in restoration or rehabilitation would be certified free from weeds and pathogens or obtained from sources that demonstrate best practice management to minimise weed and pathogen risks.

The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands.

Introduce disease that may cause the species to decline

The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Greater Glider populations within or near the Subject Land.

Interfere with the recovery of the species

There is no adopted or made recovery plan for this species. However, the *Conservation Advice for Petauroides volans (greater glider (southern and central))* lists several actions to assist with the recovery of the species, including:

- In the aftermath of bushfires, protect any unburnt habitat.
- Protect and maintain sufficient areas of suitable habitat, including denning and foraging resources and habitat connectivity, to sustain viable subpopulations throughout the species' range.
- Undertake habitat restoration to improve micro-climate conditions in areas at high risk of extreme temperatures and drought.
- Protect and maintain sufficient areas of suitable habitat, including denning and foraging resources and habitat connectivity, to sustain viable subpopulations throughout the species' range.

While the proposed removal of 21.27 ha of Greater Glider habitat will not contribute to the recovery of the species, it is not considered likely to substantially interfere with the recovery of the species for the following reasons:

- Approximately 86% of the species potential habitat has been avoided and will be retained within the Subject Land and 4% within the broader Project Area.

Significant impact criteria (Critically endangered and endangered species)

- Large tracts of intact native vegetation including Carwong, Ellangowan and Bungwalbin State Forest and Bungwalbin State Conservation Area and National Park, occur directly adjacent to the Development Footprint, and are likely contains higher quality and preferable habitat for the species, given records are condensed in these reserves. This habitat is considered adequate such that the loss of 21.27 ha of habitat within the Development Footprint would not reduce the local population size or decrease the viability of the local population. These reserves alone comprise >9000 ha, and are surrounded by greater areas of contiguous intact bushland.
- As part of the Project, preclearance assessments would be undertaken and clearing of hollow-bearing trees would be supervised by an ecologist, and any unknown populations or individuals of Greater Gliders utilising the habitat would be removed from the Development Footprint would be captured and relocated. Due to the large areas of suitable habitat nearby (i.e. within the reserve system), it is likely that displaced individuals would be successfully relocated, assuring that the local population would not decrease in numbers as a result of the Project.

Conclusion

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Greater Glider or their habitat as:

- The species was not recorded during targeted surveys undertaken to date.
- The Project will not introduce any diseases or invasive species of the Greater Glider.
- The Project will not result in the modification or fragmentation of habitat such that any new barrier to connectivity for the dispersal movements of the species will be created.
- The Project will result in the removal of 21.27 ha of PCT 3428, 3420 and 4046. Given the availability of similar resources to be retained within the Subject Land and immediate locality, including areas contiguous to the Subject Land, the removal of this vegetation is unlikely to constitute a significant impact.
- The Project does not significantly interfere with any of the conservation actions for the species.

Based on the factors above, it is concluded that the Project is unlikely to lead to a significant impact on the Greater Glider.

Yellow-bellied Glider *Petaurus australis australis* (South-Eastern)

Yellow-bellied Glider (South-Eastern) subspecies is listed as Vulnerable under the EPBC Act. It is a medium-sized arboreal marsupial, and the second largest Australian glider. The body is a greyish-brown colour with a black stripe running down the back and extending to the tail. There are two subspecies, which are similar in appearance, though the yellow-bellied glider (Wet Tropics) is typically smaller than the yellow-bellied glider (south-eastern). This subspecies occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests, and shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter, and also have a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts. During the day, the yellow-bellied glider shelters in hollows found in large, old trees, usually more than one metre in diameter, which are a critical habitat feature for the yellow-bellied glider as they use them for dens for sheltering and breeding. The species is active throughout the night and feeds on the sap of Eucalyptus species, insects, pollen and nectar. The yellow-bellied glider (south-eastern) is found from south-eastern Queensland to far south-eastern South Australia. In NSW, it predominantly occurs in forests along the eastern coast, from the NSW-Qld border to the NSW-Vic border. However, the distribution also extends inland to the western slopes of the Great Dividing Range in parts of NSW and Qld (DAWE 2022).

The yellow-bellied glider (south-eastern) is primarily threatened by climate change, altered fire regimes, clearing, fragmentation and timber harvesting.

No Yellow-bellied Gliders were recorded during the targeted surveys undertaken to date, however 75 records of Yellow-bellied glider occur within 10 kilometres of the Subject Land, with the closest record approximately 400 metres away and the most recent record from 2019 (DPE 2022g). Vegetation to be impacted within the Subject Land including PCT 3420, 3428 and 4046, including suitably sized hollow-bearing trees may provide potential foraging and breeding habitat for the species. Approximately 21.27 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 67 SIC assessment for Yellow-bellied Glider

Significant impact criteria (Vulnerable species)

Lead to a long-term decrease in the size of an important population of a species.

Important populations of Yellow-bellied Glider (South East) include stronghold populations, ecologically or genetically distinct populations (e.g., those at the limits of the subspecies' range, outlying populations), research populations, and other populations where recovery actions are being implemented. Several populations are listed as important within the approved conservation advice for the subspecies; however the list is not exhaustive and notes that all known populations should be considered important.

No Yellow-bellied Glider populations were detected during surveys undertaken to date or are known to occur within the Subject Land, however, a number of records of the species are concentrated approximately 400 m to the east and west of the Subject Land in protected vegetation comprising Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests.

The Project will include the removal 21.27 ha of native vegetation within the Subject Land, including the removal of PCT 3420, 3428, and 4046 which are associated with the species, in addition to the removal of suitable hollow-bearing trees for the species. The vegetation within the Subject Land includes flowering perennial species and suitable hollow-bearing trees, which represent potential foraging breeding habitat for Yellow-bellied Glider. Whilst works will reduce the availability of potential foraging and breeding resources within the immediate locality, the amount of a large area of highly connected, high-quality vegetation will be retained within the northern section of the Subject Land and Project Area (approximately 455.44 ha), in addition to high-quality resources within the immediate locality (>9000 ha). It is therefore unlikely the Project would lead to a long-term decrease in the size of an important population of Yellow-bellied Glider. Mitigation measures to protect trees to be retained adjacent to the Development Footprint, and pre-clearance of hollow-bearing trees will also be undertaken to ensure any further impacts to Yellow-bellied Glider are also minimised.

Reduce the area of occupancy of an important population.

The subspecies is social and lives in family groups of two to six individuals (though usually three to four) of varying age and sex composition, throughout an exclusive home range of approximately 50–65 ha (DAWE 2022). Records of an existing important population are concentrated to the south-west of the Subject Land in >9000 ha of protected vegetation comprising a string of state forests, national parks and reserves, which exists in a contiguous manner without substantial breaks in connectivity to vegetation within the Subject Land.

Given the quality and extent of vegetation to be retained both within and contiguous to the Subject Land, which includes foraging and breeding habitat represented by flowering Eucalypt and other perennial species, and hollow-bearing trees, the 21.27 ha expected to be cleared is unlikely to reduce the area of occupancy of an important population of the species both within the Subject Land and broader Richmond Valley area.

Given the size and connectivity available in the broader landscape to the north, east, west and south of the Subject Land, it is unlikely that the area of occupancy for the important population will be reduced. Foraging and breeding habitat will be retained both within and surrounding the Subject Land immediately adjacent to the Development Footprint.

Significant impact criteria (Vulnerable species)

Fragment an existing important population into two or more populations.

The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. This area also currently separates populations of Yellow-bellied Glider which reside in the above reserves.

The vegetation within the Development Footprint itself is also currently subject to edge effects from previous fragmentation through the existing easements, and ongoing agricultural practices. The Project to clear 21.27 ha of vegetation for the development of a transmission line and solar photovoltaic units, including removal of potential foraging and breeding habitat will result in fragmentation within the immediate locality, but is unlikely to create a new barrier to the movement of the local important population or further fragment vegetation within the Subject Land to the extent that it will fragment an existing important population into two or more populations. Vegetation within the Subject Land will remain highly connected to similar and higher quality vegetation both within and adjacent to the Subject Land to both to the north and west. This vegetation exists in a contiguous manner to the vegetation to be removed, and in the context of the surrounding vegetation the 21.27 ha of potential foraging and breeding habitat to be removed as a result of the proposed work represents a small proportion of the native vegetation within 10 kilometres of the locality which comprises >9000 ha.

The works to remove 21.27 ha are therefore not expected to reduce connectivity throughout the landscape, and as such, the Project will not fragment an existing important population into two or more populations.

Adversely affect habitat critical to the survival of a species.

Using the factors listed to broadly define critical habitat within the *Conservation Advice for Petaurus australis australis* (Yellow-bellied glider (south-eastern)) (DAWE 2022) it is likely critical habitat occurs within the Subject Land as the vegetation consists of:

- Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees (including winter flowering species Forest Red Gum *Eucalyptus tereticornis* and Spotted Gum *Corymbia maculata*).

It is noted that no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

The Project will remove 21.27 ha of PCT 3420, 3428 and 4046 which contain both Forest Red Gum and Spotted Gum. The Development Footprint comprises good and moderate condition vegetation that is subject to a low level of edge effects from existing easements and transmission lines and previous burning, as well as scattered trees that is subject to a higher level of edge effects such as weed ingress from surrounding exotic grassland. Similar and higher quality vegetation including hollow-bearing trees will remain available for these species both within the Subject Land and surrounding the Subject Land within the reserve system, which is contiguous with vegetation within the Subject Land. Considering these factors, it is unlikely the Project will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population.

The subspecies reproduces seasonally, with timing varying across its broad range (Woinarski, Burbidge, & Harrison 2014). Litter size is usually one, and individuals reach sexual maturity at around two years of age range (Woinarski, Burbidge, & Harrison 2014). Once sexual maturity is reached, individuals will pair up with each other, usually in a monogamous relationship. The subspecies' lifespan is a minimum of six years in the wild. Generation length is four to five years (Goldingay & Kavanagh 1991, Woinarski, Burbidge, & Harrison 2014). Actions likely to impact the breeding cycle of the

Significant impact criteria (Vulnerable species)

species include altered fire regimes, clearing, fragmentation and timber harvesting (DAWE 2022).

There are a number of records of the species approximately 400 m south-east of the Subject Land, however no Yellow-bellied Glider populations were recorded during the targeted surveys or are known to occur within the Subject Land. Scattered trees to be removed within the Subject Land currently exist in a highly modified and fragmented state from previous clearing and weed ingress. Good condition PCT 3420 and 3428 to be removed is highly connected to surrounding intact vegetation, providing similar/better quality foraging and breeding habitat.

The Project is not likely to increase fire regimes or timber harvesting, however, will result in localised clearing and fragmentation through the removal of 21.27 ha of potential habitat including suitable hollow-bearing trees. However, while this will reduce the local availability of resources, it is not anticipated that this will reduce the availability within the broader Subject Land or broader landscape such that the breeding cycle of a population would be disrupted. The species will continue to breed within >9000 ha of habitat within the adjacent reserve system, and if unknown populations of the species occasionally utilise the Subject Land, they will remain able to do so in approximately 455.44 ha of retained vegetation within the Subject Land and Project Area. Similarly, it is unlikely that short-term disturbance from indirect impacts such as noise or lighting associated with the construction will substantially interfere with the species' ability to reproduce successfully. Yellow-bellied Glider will be able to continue to breed in areas to be retained within the Subject Land, and as a result the breeding cycle of a Yellow-bellied Glider important populations will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project includes the removal of 21.27 ha of PCT 3420, 3428 and 4046 including suitable hollow-bearing trees. The removal of this vegetation will reduce the availability of foraging and breeding resources within the immediate area. A portion of the vegetation to be removed consist of low condition and regenerating vegetation, which occur in a modified state due to previous fires and clearing activities which have resulted in the presence of a high cover of exotic pasture species within the understorey. Good and moderate condition PCT 3420, 3428 and 4046 to be removed is also subject to a low level of edge effects from the existing cleared easements and transmission line. However, majority of this vegetation will be retained within the Subject Land and in the immediate vicinity. Additionally, large tracts of intact vegetation occur directly adjacent to the Development Footprint, and are likely to provide better quality habitat for the species.

Given that the Project will not constitute a new barrier to the movement of individuals of the subspecies, and the contiguous nature of the vegetation with a large tract of good quality bushland with hollow-bearing trees to the west and south of the Subject Land, the removal of vegetation for the works is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. In addition, mitigation methods outlined within the recommendations section of this report will be implemented to ensure that indirect impacts including weed establishment are minimised for the duration of the works.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species such as cats or foxes. Invasive weeds species are not known to directly harm populations of Yellow-bellied Glider, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Yellow-bellied Glider. Dieback caused by *Phytophthora cinnamomi* may also be impacting the subspecies through habitat degradation (DAWE 2022). The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices. The Project is therefore

Significant impact criteria (Vulnerable species)

unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Yellow-bellied Glider populations within or near the Subject Land.

Interfere substantially with the recovery of the species.

There is no adopted or made recovery plan for this species. However, the *Conservation Advice for Petaurus australis australis (Yellow-bellied glider (south-eastern))* lists several conservation and recovery actions to assist with the recovery of the species, including:

- Ensure suitable habitat is maintained and protected from known threats (such as high severity bushfires) around important subpopulations, as well as in areas where subpopulations have already declined through loss of habitat. When protecting an area, retain sufficient suitable habitat for subpopulation viability.
- If required, implement control measures for introduced predators, including the European red fox and feral cat, in areas burnt by bushfires. The control of introduced herbivores (e.g., feral deer) may also aid habitat recovery.
- Avoid planned burns, clearing, timber harvesting or other disturbance in a 65 ha zone around habitat which has been burnt in the past 10 years.
- Restore connectivity in subpopulations fragmented by major roads, including the use of artificial structures such as rope bridges and glide poles.

While the Project will include the removal of 21.27 ha of native vegetation providing potential foraging and breeding habitat for the subspecies, the area to be cleared is not considered to be significant in relation to the available similar and higher quality habitat (455.44 ha), and therefore a sufficient area of suitable habitat will be retained within the Subject Land and broader locality (>9000 ha). Works are not expected to increase the presence of introduced predators or increase the likelihood of fire. The Project is therefore not expected to interfere substantially with the recovery of the species.

Conclusion

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Yellow-bellied Glider (south east) or their habitat as:

- The species was not recorded during targeted surveys.
- The Project will not introduce any diseases or invasive species of the Yellow-bellied Glider.
- The Project will not result in the modification or fragmentation of habitat such that any new barrier to connectivity for the dispersal movements of the subspecies will be created.
- The Project will result in the removal of 21.27 ha of PCT 3420, 3428 and 4046. Given the availability of similar resources within the Subject Land and wider locality that are contiguous with the Development Footprint, the removal of this vegetation is unlikely to constitute a significant impact to the subspecies.
- The Project does not significantly interfere with any of the conservation actions for the species.

Based on the factors above, it is concluded that the Project is unlikely to lead to a significant impact on the Yellow-bellied Glider (south east).

Grey-headed Flying Fox *Pteropus poliocephalus*

Grey-headed Flying-fox *Pteropus poliocephalus* is listed as Vulnerable under the Commonwealth EPBC Act. The population trends with the distribution of plants with similar flowering and fruiting times which support regular annual cycles of migration and can be associated with flowering eucalyptus dependant on seasonality (Eby & Law 2008). Key threats to the Grey-headed Flying-fox include habitat fragmentation, degradation and loss, heat stress, conflict with humans and entanglement (DEW 2021).

A referral under the EPBC Act as lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities (including Grey-headed Flying Fox) as the relevant controlling provisions. The Project design has since been subject to further refinement, and targeted surveys have been undertaken, and is deemed unlikely to have a significant impact on this species.

No camps or individuals were detected within the Subject Land during the field investigation or targeted surveys. However, previous records of the Grey-headed flying fox exist in the surrounding locality (84 records within 10 kilometres of the Subject Land), with the most recent collected in 2021 within the Subject Land (DPE 2022g). Given the species is known to occur within the Subject Land, nearby resources, surrounding intact vegetation and Flying-fox camp at Woodburn, approximately 26 kilometres east of the Subject Land, the species is at risk from potential impacts to foraging habitat, including the disturbance and degradation of foraging habitat from the Project. The species is associated with PCT's 3428, 3420, 4046 and 4001 within the Subject Land, of which, 21.27 hectares of PCT's 3428, 3420 and 4046 will be removed as a result of the Project. Therefore an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 68 SIC assessment for Grey-headed Flying Fox

SIC assessment for Vulnerable species
Lead to the long-term decrease in the size of an important population of a species. Grey-headed Flying-fox is considered to be a single, mobile, national population ranging from Ingham in Queensland, to Adelaide in South Australia. They are usually found on the coastal lowlands and slopes of eastern Australia below altitudes of 200m. While the species is generally present intermittently and irregularly when assessed at a local scale, a small number of local areas do support a continuous presence while others are associated with regular, annual patterns of use (DEW 2021). These are mapped as nationally important Grey-headed Flying-fox camps, the closest of these are located approximately 26 km to the east near Woodburn. Locally recorded individuals are therefore considered to be part of the national population, which is important but not geographically restricted. The Project will impact upon 21.27 ha of potential foraging resources for Grey-headed Flying-fox in the local context. However, when considered in relation to the amount of vegetation to be retained within the Subject Land and Project Area (471.56 ha), and in the context of widely available resources for this mobile species in the 10 km-locality (>9000 ha) it is unlikely that the Project will lead to the long-term decrease in size of the highly mobile national Grey-headed Flying-fox population.
Reduce the area of occupancy of an important population. Grey-headed Flying-fox is highly mobile and widespread ranging from Ingham in Queensland to Adelaide in South Australia, a length of approximately 3,000,000 km. The Project will impact upon 21.27 ha of foraging habitat. This habitat includes important winter and spring flowering species such as Forest Red Gum, Spotted Gum, Swamp Mahogany and Melaleuca species. While one record of Grey-headed Flying Fox has been previously observed within the Subject Land, no Grey-headed Flying-fox camps and their associated roosting breeding habitat are present in proximity (within 10 km) to the Subject Land or be impacted upon, with the closest camp approximately 26 km to the east. In addition, no individuals

SIC assessment for Vulnerable species

were sighted during the field surveys.

Approximately 471.56 ha of foraging habitat will be retained within the Subject Land and Project Area, and a further >9000 ha is available immediately adjacent to the Subject Land, which will remain contiguous to the northern and southern portions of the Subject Land. Therefore, it is unlikely that the Project will reduce the area of occupation for the highly mobile Grey-headed Flying-fox.

Fragment an existing important population into two or more populations.

The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, including Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. The Subject Land itself is currently subject to a moderate level of fragmentation and edge effects through clearing of native vegetation and existing agricultural practices. While the Project will result in fragmentation of vegetation within the immediate locality for the proposed transmission line, the removal of 21.27 ha of vegetation including winter and spring flowering nectar resources will not create a barrier to the movement of these populations or further fragment vegetation within the Subject Land to the extent that it will fragment an existing population into two or more populations. The loss or degradation of this area of foraging habitat will not result in fragmentation of habitat at a local scale for this highly mobile species and are not sufficient to fragment the national population into two or more populations. Areas of similar/better quality condition vegetation will be retained both within the Subject Land, and within the broader landscape immediately adjacent to the Development Footprint.

Adversely affect habitat critical to the survival of a species.

Habitat critical to the survival of the Grey-headed Flying-fox includes important breeding and foraging resources, including winter and spring flowering nectar sources. The closest breeding camp is located approximately 26 km east of the Subject Land near Woodburn. The camp is not listed as nationally important (Cth DCCEEW 2023a).

Critical habitat for the species being defined as habitat which:

- contain native species that are known to be productive as foraging habitat during the final weeks of gestation.
- contain native species used for foraging and occur within 20 km of a nationally important camp.
- contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp (DEW 2021).

Approximately 21.27 ha of marginal foraging habitat in the form of PCT 3420, PCT 3428 and PCT 4046 will be removed by the Project, including native species that are known to be productive as foraging habitat during the final weeks of gestation. While foraging habitat is consistent with that listed as critical for Grey-headed Flying Fox, it is unlikely that impacts to 21.27 ha will be of sufficient severity so as to place the survival of the species at risk, given approximately 471.56 ha of foraging habitat comprising open woodland and forest, *Melaleuca* swamps and other winter and spring foraging trees will be avoided and therefore retained within the Subject Land and Project Area. In addition, large tracts of vegetation adjacent to the Subject Land will remain available for the foraging behaviours of the species (>9000 ha).

Disrupt the breeding cycle of an important population.

Mating occurs in early autumn, after which time the larger camps begin to break up, reforming in late spring/early summer, as food resources become more abundant (Hall & Richards 2000). Males and females segregate in October when females usually give birth. Following six months of gestation, females bear single young each year. For a period of four to five weeks after giving birth, the mother carries her single young with her to feeding sites. Young are carried on the ventral surface of their foraging mothers (Tidemann 1998). Once the young are completely furred, they are left in maternal camps and continue to be nursed until they are independent after around 12 weeks (Hall & Richards 2000). During this nursery phase, males re-join the females for courting with pair bonds being formed (Hall & Richards 2000). Therefore, actions likely to disrupt the breeding cycle of a population include disturbance to maternity camps, and clearing and fragmentation of foraging vegetation.

The Project will impact upon 21.27 ha of foraging habitat in the form of PCT 3420, PCT 3428 and PCT 4046. These

SIC assessment for Vulnerable species

communities contain Forest Red Gum, Spotted Gum, Swamp Mahogany and other species which provide important nectar resources during the final weeks of gestation. The Subject Land does not contain any camps of Grey-headed Flying-fox, with the closest camp approximately 26km to the east. It is unlikely that the loss or degradation of 21.27 ha of these resources in the context of locally available foraging habitat within both the Subject Land and broader locality (10-kilometre radius) would significantly impact upon locally breeding individuals, nor the wider population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The current Project proposes the removal of 21.27 ha of marginal foraging habitat for Grey-headed Flying-fox, encompassing winter and spring foraging resources. A portion of the vegetation to be removed consist of low condition and regenerating vegetation as well as scattered trees, which occur in a modified state due to previous fires and clearing activities which have resulted in the presence of a high cover of exotic pasture species within the understorey. Good and moderate condition PCT 3420 and 3428 to be removed is also subject to a low level of edge effects from the existing cleared easements and transmission line. However, majority of this vegetation will be retained within the Subject Land and in the immediate vicinity.

Additionally, large tracts of intact vegetation occur directly adjacent to the Development Footprint, and are likely to provide better quality habitat for the species. Given the highly mobile nature of the species it is considered that there is adequate habitat within the nearby reserves and within retained habitat within the Development Footprint to support the local population of Grey-headed Flying-fox, and that the Project would not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that it would cause the species to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Due to the Subject Land being well-connected to native vegetation, cleared paddocks and forestry, there are a number of feral animals and predators likely to be well established in the locality. Some of these are known to negatively impact Grey-headed Flying-fox including dogs and foxes. However, it is unlikely that the Project would result in the establishment of new invasive fauna species. Invasive weeds species are not known to directly harm populations of Grey-headed Flying-fox, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the local population. The Subject Land is currently subject to a low-moderate level of weed ingress, including by priority species such as Lantana. The risk of introduction and spread of weed species will be mitigated by:

- Implementation of appropriate weed control and weed disposal in accordance with Biosecurity protocols.
- Any soil or other materials imported to the site for use in restoration or rehabilitation would be certified free from weeds and pathogens or obtained from sources that demonstrate best practice management to minimise weed and pathogen risks.

The Project is unlikely to exacerbate the current level of invasive species populations utilising the Subject Land.

Introduce disease that may cause the species to decline.

The Project is unlikely to result in the introduction of a disease that could cause Grey-headed Flying-fox to decline.

Interfere substantially with the recovery of the species.

Actions considered likely to substantially interfere with the recovery of the Grey-headed Flying-fox as determined by key threats (DEW 2021) to the species are as follows:

- Habitat loss and fragmentation including important foraging species such as Forest Red Gum.
- Winter foraging resources are limited to a narrow coastal strip in QLD and northern NSW.
- Spring foraging resources are considered critical to the survival of the species.
- Exploitation – shooting of Grey-Headed Flying-foxes to protect fruit crops involves death of the individual and indirect death as a result of shooting of pregnant and lactating females.

SIC assessment for Vulnerable species

- Competition and hybridisation – indirect competition by Black Flying-fox which has had a range expansion in the past.
- Pollutants, electrocution and pathogens. A disproportionately higher number of lactating females are killed by electrocution on power lines.

The Project will incrementally contribute to habitat loss and degradation of foraging resources within important coastal lowlands for the species. However, it is unlikely that impacts to 21.27 ha will substantially interfere with the recovery of the species when compared to the amount of vegetation to be retained within the Subject Land and Project Area (471.56 ha) and broader 10 km locality (>9000 ha).

Conclusion.

In consideration of the above significant impact criteria, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the Subject Land or wider locality, as:

- The Project will result in the clearing of 21.27 ha of PCT 3420, PCT 3428 and 4046 providing foraging habitat for the species. Given the high availability of similar resources within the locality, the removal of this habitat is not considered to constitute a significant impact.
- The vegetation removal associated with the Project represents foraging habitat and will not fragment or isolate this highly mobile population.
- The Project does not substantially contribute to a key threatening process for Grey-headed Flying-fox or impact upon priority conservation actions for the species.

Koala *Phascolarctos cinereus*

Koala populations in Queensland, NSW and ACT are listed as Endangered under the EPBC Act. Koalas occupy a range of eucalypt-dominated forest and woodland types throughout their range, but favour habitats that support key forage species in more mesic microhabitats. Altitude (< 800 m above sea level) and temperature restrict the Koalas distribution, as does leaf moisture at the western and northern ends of the range.

Key threats to Koala include habitat fragmentation, predation by dogs, vehicle strikes and disease. Climate change may also be affecting Koala populations through increased temperatures causing heat stress and a reduction in the level of moisture within the leaves of browse trees.

Koala populations throughout Australia are currently under increased pressure due to the 2019-2020 summer bushfires that occurred across the southern and eastern states of Australia. DAWE has provided several resources in response to these fires including analyses of listed species habitat within fire affected areas (DEE 2020), as well as provisional lists of fauna that require urgent management intervention (DAWE 2020). Twelve percent of the likely and known distribution of the combined Koala populations across Australia have been identified as occurring within fire affected areas, and Koala has been identified as one of the species requiring urgent management intervention. Given this context, any remaining areas of high-quality Koala habitat are now critical to the conservation of the species.

A referral under the EPBC Act as lodged on 5 September 2023 based on the Project's preliminary design, and the Project was deemed a Controlled Action (EPBC 2023/09641) on 22 November 2023 with listed threatened species and communities (including Koala) as the relevant controlling provisions. The Project design has since been subject to further refinement, and targeted surveys have been undertaken, and is deemed unlikely to have a significant impact on this species.

No Koala individuals were detected during targeted surveys conducted in Winter and Summer 2023. Previous records of Koalas exist in the surrounding locality (over 800 records with the closest approximately 3 metres

from the Subject Land), and the most recent record recorded in 2022. Given vegetation surrounding the Subject Land provides connectivity to the surrounding habitat, the species is considered likely to utilise the Subject Land on occasion. The Project will result in the clearing of PCTs 3420, 3428 and 4046 containing feed tree species forming habitat for Koala. Approximately 21.27 hectares of these PCT's will be removed as a result of the Project. An assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 69 SIC assessment for Koala

SIC assessment for Endangered species
Lead to the long-term decrease in the size of a population. Important populations for Koala have not been defined, due to lack of sufficient information to adequately identify and separate the nature of important populations throughout the range of the species (DoE 2014a). Nocturnal surveys and Spot Assessment Techniques (SAT) surveys did not detect evidence of Koala within the Subject Land across two seasons. However, impacts will occur to 21.27 ha of potential Koala foraging and dispersal habitat represented by PCT 3420, 3428 and 4046 within the Subject Land. Given the availability of resources to be retained within the Subject Land (115.2 ha) and broader Project Area (455.44 ha), it is unlikely to lead to the long-term decrease in the size of a population, based on the following: • The vegetation to be impacted is unlikely to be important to the life cycle of the species given it is located within a larger patch of vegetation. • The majority of similar and/or higher condition vegetation will be retained within the Subject Land and is contiguous with large tracts of vegetation within the broader locality.
Reduce the area of occupancy of the species. PCT 3420, 3428 and 4046 within the Subject Land occur in various conditions within the Subject Land, with the Project requiring the removal of 21.27 ha of a mixture of good, moderate, low and regenerating condition vegetation. Vegetation to be removed in the far west of the Subject Land occurs on the fringe of an existing easement, and is therefore subject to edge effects. The region was subject to intense bushfire impacts in 2019/2020, to which impacts, and recovery, is clearly evident. Both unburnt and burnt areas for this TEC occur in the Subject Land, with several patches of unburnt areas avoided and retained. Impacts to 21.27 ha providing dispersal and foraging Koala habitat will reduce the occupancy of Koala populations in areas adjacent to the Subject Land. Large areas of similar and higher quality habitat will be retained within the Subject Land and immediate locality, however perimeter fencing and solar array design may impact the ability for the Koala to move into retained areas of vegetation and act as a barrier to the movement of individuals. Based on the above, the Project will result in a small reduction of the area of occupancy for a Koala population, with 21.27 ha may requiring removal. The species will continue to forage and breed in retained habitat outside of the Subject Land with mitigation measure implemented to minimise connectivity and movement impacts.
Fragment an existing population into two or more populations. The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungawalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. While the Project will result in some level of fragmentation for the development of the transmission line, the majority of intact vegetation will be retained in the immediate vicinity, which will remain contiguous

SIC assessment for Endangered species

with large tracts of intact vegetation within the locality (>9000 ha). The installation of perimeter fencing and solar array design may impact the ability for the Koala to move into retained areas of vegetation and act as a barrier to the movement of individuals. Overall however, connectivity around the Subject Land and impacts to 21.27 ha of potential Koala habitat is unlikely to become significantly fragmented or isolate the population more than the existing barriers such as the matrix of agricultural land already provide.

Adversely affect habitat critical to the survival of a species.

The Project will impact 21.27 ha of PCT 3420, 3428 and 4046 which contain one primary feed tree species (Forest Red Gum) and multiple secondary and supplementary Koala species.

Using the factors listed to define critical habitat within the *EPBC Act Referral Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE, 2022) it is likely critical habitat occurs within the Subject Land as it is considered likely that vegetation within the Subject Land would constitute foraging habitat used to meet life-cycle requirements of the Koala under (b) *whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes)*.

The Project will remove 21.27 ha of potential marginal habitat for Koala. Preliminary designs as avoided areas of habitat, including unburnt areas, with vegetation to be retained within the Subject Land and Project Area (455.44 ha) connected to large patches within the broader locality. The remainder of vegetation to be impacted that comprises good, regenerating vegetation will remain connected to large tracts of contiguous vegetation to the north and west. These areas contains similar foraging and dispersal habitat including feed and use trees. Considering these factors, it is unlikely that the Project will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of a population.

There are recent records of the species within 10m north-west of the Subject Land, however no Koala occurrences were recorded during the targeted surveys undertaken to date. The removal of 21.27 ha of vegetation for the Project constitutes a reduction of approximately 15.5 % within the Subject Land and 4.5 % within the Project Area.

While the Project would result in the removal of 21.27 ha of habitat for this species, this is unlikely to reduce the local availability of resources such that the breeding cycle of a population would be disrupted. Similarly, it is unlikely that short-term indirect disturbance from noise or lighting associated with the construction of the transmission line and solar farm will substantially interfere with the species' ability to reproduce successfully. Koalas will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of a Koala population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The current Project proposes the removal of 21.27 ha of potential Koala habitat, encompassing eucalypt woodland, including primary and secondary feed trees. Although Koala has not been observed within the Subject Land during targeted surveys undertaken to date, they are known to occur frequently in the broader locality.

A portion of the vegetation to be removed consist of low condition and regenerating vegetation, which occur in a modified state due to previous fires and clearing activities which have resulted in the presence of a high cover of exotic pasture species within the understorey. Good and moderate condition PCT 3420 and 3428 to be removed are also subject to a low level of edge effects from the existing cleared easements and transmission line. However, majority of this vegetation will be retained within the Subject Land and in the immediate vicinity.

Impacts to 21.27 ha of Koala habitat including known Koala feed trees will reduce the availability of resources within the immediate locality. However, given the contiguous nature of adjacent native vegetation with a large tract of good quality bushland containing Koala feed and use trees, the impact is not considered significant. The Project is not likely to isolate

SIC assessment for Endangered species

populations as the development will not substantially impact on the movement corridor and thus is not likely to constitute a barrier to movement and unlikely to result in the decline of the species as a whole.

Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.

The Subject Land is connected to native vegetation, cleared paddocks and forestry vegetation, where a number of feral animals and predators are likely to be established. Some of these are known to negatively impact Koalas including dogs and foxes. However, it is unlikely that the Project would result in the establishment of new invasive species. The Project is unlikely to exacerbate the current level of invasive species populations utilising the area. Invasive weeds species are not known to directly harm populations of Koala but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Koala. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices throughout works.

Introduce disease that may cause the species to decline.

The Project is unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of Koala populations in or near the Subject Land.

Interfere substantially with the recovery of the species.

Actions considered likely to substantially interfere with the recovery of Koala are defined in *EPBC Act Referral Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE, 2022)* as follows:

- Increasing Koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.
- Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.
- Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi* to habitat critical to the survival of the Koala, which are likely to reduce the carrying capacity of the habitat.
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

The Project will not result in increased dog attacks, which are primarily an issue where new urban development encroaches upon Koala habitat. While the Project can be expected to result in an increase in traffic in some areas during the construction phase, this will be temporary and will not result in sustained increases in Koala road mortalities, given existing roads will be utilised. The Project is unlikely to result in the introduction of a disease (e.g. Chlamydia) that could reduce the reproductive output of Koala populations in or near the Project. Similarly, the Project is unlikely to exacerbate the current level of invasive species threat operating within the Project. Mitigation measures will further reduce the risk of facilitating invasive species. The development will not create a barrier to the movement of Koalas between habitat patches, and therefore will not restrict the species' ability to disperse or carry out normal demographic processes. The Project is not expected to result in substantial changes to hydrology which would result in degradation of any critical habitat to the extent that the carrying capacity of that habitat is reduced.

Conclusion.

SIC assessment for Endangered species

In consideration of the above significant impact criteria, the project is unlikely to significantly impact Koalas within the Subject Land or wider locality.

The species has not been detected in any targeted surveys undertaken to date, and the Project will result in the reduction of a relatively small area (4.5 % within the Project Area including Subject Land) relative to the amount of similar and better quality resources within the locality. It is therefore concluded that the Project will not lead to a significant impact on the Koala.

Hooded Robin *Melanodryas cucullata cucullata*

The Hooded Robin is listed as Endangered under the EPBC Act. It is widespread, found across Australia, except for the driest deserts and the wetter coastal areas and rarely found on the coast. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. It requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.

The main threat to Hooded Robin include habitat clearance, fragmentation and degradation. Other threats include altered fire regimes that promote greater density in understorey shrubs or weeds, firewood collection and tidying of farmland, over-grazing by stock, rabbits *Oryctolagus cuniculus* and overabundant kangaroos *Macropus spp.*, increased predation cats *Felis catus* and foxes *Vulpes*, and invasive weeds.

No records of hooded robin have been recorded within the Subject Land. Nine records of Hooded Robin occur within 10 kilometres of the Subject Land, with the closest record recorded approximately 4 kilometres from the Subject Land, and the most recent record being from 2003 (DPE 2022g). There is potential for the Subject Land to be used occasionally by this species for foraging, as well as breeding, given the presence of associated PCTs (3420, 3428 and 4001) comprising dry Eucalypt woodland, and open grassy areas. Approximately 20.14 hectares of PCT's 3420 and 3428 will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 70 SIC assessment for Hooded Robin

SIC assessment for Endangered species

Lead to the long-term decrease in the size of a population.

Impacts to 20.14 ha of Hooded Robin foraging and dispersal habitat represented by PCT 3420 and 3428, as well as inclusive open grassy areas within the Subject Land is unlikely to lead to the long-term decrease in the size of a population, based on the following:

- The vegetation to be impacted is unlikely to be important to the life cycle of the species given it is located within a larger patch of vegetation.
- The majority of similar and/or higher condition vegetation will be retained within the Subject Land and is contiguous with large tracts of vegetation within the broader locality.

SIC assessment for Endangered species

Reduce the area of occupancy of the species.

PCT 3420 and PCT 3428 within the Subject Land occur in various conditions within the Subject Land, with the Project requiring the removal of 20.14 ha of a mixture of good, moderate, low and regenerating condition vegetation. Vegetation to be removed in the far west of the Subject Land occurs on the fringe of an existing easement, and is therefore subject to edge effects.

Impacts to 20.14 ha providing dispersal and foraging Hooded-robin habitat is unlikely to reduce the occupancy of Hooded-robin populations as large areas of similar and higher quality habitat will be retained within the Subject Land and immediate locality.

Based on the above, the Project will not result in a further reduction of the area of occupancy for a Hooded-robin population, with consideration to the small area (20.14 ha) to be impacted relative to the larger tracts of remnant native vegetation within the vicinity. The species will continue to forage and breed in retained habitat outside of the Subject Land and the Project will not represent a barrier to the movement of individuals.

Fragment an existing population into two or more populations.

The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. While the Project will result in some level of fragmentation for the development of the transmission line, the majority of intact vegetation will be retained in the immediate vicinity, which will remain contiguous with large tracts of intact vegetation within the locality. Therefore, impacts to up to 20.14 ha of Hooded-robin habitat is unlikely to become significantly fragmented or to isolate the population more than the existing barriers such as the existing easement already provide.

Adversely affect habitat critical to the survival of a species.

The Project will impact 20.14 ha of PCT 3420 and PCT 3428 forming potential Hooded-robin foraging and dispersal habitat.

Habitat critical to the survival of the hooded robin (south-eastern) include areas of:

- Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas;
- Structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses;
- Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging;
- Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat

Using the factors listed above, it is likely critical habitat occurs within the Subject Land as it is considered likely that vegetation within the Subject Land would constitute dry eucalypt and acacia woodlands with open and/or grassy understorey in some areas, as well as standing suitable trees for nesting, roosting and foraging.

The Project will remove a small area (20.14 ha) of vegetation in relation to vegetation to be retained both within the Subject Land (61.91 ha), Project Area (374.35 ha) and broader 10 km locality (>9000 ha). Regenerating and low condition vegetation within the Development Footprint constitute heavily modified habitat that would provide sub-optimal habitat for Hooded Robin only. The remainder of vegetation to be impacted that comprises good, regenerating vegetation, and planted vegetation will remain connected to large tracts of contiguous vegetation to the north and west. These areas contain similar foraging and dispersal habitat including feed and use trees. Considering these factors, it is unlikely the

SIC assessment for Endangered species

Project will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of a population.

Hooded Robins generally form monogamous pairs and occupy territories during the breeding season (between July and November) and non-breeding season. Birds usually return to the same breeding site where they typically rear several broods each season. Nests comprise small, neat cups of bark and grasses bound with webs and are situated in a tree fork or crevice, from less than 1 m to 5 m above the ground.

There are records of the species within 4 km of the Subject Land, however no Hooded Robin individuals were recorded during the field investigation or are known to occur within the Subject Land. The removal of 20.14 ha of vegetation for the Project is not considered substantial in relation to the amount of vegetation to be retained within the Subject Land (61.91ha) and Project Area (374.35 ha) and high quality bushland occurring contiguously to the north, east and west of the Subject Land (>9000 ha).

While the Project would result in the removal of a small area of habitat for this species within the locality, this is unlikely to reduce the local availability of resources such that the breeding cycle of a population would be disrupted. Similarly, it is unlikely that short-term disturbance from noise or lighting associated with the construction of the transmission line and solar farm will substantially interfere with the species' ability to reproduce successfully. Hooded Robin populations will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of a Hooded Robin population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Impacts to 20.14 ha of Hooded Robin habitat including PCT 3420 and 3428, including open grassy areas will reduce the availability of resources within the immediate locality. However, given the contiguous nature of adjacent native vegetation with a large tract of good quality bushland, the impact is not considered significant. The Project is not likely to isolate populations as the development will not substantially impact on the movement corridor and thus is not likely to constitute a barrier to movement and unlikely to result in the decline of the species as a whole.

Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.

The Project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as Foxes, Noisy Minor which are known to have a negative impact on populations of Hooded Robin. Invasive weeds species are not known to directly harm populations of Hooded Robin, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the population of Hooded Robin. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices throughout works.

Introduce disease that may cause the species to decline.

The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Hooded Robin populations in or near the Subject Land.

Interfere substantially with the recovery of the species.

SIC assessment for Endangered species

No recovery plan currently exists for Hooded Robin. However, a decision has been made to have a Recovery Plan due to the complex jurisdictional situation and the conservation planning resources required to develop the plan. A Recovery Plan is considered likely to provide additional conservation benefits and is therefore required for this subspecies. The Project is unlikely to exacerbate the current level of invasive species such as Foxes, Cats or Noisy Minor threat operating within the Subject Land. Mitigation measures will further reduce the risk of facilitating invasive plant species such as good hygiene procedures. The development will not create a barrier to the movement of Hooded Robin between habitat patches and therefore will not restrict the species' ability to disperse or carry out normal demographic processes. The Project is not expected to result in changes to fire regimes or increase the removal of dead wood. While the Project will result in the removal of 20.14 ha of PCT 3420 and 3428, vegetation to be removed is not considered significant in relation to large contiguous patches of intact vegetation surrounding the Subject Land (61.91 ha) and Project Area (374.35 ha), which has been avoided and will be retained.

Conclusion.

In consideration of the above significant impact criteria, the Project is not likely to significantly impact Hooded Robin within the Subject Land or wider locality, as:

- The Project will result in impacts to 20.14 ha of Hooded Robin foraging and dispersal habitat. Given the availability of similar resources within the locality, impacts to this vegetation is not considered to constitute a significant impact.
- The Project is unlikely to result in the introduction of a disease that could reduce the reproductive output of the Hooded Robin populations in or near the Project.
- The Project does not significantly interfere with any of the conservation actions for the species.

Spotted-tailed Quoll *Dasyurus maculatus*

The Spotted-tailed Quoll is listed as Endangered under the EPBC Act. The Spotted-tailed Quoll is a nocturnal, cat-sized, carnivorous marsupial with reddish-brown fur and distinctive white spots over its back and tail (OEH 2019).

The species was previously widely distributed from south-east Queensland, eastern NSW, Victoria, south-east South Australia and Tasmania (Jones 2001). The subspecies' mainland range is now considered to have reduced by 50–90% (Jones 2001). However, detailed distribution records and abundance estimates are generally lacking due to the scale and intensity of surveying that is required to detect the species across its entire range (DAWE 2016).

The Spotted-tailed Quoll has a preference for mature wet forest habitat, especially in areas with rainfall 600 mm/year (McKay 2008). Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. The Spot-tailed Quoll is predominantly nocturnal and rests during the day in dens (Jones 2001). Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves (OEH 2019). Individuals also require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage (DAWE 2020c). This subspecies is moderately arboreal and approximately 11% of travelling is done in trees (Jones 2001). The Spotted-tailed Quoll occupy large home ranges, with females occupying 200 – 500 hectares, while males can occupy from 500 to over 4000 hectares (OEH 2019).

No records of Spotted-tailed Quoll have been recorded within the Subject Land and none were observed during the field investigation. One record of Spotted-tailed Quoll exist in the surrounding locality (approximately 7 kilometres from to Subject Land), with the most recent collected in 2009 (DPE 2022g). Vegetation comprising PCT's 3420, 3428 and 4046 to be removed for the Project may provide potential

foraging habitat for the species. Approximately 21.27 hectares of these PCT's will be removed as a result of the Project. Therefore, an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 71 SIC assessment for Spotted-tailed Quoll

SIC assessment for endangered species
Lead to the long-term decrease in the size of a population. Habitat within the Development Footprint may be used by Spotted-tailed Quoll, although no records occur within the Subject Land, with the closest record occurring approximately 7 km away. The removal of 21.27 ha of potential Spotted-tailed Quoll habitat from the Development Footprint is unlikely to limit the habitat available to the local population. The species requires large home ranges, with females occupying non-overlapping ranges of approximately 200-500 ha, and males occupying very large, overlapping home ranges from 500 to over 4,000 ha, depending on foraging resources (EES 2020). As the impacts associated with the Project generally occur on the edges of larger areas of higher quality habitats (with large tracts of intact vegetation occurring immediately adjacent to the Development Footprint), it is considered unlikely that the Project will result in long-term decrease in the size of the local population, which will remain supported by the higher quality habitats not impacted by the Project. Removal of 21.27 ha of potential Spotted-tailed Quoll habitat from the Development Footprint, including highly modified low and regenerating vegetation that is subject to some edge effects is unlikely to reduce the area of occupancy of the species, as they will still be able to move through and around the Development Footprint.
Reduce the area of occupancy of the species The removal of 21.27 ha of potential Spotted-tailed Quoll habitat from the Development Footprint will reduce the area of occupancy of the species within the Subject Land by 16% and Project Area by 6%. Perimeter fencing and solar array design may impact the ability for the Spotted-tailed Quoll to move into retained areas of vegetation and act as a barrier to the movement of individuals. PCT 3420, PCT 3428 and PCT 4046 within the Subject Land occur in various conditions within the Subject Land, with the Project requiring the removal of 21.27 ha of a mixture of good, moderate, low and regenerating condition vegetation. Vegetation to be removed in the far west of the Subject Land occurs on the fringe of an existing easement, and is therefore subject to edge effects. Based on the above, although the Project will result reduction of the area of occupancy for the Spotted-tailed Quoll population, it is not considered to be substantial with consideration to the area (21.27 ha) to be impacted relative to the larger tracts of remnant native vegetation within the Subject Land, Project Area and 10 km locality comprising >9000 ha. The species will continue to forage and breed in retained habitat within outside of the Subject Land.
Fragment an existing population into two or more populations. The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west. While the Project will result in some level of fragmentation for the development of the transmission line, the majority of intact vegetation will be retained in the immediate vicinity, which will remain contiguous with large tracts of intact vegetation within the locality. Perimeter fencing and solar array design may impact the ability for the Spotted-tailed Quoll to move into retained areas of vegetation and act as a barrier to the movement of individuals. However, impacts to 21.27 ha of Spotted-tailed Quoll habitat is unlikely to become significantly fragmented or to isolate the population more than the existing barriers such as the existing easement and farmland already provides.
Adversely affect habitat critical to the survival of a species. Habitat that is critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (DELWP 2016). However, the threshold densities of these critical components required to support quoll populations are unknown. Consequently, it is currently not possible to define (or map) habitat critical to the survival of the Spotted-tailed Quoll. The Recovery Plan states that

SIC assessment for endangered species

given the Endangered threat status of the Spotted-tailed Quoll, all habitats within its current distribution that are known to be occupied are considered important (DELWP 2016).

Furthermore, due to the large bushfires that occurred across southern and eastern Australia in the summer of 2019-2020, approximately 29 % of the available habitat across Spotted-tailed Quoll's known range was lost, and the species was identified as requiring urgent management intervention following those fires (DAWE 2020d). Given this context, any remaining areas of Spotted-tailed Quoll habitat are now of increased importance in the conservation of the species.

The species requires large home ranges, with females occupying non-overlapping ranges of approximately 200-500 ha, and males occupying very large, overlapping home ranges from 500 to over 4,000 ha, depending on foraging resources (EES 2020). In the Marengo State Forest in north-eastern NSW, females were reported to have non-overlapping range of up to 175 ha, and males have an overlapping range of up to 757 ha (Glen & Dickman 2006).

The removal of approximately 21.27 ha of Spotted-tailed Quoll habitat as part of the Project, is not expected to be of a magnitude substantial enough to adversely affect habitat critical to the survival of a species as a whole, when considered in relation to the amount of vegetation to be retained within the Subject Land (115.2 ha) and Project Area (455.44 ha). In addition, given the small amount of Spotted-tailed Quoll records within the locality, impacts to the local population not considered to be significant.

Due to the large home ranges required by the species, with female home ranges generally not overlapping, and the loss the removal of 21.27 ha of habitat is considered a small loss in relation to adjacent habitat >9000 ha.

Disrupt the breeding cycle of a population.

Potential Spotted-tailed Quoll breeding habitat may be removed from the Development Footprint as part of the Project, including understorey vegetation, tree hollows and logs. Due to the large areas of intact vegetation comprising several reserves encompassing Bangwalbin State Forest and National Park, Ellangowan and Cowan State Forests, it is likely that adequate den sites are located within the locality such that the breeding cycle of the local population will not be interrupted by the Project. Spotted-tailed Quoll will continue to forage and breed in areas unaffected by vegetation loss and as a result the breeding cycle of a Spotted-tailed Quoll population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Approximately 21.27 ha of Spotted-tailed Quoll habitat is proposed to be removed from the Development Footprint as part of the Project, including PCT 3420, 3428 and 4046. However, only one record of Spotted-tailed Quoll has been recorded within the locality, approximately 7 km from the Subject Land within intact vegetation comprising the adjacent reserve system, including the adjacent Bungwalbin National Park, nature reserve and state forest. The Project would result in a reduction of habitat available to the local population, and the available habitat within 10 km, however large intact areas will be retained both within the Subject Land and directly adjacent to the Development Footprint that provide similar/better quality habitat. It is therefore considered that there is adequate habitat available in surrounding vegetation and nature reserves that the species as a whole is not likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

There is potential for the introduction of weeds, pests or pathogens as a result of the Project, via movement of vehicles and plant, and increase in foot traffic. However, management measures would be prepared, implemented and audited to avoid and minimise the environmental risks associated with weeds, pests and pathogens. As a minimum, these would include:

- Implementation of appropriate weed control and weed disposal in accordance with Biosecurity protocols.
- Any soil or other materials imported to the site for use in restoration or rehabilitation would be certified free from weeds and pathogens or obtained from sources that demonstrate best practice management to minimise weed and pathogen risks.
- Implementation of appropriate hygiene protocols where there are potential or known pathogen risks.

Appropriate disposal of any weed material.

Introduce disease that may cause the species to decline.

SIC assessment for endangered species

The Project will result in removal of potential habitat for Spotted-tailed Quoll within the Development Footprint. This impact is not likely to result in the introduction of diseases that may cause the species to decline.

Interfere substantially with the recovery of the species.

The main threats to Spotted-tailed Quoll include habitat loss and fragmentation, poison baiting, predation by invasive species, deliberate killing, road mortality, poor burning regimes and climate change, among others. The National Recovery Plan for the Spotted-tailed Quoll lists the following management objectives:

- Determine the distribution and status of Spotted-tailed Quoll populations throughout the range and identify key threats and implement threat abatement management practices.
- Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.
- Reduce the rate of habitat loss and fragmentation on private land.
- Evaluate and manage the risk posed by silvicultural practices.
- Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.
- Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
- Reduce the frequency of Spotted-tailed Quoll road mortality.
- Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
- Determine the likely impact of climate change on Spotted-tailed Quoll populations.
- Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

The Project would involve the removal of 21.27 ha of potential Spotted-tailed Quoll habitat, which would contribute to the above listed threat of habitat loss for the species and is somewhat averse to the management objective 'reduce the rate of habitat loss and fragmentation on private land.' However very few records are known from the broader locality, and the condition of the majority of habitat impacted is sub-optimal due to its occurrence along vegetated edges between intact vegetation and cleared farmland. Furthermore no important den or latrine sites were recorded during the field instigations, and well vegetation riparian zones, used commonly for movement through an individual's range are not well represented in the Development Footprint. As impacted habitats are largely considered sub-optimal, and large areas will be retained both within the Subject Land and immediately adjacent to the site, the Project cannot be said to be likely to interfere substantially with the recovery of the species.

Conclusion

In consideration of the above significant impact criteria, the Project is not likely to significantly impact Spotted-tailed Quoll within the Subject Land or wider locality, as:

- The Project will result in impacts to 21.27 ha of Spotted-tailed Quoll foraging and breeding habitat. Given the availability of similar resources within the locality, impacts to this vegetation is not considered to constitute a significant impact.
- The Project is unlikely to result in the introduction of a disease or invasive species that could reduce the reproductive output of the Spotted-tailed Quoll populations in or near the Project.
- The Project does not significantly interfere with any of the conservation actions for the species.

Woodland Birds

- Brown Treecreeper *Climacteris picumnus victoriae*
- Diamond Firetail *Stagonopleura guttata*

The Brown Treecreeper is Australia's largest Treecreeper and is listed as Vulnerable under the EPBC Act. The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. It is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and

plains inland of the Great Dividing Range. This species is usually observed in pairs or small groups, and forages in trees and on the ground, probing for insects, mostly ants as well as other invertebrates. The Brown Treecreeper nests in hollows in standing dead or live trees and tree stumps (DPE 2022g).

The main threats to Brown treecreeper include clearing for agriculture, fragmentation, habitat degradation, and lack of regenerating eucalypts in overstorey.

The Diamond Firetail is listed as vulnerable under the EPBC Act. It is a large, striking finch with a bright red bill, and red eyes and rump. Diamond firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 kilometres inland from the sea. Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover. Diamond firetails usually occur in flocks of between 5 to 40, and occasionally more. The species appears to be sedentary, though some populations move locally. Their flight is described as low and direct in long lines with slight undulations. Birds roost in dense shrubs or in smaller nests built especially for roosting (Cth DCCEEW 2023b).

The main threats to Diamond Firetail include historical and ongoing clearing of native vegetation, habitat degradation leading to food shortage, overgrazing.

No Diamond Firetail or Brown Treecreeper individuals were recorded within the Subject Land during the field investigation. However, 136 records of Brown Treecreeper occur within a 10-kilometre radius, with the closest recorded approximately 100 metres from the Subject Land in 2022. Ten records of Diamond Firetail occur within a 10-kilometre radius, with the closest recorded within the Subject Land, on the fringe of Ellangowan State Forest. Vegetation to be removed comprising PCTs 3420, 3428 and 4046 represent potential habitat for the species, and therefore an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 72 SIC assessment for woodland birds

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species. No important populations have been identified for Brown Treecreeper or Diamond Firetail within the approved conservation advice for these species. The Project will result in the clearing of 21.27 ha of PCT 3420, 3428 and 4046 representing potential foraging and breeding resources for these woodland birds. While the Project will result in the removal of potential foraging habitat, the total area of habitat being removed is not considered substantial in relation to the amount of retained, and non-impacted habitat available in the broader landscape. Given the expanse of native vegetation in the broader landscape, and the large patches of suitable habitat within the Subject Land to be retained, the 21.27 ha is not expected to significantly reduce habitat for these species. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of these mobile woodland bird populations.
Reduce the area of occupancy of an important population. No important populations have been identified for these woodland bird species. It is considered that vegetation within the Subject Land constitutes known habitat to the foraging and breeding practices of the Diamond Firetail. However, given the overall context of the region and the extent of the vegetation connected to these areas, the 21.27 ha expected to be cleared is unlikely to have a significant impact to the occupancy of the local population.

SIC assessment for vulnerable species

Given the size and connectivity available in the greater landscape, it is unlikely that an important population or local population would be negatively impacted by the Project. These mobile species will continue to forage in retained habitat within the surrounding landscape. As such, it is unlikely that Project will reduce the area of occupancy of these species' population.

Fragment an existing important population into two or more populations.

No important populations have been identified for these woodland bird species.

The Subject Land is located within a matrix of agricultural land that currently separates two strings of state forests and reserves, Bungwalbin National Park, State Conservation Area and State Forest to the east and Ellangowan, Braemar and Carwong State Forests to the west.

In the scope of the greater context of the surrounding land, 21.27 ha of potential habitat for Brown Treecreeper, and known habitat for Diamond Firetail to be removed as a result of the proposed work represents a reduction of approximately 4.3% within the Project Area including the Subject Land, and less than 1% of the native vegetation within 10 km of the locality, which comprises >9000 ha; a relatively small portion of land for these mobile species. While the works will result in some level of fragmentation within the immediate locality through the clearing of vegetation for the proposed transmission line, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing habitat for mobile woodland birds. As such the Project will not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species.

Under the respective approved conservation advice for Brown treecreeper and Diamond Firetail, critical habitat is defined below.

Habitat critical to the survival of the brown treecreeper (south-eastern) includes areas that have:

- Relatively undisturbed grassy woodland with native understorey. – Habitat structure should be quite open at ground level so that birds are able to feed on or near the ground and maintain vigilance against predators. – The required degree of openness is mostly likely to be created by moderate levels of disturbance by fire and/or grazing.
- Large living and dead trees which are essential for roosting and nesting sites and for foraging;
- Fallen timber which provides essential foraging habitat and;
- Hollows in standing dead or live trees and tree stumps are also essential for nesting.

Habitat critical to the survival of the diamond firetail includes areas of:

- Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats;
- Low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding;
- Drooping she-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.

Given the Subject Land contains open Eucalypt Forest and hollow-bearing trees, it is considered likely that the Subject Land comprises habitat critical to the survival of both species. However, large areas of habitat will be retained within the Subject Land and surrounding locality. Therefore, impacts to foraging, breeding and dispersal habitat are not expected to be significant. Vegetation connectivity will be maintained throughout the landscape. Although a small amount of native vegetation will be removed in relation to the amount available in adjacent areas, the Project will not substantially impact upon any of the required habitat for the two woodland birds, and thus will not adversely affect habitat critical for the species' survival.

Disrupt the breeding cycle of an important population.

No important populations have been identified for these woodland bird species.

Brown treecreepers (south-eastern) nest and roost in naturally occurring tree cavities in a variety of eucalypt species. Hollows in standing dead or live trees and tree stumps are essential for nesting. Typically, birds breed cooperatively with the breeding group consisting of a breeding pair and a few subordinate males. Nests comprise cups of grass and bark lined with fur and feathers, built in a hollow limb or trunk (Cth DCCEEW 2023c).

SIC assessment for vulnerable species

Between August and January, groups of Diamond Firetail separate into small colonies to breed. Nests are bottle shaped and are made of green grass blades and stems lined with fine grasses and feathers. To safeguard their eggs and nestlings, diamond firetails often build their nests into the base of the large stick-nest of a bird of prey (Cth DCCEEW 2023b).

The Subject Land contains both foraging and breeding habitat represented by PCT 3420, 3428 and 4046 and suitably sized hollow-bearing trees required by Brown Treecreeper. While the Project is likely to result in the loss of 10 suitable hollow-bearing trees within the Subject Land and therefore reduce the local availability of breeding resources, it is not anticipated that this will reduce the availability within the locality such that the breeding cycle of a population of Brown Treecreeper would be disrupted as a whole, given the amount of vegetation to be retained both within and adjacent to the Subject Land. A number (28) of suitably sized hollow bearing trees will be retained within the Subject Land. It is unlikely that disturbance from noise or lighting associated with the construction will substantially interfere with these species' ability to reproduce successfully. These mobile woodland birds will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The Project includes the removal of 21.27 ha of PCT 3420, 3428 and 4046, and 10 suitable hollow-bearing trees for Brown Treecreeper. The removal of this vegetation will reduce the availability of foraging and breeding resources within the immediate area. However, low and regenerating condition vegetation are currently subject to a moderate level of modification through previous clearing and weed ingress, while good and moderate condition vegetation is highly connected to larger areas of similar/good quality habitat that will be retained. The Subject Land will remain contiguous to vast areas of intact vegetation comprising multiple reserves and national parks. Given that the Project will not constitute a new barrier to the movement of individuals of the highly mobile species, and the contiguous nature of the vegetation with a large tract of good quality bushland with hollow-bearing trees to the west and south of the Subject Land, the removal of vegetation for the works is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. In addition, mitigation methods outlined within the recommendations section of this report will be implemented to ensure that indirect impacts including weed establishment are minimised for the duration of the works.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The Project will not increase invasive fauna species. Invasive weeds species are not known to directly harm populations of either woodland bird species, but do have potential to reduce quality of habitat in the adjoining bushland and therefore increase potential to harm the local population of these species. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices. The Project is therefore unlikely to exacerbate the current level of invasive species threats operating within the Subject Lands, or introduce new invasive species to the area.

Introduce disease that may cause the species to decline.

The Project is unlikely to introduce a disease that causes the woodland bird species to decline.

Interfere substantially with the recovery of the species.

There is currently no National Recovery Plan for either Brown Treecreeper or Diamond Firetail. However recovery actions are outlined within the approved conservation advice for each species. Those relating to the Project include:

- Retain and protect woodland, open forest, grassland and mallee habitat from clearing, fragmentation and disturbance (areas of 200 ha or greater within woody vegetation are particularly significant).
- Protect and maintain areas of high-quality habitat, which includes open forest, woodland, mallee and grasslands with a diverse ground layer dominated by a mixture of grass species which seed at different times of year (providing a year-round food supply) and provides scattered shrubs for shelter.
- Cease all land clearing of habitat critical of the survival of brown treecreeper (south-eastern).

SIC assessment for vulnerable species

While the Project will result in the removal of woodland and open forest habitat comprising 21.27 ha, including areas considered habitat critical to the survival of these species, the area of habitat to be removed by the Project is surrounded by contiguous areas of suitable foraging and breeding habitat, with similar or higher quality resources. The works will result in localised fragmentation of the patch, however this is unlikely to pose a barrier to movement of these mobile species within the broader locality. Given these factors it is considered unlikely that the removal of up to 21.27 ha of vegetation will interfere with the recovery of these species.

Conclusion.

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on woodland birds or their habitats as:

- The Project will not introduce any diseases or invasive species of Brown Treecreeper or Diamond Firetail.
- The Project will not interfere significantly with the recovery actions for the species.
- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species however the Project will impact 21.27 ha of potential habitat, surrounded by large swathes of habitat that will be retained both within and adjacent to the Subject Land, it is not likely to significantly impact the species.

Based on the factors above, it is concluded that the Project is unlikely to lead to a significant impact on woodland birds species.

Amphibians

- Giant Barred Frog *Mixophyes iteratus*
- Green and Golden Bell Frog *Litoria aurea*

Giant Barred Frog is listed as Vulnerable under the EPBC Act. It is a large species of frog reaching up to 11.5 cm in body length. It has a yellow-brown, copper-brown or dark brown back, with several darker patches that are closely bunched along the middle of the back, but that do not usually form a continuous stripe. There is a black stripe from the nostril to past the eye, and a black triangular patch on the tip of the snout. The sides are pale yellow or cream, with small dark brown spots. The belly is white or yellow. The pupil is vertical and the iris is gold. The legs and arms have dark horizontal bars, and the backs of the thighs are black with many pale yellow or cream spots. Fingers are unwebbed and toes are fully webbed, both without discs (TSSC 2014).

The main threats to Giant Barred Frog include; habitat loss and fragmentation, climate change, disease (Chytridiomycosis caused by chytrid fungus), and habitat damage and predation caused by invasive species.

Green and Golden Bell Frog is listed as Vulnerable under the EPBC Act. It is a large, muscular species with a robust form. Adult frogs range from approximately 45 mm to 100 mm, with most individuals being in the 60-80 mm size class. The colouration of the back is variable, ranging from a vivid pea green splotted with almost metallic brass brown or gold to almost entirely green, or having golden bronze markings that almost cover the whole back. A yellowish stripe runs from behind the eye to the lower back. This species commonly occupies ephemeral ponds with little to no vegetation (Fardell et.al 2018).

The former distribution of the Green and Golden Bell Frog ranged from the NSW north coast near Brunswick Heads southwards along the NSW coast to Victoria, where it extended into East Gippsland and west to Bathurst, Tumut and the ACT. In the 1960s, the species was considered widespread, abundant and commonly encountered. Today, the species exists as a series of isolated populations within its former range.

The main threats to Green and Golden Bell Frog include; predation of adults by European red foxes *Vulpes vulpes*, cats *Felis catus*, dogs *Canis lupus familiaris*, rats *Rattus* spp. and natural predators, road mortality, interaction with cane toads, grazing and trampling of habitat, inappropriate fire regimes.

No Giant Barred Frog or Green and Golden Bell Frog individuals were recorded within the Subject Land during targeted surveys. However, 7 records of Giant Barred Frog occur within a 10-kilometre radius, with the closest recorded approximately 6.5 kilometres from the Subject Land in 2020. No records of Green and Golden Bell Frog occur within the 10-kilometre radius. Vegetation comprising PCTs 3420, 3428, 4046 and 4001 represent potential habitat for these species, of which 21.27 hectares of PCT 3420, 3428 and 4046 will be removed for the Project. Therefore an assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (DoE 2013) has been undertaken below.

Table 73 SIC assessment for Amphibians

SIC assessment for vulnerable species

Lead to the long-term decrease in the size of an important population of a species.

No important populations have been identified for either species, however based on the restricted nature of all known populations of Green and Golden Bell Frog, all current populations are regarded as an 'important population' (TSSC 2014, DoE 2014b). Neither species was detected during targeted surveys.

The Project will result in the clearing of 21.27 ha of PCT 3420, 3428 and 4046 for Giant Barred Frog and Green and Golden Bell Frog and impact to several farm dams and unnamed ephemeral streams of Physics Creek within the far north-west and south-east of the Subject Land representing potential resources for these amphibians, with impacts completely avoided to PCT 4001 through the detailed design. While the Project will result in the removal of potential dispersal habitat, the unnamed tributaries of Physics Creek and dispersed farm dams are unlikely to constitute breeding habitat due to the lack of deep, damp cover of leaf litter required by Giant Barred Frog, and disturbance from large populations of Cane Toad inhabiting these areas which compete for resources, as well as run-off, and modification from heavy grazing, and trampling by livestock.

In addition, the total area of potential dispersal habitat being removed is not considered substantial in relation to the amount of retained within the Subject Land and Project Area (471.56 ha), and non-impacted habitat available in the broader landscape. Given the expanse of native vegetation in the broader landscape, and the large patches of suitable habitat within the Subject Land to be retained, the 21.27 ha is not expected to significantly reduce dispersal habitat for these species. Given the scale of the impact in the context of available habitat in the region, and the degraded nature of the habitat to be impacted, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of these amphibian populations.

Reduce the area of occupancy of an important population.

The Project will not result in impacts to breeding habitat for Giant Barred Frog or Green and Golden Bell Frog. Dispersal habitat within the Subject Land would be considered low, restricted to sub-optimal dispersal habitat surrounding the unnamed tributaries of Physics Creek. While these species may utilise the creekline to traverse through the Subject Land on occasion, it is unlikely that this species would be utilising the poor quality resources available on any regular basis, particularly given the density of Cane Toad populations, and the availability of higher quality resources in the south-east of the Subject Land.

Mitigation measures will be implemented to further alleviate any potential risk to this species as a result of the proposed works including, undertaking a pre-clearance surveys and the installation of frog exclusion fences.

As such, it is unlikely that proposed works will reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations.

The Subject Land is located within a matrix of agricultural land that is currently subject to a moderate level of fragmentation through vegetation clearing. No individuals of either species were recorded during the targeted surveys.

SIC assessment for vulnerable species

Although the project requires the removal of 21.27 ha of native vegetation, this is likely to constitute marginal dispersal habitat only, and no breeding habitat will be impacted. While some localised fragmentation will occur, the overall habitat connectivity for both species will be retained within the Subject Land, Project Area and broader locality. Large areas of bushland will retain connectivity to the south-east of Physics Creek, with further connective landscape and vegetation surrounding the Subject Land.

Adversely affect habitat critical to the survival of a species.

The respective approved conservation advice for Giant Barred Frog and Green and Golden Bell Frog do not define critical habitat for either species, however general habitat is defined as below:

- Giant Barred Frog requires permanent flowing drainages (from shallow, rocky rainforest streams to slow-moving rivers) in lowland open wet-forests (rainforest and wet sclerophyll forest) and (to a lesser degree) on cleared land. The species is mostly associated with pools in larger streams and stays within the riparian area. This habitat provides deep, damp, leaf litter that is utilised for both shelter and foraging, with the permanent wet conditions negating the need for seasonal migrations.
- In order to sustain a viable local population, Green and Golden Bell Frogs require breeding habitat (permanent water bodies, culverts or drainage depressions), foraging habitat (grassland, tussock vegetation or modified habitat such as golf courses), shelter habitat (rock piles or tussock vegetation), movement habitat (wet areas, creek lines, laneways or drains) and over-wintering habitat (rock piles, logs or dense vegetation).

The ephemeral streams and degraded farm dams onsite housing a large population of Cane Toads would represent sub-optimal habitat for both species. These areas lack deep, dense leaf litter required by Giant Barred Frog, and are inhabited by large populations of Cane Toad which are a direct threat to Green and Golden Bell Frog. As such no breeding habitat is expected to be impacted and impacts to dispersal habitat are expected to be low, consisting of 21.27 ha. Dispersal habitat and vegetation connectivity will also be maintained throughout the landscape, as to not limit the dispersal of this species.

Mitigation measures will be implemented to further alleviate any potential risk to this species as a result of the proposed works including, undertaking pre-clearance surveys and the installation of frog exclusion fences.

Although some native vegetation will be removed (21.27 ha), the Project will not substantially impact upon any of the required frog habitats mentioned above, and thus will not adversely affect habitat critical for either species' survival.

Disrupt the breeding cycle of an important population.

No individuals of Giant Barred Frog or Green and Golden Bell Frog were detected during targeted surveys.

The proposed works is not likely to impact on areas of suitable breeding habitat for Giant Barred Frog or Green and Golden Bell Frog, given the ephemeral nature of the waterways available and the highly degraded nature of the farm dams, both of which are inhabited by large populations of Cane Toad. Available dispersal habitat would be limited to low condition riparian vegetation surrounding the tributary of Physics Creek which is relatively dry and does not contain a large amount of leaf litter. The Project will result in the removal of a relatively small area (21.27 ha) of this vegetation, when compared to the habitat that will remain available within the Subject Land and Project Area (471.56 ha). As such, it is unlikely that the works will disrupt the breeding cycle of a population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The 21.27 ha to be removed by the Subject Land is currently subject to a moderate-high level of modification through vegetation clearing, grazing, trampling, runoff, and is inhabited by invasive species; Cane Toad.

Breeding habitat is therefore unlikely to be impacted as a result of the Project. While there is a some potential that vegetation surrounding the waterway may be utilised as marginal dispersal habitat by Giant Barred Frog and Green and Golden Bell Frog, a relatively small area will be impacted (21.27 ha) in relation to the large areas of vegetation south of Physics Creek to be retained. While the unnamed creek may be utilised as a pathway for these frog species to traverse into the Subject Land, it is unlikely that they would be utilising the poor quality habitat available within the Subject Land, as there are higher quality resources located throughout the landscape, particularly in the adjoining sections of Physics Creek that will not be impacted.

SIC assessment for vulnerable species

Therefore, the proposed works is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The farm dams and ephemeral streams within the Subject Land are currently inhabited by large populations of Cane Toad, which are known to be a direct threat to Green and Golden Bell Frog through interaction. In addition, the Subject Land is currently subject to grazing and trampling pressure from cattle and invasion from exotic plant species known to degrade habitat for Giant Barred Frog, such as Lantana. Given this, the Project is unlikely to exacerbate the current level of invasive species threat operating within the Subject Land. In addition, the risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices.

Introduce disease that may cause the species to decline.

Frog Chytrid Disease *Batrachochytrium dendrobatidis* is rapidly emerging as a significant threat to these species. However, the disease is currently widespread and it is unlikely that works within the Subject Land will introduce the disease into areas that were previously Chytrid-free due to the level of disturbance and human interaction with the Subject Land. It is still recommended that workers undertake appropriate hygiene measures in accordance with the NPWS Frog Hygiene Protocol (DECC 2008b) to reduce the likelihood of spreading the infection.

Interfere substantially with the recovery of the species.

The Recovery plan for stream frogs of south-east Queensland 2001-2005 (Harry Hines, Queensland Parks and Wildlife Service, & South-east Queensland Threatened Frogs Recovery Team 2002), which is the current recovery plan for Giant Barred Frog aims to:

- Manage the recovery process
- Monitor populations
- Gain information required for management
- Protect populations and manage habitat
- Provide education and information

The draft Green and Golden Bell Frog Recovery Plan (DEC2005) aims to:

- Increase the security of key frog populations by way of preventing the further loss of habitat.
- Ensure extant frog populations are managed to eliminate factors that are known to detrimentally affect the species.
- Implement habitat management initiatives that are informed by ecological studies.
- Establish self-sustaining and representative captive populations as 'insurance' colonies.
- Increase the level of local and regional awareness of the conservation status of the Green and Golden Bell Frog.

The removal of 21.27 ha comprising sub-optimal dispersal habitat for the species within a location with higher quality habitat within the local area is unlikely to interfere with the aims of this recovery plan. While the project will result in some localised loss of potential dispersal habitat, these areas are currently modified and connected to better-quality habitat which will be retained within the Subject Land and Project Area.

Conclusion.

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on amphibians or their habitats as:

- The Project will not introduce any diseases or invasive species of Giant Barred Frog or Green and Golden Bell Frog.
- The Project will not interfere significantly with the recovery actions for the species.

SIC assessment for vulnerable species

- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species however the Project will impact 21.27 ha of potential dispersal habitat, surrounded by large swathes of habitat that will be retained both within and adjacent to the Subject Land, it is not likely to significantly impact the species.

Based on the factors above, it is concluded that the Project is unlikely to lead to a significant impact on threatened amphibian species.

