



GOULBURN RIVER SOLAR FARM
Biodiversity Development Assessment Report

FINAL

January 2024



GOULBURN RIVER SOLAR FARM

Biodiversity Development Assessment Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Lightsource bp

Project Director: Malinda Facey
Project Manager: Jessica Henderson-Wilson
Technical Director: Rachel Musgrave
Technical Manager: Jacob Manners
Report No. 23485/R07
Date: January 2024



QMS Certification Services

This report was prepared using
Umwelt's ISO 9001 certified
Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V0	David Moore	04/07/2022	David Moore	04/07/2022
V1	Allison Riley	18/10/2022	Allison Riley	18/10/2022
V2	Rachel Musgrave	24/04/2023	Rachel Musgrave	02/05/2023
V3	Rachel Musgrave	18/01/2024	Rachel Musgrave	18/01/2024

Executive Summary

Background

Umwelt was engaged by Lightsource Development Services Australia Pty Ltd (Lightsource bp), the Proponent, to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed Goulburn River Solar Farm (the 'Project'), located south-west of the township of Merriwa, NSW.

The Project is a State Significant Development (SSD), surrounded by the Goulburn River National Park. The Project will involve the construction, operation and decommissioning of a solar farm, which would generate approximately 550 MWp (Megawatt peak) of solar electricity, with a centralised Battery Energy Storage System (BESS) of 900 MWh (Megawatt hour), a decentralised BESS of 1,160 MWh or a combined centralised and decentralised BESS of 2,060 MWh. Electrical infrastructure includes an electrical substation to connect the solar farm to the existing 500 kV transmission line that runs through the Project Area.

The development of renewable energy generation aligns with both Federal and NSW commitments to increase renewable energy generation and reduce carbon emissions. The location, design, technology, layout and size of the Project has been developed through consideration of a number of alternatives to ensure the Project would result in maximum benefits for the locality and region in the long term, whilst minimising impacts to the environment and to cultural heritage during all phases of the Project.

The Project is considered to be justified and in the public interest because:

- It will provide renewable energy that would contribute to the reduction of greenhouse gases across NSW, avoiding up to 705,000 tonnes per annum of carbon dioxide.
- The Project Area has access to existing transmission line infrastructure that has capacity to transport the electricity to the grid. This minimises the need for construction works and disturbance associated with additional infrastructure often required to connect large-scale renewable energy projects to the electricity market.
- It would not result in significant biophysical, social, cultural or economic impacts, relative to alternative sites along the existing transmission line.
- Minimal visual impacts associated with the Project as the Project Area is screened by the Goulburn River National Park.
- The large, isolated Project Area (2,000 ha) has provided flexibility in design to prioritise avoidance of high value biodiversity areas.
- The Project will include a Biodiversity Stewardship Agreement (BSA), committing 1,200 ha of the site as an offset and contributing to the supply of surplus biodiversity credits into the market.

Assessment Approach

This Report has been prepared in accordance with the requirements of the Biodiversity Assessment Method (BAM) (DPIE 2020a) and Section 6.12 of the NSW *Biodiversity Conservation Act 2016* (BC Act). This Report generally follows the Department of Planning and Environment (DPE) template for a BDAR.

It describes the biodiversity values of the Development Footprint and assesses the biodiversity impacts of the Project and should be read in conjunction with the Public Road & Culvert Upgrade BDAR.

Field surveys were carried out by 12 Umwelt ecologists over more than 600 person hours spanning 36 days and 14 nights between 2021 and 2023. Thermal drone surveys were also undertaken by Wildlife Drones over two nights during November 2023.

Assessment Results

The Development Footprint occurs within the Sydney Basin Interim Biogeographic Regionalisation for Australia IBRA Bioregion – Kerrabee IBRA Subregion. Surveys identified the following Plant Community Types (PCTs) and vegetation which will be impacted by the Project:

- PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley (693.86 ha, of which 671.37 ha comprises derived native grassland). This PCT is with a component of *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community* (CEEC), listed under the BC Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and is an entity with the potential for serious and irreversible impact (SAII).
- PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin (95.29 ha, of which 92.63 ha is comprised of derived native grassland).

These PCTs have been utilised for this assessment following the transitional provisions for the BAM Calculator update of revised Plant Community Types in eastern NSW, which occurred in April 2023.

The following ecosystem credit threatened species listed under the BC Act and/or the EPBC Act have been observed within the Project Area, however impacts on these species are not considered to be significant:

- White-throated Needletail (*Hirundapus caudacutus*) – listed as vulnerable under the EPBC Act.
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (foraging habitat only) – listed as vulnerable under the BC Act and EPBC Act (Note: This species was listed after decision on EPBC referral).
- Diamond Firetail (*Stagonopleura guttata*) – listed as vulnerable under the BC Act and EPBC Act (Note: This species was listed after decision on EPBC referral).
- Dusky Woodswallow (*Artamus cyanopterus*) – listed as vulnerable under the BC Act.
- Little Lorikeet (*Glossopsitta pusilla*) – listed as vulnerable under the BC Act.

A species polygon is not required for the above ecosystem credit species and impacts to these species and their habitats will be offset through the retirement of ecosystem credits.

There are two species credit threatened species entities with unavoidable residual impacts:

- Whilst the species was not observed during the surveys, 42.30 ha of native vegetation mapped as important habitat for the Regent Honeyeater (*Anthochaera phrygia*) is within the Development Footprint. This species is listed as critically endangered under the BC Act and EPBC Act and is an entity with the potential for SAll. Of the 42.30 ha impacted, only 17.58 ha is treed, with the remainder mapped over grassland and cleared areas.
- Barking Owl (*Ninox connivens*) (breeding habitat) – listed as vulnerable under the BC Act. 1.22 ha of highly disturbed grassland will be impacted in the vicinity of Barking Owl sightings. All hollow bearing trees where Barking Owl was observed will be retained.

Species polygons and credits have been generated for offsetting impacts to the above species.

Following the application of impact avoidance, minimisation and management measures, the following impacts requiring biodiversity credits are documented in **Table ES.1** and **Table ES.2**.

Table ES.1 Ecosystem Credit Requirements

Vegetation Condition Zone	PCT No.	PCT Name	Condition Class	Vegetation Integrity Score	Area (ha)	Credits Required
1	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Scattered Trees	78.9	22.49	1,109
2	483		Moderate DNG	34	165.36	3,509
3	483		Moderate to Low DNG	12.6	310.03	0
4	483		Low DNG	10.3	195.98	0
5	1661	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Scattered Trees	51.1	2.66	59
6	1661		Moderate to Low DNG	13.3	37.65	0
7	1661		Low DNG	3.4	54.98	0

Table ES.2 Species Credit Requirements

Species Name	Impact Area (ha)	Credits Required
Regent Honeyeater (<i>Anthochaera phrygia</i>)	42.30	1,424
Barking Owl (<i>Ninox connivens</i>)	1.22	6

The Project will impact the SAll entity, White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community. This TEC is considered to be at risk of an SAll due to:

- **Principle 1:** It will cause a further decline of the ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline and
- **Principle 2:** It will further reduce the population size of the ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.

The areas to be impacted are mostly composed of grazed areas of derived grassland which are subject to ongoing management for agricultural activities and the vegetation integrity scores of these areas reflects conditions associated with a significant La Niña weather event between 2021 and 2022. Areas of scattered trees which correspond to this CEEC represent only 3.3% of the total area of this PCT within the Development Footprint and higher quality areas of this PCT have been avoided and designated for inclusion within a proposed Biodiversity Stewardship Site within the residual parts of the Project Area.

The works will also impact areas of mapped important habitat for the Regent Honeyeater. This species listed as at risk of an SAI due to:

- **Principle 1:** It will cause a further decline of the species that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline and
- **Principle 2:** It will further reduce the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.

A report containing expert assessment and conservation advice on the Regent Honeyeater has been prepared by the recognised species expert, Dr Ross Crates, to accompany this assessment (**Appendix H**). The report identifies that the habitat within the proposed Development Footprint represents at best marginal foraging habitat for the species, due to the relatively high elevation, exposed nature of the site and the low density of feed trees. It is very unlikely that Regent Honeyeaters would breed within the habitats that would be impacted by the Project. The habitats of most value to the Regent Honeyeater within the subject site are located within the proposed BSA.

Matters of National Environmental Significance

Matters of National Environmental Significance known or with potential to occur within the Development Footprint were assessed in accordance with the EPBC Act Significant Impact Guidelines and any applicable recovery plans or EPBC Act policy statements. The assessments undertaken have identified that the Project would result in significant impacts under the EPBC Act to the White Box – Yellow Box Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC, the Regent Honeyeater (*Anthochaera phrygia*) and the Painted Honeyeater (*Grantiella picta*). Offsets for the CEEC and Regent Honeyeater are proposed under the BAM. The Painted Honeyeater, an ecosystem credit species, will be addressed within the Project’s ecosystem credit obligation (for PCT 483).

Measures to Avoid and Minimise Impacts

Biodiversity impacts have been avoided and minimised through refinements to the Development Footprint. Development Footprint alterations have resulted in biodiversity impact avoidance through an initial avoidance of approximately 38% (reducing from 2,000 ha to 1,249 ha) of the Project Area prior to submitting the Scoping Report, a secondary approximately 30% reduction in Development Footprint area (reducing from 1,249 ha to 882 ha) and a further approximately 10% reduction in Development Footprint (882 ha to 792.19 ha). In total, 60.39% of the Project Area, including the highest value ecological areas, has been avoided.

From the Scoping Report (December 2021) to the present, the Development Footprint has greatly reduced in size to respond to an impacted areas of mapped Regent Honeyeater important habitat, a reduction of almost 70 ha. A report containing expert assessment and conservation advice on the Regent Honeyeater has been prepared by the recognised species expert, Dr Ross Crates, to accompany this assessment in **Appendix H**. The report identifies that the mapped important Regent Honeyeater habitat which will be impacted by the Project is of low importance to the species.

Table ES.3 provides a summary of the impact reduction achieved for the overall Development Footprint and impacts to the potential SAIL entities, based on current vegetation community mapping for the Project Area and Regent Honeyeater mapped Important Habitat.

Table ES.3 Goulburn River Solar Farm Impact Avoidance

	Unit	Design A* (Dec 2021) Scoping Report & EPBC referral	Design B (Nov 2022)	Design C (May 2023) EIS	Design D (Dec 2023) Amendment Report	Difference (A to D)
Development footprint						
Development footprint	ha	930.36	882	799.50	792.19	-138.14 (-15%)
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland						
PCT 483 Moderate Condition Woodland	ha	2.37	0.27	0	0	-2.37 (-100%)
PCT 483 Scattered Trees	ha	60.45	42.75	23.42	22.49	-37.96 (-63%)
PCT 483 Uncategorised Derived Native Grassland (mostly moderate condition)	ha	76.32	42.96	2.27	0	-76.32 (-100%)
PCT 483 DNG Moderate Condition Derived Native Grassland	ha	163.00	162.53	164.99	165.36	+2.36 (+1%)
PCT 483 Moderate to Low Condition Derived Native Grassland	ha	314.61	315.11	310.07	310.03	-4.59 (-1%)
PCT 483 Low Condition Derived Native Grassland	ha	197.75	197.39	199.35	195.98	-1.77 (-1%)
Regent Honeyeater						
Regent Honeyeater Important Habitat**	ha	108.9	74.93	44.96	42.30	- 66.47 (-61%)

* Design revision A was used in the Scoping Report and EPBC referral. This design revision encompassed an evolving footprint with a few different spatial iterations and as such has variously been presented as a maximum (1,249 ha) and minimum (930 ha). Impact calculations presented in the Scoping Report and EPBC referral were based on preliminary vegetation community mapping, whereas the numbers presented herein reflect the refined vegetation community mapping. As a result, the numbers for Design Revision A may not be consistent with previous reporting.

** Includes native vegetation and cleared areas.

The following key impact avoidance and minimisation measures have been applied:

- Selection of higher rated capacity solar panels to ensure that the Development Footprint is minimised, the Project retains a capacity of a 550 MWp of solar electricity and the cost of purchasing the solar panels maintains the Project's economic viability.
- Designing the Project layout in such a way that landscape scale connectivity between the Project Area and surrounding Goulburn River National Park will be maintained, along with continued local connectivity across the Project Area. This has been done by focussing the Project infrastructure in discrete fenced areas, linked by access tracks which will not be fenced and will therefore allow for wildlife movement.
- Designing the Development Footprint to avoid Redlynch Creek in the north east of the Project Area by creating a 60 m corridor that will enable wildlife movement along the riparian corridor as well as protect water quality.
- Redesign of the Project to minimise impacts on areas of mapped Regent Honeyeater important habitat.
- Reduction and alteration of the Development Footprint to minimise impacts to areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. This included impact avoidance measures targeted at retaining areas of woodland with intact crown condition, areas of scattered trees and higher quality derived native grassland condition zones.
- Prioritising areas for avoidance which are both mapped Regent Honeyeater important habitat and CEEC woodland.
- Alteration of the Project to avoid breeding habitat for the Barking Owl.
- Alteration of the Project to entirely avoid impact to PCTs associated with habitat for the Large-eared Pied bat (*Chalinolobus dwyeri*) and the Eastern Cave Bat (*Vespadelus troughtoni*).
- Reduction of the Development Footprint to entirely avoid impacts to areas of PCT 1607 Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter.
- Reduction of the Development Footprint to entirely avoid impacts to areas of PCT 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin which corresponds to the Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion vulnerable ecological community (VEC).
- Avoidance of Aboriginal heritage sites, and protection of the remnants of a slab hut of historic heritage importance.

Impacts which cannot be avoided or minimised will be managed in the following ways:

- Education and training for construction and operation staff.
- Establishing vegetation protection zones for retained areas.
- Pre-clearance surveys and ecologist supervision, enabling rescue of native fauna as well as salvaging habitat features (such as hollows or selective felled timber) for relocation into adjacent retained areas.

- Erosion and sediment control.
- Weed management.

Offsets

The proponent is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project. The biodiversity offset strategy for Goulburn River Solar Farm consists of the following:

- Establishment of an approximately 1,200 ha Biodiversity Stewardship Agreement (BSA) over the residual parts of the Project Area covering the credit requirement for PCT 1661, Regent Honeyeater and partially covering the credit obligation of PCT 483.
- Retirement of residual credits across two existing BSAs.
- Payment into the Biodiversity Conservation Fund (BCF).

Declaration

i. Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared by Umwelt (Australia) and to the best of my knowledge is based on the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020a) and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Name: Jacob Manners

Signature: A handwritten signature in black ink, appearing to read 'Jacob Manners', enclosed within a hand-drawn oval.

Date: 23 January 2024

BAM Assessor Accreditation no: BAAS17099

Abbreviations

Term/Abbreviation	Definition
AIAPs	Additional impact assessment provisions for SAI
AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BCD	Biodiversity, Conservation, and Science Division within NSW Department of Planning and Environment
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
BSA	Biodiversity Stewardship Agreement
BSS	Biodiversity Stewardship Site
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	critically endangered ecological community
CEMP	Construction Environmental Management Plan
CST	Credit Supply Taskforce
DBH	diameter at breast height over bark
DPE	Department of Planning and Environment (NSW)
DPIE	Department of Planning, Industry, and the Environment (NSW) (superseded, now DPE)
EAH	Environmental Agency Head
EC	ecological community listed under the EPBC Act
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EEC	endangered ecological community
EIS	Environmental Impact Statement
EPC	Engineering Procurement Contractor
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GIS	Geographic Information System
GPS	Global Positioning System
HTW	high threat weed

Term/Abbreviation	Definition
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
kV	kilovolts
LGA	Local Government Area
LLS Act	<i>Local Land Services Act 2013 (NSW)</i>
Lightsource bp	Lightsource Development Services Australia Pty Ltd
m	metres
MNES	matters of national environmental significance
MWh	Megawatt hour
MWp	Megawatt peak
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NVR Mapping	Native Vegetation Regulatory Mapping
PCT	Plant Community Type
Project Area	The broader property area that the subject land is located within.
PV	Photovoltaic
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
STVM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
TSSC	Threatened Species Scientific Committee – DCCEEW
VEC	vulnerable ecological community

Glossary

Project-Specific Term	Description
Assessment Area	Includes the Development Footprint and the area of land within the 1500 m buffer zone surrounding the Development Footprint (or 500 m buffer for linear developments).
Battery Energy Storage System (BESS)	The entire battery system comprising of a power conversion system (battery storage units and inverters), either centralised or distributed (i.e. decentralised) throughout the solar farm site. The BESS is housed in a series of outdoor containers. Note: the Amended Project details the amendments to the proposed BESS arrangements, including increasing the capacity of the centralised BESS to 450 MWp, and the addition of a decentralised 580 MWp BESS, plus the option for both BESS configurations.
Development Footprint	The maximum extent of ground disturbance associated with construction and operation of the Goulburn River Solar Farm as presented in the EIS and subsequently the Amendment Report. Note: the Amended Project has an amended Development Footprint.
Development Site	An area of land that is subject to a proposed development under the EP&A Act, including areas which will be retained and impacted by the project (synonymous with Subject Land and Project Area).
Project Area	The total area investigated during various specialist studies and the broader property the Development Footprint will be located on. The Project Area covers approximately 2,000 ha and includes the Solar Farm Site, the BESS development area and ancillary infrastructure. This includes a 10 m set back (i.e., APZ) from the perimeter of the Site boundary. This does not include road upgrades and repairs on Wollara Road and Ringwood Road. It also comprises the proposed Biodiversity Stewardship Site.
Proponent	Lightsource Development Services Australia Pty Ltd (Lightsource bp).
Subject Land	The land subject to the development application (synonymous with development site). The Development Footprint/disturbance footprint is located within the Subject Land area.
Site	The property(ies) in which the Project Area is located.
Transmission line	The existing 500 kV overhead transmission line located in the south-eastern corner of the Project Area that would connect the solar farm to the grid connection point into the National Energy Market network. Note: the Amended Project includes an additional Transmission Tower within the easement to accommodate the connection to the transmission network.

Table of Contents

Executive Summary	i
Declaration	viii
Abbreviations	ix
Glossary	xi
1.0 Introduction	1
1.1 Overview	1
1.2 Proposed Development	1
1.2.1 Development Overview	1
1.2.2 Location and Subject Land Description	2
1.2.3 Proposed Development Description	2
1.2.4 Project Site Selection and Biodiversity Design Considerations	3
1.3 Purpose of this Report	8
1.4 Statutory Considerations	20
1.5 Project Team	24
1.5.1 Other Documentation	25
1.6 Biodiversity Offsets Scheme Entry	25
1.7 Excluded Impacts – NVR Mapping	27
1.8 Matters of National Environmental Significance	30
1.9 Information Sources	31
2.0 Methods	32
2.1 Site Context Methods	32
2.1.1 Landscape Features	32
2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Methods	32
2.2.1 Existing Information	32
2.2.2 Mapping Native Vegetation Extent and Plant Community Types	33
2.2.3 Plot-Based Floristic and Vegetation Integrity Survey	33
2.3 Threatened Flora Survey Methods	37
2.3.1 Review of Existing Information	37
2.3.2 BioNet Atlas Threatened Flora Records	37
2.3.3 Habitat Constraints Assessment	39
2.3.4 Flora Surveys	39
2.4 Threatened Fauna Survey Methods	46

2.4.1	Review of Existing Information	46
2.4.2	BioNet Atlas Threatened Fauna Records	46
2.4.3	Habitat Constraints Assessment	49
2.4.4	Fauna Surveys	49
2.5	Threatened Fungi	59
2.6	Weather Conditions	59
2.7	Limitations	59
3.0	Site Context	61
3.1	Assessment Area	61
3.2	Landscape Features	61
3.2.1	IBRA Bioregions and IBRA Subregions	61
3.2.2	Rivers, Streams, Estuaries and Wetlands	61
3.2.3	Habitat Connectivity	61
3.2.4	Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance	62
3.2.5	Areas of Outstanding Biodiversity Value	62
3.2.6	NSW (Mitchell) Landscapes	62
3.2.7	Additional Landscape Features Identified in the SEARS	62
3.3	Native Vegetation Cover	62
4.0	Native Vegetation, Threatened Ecological Communities and Vegetation Integrity	65
4.1	Native Vegetation Extent	65
4.1.1	Changes to the Mapped Native Vegetation Extent	65
4.1.2	Areas That Are Not Native Vegetation	65
4.2	Plant Community Types	67
4.2.1	Overview of PCTs Present	67
4.2.2	Description of PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	71
4.2.3	Description of PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	77
4.2.4	Other PCTs Surveyed within the Project Area	81
4.2.5	Cleared Land and Waterbodies	81
4.3	Threatened Ecological Communities	82
4.4	Vegetation Zones	86
4.5	Vegetation Integrity (Vegetation Condition)	89
4.5.1	Vegetation Integrity Survey Plots	89

4.5.2	Scores	89
4.5.3	Use of Benchmark Data	90
5.0	Habitat Suitability for Threatened Species	91
5.1	Identification of Threatened Species for Assessment	91
5.1.1	Ecosystem Credit Species	91
5.1.2	Species Credit Species	95
5.2	Presence Determination for Candidate Species Credit Species	105
5.2.1	Threatened Flora Species	105
5.2.2	Threatened Fauna Species	105
5.3	Threatened Species Surveys	108
5.3.1	Candidate Threatened Flora Species Surveys	108
5.3.2	Candidate Threatened Fauna Species Surveys	109
5.3.3	Expert Reports and More Appropriate Local Data	123
5.3.4	Area or Count, and Location of Suitable Habitat for a Species Credit Species (a Species Polygon).	124
5.3.5	Results for BC Act Listed Ecosystem Credit Species	136
5.3.6	Results for EPBC Act Listed Species	136
5.4	SEPP (Biodiversity and Conservation) 2021	137
6.0	Identifying Prescribed Impacts	139
7.0	Avoid and Minimise Impacts	146
7.1	Avoid and Minimise Direct and Indirect Impacts	146
7.1.1	Project Location	149
7.1.2	Project Design and Planning	152
7.2	Avoid and Minimise Prescribed Impacts	156
7.2.1	Project Location	157
7.2.2	Project Design	157
7.3	Other Measures Considered	157
7.3.1	Do Nothing Option	157
7.4	Summary of Measures to Avoid and Minimise Impacts	159
8.0	Impact Assessment	161
8.1	Direct Impacts	161
8.1.1	Residual Direct Impacts	161
8.1.2	Change in Vegetation Integrity Score	163
8.2	Indirect Impacts	166
8.3	Prescribed Impacts	169

8.3.1	Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance	169
8.3.2	Human Made Structures	169
8.3.3	Non-Native Vegetation	170
8.3.4	Excluded Areas – Category 1 Exempt Land	170
8.3.5	Habitat Connectivity	170
8.3.6	Waterbodies, Water Quality and Hydrological Processes	171
8.3.7	Vehicle Strikes	172
8.4	Mitigating Residual Impacts – Management Measures and Implementation	172
8.4.1	Workforce Education and Training	172
8.4.2	Implementation of Vegetation Protection Zones for Areas to be Retained	172
8.4.3	Ecologist Pre-Clearance Surveys and Supervision of Works	173
8.4.4	Erosion and Sedimentation Control	173
8.4.5	Weed Management	174
8.4.6	Fencing, Access Control and Fauna Exclusion	174
8.4.7	Preparation and Implement of Construction Environmental Management Plan	175
8.5	Adaptive Management Strategy for Uncertain Impacts (Where Relevant)	180
9.0	Serious and Irreversible Impacts	181
9.1	Assessment for Serious and Irreversible Impacts on Biodiversity Values	181
9.2	Additional Impact Assessment Provisions for TECs at Risk of an SAI	184
9.3	Additional Impact Assessment Provisions for Threatened Species at Risk of an SAI	194
9.3.1	Regent Honeyeater (<i>Anthochaera phrygia</i>)	194
9.4	Additional conservation measures for impacted SAI entities	202
10.0	Impact Summary	204
10.1	Determining an Offset Requirement for Impacts	204
10.1.1	Impacts on Native Vegetation and TECs (Ecosystem Credits)	204
10.1.2	Impacts on Threatened Species and their Habitat (Species Credits)	205
10.1.3	Indirect and Prescribed Impacts	205
10.2	Impacts That Do Not Need Further Assessment	206
11.0	Biodiversity Credit Reports	208
11.1	Ecosystem Credits	208
11.2	Species Credits	210
11.3	Biodiversity Offset Strategy	210
11.3.1	Goulburn River BSA	211
11.3.2	Existing Stewardship Site(s)	212

11.3.3	Payment into the BCF	213
11.3.4	Summary of Biodiversity Offset Approach	213

12.0 References 214

Figures

Figure 1.1	Site Map	5
Figure 1.2	Location Map	6
Figure 1.3	Development Layout	7
Figure 1.4	Biodiversity Values Map	26
Figure 1.5	Native Vegetation Regulatory Map	29
Figure 2.1	Field Survey Locations – Vegetation Plots	36
Figure 2.2	Field Survey Locations – Threatened Flora	45
Figure 2.3	Field Survey Locations – Threatened Fauna	57
Figure 2.4	Location of Arboreal Mammal Thermal Drone Surveys	58
Figure 3.1	Rivers, Streams, Estuaries, and Wetlands Downstream of the Subject Land	63
Figure 3.2	Habitat Connectivity	64
Figure 4.1	Native Vegetation Extent	66
Figure 4.2A	Plant Community Types and Vegetation Condition Zones Impacted within the Development Footprint	69
Figure 4.2B	Plant Community Types and Vegetation Condition Zones Retained within the Project Area	70
Figure 4.3A	Threatened Ecological Communities within the Development Footprint	84
Figure 4.3B	Threatened Ecological Communities Retained within the Project Area	85
Figure 5.1	Regent Honeyeater Species Polygon	127
Figure 5.2	Barking Owl Species Polygon and Observation Location Map	130
Figure 5.3	Large-eared Pied-bat Species Polygon and Observation Location Map	132
Figure 5.4	Eastern Cave Bat Species Polygon and Observation Location Map	134
Figure 5.5	Ecosystem Credit Species Observation Locations	135
Figure 6.1	Prescribed Impact Features	141
Figure 7.1	Impact Avoidance and Minimisation Locations	148
Figure 7.2	Detail of changes to the Development Footprint (EIS = blue, Amendment Report = red; Regent Honeyeater important habitat is shown as orange, with box gum woodland scattered trees in green)	149
Figure 8.1	Final Impact Areas within the Development Footprint	162
Figure 9.1	Locations of Habitat for Potential Serious and Irreversible Impact Entities	183
Figure 9.2	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Impact Avoidance	192
Figure 9.3	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC NSW Extent	193
Figure 9.4	Regent Honeyeater Impact Avoidance	201
Figure 10.1	Thresholds for Assessing and Offsetting Impacts	207

Photos

Photo 1.1	Example of the type of solar modules and rows proposed	3
Photo 2.1	Example of typical wide spacing between scattered trees in PCT 483 Scattered Trees condition zone	41
Photo 2.2	Example of PCT 1661 scattered trees condition zone which were included for searches of threatened shrubs	42
Photo 2.3	Example of less degraded parts of PCT 1661 Derived Native Grassland condition zones which were included for surveys for threatened shrubs	42
Photo 2.4	Example of highly degraded parts of PCT 1661 Derived Native Grassland condition zones which were excluded from surveys for threatened shrubs	43
Photo 4.1	PCT 483 Condition Zone 1 – Scattered Trees	72
Photo 4.2	PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland	73
Photo 4.3	PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland	74
Photo 4.4	PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland	75
Photo 4.5	PCT 1661 Condition Zone 1 – Scattered Trees	78
Photo 4.6	PCT 1661 Condition Zone 1 – Moderate to Low Derived Native Grassland	79
Photo 4.7	PCT 1661 Condition Zone 1 – Low Condition Derived Native Grassland	80
Photo 4.8	Visual comparison of differing conditions encountered for derived grassland vegetation related to rainfall over the survey period	89
Photo 6.1	Example of surface rock and rock piles	142
Photo 6.2	Operational open farm shed located within the Development Footprint	142
Photo 6.3	Operational open farm shed located within the Development Footprint	143
Photo 6.4	Operational open farm shed containing stock feed located within the Development Footprint	143
Photo 6.5	Partially dismantled shed located within the Development Footprint	144
Photo 6.6	Abandoned cottage (Redlynch House) which has been removed from the Development Footprint	144
Photo 6.7	Partially dismantled shed located within the Development Footprint near Redlynch Creek	145

Tables

Table 1.1	SEARs Relevant to the Biodiversity Assessment	9
Table 1.2	Summary and Reference Table for BCD Submissions	14
Table 1.3	Legislation Relevant to the Project	21
Table 1.4	Accredited BAM Assessors and their role in this Project	24
Table 2.1	Landscape Features Assessed and Data Sources	32
Table 2.2	Plant Community Type Survey Plot Stratification Details	35
Table 2.3	Bionet Atlas Threatened Flora Records within 1.5 km	38
Table 2.4	Flora Species Targeted and Field Survey Methods Used	43
Table 2.5	BioNet Atlas Threatened Fauna Records within 1.5 km	47
Table 2.6	Details of Diurnal Threatened Fauna Surveys Completed	51
Table 2.7	Details of Nocturnal Threatened Fauna Surveys Completed	54

Table 2.8	Details of Remote Detection Threatened Fauna Surveys Completed	56
Table 3.1	Native Vegetation Cover in the Assessment Circle	62
Table 4.1	Plant Community Types Identified within the Development Footprint	68
Table 4.2	Overview of PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley Characteristics	71
Table 4.3	Overview of PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin Characteristics	77
Table 4.4	TECs within the Development Footprint	83
Table 4.5	Vegetation Condition Zones and Patch Sizes	87
Table 4.6	Vegetation Integrity Condition Scores	89
Table 5.1	Predicted Ecosystem Credit Species	92
Table 5.2	Candidate Flora Species Credit Species Determination	96
Table 5.3	Candidate Threatened Fauna Species Credit Species Determination	100
Table 5.4	Determination of Presence of Candidate Flora Species Credit Species on the Development Footprint	105
Table 5.5	Determination of Presence of Candidate Fauna Species Credit Species within the Development Footprint	106
Table 5.6	Candidate Threatened Flora Species Survey Details	108
Table 5.7	Candidate Threatened Fauna Species Survey Details	109
Table 5.8	Regent Honeyeater Species Polygon Details	125
Table 5.9	Barking Owl Species Polygon Details	128
Table 5.10	Ecosystem Credit Species Observation Details	136
Table 5.11	Results for EPBC Act Listed Species Present (recorded within the Development Footprint)	136
Table 5.12	Koala Feed Tree Present within Project Area	137
Table 6.1	Prescribed Impacts Identified	139
Table 7.1	Goulburn River Solar Farm Impact Avoidance	146
Table 7.2	Avoidance and Minimisation Measures for Direct, Indirect and Prescribed Impacts	159
Table 8.1	Summary of Residual Direct Impacts	161
Table 8.2	Impacts to Vegetation Integrity	165
Table 8.3	Summary of Residual Indirect Impacts	167
Table 8.4	Summary of Proposed Mitigation and Management Measures for Residual Impacts (Direct, Indirect, and Prescribed)	176
Table 8.5	Implementation Details for Proposed Impact Mitigation and Management Measures	178
Table 9.1	Entities at Risk of an SAI	182
Table 9.2	SAI Impact Assessment – Box White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CECC	184
Table 9.3	All Impact Assessment – Regent Honeyeater	194
Table 9.4	Conservation measures for SAI with potential to be significantly impacted by the Project	202
Table 10.1	Impacts that Do Not Require Offset – Ecosystem Credits	204
Table 10.2	Impacts that Require an offset – Ecosystem Credits	205
Table 10.3	Impacts that Require an Offset – Species Credits	205
Table 11.1	Ecosystem Credit Class and Matching Credit Profiles	209
Table 11.2	Species Credit Class and Matching Credit Profiles	210
Table 11.3	Existing Sites for Residual Credit Retirement	213

Appendices

Appendix A	EPBC Act Matters of National Environmental Significance Report
Appendix B	Location Map and Native Vegetation Extent Figures (1:10,000 Scale)
Appendix C	BDAR Compliance Table
Appendix D	CVs for Key Project Team Members
Appendix E	Thermal Drone Koala Survey Report
Appendix F	BAM Vegetation Integrity Plot Data
Appendix G	BAM Calculator Reports
Appendix H	Regent Honeyeater Expert Assessment & Conservation Advice Report

1.0 Introduction

1.1 Overview

Umwelt has been engaged by Lightsource Development Services Australia Pty Ltd (Lightsource bp), the Proponent, to prepare a Revised Biodiversity Development Assessment Report (BDAR) for the response to submissions for the proposed Goulburn River Solar Farm (the Project). The Project is a State Significant Development (SSD) under Division 4.7 of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The project includes two components which have been assessed in separate BDARs, including the Goulburn River Solar Farm (this report) and the associated Public Road and Culverts BDAR (Umwelt, 2024). All of the Development Footprint Areas are located within the Upper Hunter Local Government Area (LGA) of New South Wales (NSW).

This report has been prepared in accordance with the requirements of the Biodiversity Assessment Method (BAM) (DPIE 2020a) and Section 6.12 of the NSW *Biodiversity Conservation Act 2016* (BC Act). This report describes the biodiversity values of the Development Footprint and assesses the impacts of the proposed works.

The Project requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and has been declared a controlled action. The BAM has been endorsed as the assessment method for Matters of National Environmental Significance (MNES) under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act. Nationally listed threatened species, threatened ecological communities (TECs) and migratory species have been considered and assessed as part of this BDAR and in a separate MNES Assessment provided in **Appendix A**.

This (revised) BDAR is an updated version of the BDAR submitted with the Project Environmental Impact Statement (EIS) in May 2023 (Umwelt, 2023a). Since lodgement of the EIS, Lightsource bp has conducted a thorough review of the layout and optimised the design to enhance Project efficiency while minimizing associated environmental and social impacts. Project changes have occurred to address government agency and community submissions and to encompass the findings of the layout review and design optimisation process. This BDAR, alongside the Public Road and Culverts BDAR (Umwelt, 2023b) and Amendment Report (Umwelt, 2023c).

1.2 Proposed Development

1.2.1 Development Overview

The Project is a proposed solar farm which includes construction, operation, maintenance and eventually decommissioning works. The solar farm is proposed to generate approximately 550 MWp (Megawatt peak) of solar electricity, with a centralised Battery Energy Storage System (BESS) of 900 MWh (Megawatt hour), a decentralised BESS of 1,160 MWh or a combined centralised and decentralised BESS of 2,060 MWh. Electrical infrastructure includes an electrical substation to connect the solar farm to the existing 500 kilovolts (kV) transmission line that runs through the Project Area.

1.2.2 Location and Subject Land Description

The Goulburn River Solar Farm is located approximately 28 kilometres (km) southwest of the township of Merriwa and is surrounded by the Goulburn River National Park. It is within the Upper Hunter Local Government Area (LGA) of New South Wales (NSW). The boundary of the Project Area and Development Footprint is shown on the Site Map provided as **Figure 1.1** and the Location Map, provided as **Figure 1.2**. **Figure 1.2** is also provided in **Appendix B** of this Report at a scale of 1:10,000.

The Project Area has been subject to extensive clearing associated with a long history of grazing, which started in the late 1860s, along with instances of cropping and pasture improvement (OzArk Environment & Heritage 2023). In recent years, up to 1,000 head of cattle have been typically present across the lots which comprise the majority of the Development Footprint.

The elevated central parts of the Project Area are located on the Liverpool West Basalt rock unit, with surrounding areas on the Banks Wall Sandstone rock unit, which is part of the Narrabeen Group sandstones (Colquhoun *et al.*, 2021). The areas influenced by the Liverpool West Basalt rock unit are highly productive and have been historically cleared and continue to be utilised for livestock grazing on improved pastures.

The current site vegetation consists of a mosaic of exotic dominated pasture vegetation where pasture improvement has taken place, derived native grasslands subject to various degrees of disturbance in various timeframes, isolated paddock trees, areas of thinned trees and intact woodland and forest around the periphery of the Project Area.

1.2.3 Proposed Development Description

The Development Footprint and Project Area are mapped in **Figure 1.3**. The key components of the Project include:

- Approximately one million bifacial solar photovoltaic (PV) modules on ground-mounted single axis tracking framework, with rows approximately 5 m apart, depending on tracker configuration, and an average height approximately 3.1 m at full tilt, with a maximum of 4 m in some areas due to undulating site topography (**Photo 1.1**).
- The option to construct and operate a 450 MWp/900 MWh centralised BESS, a 580 MWp/1160 MWh decentralised BESS or a combined centralised and decentralised BESS with a total capacity of 1,030 MWp/2,060 MWh. Each proposed option has a discharge duration of two hours. The BESS would most likely comprise of a lithium phosphate iron battery system, to be housed in a series of outdoor containers, aggregated in one central location. The BESS would be located adjacent to the substation in the south east corner of the Project Area. The decentralised BESS option involves 560 individual 6.1 m (i.e., 20 foot) battery containers and DC-DC converters, and associated infrastructure being situated next to the PV inverter stations located throughout the solar arrays, rather than in a centralised location as originally proposed.
- Onsite 500 kV switchyard and substation, with underground electrical conduits and cabling leading into the yard and overhead lines reaching above to the existing transmission line. An additional transmission tower to be constructed within south-eastern portion of the Project Area, within the existing transmission line easement.
- Onsite power line connection via underground electrical conduits and cabling.

- Communications tower, up to 30 m high, providing communications, radio and cellular services to the site and wider region.
- Internal access roads allowing for site maintenance.
- Site office and operations and maintenance building with parking for the operations team.
- Primary solar farm site access point from the existing driveway from Wollara Road, with additional existing access points to be maintained along the north-western boundary of the Project Area for emergency use.
- Drainage line crossings if and where required to manage existing surface water flows (to be determined during further design development) and access points for construction purposes.
- Security fencing around the three discrete Development Footprint areas, installation of crossing gates, water tanks or dams, and fencing and potential alternate secondary access points to facilitate livestock grazing.

The Project is expected to operate for 40 years or more. After the initial 40-year operating period, the solar farm would either be decommissioned, removing all above ground infrastructure, and returning the site to its existing land capability, or repurposed with new PV equipment subject to technical feasibility and planning consents.



Photo 1.1 Example of the type of solar modules and rows proposed

1.2.4 Project Site Selection and Biodiversity Design Considerations

The following design considerations have been factored into the selection of the Development Footprint and biodiversity impact avoidance:

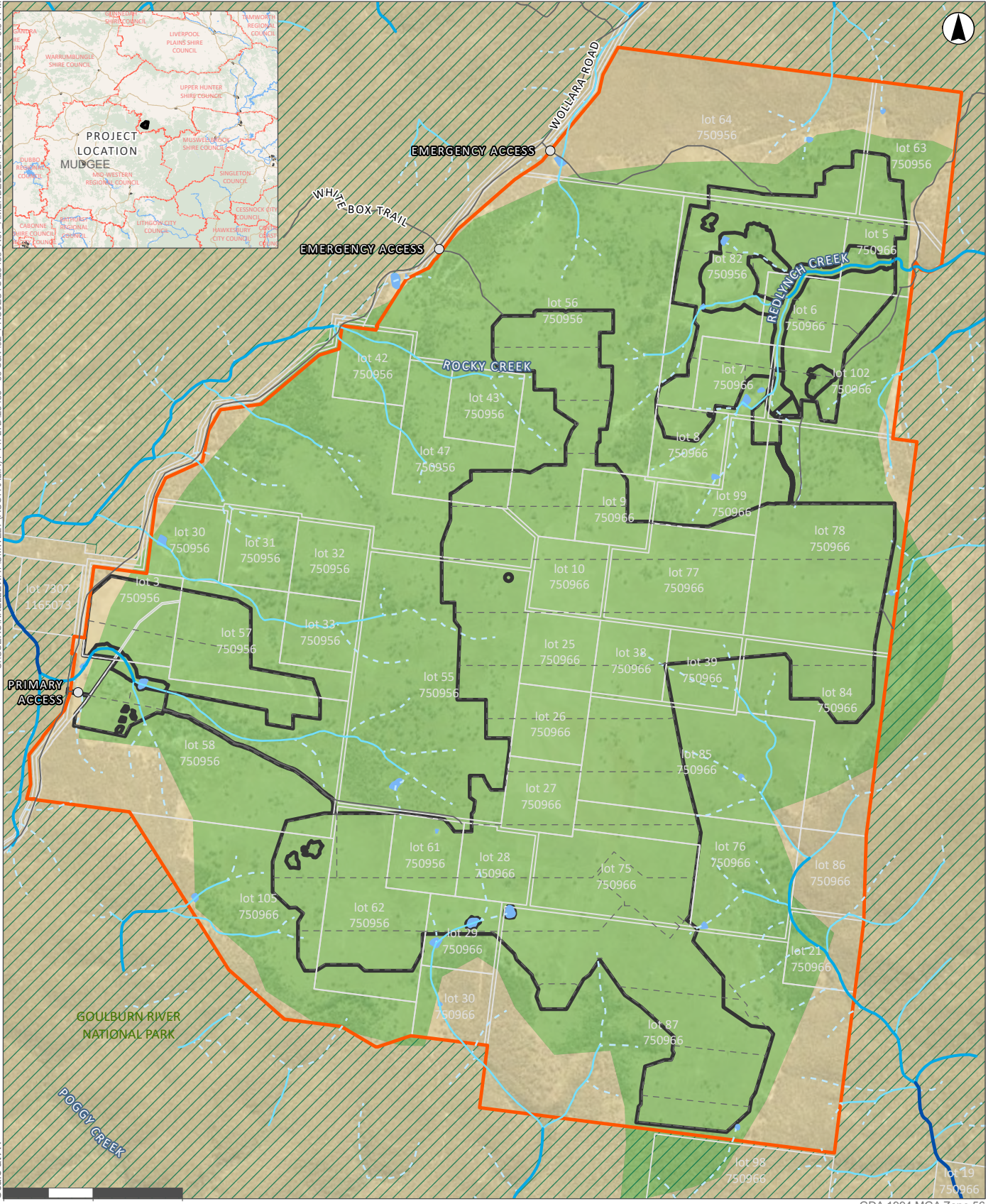
- The Project Area was predominantly selected as the location of a solar farm due to the presence of an existing 500 kV transmission line, removing the requirement for a new electricity transmission line along with associated impacts. To ensure that the Project remains economically viable, the total capacity of solar production needs to remain at or above a 550 MWp of solar electricity. The Project is therefore at the minimum size needed to be viable.

- The Project Area is also characterised by suitable terrain and topography, high quality solar irradiance and ideal climatic conditions and access to major transport networks for delivery of construction materials. There is only one surrounding land holder (the NSW Government) and the visual impacts associated with the Project can be managed through the screening provided by the Goulburn River National Park.
- The Project Area (2,000 ha) has provided flexibility in design to prioritise avoidance of high value biodiversity areas and the subject land has been already impacted by widespread clearing and ongoing pasture improvement works for agricultural use.

Throughout the EIS preparation and scoping phases of the Project several design refinements have occurred, which are detailed in **Section 7.0**. Key measures to avoid and minimise impacts include:

- Biodiversity impacts have been avoided and minimised through refinements to the Development Footprint. From the Scoping Report (December 2021) to the present, the Development Footprint has greatly reduced in size to respond to emerging understanding of site-specific biodiversity constraints and to prioritise the avoidance of impacts on potential serious and irreversible impact entities. The Development Footprint has been reduced by 456.78 ha from the Scoping Report (where it covered 1,249 ha of the Project Area) to present day (792.19 ha). This represents a 37% reduction in developable area.
- Selection of higher rated capacity solar panels to ensure that the Development Footprint is minimised, the Project obtains a capacity of a 550 MWp of solar electricity and the cost of purchasing the solar panels maintains the Project's economic viability.
- Optimising opportunities to maintain connectivity between the Project Area and surrounding Goulburn River National Park and within the Project Area through limiting fencing to strategic areas.
- Redesign the Project to minimise impacts on areas of mapped Regent Honeyeater (*Anthochaera phrygia*) important habitat (the generic mapping includes both areas of scattered trees and grassland).
- Alteration of the Project to reduce impacts to suitable breeding habitat for the Barking Owl (*Ninox connivens*).
- Alteration of the Project to avoid impact to Plant Community Types (PCTs) associated with habitat for the Large-eared Pied bat (*Chalinolobus dwyeri*) and the Eastern Cave Bat (*Vespadelus troughtoni*).
- Reduction in the area occupied by the Project for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (listed as critically endangered under both the BC Act and EPBC Act) to avoid areas of woodland with intact crown condition and resulting in impact minimisation to areas to areas of scattered trees and derived native grassland condition zones.
- Establishment of exclusion zones within the Development Footprint to avoid Redlynch Creek which crosses the Project Area, and the remnants of a historic Slab Hut of historic heritage importance.

C:\USERS\KELLEWAY\UMWELT (AUSTRALIA) PTY. LTD\23485 - 03 S&V02 PROJECTS\23485 ROT AMENDEDBAR V7 APRX 22/01/2024 6:54 PM



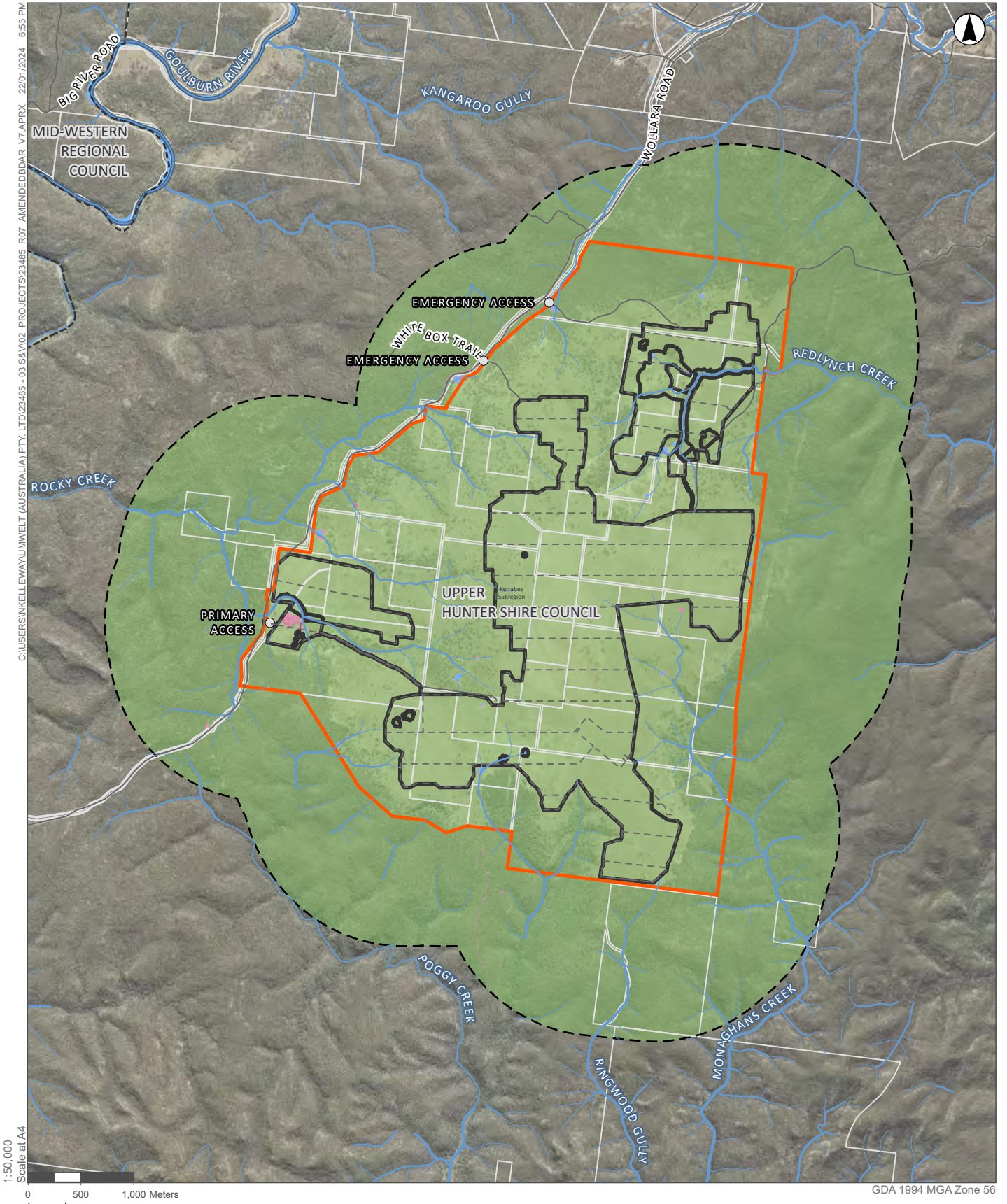
1:30,000
Scale at A4

0 500 1,000 Meters

GDA 1994 MGA Zone 56

- | | | |
|------------------------------|----------------------|--|
| ○ Access Points | Stream Order | Mitchell Landscapes |
| - - - Proposed Access Tracks | --- 1st Order Stream | ■ Lees Pinch Foothills |
| — Existing Roads and Tracks | — 2nd Order Stream | ■ Liverpool Range Valleys and Foothlopes |
| ▭ Property Boundaries | — 3rd Order Stream | |
| ▭ Project Area | — 4th Order Stream | |
| ▭ NSW National Parks | | |
| ▭ Development Footprint | | |

FIGURE 1.1
Site Map

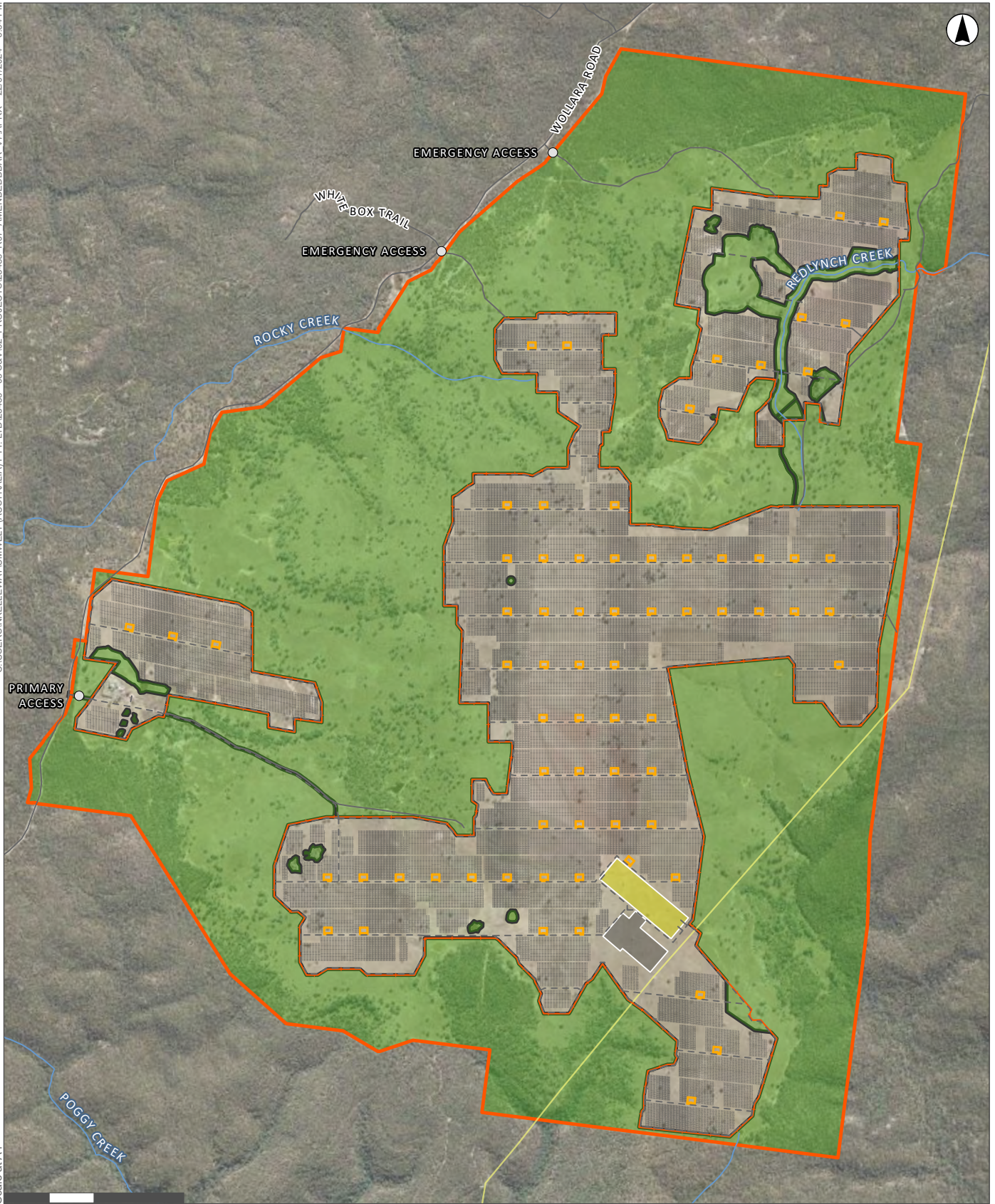


1:50,000
Scale at A4

GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - 1500m Buffer Area (Total extent = 4589.24 ha)
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area
 - ▭ IBRA Regions
 - Native Vegetation Extent
 - Native Vegetation Extent (Total Area = 4570.6 ha)
 - Non-Native Vegetation Extent (Total Area = 18.7 ha)

FIGURE 1.2
Location Map



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Electricity Transmission Line
 - Security Fence
 - Watercourse
 - Retained / Impact Avoidance Areas
 - Development Footprint
 - Project Area
 - Battery Energy Storage System
 - Inverters
 - Substation

GDA 1994 MGA Zone 56

FIGURE 1.3
Development Layout

1.3 Purpose of this Report

This BDAR has been prepared as part of the Environmental Impact Statement (EIS) documentation for the Project to address the Secretary's Environmental Assessment Requirements (SEARs) in relation to biodiversity for the proposed Solar Farm (refer **Table 1.1**). Submissions from the Biodiversity, Conservation, and Science Division (BCD) have been addressed in this BDAR and a summary of these responses is provided in **Table 1.2**. This report provides an assessment of the biodiversity values of the Development Footprint, documents the application of the avoid, minimise and offset framework and assesses the likely biodiversity impacts of the Project.

This BDAR has been prepared in accordance with the BC Act and BAM (NSW DPIE 2020a). The Project is a SSD under Division 4.7 of Part 4 of the EP&A Act and is therefore required to be accompanied by a BDAR in accordance with Section 7.9 of the BC Act.

The Project requires approval under the EPBC Act and has been declared a controlled action. On 2 February 2022, the Project was determined to be a Controlled Action requiring approval under the EPBC Act by the Commonwealth Minister for the Environment due to its potential impact on listed threatened species and ecological communities.

The assessment path for the Project is under the bilateral agreement between the Commonwealth and NSW Government. The DCCEEW determined it a controlled action on 2 February 2022 and issued assessment requirements which were issued as Supplementary SEARs for the Project (refer to Appendix 1 of the EIS). The BAM has been endorsed as the assessment method for MNES in accordance with the Bilateral Agreement made under the EPBC Act. EPBC listed threatened species, TECs and migratory species have been considered and assessed as part of this BDAR (see **Appendix A**).

The controlled action decision (EPBC 2021/ 9102) relates to the Solar Farm Project. The proponent is applying for a variation to the action to also include the road upgrades. This application is being done in parallel to the Amendment Report assessment, with timing determined in consultation with DPE and DCCEEW.

Table 1.1 SEARs Relevant to the Biodiversity Assessment

Key Issues	Secretary's Environment Assessment Requirements	Where addressed
SEARs		
Biodiversity	An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the <i>Biodiversity Conservation Act 2016</i> (NSW), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR), unless BCS and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values	The BDAR itself
	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	Section 7.0 and Section 8.0 of this BDAR
	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, and	Appendix 7 of the EIS
	If an offset is required, details of the measures proposed to address the offset obligations.	Section 11.3 of this BDAR
Biodiversity Conservation Division (BCD) Submission		
Biodiversity	1. Biodiversity impacts related to the proposed development (SSD-33964533) are to be assessed in accordance with the Biodiversity Assessment Method 2020 and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the <i>Biodiversity Conservation Act 2016</i> (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method 2020.	The BDAR itself.
	2. 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 Biodiversity Assessment Method 2020.	Section 7.0 and Section 8.0 of this BDAR.
	3. The BDAR must include details of the measures proposed to address the offset obligation as follows. <ul style="list-style-type: none"> • The total number and classes of biodiversity credits required to be retired for the development/project. • The number and classes of like-for-like biodiversity credits proposed to be retired. • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules. • Any proposal to fund a biodiversity conservation action. • Any proposal to conduct ecological rehabilitation (if a mining project). • Any proposal to make a payment to the Biodiversity Conservation Fund. 	Section 11.0 of this BDAR.

Key Issues	Secretary's Environment Assessment Requirements	Where addressed
	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.	
	4. 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 <i>Biodiversity Conservation Act 2016</i> .	Section 1.5 of this BDAR.
EPBC Act Assessment Requirements – supplementary SEARs		
General requirements – Relevant regulations	5. The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) and all matters outlined below in relation to the controlling provisions.	Appendix A of this BDAR.
General requirements – Project description	6. The title of the action, background to the action and current status.	Appendix A of this BDAR.
	7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.	Appendix A of this BDAR.
	8. How the action relates to any other actions that have been or are being taken in the region affected by the action.	Appendix A of this BDAR.
General requirements – Impacts	9. How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	Section 1.2 of this BDAR.
	10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: <ul style="list-style-type: none"> • a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts • a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible • analysis of the significance of the relevant impacts; and • any technical data and other information used or needed to make a detailed assessment of the relevant impacts. 	Appendix A of this BDAR.
General requirements – Avoidance, mitigation, and offsetting	11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: <ul style="list-style-type: none"> • a description, and an assessment of the expected or predicted effectiveness of the mitigation measures 	Section 7.0 and Appendix A of this BDAR.

Key Issues	Secretary's Environment Assessment Requirements	Where addressed
	<ul style="list-style-type: none"> any statutory policy basis for the mitigation measures the cost of the mitigation measures an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program. 	
	<p>12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.</p>	<p>Appendix A of this BDAR.</p>
	<p>13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any:</p> <ul style="list-style-type: none"> conservation advice or recovery plan for the species or community relevant threat abatement plan for the species or community wildlife conservation plan for the species; and any strategic assessment. <p>Note: the relevant guidelines and policy statements for each species and community are available from the Department of the Environment Species Profiles and Threats Database. (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)</p>	<p>Appendix A of this BDAR.</p>
	<p>14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15–17.</p>	<p>Appendix A of this BDAR.</p>
<p>Biodiversity (threatened species and communities and migratory species)</p>	<p>15. The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.</p>	<p>Appendix A of this BDAR.</p>
	<p>16. For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate:</p>	<p>Appendix A of this BDAR. Impact avoidance measures</p>

Key Issues	Secretary's Environment Assessment Requirements	Where addressed
	<ul style="list-style-type: none"> • description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans; • details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements; • description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and • description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action; • identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account; • a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established. • details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and • details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites. <p>Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action and deliver an overall conservation outcome that improves or maintains the viability of the MNES i.e., 'like for like'. In applying the BAM, residual impacts on EPBC Act listed TECs must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.</p>	<p>are also described in Section 7.0.</p>
	<p>17. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. (http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy.)</p>	

Key Issues	Secretary's Environment Assessment Requirements	Where addressed
<p>Appendix A Protected matters relevant to the Goulburn River Solar Farm (EPBC 2021/9102) project</p>	<p>Based on the information in the referral documentation, the location of the action, species records and likely habitat present in the area, there are likely to be significant impacts to:</p> <ul style="list-style-type: none"> • White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered. • Regent Honeyeater (<i>Anthochaera phrygia</i>) – Critically Endangered. <p>Additionally, there is some risk that there may be significant impacts on the following matters and further assessment to determine if the communities and species listed below are present in the proposed action area and, if so, the extent to which they may be impacted by the proposed action, is required:</p> <ul style="list-style-type: none"> • Central Hunter Valley Eucalypt Forest and Woodland – Critically Endangered. • Swift Parrot (<i>Lathamus discolor</i>) – Critically Endangered. • Painted Honeyeater (<i>Grantiella picta</i>) – Vulnerable. • Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) – Vulnerable. • Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>) – Vulnerable. • Pink tailed Worm-lizard (<i>Aprasia parapulchella</i>) – Vulnerable. • Bluegrass (<i>Dichanthium setosum</i>) – Vulnerable. • <i>Homoranthus darwinioides</i> – Vulnerable. <p>Several threatened species and ecological communities have been identified as priority management species following the 2019–2020 bushfires. This includes the White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland threatened ecological community and the Regent Honeyeater (as discussed above), and the following listed species that may be impacted by the proposed action:</p> <ul style="list-style-type: none"> • Koala (<i>Phascolarctos cinereus</i>) (Combined Population of QLD, NSW and the ACT) – Vulnerable. • Greater Glider (<i>Petauroides Volans</i>) – Vulnerable. • Brush tailed Rock wallaby (<i>Petrogale penicillata</i>) – Vulnerable. • Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (<i>Dasyurus maculatus maculatus</i>) (South-east mainland population)) – Endangered. • New Holland Mouse, Pookila (<i>Pseudomys novaehollandiae</i>) – Vulnerable. • Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) – Vulnerable. 	<p>Appendix A of this BDAR.</p>

Key Issues	Secretary’s Environment Assessment Requirements	Where addressed
	<p>Further analysis of the impacts of the fires on those species and communities identified above should be undertaken during the assessment.</p> <p>Note: uncertainty around the extent and number of protected matters that may be impacted will need to be resolved through the assessment process once final alignment and construction plans have been completed.</p> <p>Note: this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under these controlling provisions are assessed for the Commonwealth decision-maker’s consideration.</p>	

Table 1.2 Summary and Reference Table for BCD Submissions

#	BCD submission	Summary of approach	Reference to where it has been addressed
1	<p>The project is considered likely to result in a Serious and Irreversible Impact to Box – Gum Woodland CEEC</p> <p>The proponent should revise the current Development Footprint and avoidance and minimisation strategies proposed to further reduce impacts to Box Gum Woodland CEEC.</p>	<p>In response to public and agency submissions received following public exhibition and progression of detailed design the Development Footprint has been further reduced by 7.31 ha to 792.19 ha. The final design revision has avoided an additional 6.25 ha of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC.</p> <p>From Design Revision A (based on a 930 ha footprint at Scoping Report stage) to the current footprint, impacts to the woodland form of this CEEC have been reduced by 100%. Impacts on scattered trees have reduced by 62%. Impacts on derived native grassland (all condition zones) have reduced by more than 10%.</p> <p>Further information has been provided about the likely impacts to the CEEC. Whilst the change in vegetation integrity of Box Gum Woodland CEEC derived native grassland as a result of the Project has been assumed to be total (i.e., all vegetation integrity across the entire Development Footprint reduced to zero), this is a precautionary approach to assessing impact and calculating the resulting credit obligation, and is unlikely to be the case in practice. Of the 693.86 ha of PCT 483 within the Project Footprint only approximately 7% would be fully impacted. The access tracks, BESS, inverters and on-site substation footprints would result in complete removal of the underlying PCT. This equates to 48.2 ha of permanent (for the life of the Project) impacts to PCT 483.</p>	<p>Section 8.1 and Section 9.1 below.</p> <p>Section 8.1 of the Road Upgrade BDAR.</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
		<p>Information has been provided (Section 8.2.1 below) to justify the assumption that vegetation integrity will be maintained in low condition CEEC derived native grassland. The proponent has made a new commitment to undertake a study of vegetation integrity pre and post construction, to test the hypothesis of whether the installation and operation of solar panels results in a substantial change to the VI score for very low to moderate condition derived native grasslands (specifically, PCT 483).</p>	
2	<p>The project is considered likely to result in a Serious and Irreversible Impacts to the regent honeyeater (<i>Anthochaera phrygia</i>)</p> <p>The proponent should revise the current Development Footprint and avoidance and minimisation strategies proposed to further reduce impacts to Box Gum Woodland CEEC and undertake further actions to reduce the risk of SAIL for the regent honeyeater (<i>Anthochaera phrygia</i>). This should include developing further avoidance actions. There are several areas of Mapped Important Habitat near the boundaries of the project, particularly in the north and west of the proposed Development Footprint that BCD considers to be potential breeding habitat and these should be prioritised for avoidance.</p> <p>The proponent should engage a suitable expert on the regent honeyeater to assist with identifying areas for further avoidance, the completion of the SAIL assessment and consideration of additional and appropriate measures for the regent honeyeater.</p>	<p>Between May 2023 (EIS submission) and the Amendment Report, design refinements have focused on avoiding areas of higher quality Regent Honeyeater mapped important habitat, as discussed with BCD during the site visit mid-2023.</p> <p>From Design Revision A (Scoping Report) to present, the Project has managed to avoid 62% of the initially proposed mapped Regent Honeyeater important habitat area, a reduction of 67.27 ha. Of the 42.30 ha impacted, only 17.58 ha is treed, with the remainder mapped over grassland and cleared areas.</p> <p>The proponent engaged a suitable species expert, Dr Ross Crates (Future Fauna), who conducted a site visit in late October. Dr Crates prepared an expert report, which has been included as part of the Solar Farm BDAR. The SAIL assessment for Regent Honeyeater has been completed with input from Dr Crates, who has also suggested appropriate additional measures for this species.</p> <p>The report identifies that the habitat within the proposed Development Footprint represents at best marginal foraging habitat for the species, due to the relatively high elevation, exposed nature of the site and the low density of feed trees. It is very unlikely that Regent Honeyeaters would breed within the habitats that would be impacted by the Project. The habitats of most value to the Regent Honeyeater within the subject site are located within the proposed biodiversity stewardship area.</p> <p>The proponent is committed to supporting additional measures for Regent Honeyeater, to be confirmed in consultation with species' expert. As suggested by Dr Crates, offsite measures are expected to offer greatest benefit to the species.</p>	<p>Section 9.3 below and Appendix H (Expert report).</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
3	<p>The striped legless lizard (<i>Delma impar</i>) has not been appropriately considered or surveyed for at the Goulburn River Solar Farm site</p> <p>The proponent should undertake appropriate survey effort as outlined in Section 4 of Attachment B of this letter for the striped legless lizard (<i>Delma impar</i>). Concentrated efforts should be undertaken within rocky areas with moderate grass cover (including exotic grass cover).</p>	<p>Additional information has been provided to justify how the survey approach aligns with the survey guidelines at the time of field work. The Project team have also conducted a detailed literature review to better understand the ecological requirements of <i>Delma vescolineata</i> and the likelihood of occurrence within the Subject Site.</p> <p><i>Delma sp.</i> were surveyed for using a method (habitat searches) which is consistent with the available guidelines at the time of assessment, and is a method which has been proven to positively identify <i>Delma vescolineata</i> within the Hunter Valley region. No <i>Delma sp.</i> were found to occur within the Development Footprint during current surveys.</p> <p><i>Delma impar</i> (Fisher 1892) and <i>Delma vescolineata</i> have therefore been excluded from further assessment under the BAM on the basis that the Development Footprint falls outside the known and modelled geographic ranges, such the species should be considered vagrant.</p>	<p>Section 5.3 below.</p>
4	<p>Threatened microbats have not been adequately considered or surveyed for at the Goulburn River Solar Farm site.</p> <p>The proponent should undertake appropriate survey effort in accordance with the Threatened Species Data Collection (TBDC) and the 'Species credit' threatened bats and their habitats survey guide should be demonstrated for threatened microbats, including large-eared pied bat (<i>Chalinolobus dwyeri</i>), eastern cave bat (<i>Vespadelus troughtoni</i>), little bent-winged bat (<i>Miniopterus australis</i>) and large bent-winged bat (<i>Miniopterus orianae oceanensis</i>). This should include fly-out surveys, thermal inspections and/or harp trapping.</p>	<p>Additional survey has been undertaken for threatened microbats. Microbat roost fly-out surveys were conducted at built structures (farm sheds) across four nights in October/November 2023. Anabat were also set out for four nights (10 and 31 October/1 and 2 November). No threatened bats were identified through this additional survey effort.</p> <p>The Solar Farm BDAR has been updated to include additional detail about targeted surveys for microbats. New maps have been prepared (Figures 5.3 and 5.4 in the Solar Farm BDAR) to show where the species polygons for threatened microbats occur. These do not intersect with the Development Footprint.</p> <p>The Project is not considered to have an impact on any associated PCTs or breeding habitat for threatened microbats.</p> <p>NB: The Solar Farm BDAR has been updated to note a positive record of Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) and assumed record of Eastern Can Bat (<i>Vespadelus troughtoni</i>), to the north of the Development Footprint (within the proposed biodiversity stewardship area).</p>	<p>Section 2.4 and Section 5.3 below.</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
5	<p>Survey effort has not been adequately demonstrated for nocturnal fauna</p> <p>The proponent should provide additional information to justify deviations in survey effort from the requirements of the TBDC and Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act for greater glider (<i>Petauroides volans</i>), squirrel glider (<i>Petaurus norfolcensis</i>), barking owl (<i>Ninox connivens</i>), masked owl (<i>Tyto novaehollandiae</i>), powerful owl (<i>Ninox strenua</i>) and koala (<i>Phascolarctos cinereus</i>). This information could include confirmation that the reduced survey effort was approved by BCD, further survey or justification with reference to approved species experts, or peer-reviewed literature. Further surveys should be conducted to demonstrate that:</p> <ul style="list-style-type: none"> • Spotlight surveys target areas of mature eucalypts and that these transects were completed on two separate nights. • Koalas were surveyed using approved, evidence-based methodology to maximise the possibility of detection. 	<p>Additional survey has been undertaken for nocturnal fauna, with the approach confirmed as appropriate in consultation with BCD. This consisted of spotlighting and quiet listening (i.e., for owls) over four nights in October/November 2023, as well as two nights of thermal drone surveys. Two drones were used to provide thorough coverage of the Project Footprint.</p> <p>No threatened nocturnal fauna have been confirmed within the Project Footprint.</p>	<p>Section 2.4.4 below and Appendix E (Thermal Drone Report).</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
6	<p>Threatened fauna have been erroneously excluded from survey at the proposed road upgrade site.</p> <p>The proponent should provide further justification to outline why the striped legless lizard (<i>Delma impar</i>) and koalas (<i>Phascolarctos cinereus</i>) were excluded from the list of candidate species credit species for the Goulburn River Solar Farm Road site with reference to Section 5.2 of the BAM. This may be achieved through further survey in accordance with approved and best practice methodology, an expert report or reference to supplementary published literature where necessary.</p>	<p>Additional information has been included to justify the assessment approach for candidate fauna (and flora) species credit species.</p> <p>Further targeted surveys have also been conducted in August, October and November 2023. This has included additional:</p> <ul style="list-style-type: none"> • Parallel traverse at 5 m width for threatened flora species. • Diurnal census for threatened fauna and habitat constraint survey. • Rock rolling. • Spot assessment technique. • Spotlighting. • Baited arboreal and terrestrial camera traps. <p>Species which could not be surveyed for in accordance with the BAM and were assumed to be present.</p>	<p>Section 5.3 of the Road Upgrade BDAR.</p>
7	<p>Threatened flora survey effort has not been shown to meet minimum survey requirements</p> <p>The proponent should provide further details of threatened flora survey effort to demonstrate how the threatened flora surveys meet BCD's threatened flora survey guideline.</p>	<p>The two BDARs have been updated with additional information about the surveys for threatened flora. This has included an expanded method, as well as species-specific discussion about each of the candidate threatened flora species survey details.</p>	<p>Section 2.3 and Section 5.3 below.</p> <p>Section 2.3 of the Road Upgrade BDAR</p>
8	<p>Offsite impacts of herbicide use require assessment</p> <p>The proponent should ensure that any direct, indirect or prescribed impacts to vegetation on the Goulburn River National Park from herbicide used on the project</p>	<p>There is a separation buffer area between the Development Footprint areas and the National Park. The Development Footprint for the Road and Culvert Upgrades ends 20m from the National Park boundary. There are only limited areas on the southern and eastern boundary of the Solar Farm where the Development Footprint is <50m from the National Park boundary, and nowhere it is closer than 30m.</p>	<p>Section 2.3 below and Appendix C (Summary of Mitigation Measures in the Amendment Report).</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
	<p>area are assessed in accordance with the BAM.</p>	<p>The Project will involve minimal use of herbicides to control exotic species. The proponent intends to set an objective to maintain or improve vegetation integrity in derived native grassland areas within the Solar Farm Development Footprint (see response to BCD recommendation #1). Herbicides will be applied in a targeted and sensitive manner across the Development Area, to reduce the risk of impacts on non-target species and for any pollutants to enter downstream watercourses.</p> <p>The Project Biodiversity Management Plan will detail controls for herbicide use. This will include that herbicide application would be kept to a minimum and be applied in accordance with relevant application guidelines. A record of herbicide application will be kept. Only herbicides registered for use near water will be used in the vicinity of waterways, including ephemeral waterways. The primary weed control within the National Park is herbicide use (NSW National Parks and Wildlife Service, 2003), sensitively applied within and around watercourses. Where relevant, weed (and pest) control will be done in consultation with neighbouring land managers (specifically, National Parks and Wildlife Service).</p> <p>There are not anticipated to be any direct, indirect or prescribed impacts to vegetation within the Goulburn River National Park from herbicide use in the Development Footprint.</p>	
9	<p>A revised map of Native Vegetation Extent is required</p> <p>The proponent should prepare revised versions of Figure 4.1 from Appendix 6 and of Figure 1.2 from Appendix 6 or new maps that show the native vegetation extent of the subject land at no more than 1:10,000.</p>	<p>Revised maps showing the location map and native vegetation extent on the subject land at no more than 1:10,000 for the Solar Farm BDAR.</p>	<p>Appendix B of the Solar Farm BDAR and Section 4.1 below.</p>
10	<p>Additional information is required to complete the BDARs</p> <p>The proponent should provide additional information to meet all requirements of the</p>	<p>Qualifications and relevant experience of the Project team have been provided, including curriculum vitae of key team members.</p> <p>Adaptive management action outcomes and implementation details for proposed impact mitigation and management measures have been updated to more clearly communicate how uncertain biodiversity impacts will be managed.</p>	<p>Appendix D of the Solar Farm BDAR.</p> <p>Table 8.4 and Table 8.5 below.</p>

#	BCD submission	Summary of approach	Reference to where it has been addressed
	Biodiversity Development Assessment Report.	The assessment of compliance with BDAR minimum information requirements has been updated for completeness, and cross references checked.	Appendix C of the Solar Farm BDAR.
11	<p>Further information is required to enable BCD to conduct the bilateral assessment for the project</p> <p>The proponent should provide additional information in relation to the assessment of impacts to Matters of National Environmental Significance as outlined in this letter to enable the Bilateral Assessment to be completed for this project.</p>	Appendix A of the Solar Farm BDAR contains a table (MNES Report, Table 1.2) which details each comment from BCD, how it was addressed, and where it has been addressed.	Appendix A of the Solar Farm BDAR.

1.4 Statutory Considerations

Commonwealth and State legislation relevant to this BDAR is described in **Table 1.3**.

Table 1.3 Legislation Relevant to the Project

Relevant legislation	Governing Agency	Summary
Commonwealth legislation		
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	<p>The EPBC Act is the Commonwealth Government’s primary piece of environmental legislation and is administered by the Australian Government DCCEEW. It is designed to protect national environmental assets, known as MNES, which include threatened species of flora and fauna, endangered ecological communities, and migratory species, as well as other protected matters. It defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna, and communities.</p> <p>Preliminary investigations identified that the Project would likely have a significant impact on biodiversity protected under the EPBC Act. A referral was subsequently prepared and submitted, with the Project being determined to be a controlled action (ref 2021/9102) under the EPBC Act on 2 February 2022. The controlled action included the requirement for the Proposal to be assessed by an accredited assessment under EP&A Act. The Proposal will be assessed under the Bilateral Agreement between the Commonwealth and NSW, which will then be used to inform the Commonwealth Environment Minister’s determination. The Commonwealth Assessment Requirements and where this BDAR addresses each requirement are summarised in Table 1.1.</p>
NSW legislation		
<i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)	Department of Planning and Environment (DPE)	<p>The EP&A Act is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, populations and ecological communities, and their habitats of biodiversity values, as listed in the NSW BC Act and NSW <i>Fisheries Management Act 1994</i> (FM Act).</p> <p>Section 4.36 of the EP&A Act provides for the declaration of a project as SSD. Under the EP&A Act, the declaration of a project as SSD can be made by meeting the requirements of a State Environmental Planning Policy (SEPP) or by the Minister for Planning and Homes. Clause 20 of Schedule 1 of Planning Systems SEPP prescribes that development for the purpose of ‘electricity generating works’ that has a capital investment value of more than \$30 million is SSD. The Project has a capital investment value of greater than \$30 million. As SSD, the Proposal would be assessed under Part 4 Division 4.7 section 4.36 of the EP&A Act. The Minister for Planning and Homes is the consent authority for SSD. The Minister (or the Minister’s delegate) is required to take into consideration the matters listed under section 4.15 of the EP&A Act when determining the development application (DA).</p>

Relevant legislation	Governing Agency	Summary
		Under Division 4.4 section 4.39 an EIS is required to accompany a DA that has been determined as SSD. The proponent is required to consult with the Secretary of DPE with regard to the matters to be addressed in the EIS. These are referred to as the SEARs. The SEARs for the Project were issued by DPE on 1 February 2021. Broadly, the SEARs require biodiversity impacts related to all stages of a proposal to be assessed in accordance with section 7.9 of the BC Act and documented in a BDAR. The SEARs and where this BDAR addresses each requirement pertaining to biodiversity are summarised in Table 1.1 .
<i>Biodiversity Conservation Act 2016</i> (BC Act)	DPE	<p>The BC Act and its supporting regulations commenced on 25 August 2017. The BC Act sets out the environmental impact assessment framework for threatened species, TECs and Areas of Outstanding Biodiversity Value (formerly critical habitat) for Major Projects, Part 5 activities, and local development.</p> <p>The BC Act provides a framework to avoid, minimise and offset the impacts of proposed development and established a methodology for assessing the likely impacts on biodiversity values and calculating measure to offset those impacts (the BAM). Sections 7.9 of the BC Act requires that SSD under Part 4 of the EP&A Act that triggers the Biodiversity Offset Scheme (BOS) must be accompanied by a BDAR prepared by an accredited assessor in accordance with the BAM.</p>
Biodiversity Conservation Regulation 2017 (BC Regulation)	DPE	The BC Regulation commenced on 25 August 2017. The object of the BC Regulation is to make provision for matters that are required or authorised to be prescribed as a consequence of the enactment of the BC Act. The BC Regulation provides the thresholds which trigger the BOS, the principles for consideration of serious and irreversible biodiversity impacts, rules for meeting a biodiversity offset obligation, biodiversity certification criteria, additional biodiversity impacts to which the scheme applies and compliance provisions for unauthorised clearing and accredited assessors. This BDAR has been prepared in accordance with the provisions of the BC Regulation.
<i>National Parks and Wildlife Act 1974</i> (NPW Act)	DPE	<p>The NPW Act provides for the protection of Aboriginal sites and designated conservation areas as well as the flora and fauna within conservation areas. The objective of the NPW Act is to consolidate and amend the law relating to the establishment, preservation and management of national parks, historic sites, certain other areas, and the protection of certain fauna, native plants and Aboriginal objects.</p> <p>Goulburn River National Park, listed under the NPW Act, surrounds the Project Area.</p>
<i>Fisheries Management Act 1994</i> (FM Act)	Department of Primary Industries (DPI)	<p>The objectives of the FM Act are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. More detailed objectives relevant to the Project include:</p> <ul style="list-style-type: none"> • to conserve fish stocks and key fish habitats • to conserve threatened species, populations and ecological communities of fish and marine vegetation • to promote ecologically sustainable development, including the conservation of biological diversity. <p>An Aquatic Assessment which includes an assessment of the likely impacts on listed aquatic threatened species, populations and ecological communities under the FM Act is provided in Appendix 7 of the EIS.</p>

Relevant legislation	Governing Agency	Summary
<i>Biosecurity Act 2015</i>	DPI	The Biosecurity Act replaced the <i>Noxious Weeds Act 1993</i> on 1 July 2017. The Biosecurity Act is a wide-ranging legislation that outlines the requirements of government, councils, private landholders, and public authorities in the management of biosecurity matters. Priority weeds are regulated under the Biosecurity Act with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose. Some priority weeds have additional management obligations which may apply generally, or under specific circumstances. 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 as is reasonably practicable.
<i>Local Land Services Act 2013 (LLS Act)</i>	Local Land Services (LLS)	<p>The LLS Act, supported by the Local Land Services Regulation 2014 (LLS Regulation), established 11 regional Local Land Services organisations to provide biosecurity, natural resources management and agricultural advisory services.</p> <p>Under Part 5A of the LLS Act and the supporting regulation, a Native Vegetation Regulatory (NVR) map showing the extent of categorised land in NSW is to be published by the Environment Agency Head. The NVR map underpins the legislative framework for native vegetation clearing in rural areas by categorising land in NSW. However, the map applies only to the following zones (if they are not in an excluded LGA): Zone RU1 Primary Production, Zone RU2 Rural Landscape, Zone RU5 Primary Production Small Lots and Zone RU6 Transition.</p> <p>Currently, various map categories have been released under staged transitional arrangements. The online NVR map viewer currently displays Excluded Land, Category 2 – Vulnerable Land and Category 2 – Sensitive Land. Category 1 – Exempt Land and Category 2 – Regulated Land maps have not yet been released. During the transition period landholders must determine if their land is Category 1 – Exempt Land or Category 2 – Regulated land under the LLS Act.</p> <p>The BAM does not need to be applied to land mapped as Category 1 – Exempt Land. Portions of the Development Footprint have been mapped as Category 1 – Exempt Land on the extract of the Draft Native Vegetation Regulatory map, provided by the NSW Government for this Project.</p>
State Environmental Planning Policy (Biodiversity and Conservation) 2021	DPE	<p>SEPP (Biodiversity and Conservation) 2021 commenced in March 2022 and includes a number of previous planning policies including Koala Habitat Protection 2019 and Koala Habitat Protection 2021, Chapter 3 and 4, respectively. Schedule 2 identifies that the provisions of chapters 3 and 4 apply in the Upper Hunter LGA. For all RU1 (Primary Production), RU2 (Rural Landscape) or RU3 (Forestry) zoned land outside of the Sydney Metropolitan Area and Central Coast, Chapter 3 Koala Habitat Protection 2020 applies.</p> <p>Chapter 3 aims to encourage the proper conservation and management of areas of natural vegetation that may provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. This is to be achieved through identifying areas of core Koala habitat, including these areas in environment protection zones and where required managing development consent in relation to areas of core Koala habitat. An assessment of impacts to Koalas under the SEPP (Biodiversity and Conservation) is provided in Section 5.4.</p>

1.5 Project Team

This BDAR was prepared by Umwelt in accordance with the requirements of the BC Act and the BAM (NSW DPIE 2020a) and following the specific requirements detailed within Appendix K of the BAM (see BDAR Compliance checklist in **Appendix C**).

Table 1.4 outlines the details of the Umwelt ecologists involved in the survey, calculations and reporting for the Project. CVs for key project staff are provided in **Appendix D**.

Table 1.4 Accredited BAM Assessors and their role in this Project

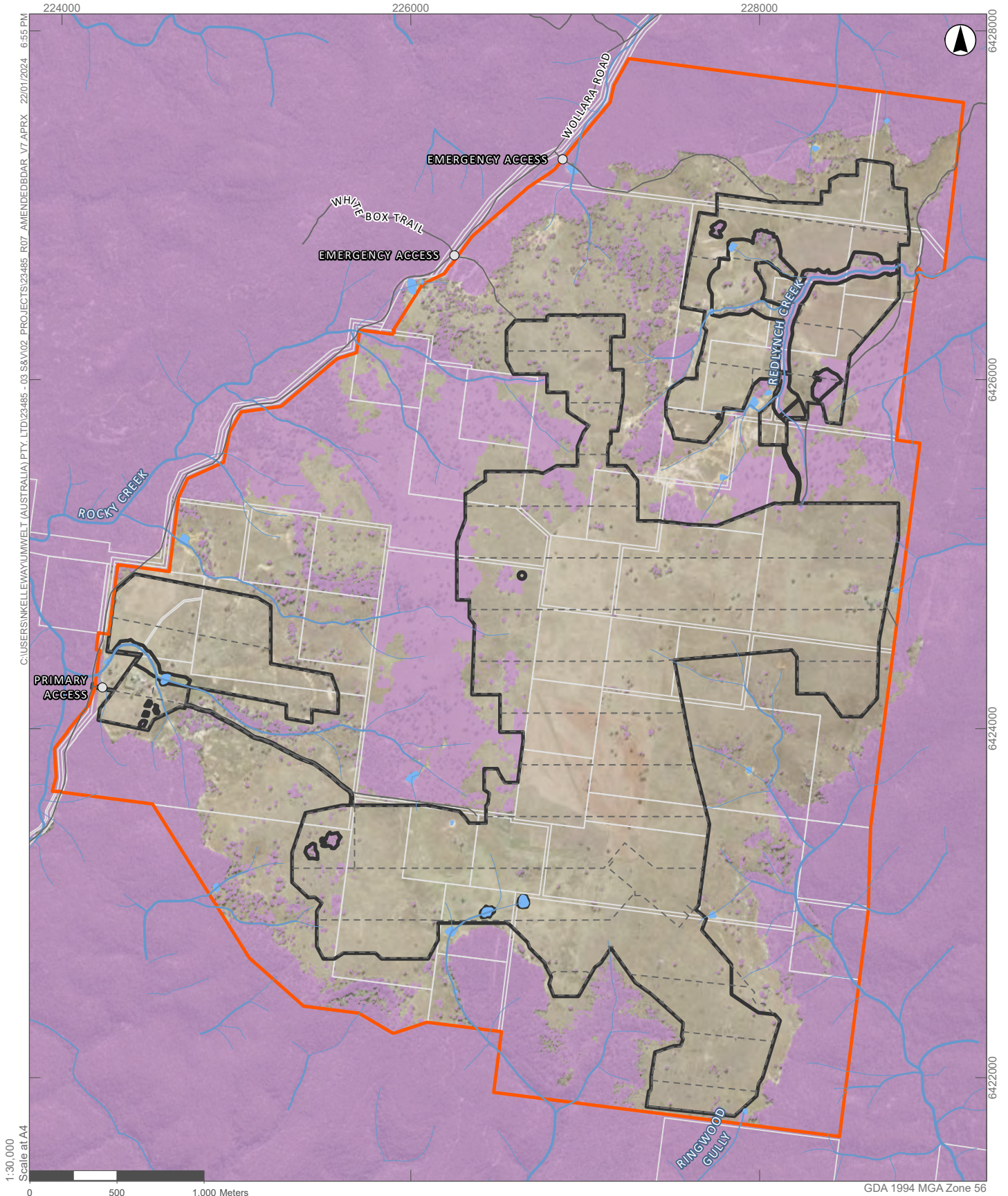
Name	Qualifications	Years of Industry Experience	BAM Accreditation Number	Contribution to the project
Jacob Manners	MWldMgt, BSc	>16	BAAS17099	Biodiversity Assessment Project Manager, Accredited assessor, BAM plots, PCT mapping and threatened species surveys
Rachel Musgrave	Bsc (Hons)	>15	BAAS18032	Document Review / BAM Plots / Technical Project Director from Dec 2022
Allison Riley	BSc	>20	BAAS17042	Document Review / Technical Project Director to Dec 2022
Sarah Hart	MSc, BSc, Dip EnvMgt	9	BAAS21026	Threatened species surveys and BAM Plots
Dayna Mitchell	BEnvScMgt	3	-	Report preparation
Patricia Robinson	BEnvSc	13	BAAS18123	Threatened flora surveys / BAM Plot Surveys
Belinda Howe	BEnvScMgt	7	BAAS21019	Threatened species surveys
Rebecca Vere	MEnvMgt, Bsc(Hons)	>20	-	Threatened species surveys
David Sharpe	PhD, BSC App Sc	>20	-	Expert input into survey and assessment of glider species.
Joel Callaghan	BSc (Hons)	5	-	Threatened species surveys and PCT Mapping
Matthew Mullaney	BEnvSc	3	-	Threatened species surveys and BAM Plots
Jarmin Thornberry	BEnvScMgt Dip CLMgt	2	-	Threatened species surveys and BAM Plots
William Brown	BEnvScMgt	6	-	Threatened species surveys
Alex Cottle	BEnvScMgt	3	-	Threatened species surveys
Kate Faber	BEnvScMgt	6	-	Threatened species surveys

1.5.1 Other Documentation

Other information sources relied upon are referenced in the text and are listed in the References section of this report (**Section 12.0**).

1.6 Biodiversity Offsets Scheme Entry

The Biodiversity Offset Scheme (BOS) applies to all SSD Projects and the SEARS require a BDAR to be prepared for the Project in accordance with Section 7.9 of the BC Act. The Development Footprint also includes mapped Biodiversity Values areas on the Biodiversity Values Map, as shown in **Figure 1.4**.



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area
- Biodiversity Values Map (v13.1)**
- Threatened Species or
 - Communities with potential for Serious and Irreversible Impacts

FIGURE 1.4
Biodiversity Values Map

1.7 Excluded Impacts – NVR Mapping

The BC Act (at Clause 6.8(3)) specifies that the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-Exempt Land (as defined in Part 5A of the Local Land Services Act 2103 (LLS Act)), other than prescribed impacts (as defined in clause 6.1 of the NSW Biodiversity Conservation Regulation 2017 (BC Regulation)).

The NSW Government has undertaken a transitional approach to the release of the Native Vegetation Regulatory (NVR) Map, which currently includes releasing draft but not final mapping of areas of Category 1 Exempt Land.

The assessment of Category 1 – Exempt Land under the BAM during this transitional period has been dealt with in BAM Assessor Updates (No. 22 6 September 2019 and No. 3 6 August 2018). The guidance provided identified that accredited assessors were responsible for determining areas of Category 1 – Exempt Land for developments affecting rural land. These areas were identified as not requiring impact assessment offset calculations relating to vegetation integrity and habitat suitability.

Umwelt initially completed a desktop assessment to determine areas of Category 1 - Exempt Land within the Project Area and found that derived grassland areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions CEEC was represented within areas of Category 1 – Exempt Land within the Development Footprint. These areas primarily consisted of highly degraded grazing paddocks. The LLS Act identifies that Category 1 - Exempt Land excludes land mapped by the Environment Agency Head (EAH) as land containing a CEEC under the BC Act. Umwelt identified that no areas of CEEC vegetation mapped by the EAH occurred within the Project Area.

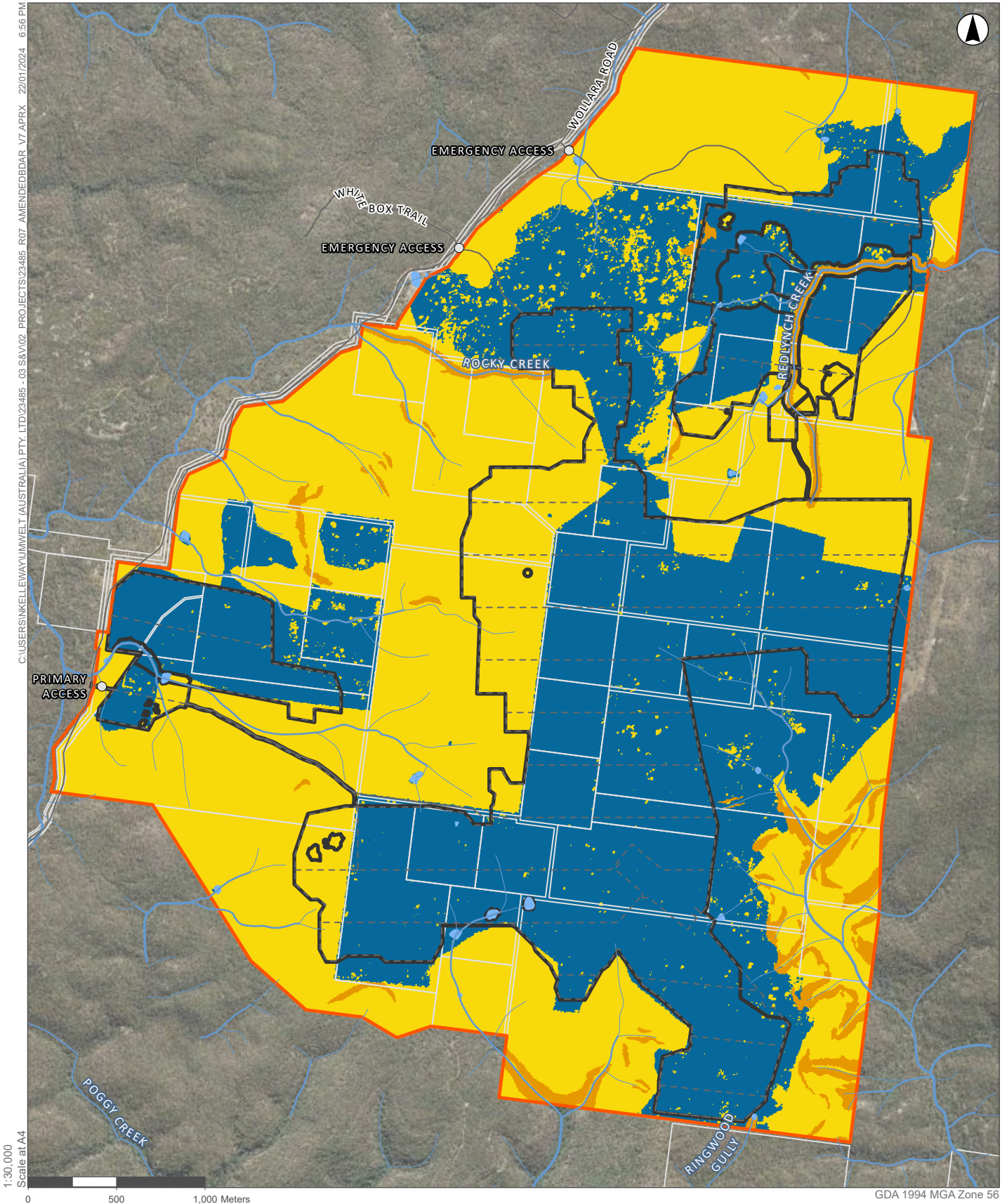
Umwelt's Land Categorisation Assessment Report was sent to the Biodiversity Conservation and Science Division (BCD) within DPE for review on 29 September 2022. A request for the NSW Government's full draft NVR mapping was also forwarded to BCD and the Map Review Team on this date. No correspondence was received in relation to the 29 September 2022 email request or a follow request on 7 November 2022.

During December 2022 the DPE released the guide *"Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme"* (current version DPIE 2023a). This document updated the NSW Government's advice on Category 1 – Exempt Land mapping and CEECs, and provides advice that CEECs and critically endangered species of plants are designated as Category 2 – Sensitive Regulated Land (clause 108(2)(b), LLS Regulation), noting that state-wide comprehensive mapping both entities is not currently published, and that a complete site-based floristic assessment is required to confirm the presence or absence of CEECs and/or critically endangered plants for any reasonable assessment of NVR map land category.

The White Box - Yellow Box - Blakely's Red Gum Grassy Woodland CEEC includes areas of derived native grassland, with no condition threshold excluding degraded areas such as paddock remnants with weedy understories and only a few hardy natives left. This has resulted in assessment of areas that were initially otherwise captured as Category 1 – Exempt Land, being assessed as Category 2 – Sensitive Regulated Land for the purposes of the BAM.

Umwelt submitted another request to the Map Review Team in March 2023 requesting the draft NVR mapping for the Project Area and obtained a raster copy of the map layer on 24 March 2023. A further Draft NVR map containing further changes was formally published for the Hunter region (including the Project Area) by the NSW Government on 7 December 2023. A copy of the current published Draft NVR map is provided as **Figure 1.5** and confirms that the large parts of the Project Area meet the land management and disturbance requirements for consideration as Category 1 – Exempt Land.

For the purposes of this assessment and compliance with the BAM, areas of derived native grassland with potential alignment to the White Box - Yellow Box - Blakeley's Red Gum Woodland and Derived Native Grassland CEEC listed under the BC Act, have been considered Category 2 – Sensitive Regulated Land as per the current advice from DPE. This includes unreasonable inclusion of highly degraded agricultural land which meets the requirements for Category 1 – Exempt Land under the LLS Act.



1:30,000 Scale at A4
 C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY.LTD\23485 - 03.S&V02 PROJECTS\23485 R07 AMENDEDBAR V7.APRX 22/01/2024 6:56 PM

GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area
- Draft Native Vegetation Regulatory Map (DPE 2023)**
- Category 1 - exempt land
 - Category 2 - regulated land
 - Category 2 - vulnerable regulated land

FIGURE 1.5

Draft Native Vegetation Regulatory Map

1.8 Matters of National Environmental Significance

The Project has been determined to be a Controlled Action and requires approval under the EPBC Act. DCCEEW have identified that based on the information in the referral documentation, the location of the action, species records and likely habitat in the area, there are likely to be significant impacts to:

- White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland – critically endangered ecological community.
- Regent Honeyeater – critically endangered.

DCCEEW has also identified that there is some risk that there may be significant impacts on the following further matters and further assessment is required to determine if the following communities and species are present in the proposed action area and if so, the extent to which they may be impacted by the proposed action:

- Central Hunter Valley Eucalypt Forest and Woodland – critically endangered
- Swift Parrot (*Lathamus discolor*) – critically endangered.
- Painted Honeyeater (*Grantiella picta*) – vulnerable.
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – vulnerable.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – vulnerable.
- Pink tailed Worm-lizard (*Aprasia parapulchella*) – vulnerable.
- Bluegrass (*Dichanthium setosum*) – vulnerable.
- *Homoranthus darwinioides* – vulnerable.

DCCEEW has also requested further analysis of the impacts of the 2019–2020 bushfires on the following species as part of this assessment:

- White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland – critically endangered ecological community.
- Regent Honeyeater – critically endangered.
- Koala (*Phascolarctos cinereus*) (Combined Population of QLD, NSW and the ACT) – vulnerable.
- Greater Glider (*Petauroides volans*) – vulnerable.
- Brush tailed Rock wallaby (*Petrogale penicillata*) – vulnerable.
- Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (*Dasyurus maculatus maculatus* (South-east mainland population)) – endangered.
- New Holland Mouse, Pookila (*Pseudomys novaehollandiae*) – vulnerable.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable.

Table 1.1 in **Section 1.3** details the assessment requirements associated with the Controlled Action determination.

The BAM has been endorsed as the assessment method for MNES under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act. Nationally listed threatened species, TECs and migratory species have been considered and assessed as part of this BDAR. A separate MNES assessment addressing the requirements of the Project Assessment Notes provided by DCCEEW is included in **Appendix A**. Only the EPBC-listed species at the time of the controlled action decision are required to be assessed.

1.9 Information Sources

The following guidance documents and resources specific to the BAM and relevant to the preparation of this BDAR were reviewed:

- Biodiversity Assessment Method (NSW DPIE 2020a).
- Biodiversity Assessment Method Operational Manual – Stage 1 (NSW DPE 2022a).
- Biodiversity Assessment Method Operational Manual – Stage 2 (NSW DPE 2023b).
- Biodiversity Assessment Method (BAM) Calculator User Guide (NSW OEH 2017).
- NSW Bionet including the Bionet Atlas, Bionet Vegetation Database and Threatened Species Data Collection (TBCD) (NSW DPE 2023c).
- Guidance for the Biodiversity Development Assessment Report Template (including the template) (NSW DPE 2022b).
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment method (NSW DPIE 2020b).
- Flora Species with Specific Survey Requirements List Version 1 (NSW DPIE 2020c).
- ‘Species Credits’ threatened bats and their habitats (NSW OEH 2018).
- ‘Species Credits’ threatened bats and their habitats (NSW DPIE 2021).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (NSW DEC 2004).
- Threatened Reptiles: Biodiversity Assessment Method survey guide (NSW DPE 2022c)
- Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method survey guide (NSW DPE 2022d).
- Other information sources relied upon are referenced in the text and are listed in the References Section of this report (**Section 12.0**).

Umwelt noted a revised version of ‘Species Credits’ threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPIE (2021) guideline with respect to development of species polygons for threatened microbat species.

2.0 Methods

2.1 Site Context Methods

2.1.1 Landscape Features

As detailed in Section 3 of the BAM (DPIE 2020a), a landscape assessment for the Project is required, which was initially conducted as a desktop assessment and confirmed during field surveys (where practicable). The landscape and site context features in **Table 2.1** were identified for the Assessment Area (1,500 m buffer) in accordance with Section 3 of the BAM (DPIE, 2020a).

Table 2.1 Landscape Features Assessed and Data Sources

Landscape and Site Context Features	Data Source
IBRA Bioregions	NSW Interim Biogeographic Regions of Australia (IBRA region and subregion) – Version 7
IBRA Subregions	NSW Interim Biogeographic Regions of Australia (IBRA region and subregion) – Version 7
NSW Mitchell Landscapes	NSW (Mitchell) Landscapes Version 3.1 (DPIE 2016)
Native vegetation extent within designated assessment buffer areas	Aerial imagery
Patch Size	Aerial imagery
Cleared Areas	Aerial imagery
Rivers and Streams (classified according to stream order)	NSW Hydrography (2022)
Estuaries and Wetlands	Directory of important wetlands in Australia
Connectivity features	Aerial imagery
Karst, caves, crevices, cliffs, rocks and other geological features of significance	Aerial imagery and topographic maps
Areas of outstanding biodiversity value	Areas of Outstanding Biodiversity Value register

2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Methods

2.2.1 Existing Information

The following existing information was reviewed to inform the identification of PCTs (**Section 4.2**) and TECs (refer to **Section 4.3**):

- NSW State Vegetation Type Map Version C2.0M2.0. (NSW DPE, 2023d).
- Notice and Reason for the Final Determination for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community (NSW Threatened Species Scientific Committee 2020a).

- Conservation Assessment of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (NSW Threatened Species Scientific Committee 2020b).
- Approved Conservation Advice for the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DCCEEW 2023a).
- EPBC Act Policy Statement 3.5 – White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands (AGDEH 2006a).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List (AGDEH 2006b).
- Commonwealth Listing Advice on White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC 2006).

2.2.2 Mapping Native Vegetation Extent and Plant Community Types

The native vegetation extent within the Development Footprint was determined during site surveys, through Geographic Information Systems (GIS) mapping and aerial photograph interpretation using recent aerial imagery. Native vegetation and PCT mapping were undertaken using best-practice techniques to delineate vegetation communities across the Development Footprint. Vegetation mapping involved the following key steps:

- Review of aerial imagery to assess vegetation distribution patterns as dictated by change in canopy texture, tone, and colour, as well as topography.
- Review of the modelled distribution of vegetation communities within broader scale regional based vegetation mapping.
- Preparation of a draft PCT map based on interpretation of digital aerial imagery.
- Field-based ground-truthing of the draft plant community type, including surveys of rapid data points, GPS plotting of boundaries of floristic assemblage change and identification of tree dominant species.
- Confirmation of vegetation community floristic delineations based on plot data.

Vegetation communities were delineated through the identification of patterns of plant species assemblages in each of the identified strata. Slight variations in species composition are typical across the extent of a community and are often associated with microhabitats or ecotones with other plant communities.

The extent of native ground-cover vegetation within offsite areas where a canopy of native trees was absent, was estimated based on the visual interpretation of aerial imagery including areas of cultivation and fence boundaries. Native vegetation extent mapping offsite is broad-scale and was prepared specifically for the estimation of native vegetation cover under the BAM (DIPE, 2020a).

2.2.3 Plot-Based Floristic and Vegetation Integrity Survey

A stratified plot-based survey of the Development Footprint was undertaken in accordance with Table 3 and Section 4.2.1 of the BAM.

Plot-based vegetation surveys were completed to assess vegetation composition, structure, function, enable calculation of the vegetation integrity scores for Vegetation Condition Zones, sample areas of expected environmental variation and verify the results of previous mapping and available site information. Each plot survey consisted of a 20 x 20 m plot nested in a larger 20 x 50 m plot. The plot data was collected in accordance with Sections 4.2.1 and Section 4.3.4 of the BAM. The following information was recorded for each plot:

- Unique plot reference.
- Plot GPS coordinates (easting and northing).
- Date of the survey.
- Name of field surveyors.
- Bearing along a 50 m transect through the plot.
- Physiographic features that may assist in PCT identification such as slope, aspect and soil characteristics.
- Signs of disturbance.
- Photographs of the vegetation.
- For the nested 20 x 20 m / 400 m² floristic plot all required vegetation composition and structure variables were recorded including:
 - Full species name for all native and exotic flora species (where sufficient diagnostic material was present).
 - Foliage cover recorded as a percentage for all alive and dead flora species rooted within and overhanging the boundaries of the plot.
 - Abundance rating for all flora species rooted within the plot.
 - All vascular plants recorded within floristic plots were identified using keys and nomenclature in Plantnet NSW Flora Online Identification Keys (The Royal Botanic Gardens and Domain Trust 2023).
- For the 20 m x 50 m plot all required vegetation function values were recorded including:
 - Tree stem size class (presence/absence or estimated abundance).
 - Tree regeneration (presence/absence).
 - Combined length of all individual fallen logs ≥ 10 cm diameter and ≥ 50 cm in length.
 - Hollow bearing trees (number of trees rooted in the plot with hollows ≥ 5 cm wide).
 - Litter cover (all plant material that had detached from a plant and located on the ground surface) assessed as the average percentage cover of five 1 m² sub-plots spaced at 10 m intervals alternating either side of the plot midline.
 - Number of large trees with a DBH \geq the large tree benchmark for the PCT.

Plot locations were selected to ensure that they captured attributes relevant to each vegetation condition zone, to provide a representative assessment of the vegetation integrity of the vegetation condition zone, accounting for the level of variation in the broad condition state of the vegetation condition zone.

Subsequent amendments to the Development Footprint during the design process to avoid impacts to biodiversity values have resulted in some plots located outside, but still adjacent to, the Development Footprint.

At each plot, approximately 45 to 60 minutes was spent searching and recording all vascular flora species present within each strata of the 20 x 20 m floristic plot. Searches were generally undertaken through parallel transects from one side of the plot to another. An effort was made to search the tree canopy and tree trunks for mistletoes, vines, and epiphytes where present.

A total of 72 BAM plots were sampled by Umwelt ecologists between 3 February 2022 and 2 February 2023, as detailed below:

- 3 February 2022
- 21–25 March 2022
- 5–7 April 2022
- 15–16 June 2022
- 30 January–2 February 2023.

Plot locations are shown in **Figure 2.1** and plot stratification details for each Vegetation Condition Zone are provided in **Table 2.2**.

Table 2.2 Plant Community Type Survey Plot Stratification Details

Vegetation Zone No.	Vegetation Condition Zone Name	PCT ID	PCT Name	Area (ha)	Quantity of Plots Required (BAM 2020 Table 3)	Plots Completed in 2022/23
1	Scattered Trees	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	22.49	4	5
2	Moderate Condition Derived Native Grassland			165.36	6	18
3	Moderate to Low Condition Derived Native Grassland			310.03	7	19
4	Low Condition Derived Native Grassland			195.98	6	10
5	Scattered Trees	1661	Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	2.66	2	4
6	Moderate to Low Condition Derived Native Grassland			37.65	4	11
7	1661 Low Condition Derived Native Grassland			54.98	5	5

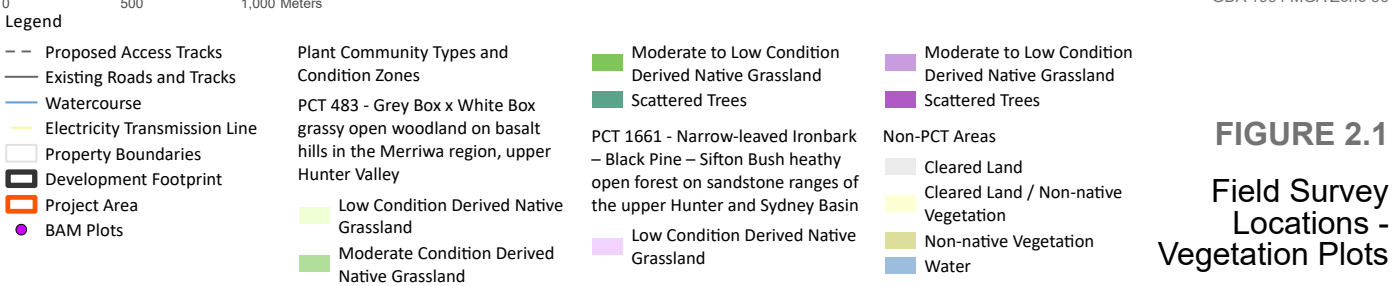
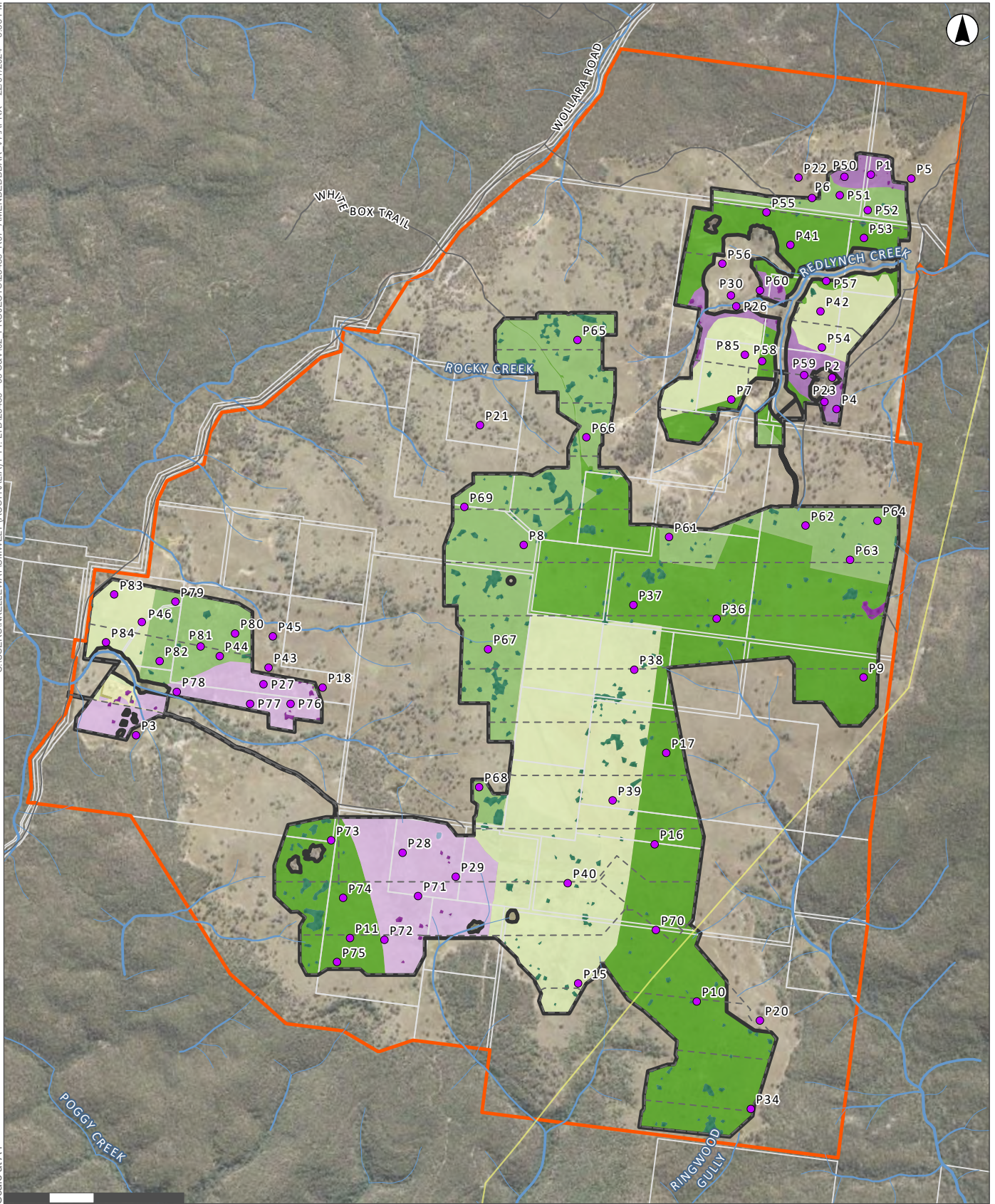


FIGURE 2.1
Field Survey Locations - Vegetation Plots

2.3 Threatened Flora Survey Methods

2.3.1 Review of Existing Information

The following existing information was reviewed to inform the threatened flora species surveys and assessment of habitat constraints and microhabitats:

- NSW Government Biodiversity Assessment Method Calculator (BAM-C).
- Threatened flora records held on the NSW BioNet Atlas of NSW Wildlife within the Assessment Area (NSW DPE 2023c).
- Vegetation associations reports for the Sydney Basin IBRA bioregion – Kerrabee IBRA sub-region for each PCT present to determine threatened fauna species PCT associations.
- Habitat constraints listed in the TBDC (NSW DPE 2023c).
- BAM Flora species with specific survey requirements spreadsheet (NSW DPIE 2020d).

2.3.2 BioNet Atlas Threatened Flora Records

A search of the BioNet Atlas of NSW Wildlife was undertaken to determine the presence of any threatened flora species previously recorded within the Development Footprint or the Assessment Area (NSW DPE 2023c), and to inform this amended BDAR. This amended BDAR has adopted a 1.5 km buffer search of records within the BioNet Atlas to be consistent with the Assessment Area for the Project. It is noted that the May 2023 version of the BDAR included a 10 km buffer search around the Project Area. There are five threatened flora species recorded between 1.5 km and 10 km of the Project Area. Of these five species, Pine Donkey Orchid (*Diuris tricolor*), *Ozothamnus tessellatus*, and *Eucalyptus camaldulensis* population in the Hunter catchment are considered to have a low likelihood of occurrence and are not considered further within this report. The remaining two species, *Cymbidium canaliculatum* and *Dichanthium setosum*, are considered to have a moderate likelihood of occurring on the Project site (*Cymbidium canaliculatum*) or have been identified within the supplementary SEARs at risk of significant impact (*Dichanthium setosum*), therefore have been retained within this report for further assessment.

Details of the threatened flora species recorded on the BioNet Atlas within a 1.5 km buffer of the Development Footprint Area are listed in **Table 2.3**, including the number of records and date of records within the search area. An assessment of likelihood of occurrence is also provided using the following criteria:

- High / Known – Suitable habitats which are known to support this species are present and the species is known or expected to occur within the Development Footprint based on observation or historical records.
- Moderate – Suitable habitats which are known to support this species are present within the Development Footprint and the species may occur (further surveys required).
- Low – Suitable habitats or microhabitats for this species are not present within the Development Footprint, or the Development Footprint is too disturbed to support this species and the species is not known or likely to occur.

Species known to occur or with a moderate or high likelihood of occurrence have been included for further assessment within this Report.

Table 2.3 Bionet Atlas Threatened Flora Records within 1.5 km

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records within 1.5 km	Likelihood of Occurrence	Comments
<i>Commersonia rosea</i> (<i>Androclava rosea</i>)	-	E	E	01/03/2005	1	Low	Fire ephemeral species which occurs on skeletal sandy soils in scrub and heath. Recorded on the BioNet Atlas adjacent to Project Area on western side of Wollara Road. No associated PCTs or vegetation formations are present within the Development Footprint and the habitats present are not likely to support this species.
<i>Homoranthus darwinioides</i>	Fairy Bells	V	V	28/10/2021	9	Moderate potential for occurrence in PCT 1661.	Recorded in the Goulburn River National Park in sandstone habitats adjoining the Project Area.

2.3.3 Habitat Constraints Assessment

The following field-based surveys were undertaken to assess the habitat constraints for the candidate threatened flora species:

- Field searches for habitat constraints identified from the desktop review of the TBDC.
- Direct observation of the quality and suitability of micro-habitats present.
- Collection of rapid flora assessments for each PCT to assess the condition of the habitats present on 9–12 August 2021.
- Collection of site photographs to assess the condition of habitats present.

Suitable habitat for *Monotaxis macrophylla* was also targeted during habitat searches on a precautionary basis. This species is associated with PCT 483 and is a fire ephemeral plant that grows in rock ridges and hillside microhabitats (DPE 2023c). Bell (2021) reports this species has been observed growing on near level sandstone rock platform and ridgeline microhabitats, following germination stimulated by wildfire. Habitat searches were undertaken throughout the Development Footprint for these microhabitats, however no areas of rock platforms or rocky ridgelines were observed within the Development Footprint in areas of this PCT. The Development Footprint is also considered too degraded to support this species due to historical clearing, pasture improvement and altered fire regimes. This species is fire dependent, and fire has been largely excluded from the Development Footprint through fuel load reduction associated with the ongoing agricultural use and grazing of the site.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM-C. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted. The species credit species predicted to occur on the Development Footprint and justifications for ruling species out from further survey and assessment are identified in **Table 5.2** in **Section 5.1.2.1** and **Table 5.3** in **Section 5.1.2.2**.

2.3.4 Flora Surveys

The May 2023 version of the BDAR described targeted surveys for an additional three species, namely:

- Pine Donkey Orchid
- *Ozothamnus tessellatus*
- *Commersonia rosea*.

As detailed in **Section 2.3.2** and **Section 2.3.3** above, these species are considered to have a low likelihood of occurring within the Project Area due to an absence of suitable habitat, including differences between preferred floristic associations and those present within the Development Footprint. They are not associated with any PCTs present within the Development Footprint. Notwithstanding, these species have been targeted and reported on as part of the May 2023 version of the BDAR, and Umwelt considers the survey effort carried out to be adequate to demonstrate their absence.

As detailed within Section 5.2.1 (2) of the BAM, candidate species are determined through a set of criteria, including but not limited to plant community type associations and previous site records, using the data contained in the BioNet Atlas Threatened Species Data Collection (TBDC). Pine Donkey Orchid, *Ozothamnus tessellatus*, and *Commersonia rosea* do not meet the criteria for inclusion as a candidate species under the BAM, therefore, notwithstanding their inclusion in the May 2023 version of the BDAR for completeness and on a precautionary basis, they have not been considered further within this amended BDAR.

Searches for threatened flora species were completed in accordance with the NSW Survey Guide, 'Surveying threatened plants and their habitats' (DPIE 2020c) and any relevant species requirements listed in the TBDC (NSW DPE 2023ba). Details of the field survey methods used and species targeted are listed in **Table 2.4** and the locations of the surveys completed are mapped in **Figure 2.2**.

Within the Development Footprint surveys for the following threatened flora species were completed:

- *Cymbidium canaliculatum*.
- *Pomaderris queenslandica*.
- *Homoranthus darwinioides*.

The threatened flora surveys were completed within the following PCTs:

- PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.
- PCT 1661 Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin.

The threatened epiphytic orchid species, *Cymbidium canaliculatum*, is not associated with any of the PCTs present, however was included as a candidate species for PCT 483, as it is considered by Umwelt to have a moderate potential for occurrence as know potential host tree species are present. Records for this species within a 10 km radius are denatured but predominantly occur south of Goulburn River. *Cymbidium canaliculatum* was targeted initially through walking searches (grid-based), however areas of suitable habitat were too far apart for this method to be practical (See **Photo 2.1**). Further searches were undertaken from a vehicle with a spotter and a pair of binoculars. Vehicle searches were utilised to allow for efficient travelling across large areas of unsuitable habitat due to the widely dispersed nature of the suitable host habitat. Furthermore, the absence of midstory species, sparse distribution of suitable host trees mean that line of sight was suitable for direct observation of the readily observable species. Each scattered paddock tree and any logs observed within the Development Footprint were searched, with frequent stopping of the vehicle to allow for the searches to be completed thoroughly.



Photo 2.1 Example of typical wide spacing between scattered trees in PCT 483 Scattered Trees condition zone

Searches for the threatened shrubs, *Pomaderris queenslandica* and *Homoranthus darwinoides*, were undertaken for within the associated PCT 1661. These searches consisted of parallel transects with a maximum spacing of 20 m. Searches for these species were targeted to areas of suitable habitat which supported remnant shrubs. These areas predominantly coincided with the Scattered Trees condition zone of PCT 1661 (see **Photo 2.2**) and grassland areas which had not been subject to intensive agricultural management resulting in removal of shrubs (see **Photo 2.3**). The areas of highly degraded derived native grassland associated with this PCT (see **Photo 2.4**) are considered to be too degraded to support potential habitat for threatened shrub species and were excluded from surveys.



Photo 2.2 Example of PCT 1661 scattered trees condition zone which were included for searches of threatened shrubs



Photo 2.3 Example of less degraded parts of PCT 1661 Derived Native Grassland condition zones which were included for surveys for threatened shrubs

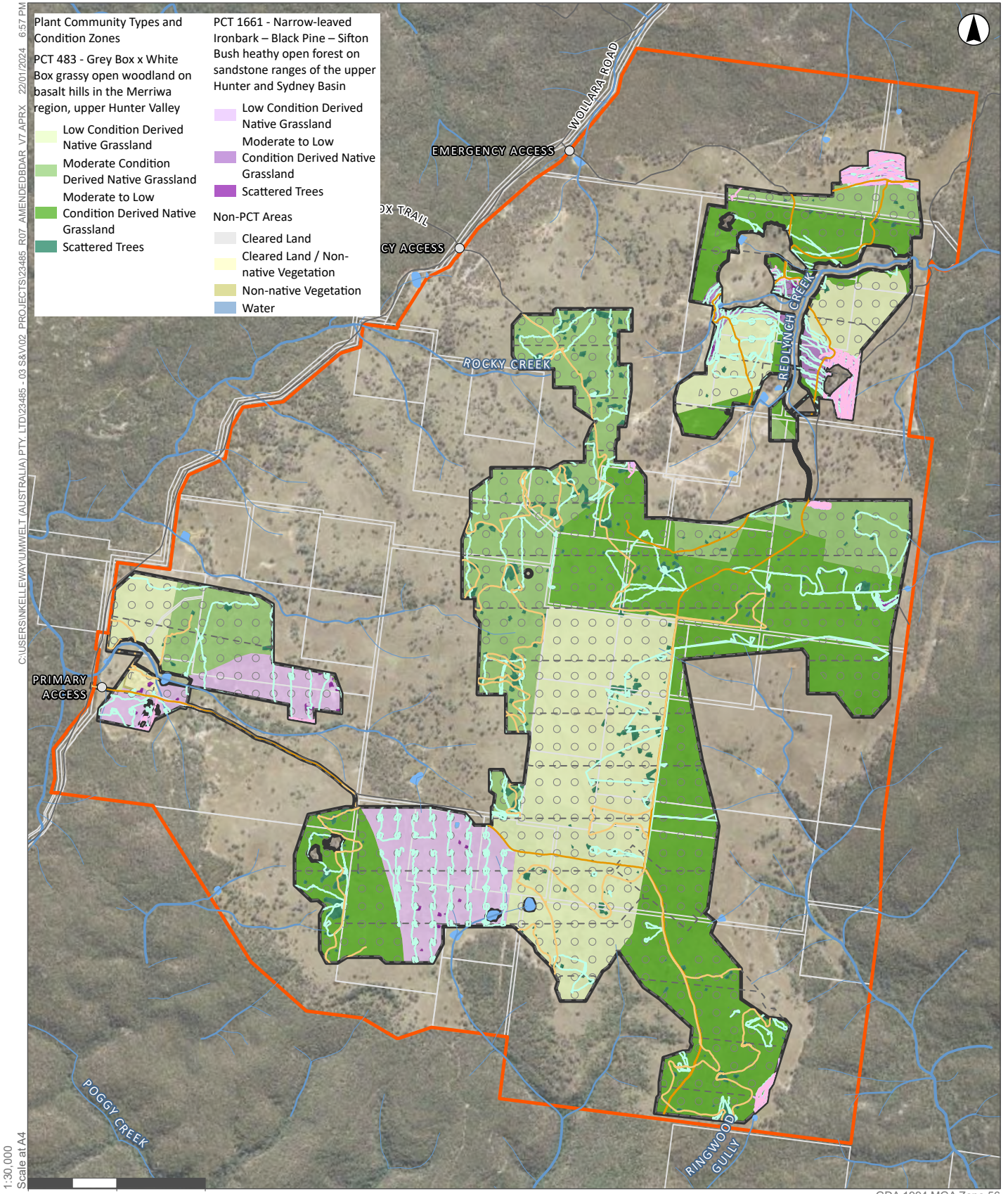


Photo 2.4 Example of highly degraded parts of PCT 1661 Derived Native Grassland condition zones which were excluded from surveys for threatened shrubs

Table 2.4 Flora Species Targeted and Field Survey Methods Used

Survey Dates	Target Species Group	Survey Method	PCT and Condition Zone Targeted
13–14 October 2021	Threatened Shrubs	<20 m wide parallel traverse.	Searches targeted within PCT 1661 in areas of lower disturbance including the Scattered Trees and parts of the Moderate to Low Derived Native Grassland condition zones.
23 November 2021	Threatened shrubs	<20 m wide parallel traverse.	Searches targeted within PCT 1661 in areas of lower disturbance including the Scattered Trees and parts of the Moderate to Low Derived Native Grassland condition zones.
31 January 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	Parallel traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.
2 February 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	Parallel traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.

Survey Dates	Target Species Group	Survey Method	PCT and Condition Zone Targeted
7 February 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	Parallel traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.
8 February 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	Parallel traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.
9 February 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	Parallel traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.
10 February 2022	Epiphytic orchid searches	Combination of grid based (100 square-metre grid with 40 m search area) and 20 m wide traverse through areas of suitable habitat.	20 m wide traverse searches were completed for PCT 1661 Scattered Trees Condition Zone and grid-based search was partially completed for other parts of the site.
31 October 2023	Epiphytic orchid searches	20 m wide traverse through areas of suitable habitat.	20 m wide traverse searches were completed from a vehicle targeting Scattered Trees condition zones for all PCTs.
1 November 2023	Epiphytic orchid searches	20 m wide traverse through areas of suitable habitat.	20 m wide traverse searches were completed from a vehicle targeting Scattered Trees condition zones for all PCTs.
4 November 2023	Epiphytic orchid searches	20 m wide traverse through areas of suitable habitat.	20 m wide traverse searches were completed from a vehicle targeting Scattered Trees condition zones for all PCTs.



Plant Community Types and Condition Zones

PCT 483 - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Low Condition Derived Native Grassland

Moderate Condition Derived Native Grassland

Moderate to Low Condition Derived Native Grassland

Scattered Trees

PCT 1661 - Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin

Low Condition Derived Native Grassland

Moderate to Low Condition Derived Native Grassland

Scattered Trees

Non-PCT Areas

Cleared Land

Cleared Land / Non-native Vegetation

Non-native Vegetation

Water

C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY.LTD\23485 - 03.S&V02 PROJECTS\23485 - R07 AMENDEDBAR V7.APRX 22/01/2024 6:57 PM
 1:30,000 Scale at A4

GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Waterbodies
 - Property Boundaries
 - Phase 1 Grid Search Circles
 - Development Footprint
 - Project Area
- Threatened Flora Survey Transects**
- January & February 2022
 - November 2021
 - October 2021
- Threatened Epiphytic Orchids Broad Area Spotter Search from Vehicle - October and November 2023**
- October 2023
 - November 2023

FIGURE 2.2

Field Survey Locations - Threatened Flora Surveys

2.4 Threatened Fauna Survey Methods

2.4.1 Review of Existing Information

The following existing information was reviewed to inform the threatened fauna species surveys and assessment of habitat constraints and microhabitats:

- BAM-C (available online to accredited BAM assessors).
- Threatened fauna records held on the NSW BioNet Atlas of NSW Wildlife within the Assessment Area (NSW DPE 2023c).
- Vegetation associations reports for the Sydney Basin IBRA bioregion – Kerrabee IBRA sub-region for each PCT present to determine threatened fauna species PCT associations.
- Habitat constraints listed in the TBDC (NSW DPE 2023c).

2.4.2 BioNet Atlas Threatened Fauna Records

A search of the BioNet Atlas of NSW Wildlife was undertaken to determine the presence of any threatened fauna species previously recorded within the Development Footprint or the Assessment Area (NSW DPE 2023c), and to inform this amended BDAR. This amended BDAR has adopted a 1.5 km buffer search of records within the BioNet Atlas to be consistent with the Assessment Area for the Project. It is noted that the May 2023 version of the BDAR included a 10 km buffer search around the Project Area. There are 20 threatened fauna species recorded within 10 km of the Project Area which have not been recorded within 1.5 km of the Project Area. Of these, eight species are ecosystem credit species, and do not require further targeted survey under the BAM. Of the remaining 16 species, species have been retained within this report for further assessment which have either been identified as a candidate species within the BAM-C, been identified within the supplementary SEARs at risk of significant impact, or have a minimum moderate likelihood of occurrence. Those species considered to have a low likelihood of occurring within the Project Area have not been considered further within this amended BDAR.

Details of the threatened fauna species recorded on the BioNet Atlas within a 1.5 km buffer of the Development Footprint Area are listed in **Table 2.5**, including the number of records and date of records within the search area. An assessment of likelihood of occurrence is also provided using the following criteria:

- High / Known – Suitable habitats which are known to support this species are present and the species is known or expected to occur within the Development Footprint based on observation or historical records.
- Moderate – Suitable habitats which are known to support this species are present within the Development Footprint and the species may occur (further surveys required).
- Low – The species is not associated with the PCTs present, suitable habitats or microhabitats for this species are not present within the Development Footprint, or the Development Footprint is too disturbed to support this species and the species is not known or likely to occur.

Species known to occur or with a moderate or high likelihood of occurrence have been included for further assessment within this Report.

Table 2.5 BioNet Atlas Threatened Fauna Records within 1.5 km

Scientific Name	Common Name	BC Act Status	Current EPBC Act Status	Date Last Recorded	Number of Records	Likelihood of Occurrence
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	23/05/2002	12	Foraging habitat use: low to moderate, Breeding habitat use: low.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Vulnerable	-	3/11/2020	37	Observed.
<i>Calyptorhynchus lathami</i>	South-eastern Glossy Black-Cockatoo	Vulnerable	Vulnerable*	21/10/2020	17	Observed.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Endangered^	15/12/2000	4	There are no associated PCTs present and the Development Footprint area is significantly disturbed. BCD requested additional roost surveys of the sheds present.
<i>Chthonicola sagittata</i>	Speckled Warbler	Vulnerable	-	3/11/2020	53	High.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Vulnerable	Vulnerable*	3/11/2020	87	High.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Vulnerable	-	21/10/2020	19	High.
<i>Glossopsitta pusilla</i>	Little Lorikeet	Vulnerable	-	6/10/2020	30	Observed.
<i>Hieraetus morphnoides</i>	Little Eagle	Vulnerable	-	6/10/2020	2	Moderate.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	Vulnerable	28/02/2016	1	Observed.
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	-	6/10/2008	1	Moderate.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Vulnerable	Endangered*	3/11/2020	20	High.

Scientific Name	Common Name	BC Act Status	Current EPBC Act Status	Date Last Recorded	Number of Records	Likelihood of Occurrence
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	-	23/05/2019	11	High.
<i>Neophema pulchella</i>	Turquoise Parrot	Vulnerable	-	6/10/2020	23	High.
<i>Ninox connivens</i>	Barking Owl	Vulnerable	-	3/11/2020	14	Observed.
<i>Phascolarctos cinereus</i>	Koala	Endangered	Endangered^	31/12/1957	7	Low (record marked on site from last day of 1957 in centre of mapsheet. Location of record is not accurate and unlikely to be from the Project Area). Recent call, scat and scratching records are 5 km SW on alluvial flats associated with the Goulburn River.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Vulnerable	-	22/10/2019	1	High.
<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable	Vulnerable*	13/10/2020	42	Observed.
<i>Vespadelus trougtoni</i>	Eastern Cave Bat	Vulnerable	-	16/12/2000	1	There are no associated PCTs present and Development Footprint is significantly disturbed. BCD requested additional roost surveys of the sheds present.

* = Species listed under EPBC Act after decision on referral.

^ = Species listing status increased after decision on referral.

2.4.3 Habitat Constraints Assessment

Field-based searches were undertaken to assess the habitat constraints for the candidate threatened fauna species. These searches included observation of habitat constraints identified from the desktop review of the TBDC and recording of the presence, quality and/or suitability of micro-habitats present including:

- hollow bearing trees, particularly those of suitable size for threatened cockatoo and owl breeding habitat
- koalas use trees
- rocky habitats suitable for reptiles
- outcrops, caves, tunnels and old buildings suitable for threatened microbat species.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM-C. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted.

2.4.4 Fauna Surveys

The May 2023 version of the BDAR escribed effort and results of targeted surveys for additional species, namely:

- Large Forest Owls, including Powerful Owl and Masked Owl.
- Squirrel Glider.
- Gang-gang Cockatoo.

As detailed in **Section 2.3.2** and **Section 2.3.3** above, these species are considered to have a low likelihood of occurring within the Project Area due to an absence of suitable habitat, including differences between preferred floristic associations and those present within the Development Footprint and/or absence of suitable breeding habitat. They are not associated with any PCTs present within the Development Footprint. Notwithstanding, these species were targeted during surveys and reported on as part of the May 2023 version of the BDAR, and Umwelt considers the survey effort carried out to be adequate to demonstrate their absence. Notably, additional survey effort conducted for this amended BDAR (including spotlighting and thermal drone surveys) is also appropriate for these additional species, which were not observed. The thermal drone surveys successfully identified non-threatened hollow-dwelling fauna (Brush-tail Possum, Owllet Nightjar) and roosting parrots (Sulphur Crested Cockatoo, Pink Galah, Eastern Rosella), suggesting that threatened parrots, gliding mammals and perching forest owls would have had a high likelihood of being observed, if present.

As detailed within Section 5.2.1 (2) of the BAM, candidate species are determined through a set of criteria, including but not limited to plant community type associations and previous site records, using the data contained in the BioNet Atlas Threatened Species Data Collection (TBDC). None of the aforementioned species meet the criteria for inclusion as a candidate species under the BAM, therefore, notwithstanding their inclusion in the May 2023 version of the BDAR for completeness and on a precautionary basis, they have not been considered further within this amended BDAR.

2.4.4.1 Fauna Survey Guidelines

Targeted surveys for candidate threatened fauna species were completed with reference to the following:

- NSW BioNet Atlas incorporating the Threatened Biodiversity Data Collection (NSW DPE 2023c).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, NSW Department of Environment and Conservation (NSW DEC 2004).
- Threatened Reptiles: Biodiversity Assessment Method survey guide (DPE 2022c).
- Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method survey guide (DPE 2022d).
- 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method, Office of Environment and Heritage (NSW OEH 2018b).
- Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DSEWPC 2011a).
- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010a).
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010b).
- Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010c).
- Camera Trapping: wildlife management and research (Meek and Fleming 2014).
- A review of koala habitat assessment criteria and methods (Youngentob *et al.*, 2021).

Umwelt noted a revised version of 'Species Credits' threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPIE (2021) guideline with respect to development of species polygons for threatened microbat species.

2.4.4.2 Diurnal Fauna Surveys

The following methods were utilised for targeted diurnal fauna surveys:

- Nest site searches for candidate raptor species.
- Active searches for reptiles (rock rolling).
- Searches for threatened cockatoo feeding and breeding trees.

- Searches and assessment of potential threatened owl nest trees.
- Searches for microbat roosts and ultrasonic call recording.
- Opportunistic observation.

The details of diurnal fauna surveys completed are provided in **Table 2.6** and Umwelt fauna survey locations are mapped in **Figure 2.3**.

Table 2.6 Details of Diurnal Threatened Fauna Surveys Completed

Survey Date	Survey Methods	Threatened fauna groups targeted	Weather conditions	Survey Effort / Time
09/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	5–18°C, light ESE breeze, no rain.	6.25 hrs x 2 persons / 10:15–16:30
10/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	2–21°C, light WNW breeze, no rain.	9.5 hrs x 2 people / 07:30–17:00
11/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	3–23°C, light WNW breeze, no rain.	9.25 hrs x 2 people / 07:30–16:45
12/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	12–20°C, light WNW breeze, no rain.	6.75 hrs x 2 people / 07:45–14:30
23/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna, breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	7–21°C, light NNW breeze, no rain.	4.5 hrs x 2 people / 13:00–17:30
24/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	7–10°C, light WNW wind 11.6 mm rain.	4.5 hrs x 2 people / 12:00–16:30
25/08/21	<ul style="list-style-type: none"> • Targeted diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	3–15°C, WNW wind, 4.4 mm rain in the morning.	5 hrs x 2 people / 12:30–17:30

Survey Date	Survey Methods	Threatened fauna groups targeted	Weather conditions	Survey Effort / Time
26/08/21	<ul style="list-style-type: none"> Targeted diurnal census. Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	1–18°C, WSW breeze, no rain.	4 hrs x 2 people / 10:30–14:30
21/09/21	<ul style="list-style-type: none"> Targeted diurnal census. Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	15°C, WSW breeze, no rain.	7.5 hrs x 2 people / 10:00–17:30
22/09/21	<ul style="list-style-type: none"> Targeted diurnal census. Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	10–20°C, NW breeze, no rain.	7.5 hrs x 2 people / 07:00–14:30
13/10/21	<ul style="list-style-type: none"> Targeted diurnal census. Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	10–20°C, ESE breeze, no rain.	10 hrs x 2 people / 10:00–20:00
14/10/21	<ul style="list-style-type: none"> Targeted diurnal census. Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	15–20°C, SSE breeze, no rain.	3.5 hrs x 2 people / 08:00–11:30
23/11/21	<ul style="list-style-type: none"> Reptile rock-rolling searches. 	Reptiles	14–25°C, ESE breeze, no rain.	5 x rock rolling searches of ≈ 200 rocks per search (approximately 40 person minutes per rock rolling transect)
24/11/21	<ul style="list-style-type: none"> Reptile rock-rolling searches. 	Reptiles	16–26°C, WNW breeze, 1 mm rain.	3 x rock rolling searches of ≈ 200 rocks per search (approximately 40 person minutes per rock rolling transect)
24/11/21	<ul style="list-style-type: none"> Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	16–26°C, WNW breeze, 1 mm rain.	8.75 hrs x 2 people / 07:45–16:30
7/12/21	<ul style="list-style-type: none"> Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	15–26°C, WNW breeze, 2.8 mm rain with evening thunderstorms	3 hrs x 2 people / 17:00–20:00

Survey Date	Survey Methods	Threatened fauna groups targeted	Weather conditions	Survey Effort / Time
8/12/21	<ul style="list-style-type: none"> Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	14–28°C, SSW moderate to strong wind, 12.2 mm rain with intermittent thunderstorm.	7 hrs x 2 people / 13:00–20:00
9/12/21	<ul style="list-style-type: none"> Avifauna breeding activity, stick nest and tree hollow search. 	Hollow and stick nesting birds	12–25°C, WNW breeze, 58 mm rain (fine during survey but heavy rainfall night prior).	3.5 hrs x 2 people / 09:00–12:30
31/01/22	Opportunistic observation.	All threatened fauna species	15–33°C, SSE breeze, no rain.	2.25 hrs x 2 people / 14:45–17:00
1/02/22	Opportunistic observation.	All threatened fauna species	16–32°CW breeze, no rain.	10.5 hrs x 2 people / 07:30–18:00
2/02/22	Opportunistic observation.	All threatened fauna species	20–25°C, SE breeze, overcast with 0.4 mm rain.	6.5 hrs x 2 people / 07:30–14:00
3/02/22	BAM plots / Opportunistic observation.	All threatened fauna species	16–23°C, light ESE breeze, 2.4 mm rain.	9.5 hrs x 2 people / 08:00–17:30
7/02/22	Opportunistic observation.	All threatened fauna species	12–15°C, E breeze, 0.2 mm rain with late afternoon thunderstorm.	9 hrs x 2 people / 10:00–19:00
8/02/22	Opportunistic observation.	All threatened fauna species	10–26°C, ESE breeze, 0.2 mm rain.	11 hrs x 2 people / 07:00–18:00
9/02/22	Opportunistic observation.	All threatened fauna species	7–30°C, SSW breeze, no rain.	11 hrs x 2 people / 07:00–18:00
10/02/22	Opportunistic observation.	All threatened fauna species	10–34°C, light S breeze, no rain.	9.5 hrs x 2 people / 07:00–16:30
10/03/22	Opportunistic observation.	All threatened fauna species	13–22°C, E breeze, no rain.	12 hrs x 2 people / 06:30–18:30
21/03/22	BAM plots / Opportunistic observation.	All threatened fauna species	12–26°C, E breeze, no rain.	1.5 hrs x 2 people / 15:30–17:00
22/03/22	BAM plots / Opportunistic observation.	All threatened fauna species	10–30°C, WNW wind, no rain.	9 hrs x 2 people / 07:30–16:30
23/03/22	BAM plots / Opportunistic observation.	All threatened fauna species	13–30°C, ESE breeze, no rain.	9 hrs x 2 people / 07:30–16:30
24/03/22	BAM plots / Opportunistic observation.	All threatened fauna species	17–22°C, ESE breeze, no rain.	9 hrs x 2 people / 07:30–16:30

Survey Date	Survey Methods	Threatened fauna groups targeted	Weather conditions	Survey Effort / Time
25/03/22	BAM plots / Opportunistic observation.	All threatened fauna species	15–23°C, ESE breeze, no rain.	2.5 hrs x 2 people / 07:30–10:00
5/04/22	BAM plots / Opportunistic observation.	All threatened fauna species	15–21°C, ESE breeze, no rain.	9.25 hrs x 2 people / 07:30–16:45
6/04/22	BAM plots / Opportunistic observation.	All threatened fauna species	11–21°C, SE breeze, overcast, no rain.	10 hrs x 2 people / 07:30–17:30
7/04/22	BAM plots / Opportunistic observation.	All threatened fauna species	17–20°C, SE breeze, no rain.	9.5 hrs x 2 people / 07:30–17:00
15/06/22	Avifauna breeding activity and hollow search.	Owls	17°C, WNW breeze, no rain.	5 hrs x 2 people / 12:00–17:00
16/06/22	Avifauna breeding activity and hollow search.	Owls	5–19°C, NW breeze, no rain.	5 hrs x 2 people / 07:45–12:45
Total Diurnal Survey Effort				524 person hours over 36 days

2.4.4.3 Nocturnal Fauna Surveys

The following methods were utilised for targeted nocturnal fauna surveys:

- spotlighting and stag-watching searches
- quiet listening for candidate threatened fauna calls
- targeted call playback
- thermal drones (see remote detection method description below).

Details of these surveys are provided in **Table 2.7** and Umwelt survey locations are mapped in **Figure 2.3**. The locations of the thermal drone surveys are shown in **Appendix E** and are also mapped in **Figure 2.4**.

Table 2.7 Details of Nocturnal Threatened Fauna Surveys Completed

Survey Date	Survey Methods	Targeted Threatened Species Group	Weather conditions	Survey Effort / Time
23/08/21	Quiet listening Call playback x2 Spotlighting	Owls and mammals	10°C, light E wind, no rain.	2.75 hrs x 2 people 17:30–20:15
25/08/21	Quiet listening Call playback x3 Spotlighting	Owls and mammals	15–5°C, WNW wind, no rain during surveys.	4.25 hrs x 2 people 17:30–21:45
30/08/21	Quiet listening Call playback x3 Spotlighting	Owls and mammals	10–5°C, fine, no wind, recent rain	4.5 hrs x 2 people 17:00–21:30

Survey Date	Survey Methods	Targeted Threatened Species Group	Weather conditions	Survey Effort / Time
13/10/21	Quiet listening Stag Watching Call playback x1 Spotlighting	Owls and mammals	10°C, fine, ESE breeze, no rain.	1 hr x 2 people 19:00–20:00
23/11/21	Quiet listening Stag Watching Spotlighting	Owls and mammals	16°C, overcast, ESE breeze, no rain (prior rain on 20-22/11/21)	1.5 hrs x 2 people 20:00–21:30
7/12/21	Quiet listening Stag Watching Call playback x4 Spotlighting	Owls and mammals	15°C, overcast, WNW wind, high humidity with thunderstorm during evening	3 hrs x 2 people 20:00–23:00
8/12/21	Quiet listening Stag Watching Call playback x4 Spotlighting	Owls and mammals	15°C, SSW winds, intermittent thunderstorms	1.5 hrs x 2 people 20:00–21:30
2/02/22	Spotlighting and general amphibian survey	Opportunistic spotlighting	18°C, overcast, SE breeze, no rain (prior rain on 26-28/01/22).	1 x ≈500 m transect completed by 2 people over 1.5 hrs 20:00–21:30
6/04/22	Spotlighting and general amphibian survey	Opportunistic spotlighting	20°C, overcast, SE breeze, no rain (prior rain on 2/04/22).	1 x ≈500 m transect completed by 2 people over 2 hrs 18:00–20:00
15/06/22	Quiet listening Stag Watching Call playback x 4 Spotlighting	Owls and mammals	10-5°C, fine, WNW breeze, no rain.	5 hrs x 2 people 16:30–21:30
30/10/23	Spotlighting	Arboreal mammals	28°C, 4/8 cloud, 28C, calm, no rain	4 hrs x 2 people 19:30–20:30 – spotlighting
31/10/23	Spotlighting	Arboreal mammals	18-22°C, 0/4 cloud, light to moderate breeze, fine	4 hrs x 2 people 19:30–20:30 – spotlighting
1/11/23	Spotlighting	Arboreal mammals	20°C, 0/4 cloud, moderate to fresh breeze, fine	4.45 hrs x 2 people 19:00–11:45 – spotlighting
2/11/23	Spotlighting	Arboreal mammals	23°C, 0/4 cloud, moderate breeze, no cloud, fine	3.5 hrs x 2 people 19:30–11:00 – spotlighting
Total nocturnal survey effort				96.9 person hours completed over 14 nights

2.4.4.4 Remote Detection Fauna Surveys

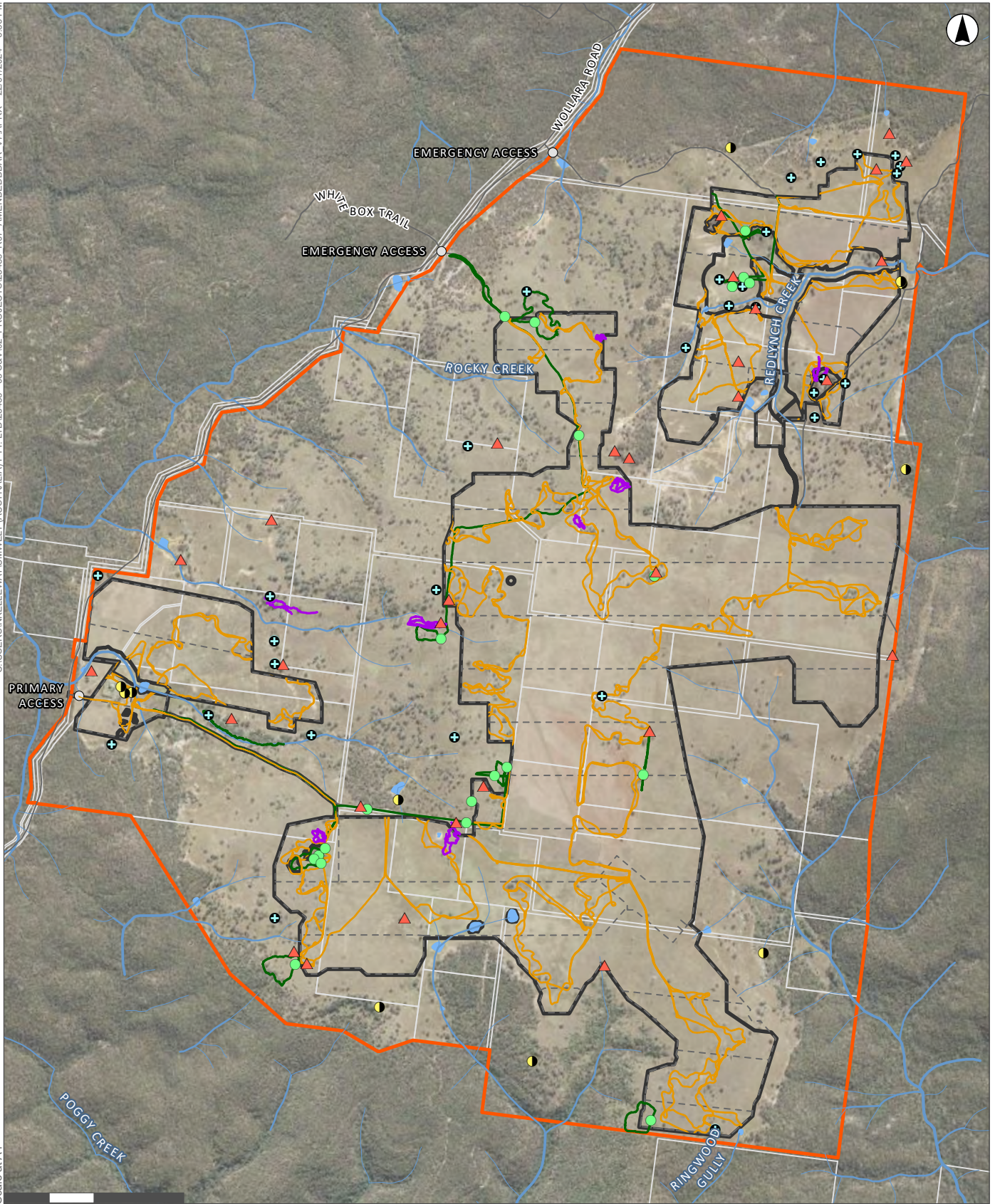
The following methods were utilised for the completion of targeted fauna remote detection surveys:

- Arboreal baited remote camera surveys.
- Ultrasonic microbat call recording.
- Thermal drones (Completed by Wildlife Drones / see separate report in **Appendix E**).

Details of these surveys are provided in **Table 2.8**.

Table 2.8 Details of Remote Detection Threatened Fauna Surveys Completed

Survey Date	Survey Methods	Threatened Species Groups Targeted	Weather conditions	Survey Effort / Time
1/02/2022–10/03/2022 (rebaited 9/02/2022)	Arboreal baited remote triggered camera survey	Threatened mammals	variable	1080 camera trap nights (30 cameras x 36 nights)
13/12/2021–26/12/2022	Ultrasonic microbat call detection (Anabat)	Large-eared Pied-bat Eastern Cave Bat	Variable (Min temp = 9.1°C, 4 nights with rainfall >0.2 m)	18 recording nights with 2 Anabats (1 unit x 4 nights, 1 unit x 14 nights)
30/10/23	Microbat roost flyout survey at structures (Redlynch House (dilapidated cottage) in northern part of site)	Microbats	28°C, 4/8 cloud, 28C, calm, no rain	1.5 hrs 1900–2030 – ultrasonic call recording at potential microbat roost (dilapidated cottage) x 2 anabats
31/10/23	Microbat roost flyout survey at structures (dilapidated cottage in northern part of site)	Microbats	18–22°C, 0/4 cloud, light to moderate breeze, fine	1.5 hrs 1900–2030 – ultrasonic call recording at potential microbat roost (dilapidated cottage) x 2 anabats
1/11/23	Microbat roost flyout survey at structures (farm sheds)	Microbats and owls	20°C, 0/4 cloud, moderate to fresh breeze, fine	1.5 hrs 1900–2030 – ultrasonic call recording at potential microbat roost (farm sheds) x 2 anabats
2/11/23	Microbat roost flyout survey at structures (farm sheds)	Microbats	23°C, 0/4 cloud, moderate breeze, no cloud, fine	1.5 hrs 1900–2030 – ultrasonic call recording at potential microbat roost (farm sheds) x 2 anabats
7–8/11/23	Thermal drone survey	Arboreal mammals	Variable	2 drones x 1 night
8–9/11/23	Thermal drone survey	Arboreal mammals	Variable	2 drones x 1 night



Legend

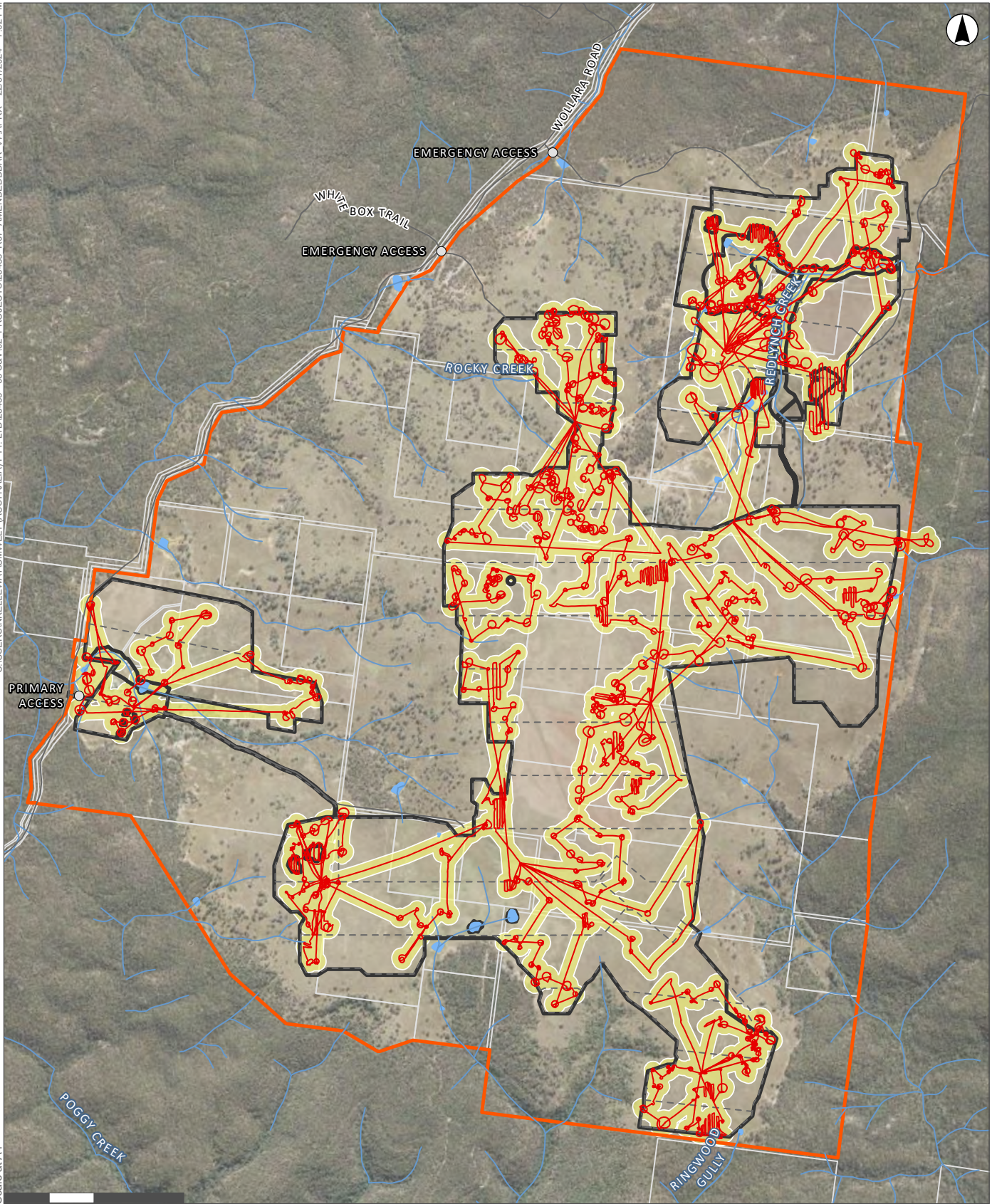
- Access Points
- - Proposed Access Tracks
- Existing Roads and Tracks
- Watercourse
- Waterbodies
- Property Boundaries
- ▭ Development Footprint
- ▭ Project Area

Threatened Fauna Surveys

- ▲ Diurnal Bird Survey Locations (30)
- Call Playback Locations (21)
- Anabat Locations (14)
- ⊕ Camera Locations (30)
- Reptile Rock Roll Searches
- Spotlight Searches on Foot
- Spotlight Searches from Vehicle

FIGURE 2.3

Field Survey Locations - Threatened Fauna Surveys



GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Property Boundaries
 - Project Area
 - Development Footprint
 - Waterbodies
 - Thermal Drone Flight Paths
 - Thermal Drone Flight Coverage

FIGURE 2.4

Location of Arboreal Mammal Thermal Drone Surveys

2.5 Threatened Fungi

No threatened fungi species were identified as predicted or candidate threatened species.

2.6 Weather Conditions

All flora surveys were completed during suitable weather conditions. The weather conditions during fauna surveys are listed in **Table 2.6**, **Table 2.7** and **Table 2.8**.

2.7 Limitations

The areas to be impacted are mostly composed of grazed areas of derived grassland which are subject to ongoing management for agricultural activities. Potential limitations associated with floristic and vegetation integrity plot surveys were overcome by exceeding the minimum plots requirements of the BAM for most vegetation zones and completing the surveys during warmer months and a period which coincided with a significant La Niña weather event between 2021 and early 2023.

Potential limitations related to threatened species surveys were overcome by the completion of surveys during the appropriate seasonal periods specified within the TBDC to maximise the probability of detection.

New guidelines relating to survey and assessment were released during the completion of fieldwork and reporting for this BDAR.

The BCD BOS Help Desk Team were consulted in June 2022 via email regarding new survey guidelines (specifically the koala guidelines) and advised that: If the Department publishes new or amend existing survey guides to support the application of the BAM, assessors are expected to apply these to all assessments for which the survey component has yet to be completed, and to all new assessments that commence on, or after the publication date. This is to ensure that your biodiversity assessment reports (BAR) meet the requirements of BAM s6.5.1.3. (BAM 2020 5.3(2.b.)). Where survey has been completed prior to the publication of a survey guide, the Department expects the assessor (or surveyor) to have applied current best-practice in searching for the target species (in accordance with BAM s6.5.1.4). Assessors can use information from other published, peer-reviewed sources to guide survey technique and effort, but this must be clearly documented and justified in the BAR as well as indicating how this differs from our recently published guide.

New and/or updated guidelines released included:

- Threatened Reptiles Biodiversity Assessment Method Survey Guide (NSW DPE 2022c).
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (NSW DPE 2022b).
- Determining Native Vegetation Land Categorisation for Application in the Biodiversity Offsets Scheme (DPE 2023a).

Targeted surveys for Pink-tail Legless Lizard, Striped Legless Lizard, and Koalas had been carried out prior to the release of the new guidelines being released. Further details in relation to differences between the newly released survey guidelines for reptiles and the Koala are documented in **Section 5.2.2** of this Report.

The guidance for determining Native Vegetation Land Categorisation for Application in the BOS provides precautionary guidance which requires land containing critically endangered ecological communities (regardless of condition state), or critically endangered plants to be designated as Category 2 Sensitive Regulated Land. This guidance was followed for the preparation of this Report and all areas of PCT 483, including highly degraded Category 1 – Exempt Land agricultural areas containing derived grassland, were assessed as Category 2 Sensitive Regulated Land for the purposes of this assessment.

3.0 Site Context

3.1 Assessment Area

The Assessment Area, which includes the Development Footprint and the area of land within a 1500 m buffer zone is shown on the Location Map in **Figure 1.2**.

3.2 Landscape Features

Landscape features identified within the Development Footprint are shown on the Site Map provided as **Figure 1.1** and landscape features in the Assessment Area are shown on the Location Map provided as **Figure 1.2**. Further information on landscape features is provided in **Sections 3.2.1** to **Sections 3.2.7**.

3.2.1 IBRA Bioregions and IBRA Subregions

The Development Footprint is located within the Sydney Basin IBRA bioregion and Kerribee IBRA subregion.

3.2.2 Rivers, Streams, Estuaries and Wetlands

The locations of the streams within the Development Footprint are shown on the Site Map provided as **Figure 1.1** and the locations of streams and rivers within the Assessment Area are shown on the Location Map provided as **Figure 1.2**.

There are several first and second order streams within the Development Footprint. One third order watercourse associated with Redlynch Creek did fall within one iteration of the Development Footprint but has subsequently been excluded. All watercourses within or immediately outside the Development Footprint flow into the Goulburn River. There are no estuaries or wetlands located within or adjacent to the Development Footprint or the Project Area. The Project Area is within the Goulburn River Catchment which joins the Hunter River near Denman. The Ramsar listed Hunter Estuary Wetlands – Kooragang Nature Reserve is approximately 160 km downstream of the Project Area as shown in **Figure 3.1**.

3.2.3 Habitat Connectivity

The Development Footprint contains agricultural land, predominantly comprised of grazed grasslands with remnant trees. It is surrounded by the Goulburn River National Park. Patches of retained forest and woodland vegetation are present typically in areas surrounding watercourses and on steeper or less fertile rocky habitats.

Current opportunities for wildlife movement across the Development Footprint (and much of the Project Area) are limited to more mobile species such as medium to large sized birds and mammals. As the majority of the Development Footprint is expanses of land with limited vegetation cover for protection and camouflage, movement by prey species is expected to be minimal. Scattered trees (as shown in **Figure 4.2**) would provide stepping stones for mobile fauna movement, however are spaced too far apart to facilitate ready movement by gliding mammals or protection for other species sensitive to large gap crossings (such as small forest birds).

The Development Footprint contains three connectivity pathways which will be retained to enable wildlife movement, as shown in **Figure 3.2**. The three areas which form the Development Footprint will be fenced for safety and security purposes, as well as to exclude fauna. The vehicle tracks will not be fenced, to prevent habitat fragmentation and ensure that access for terrestrial fauna species is maintained across the Project Area.

The Goulburn River National Park contains an expanse of native vegetation and connects regionally to several other large natural areas managed for conservation along the Great Dividing Range, including Wollemi and Yengo National Parks to the south, Goonoo State Conservation Area to the west and Coolah Tops National Park to the north.

3.2.4 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance

No karst, caves, crevices, cliffs, rocks or other geological features of significance were observed within the Development Footprint. Review of aerial imagery and surveys for the biodiversity stewardship agreement confirmed rock areas and small cliffs outside of the Development Footprint, within the Assessment Area.

3.2.5 Areas of Outstanding Biodiversity Value

The Development Footprint and Assessment Area do not contain any Areas of Outstanding Biodiversity Value (AOBV) (formerly critical habitat), as identified under the BC Act.

3.2.6 NSW (Mitchell) Landscapes

The Development Footprint is mapped as occurring within the Liverpool Range Valleys and Foothills NSW (Mitchell) Landscape.

3.2.7 Additional Landscape Features Identified in the SEARS

There are no specific additional landscape features identified for assessment in the SEARS.

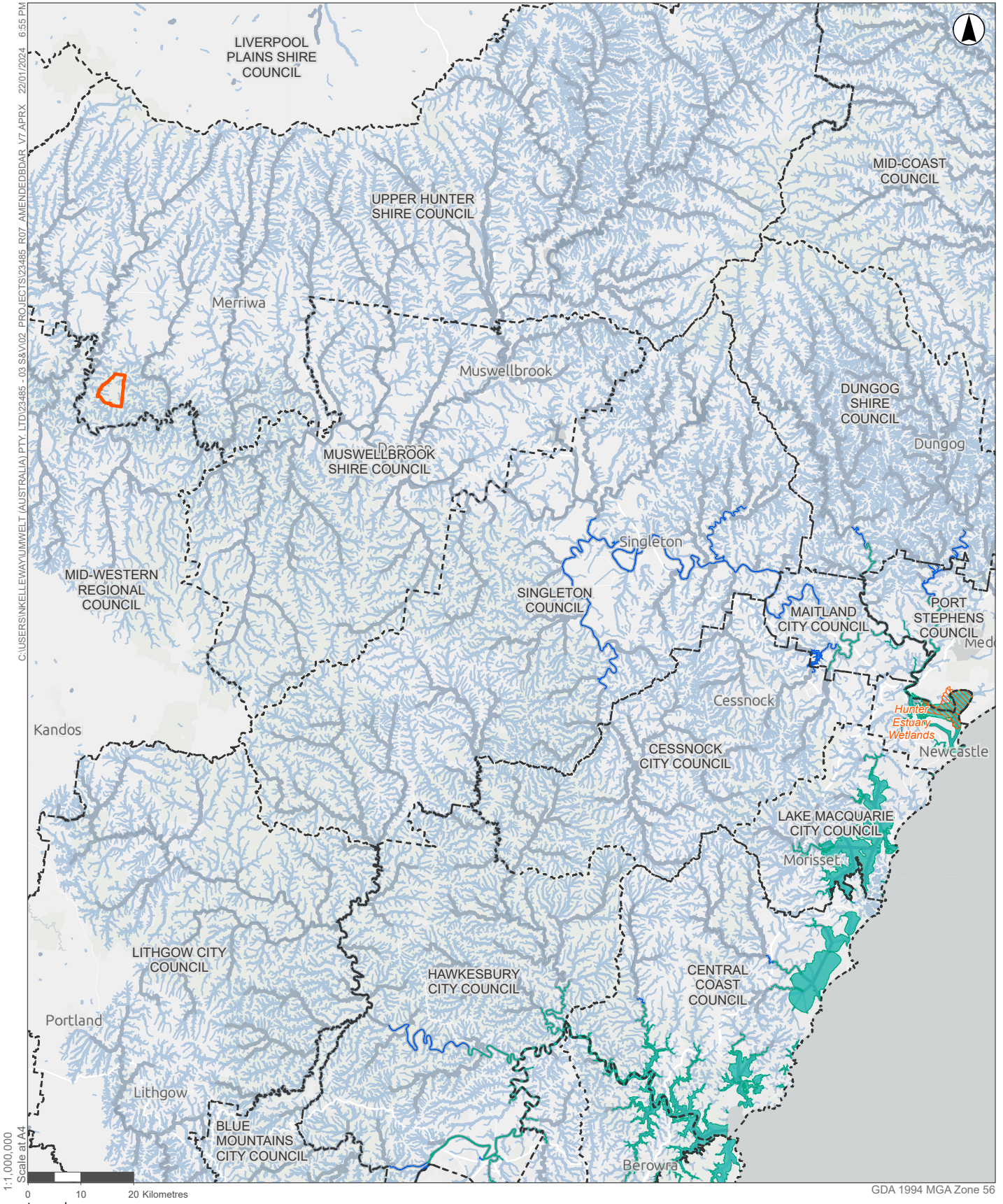
3.3 Native Vegetation Cover

The native vegetation cover within the Assessment Area was determined through site surveys of the Development Footprint and aerial photograph interpretation using ArcMap software and the world imagery base map aerial dated 9 August 2018.

Table 3.1 summarises the extent of native vegetation cover within the assessment area and **Figure 1.2** shows the extent of native vegetation cover within the assessment area. The high percentage of native vegetation cover within the Assessment Area can be attributed to the presence of Goulburn River National Park immediately outside the Project Area.

Table 3.1 Native Vegetation Cover in the Assessment Circle

Native Vegetation Cover	
1500 m Buffer Assessment Area (ha)	4589.3 ha
Total Area of Native Vegetation Cover (ha)	4570.6 ha
Percentage of Native Vegetation Cover (%)	99.6%
Class (0–10, >10–30, >30–70 or >70%)	>70%



C:\USERS\KELLEWAY\Umwelt (AUSTRALIA)\PTY.LTD\23485_03.S&V02_PROJECTS\23485_R07_AMENDED\BAR_V7.APRX 22/01/2024 6:55 PM

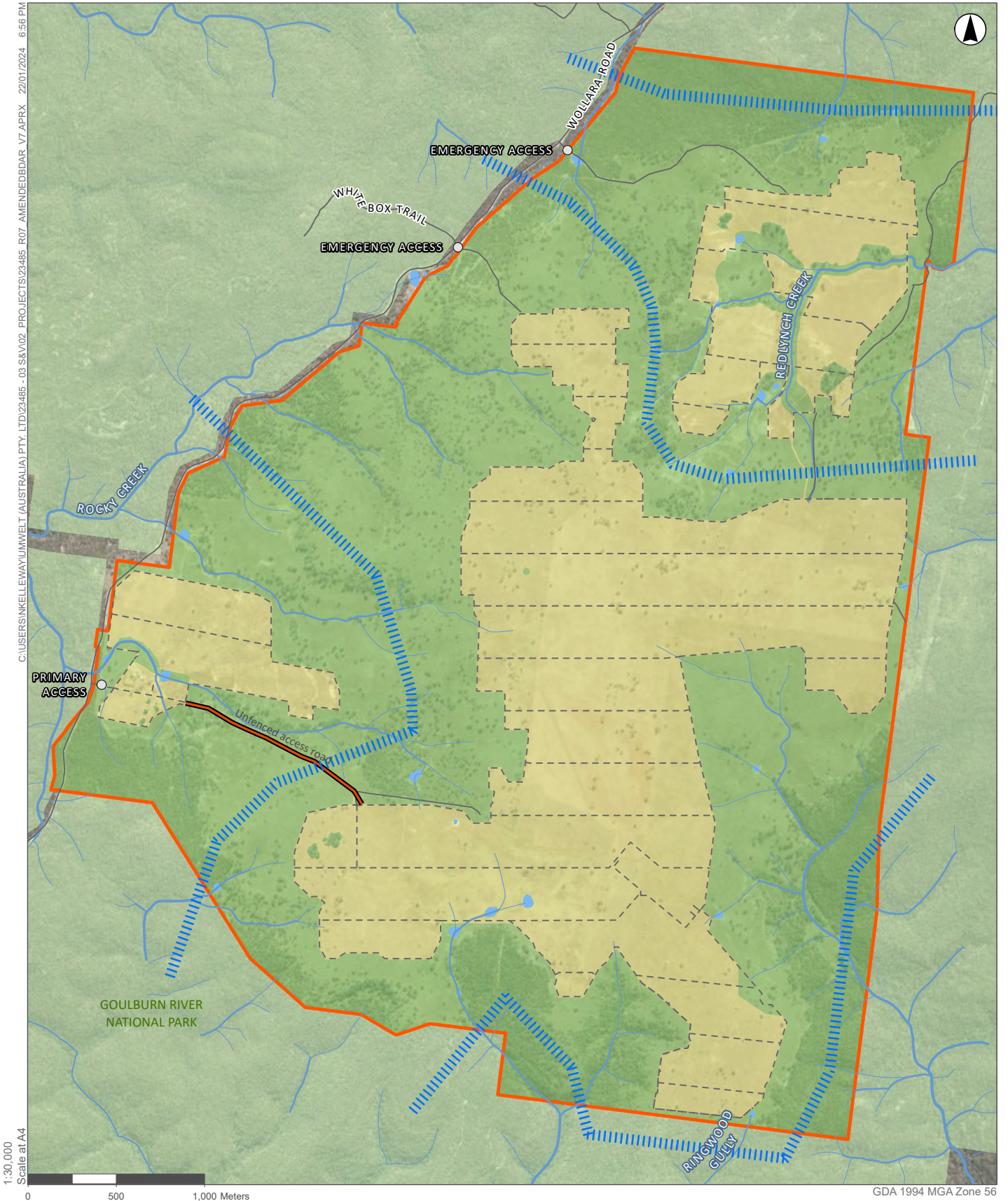
1:1,000,000
Scale at A4

GDA 1994 MGA Zone 56

- Legend**
- Local Government Boundary
 - Project Area
 - Estuary
 - Freshwater
 - Ramsar Wetlands
 - Strahler Stream Order**
 - 2
 - 3
 - 4
 - > 5

FIGURE 3.1

Rivers, Streams, Estuaries and Wetlands Downstream of the Subject Land



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Unfenced Vehicle Access Track
 - |||| Retained Connectivity Pathway
 - ▭ Project Area
 - ▭ Development Footprint
 - ▭ NSW National Parks
 - ▭ Retained Habitat Areas
 - ▭ Waterbodies

FIGURE 3.2
Habitat Connectivity

4.0 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

4.1 Native Vegetation Extent

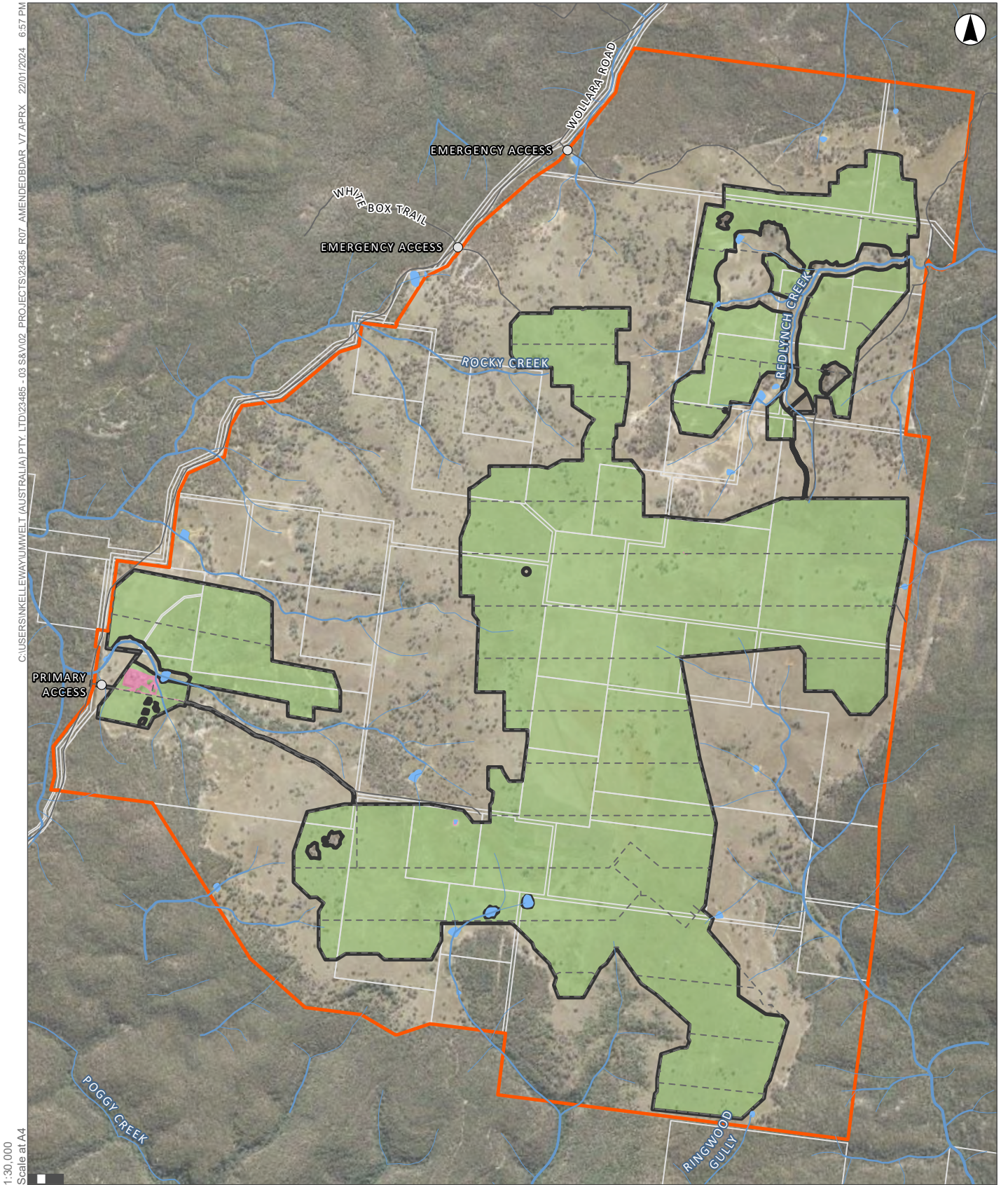
The parts of the Development Footprint assessed as native vegetation for the purposes of the vegetation integrity surveys are shown in **Figure 4.1**.

4.1.1 Changes to the Mapped Native Vegetation Extent

No notable changes were observed during surveys to the mapped native vegetation extent visible on the aerial imagery utilised for this assessment. **Appendix B** shows the native vegetation extent of the subject land at a scale of 1:10,000.

4.1.2 Areas That Are Not Native Vegetation

There are minor areas assessed as not native vegetation, these are situated around the existing dwelling where exotic vegetation has been established and in areas that are totally cleared including several small existing dams.



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03_S&V02_PROJECTS\23485_R07_AMENDED\BAR_V7_APRX_22/01/2024_6:57 PM

1:30,000
 Scale at A4

0 100 200 Meters

GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area
- Native Vegetation**
- ▭ Native Vegetation Extent (Total Area = 4570.6 ha)
 - ▭ Non-Native Vegetation Extent (Total Area = 18.7 ha)

FIGURE 4.1

Development Footprint Native Vegetation Extents

4.2 Plant Community Types

4.2.1 Overview of PCTs Present

The PCTs identified in this assessment are based on the PCTs available prior to the release of the revised PCTs for eastern NSW and associated update to the BAM-C which occurred in February 2023. In-progress BAM-C assessments and projects with substantially progressed surveys are able to undertake this approach, in accordance with the transitional arrangements.

Vegetation within the Development Footprint has been assessed as aligning with the BioNet Vegetation Classification PCTs identified within **Table 4.1** and their extent is shown in **Figure 4.2A**. Detailed descriptions of each PCT are provided in **Section 4.2.2**. A draft map of the PCTs identified as part of the proposed Biodiversity Stewardship Site is also provided as **Figure 4.2B**, which demonstrates avoidance of areas of higher quality areas of native vegetation within the Project Area.

Table 4.1 Plant Community Types Identified within the Development Footprint

PCT ID	PCT name	Vegetation Class	Vegetation Formation	NSW VIS Percentage Cleared Estimate	Development Footprint Vegetation Condition Zone	Plots Completed	Condition Zone Area (ha)	Total PCT Area (ha)
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	90%	Scattered Trees	5	22.49	693.86
					Moderate Condition Derived Native Grassland	18	165.36	
					Moderate to Low Condition Derived Native Grassland	19	310.03	
					Low Condition Derived Native Grassland	10	195.98	
1661	Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	50%	Scattered Trees	4	2.66	95.29
					Moderate to Low Condition Derived Native Grassland	11	37.65	
					Low Condition Derived Native Grassland	5	54.98	
N/A	Waterbodies / Dams	N/A	N/A	N/A	N/A	N/A	0.14	0.14
N/A	Cleared Land / Exotic Vegetation	N/A	N/A	N/A	N/A	N/A	2.92	2.92

C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY.LTD\23485 - 03.S&V02 PROJECTS\23485 R07 AMENDEDBOAR V7.APRX 22/01/2024 6:55 PM
 1:30,000
 Scale at A4

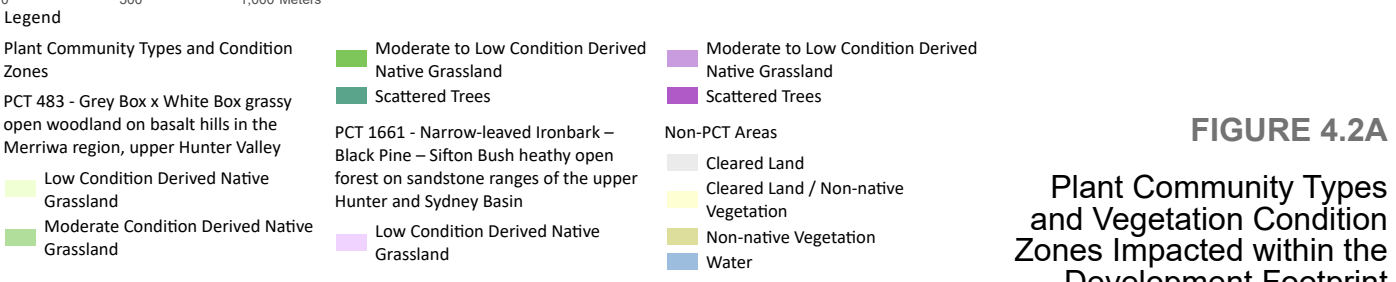
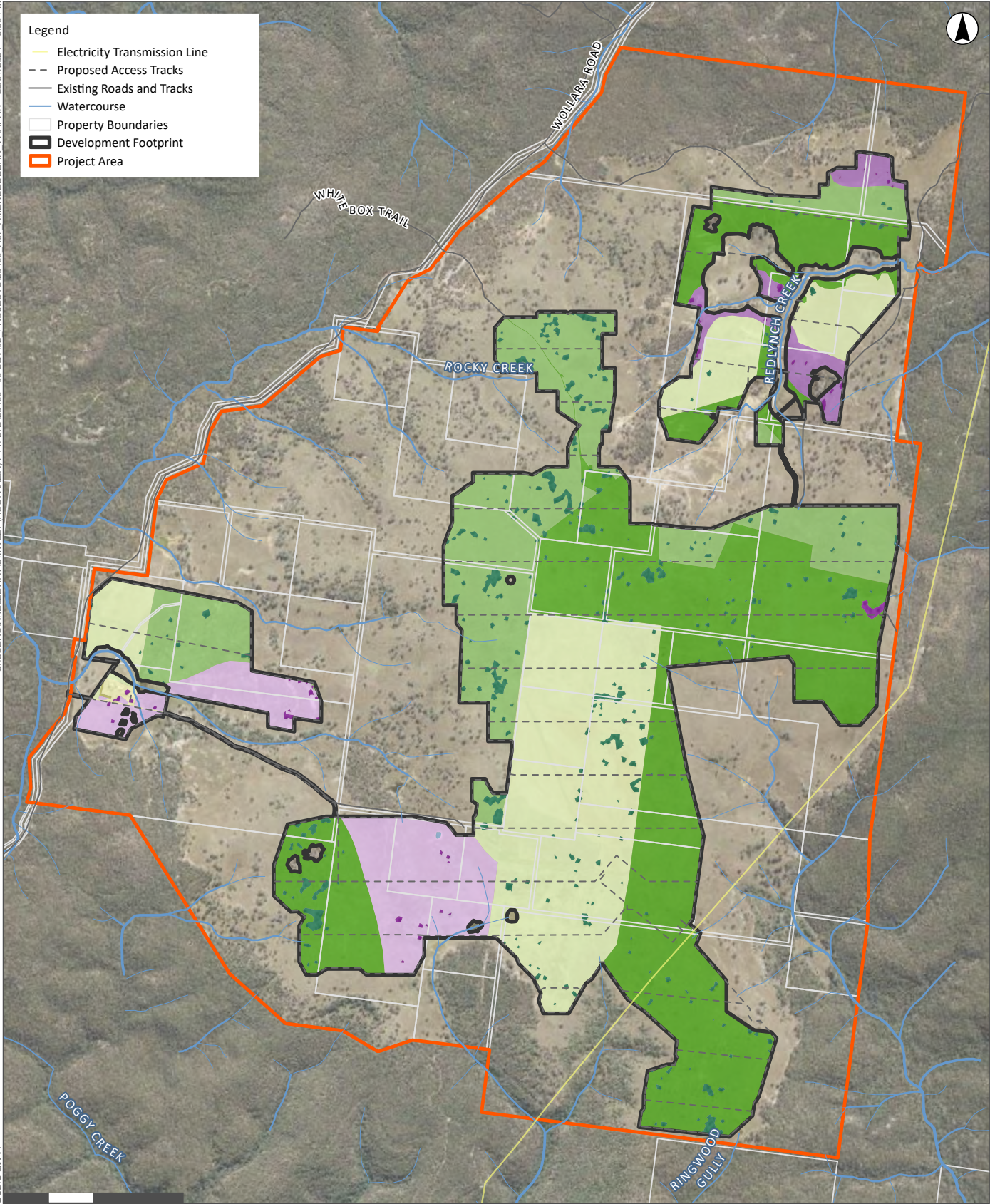
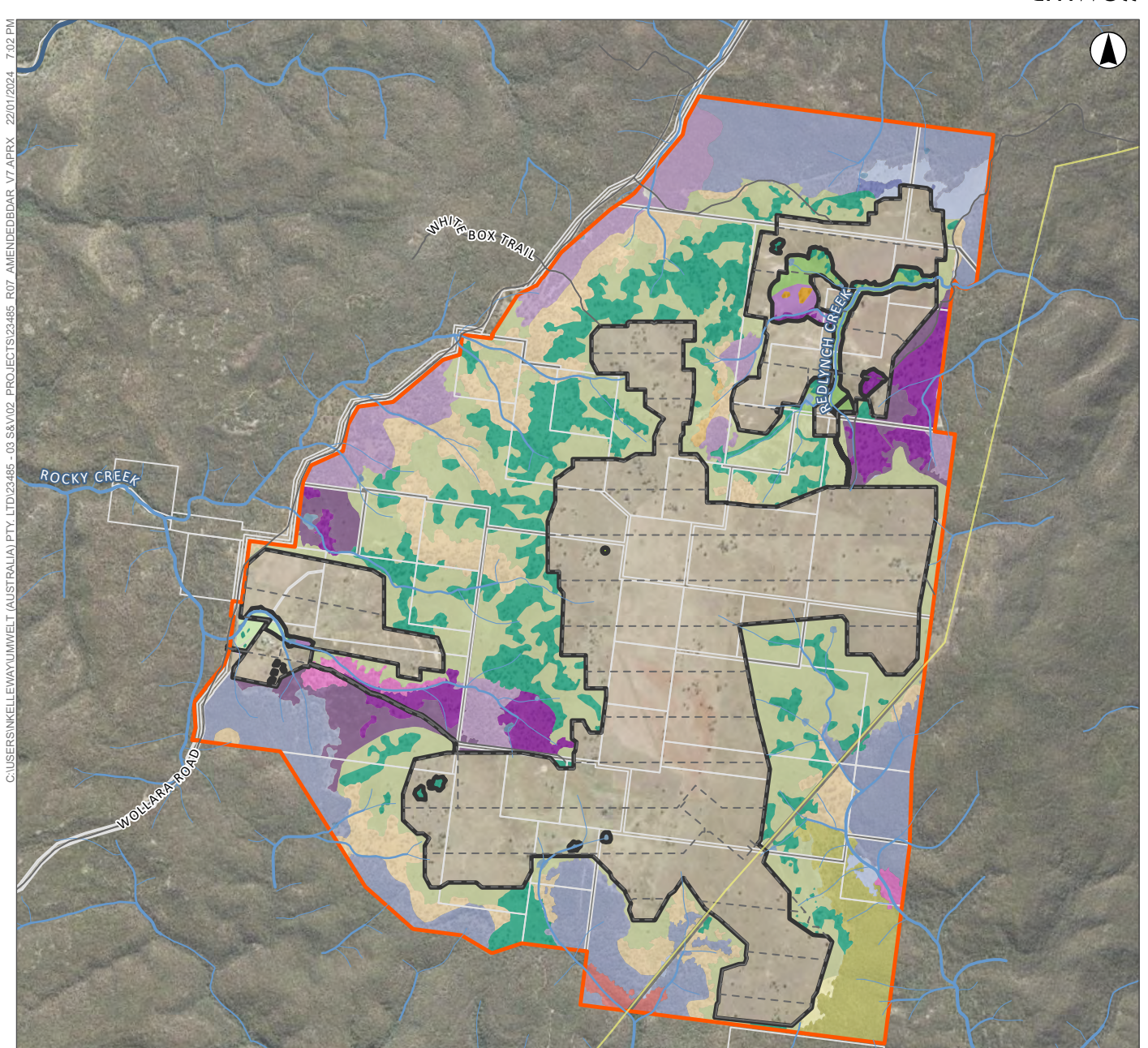


FIGURE 4.2A

Plant Community Types and Vegetation Condition Zones Impacted within the Development Footprint

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)

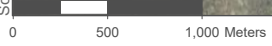
C:\USERS\KELLEWAY\Umwelt (AUSTRALIA)\PTY.LTD\23485 - 03 S&V02 PROJECTS\23485 R07 AMENDEB0AR V7 APRX - 22/01/2024 7:02 PM



Plant Community Types and Condition Zones

<p>PCT 1607 Blakely's Red Gum - Narrow-leaved ironbark - Rough-barked Apple shrubby woodland of the upper Hunter</p> <ul style="list-style-type: none"> Moderate Condition 	<p>PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, Upper Hunter Valley</p> <ul style="list-style-type: none"> Derived Native Grassland Low Condition Derived Native Grassland Moderate Condition Moderate Condition Derived Native Grassland Moderate to Low Condition Derived Native Grassland Scattered Trees 	<p>PCT 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter</p> <ul style="list-style-type: none"> Derived Native Grassland Moderate Condition 	<ul style="list-style-type: none"> Moderate Condition Scattered Trees
<p>PCT 1661 Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the Upper Hunter and Sydney Basin</p> <ul style="list-style-type: none"> Low Condition Derived native Grassland Moderate Condition Moderate to Low Condition Derived Native Grassland Scattered Trees Derived Native Grassland 	<p>PCT 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin</p> <ul style="list-style-type: none"> Moderate Condition Scattered Trees 	<p>Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin</p> <ul style="list-style-type: none"> Derived Native Grassland 	<p>PCT 616 Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion</p> <ul style="list-style-type: none"> Moderate Condition
<p>Non - PCT Areas</p> <ul style="list-style-type: none"> Cleared land Water Easements 			

1:40,000
Scale at A4



GDA 1994 MGA Zone 56

- Legend**
- Electricity Transmission Line
 - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Property Boundaries
 - Development Footprint
 - Project Area

FIGURE 4.2B
Draft Plant Community Types and Vegetation Condition Zones Retained within the Project Area

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)

4.2.2 Description of PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

4.2.2.1 PCT Description

PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley is the dominant PCT across the Development Footprint, its characteristics are summarised in **Table 4.2**. DPE (2023a) have identified this PCT occurs as a mid-high to tall open woodland or woodland dominated by a White Box (*Eucalyptus albens*) x Grey Box (*Eucalyptus moluccana*) intergrade on brown to black earth, chocolate loam to clay soils derived from basalt on the Merriwa Plain and lower southern slopes of the Liverpool Range. This PCT is associated with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the BC Act and the EPBC Act.

Table 4.2 Overview of PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley Characteristics

PCT ID	483
PCT name	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodland
Percent cleared value (%)	90%
Condition States and Extent within Development Footprint (ha)	Condition Zone 1 – Scattered Trees: 22.49 ha Condition Zone 2 – Moderate Condition Derived Native Grassland: 165.36 ha Condition Zone 3 – Moderate to Low Condition Derived Native Grassland: 310.03 ha Condition Zone 4 – Low Condition Derived Native Grassland: 195.98 ha Total Area: 693.86 ha
Location	The Development Footprint is centred on a fertile Basalt Cap. This PCT is associated with the Basalt Cap and the adjoining side slopes and flats. Within the Development Footprint it is replaced by PCT 1661 in areas of higher sandstone influence.
Floristic Description – Canopy Stratum	Where a canopy stratum is present the dominant tree species are <i>Eucalyptus moluccana</i> , <i>Eucalyptus albens</i> and the hybrid <i>Eucalyptus albens</i> x <i>moluccana</i> , which is referred to by some authors as <i>Eucalyptus albemol</i> (McRae and Cooper 1985).
Floristic Description – Mid Stratum	The mid stratum is typically absent due to historical clearing and ongoing pasture improvement and cattle grazing.
Floristic Description – Ground Stratum	The understorey is dominated by grasses including <i>Sporobolus creber</i> , <i>Bothriochloa macra</i> , <i>Austrostipa bigeniculata</i> , <i>Austrostipa scabra</i> , <i>Digitaria brownii</i> , <i>Aristida ramosa</i> , <i>Chloris truncata</i> , <i>Cynodon dactylon</i> with forbs such as <i>Dichondra repens</i> , <i>Calotis lappulacea</i> and <i>Glycine tabacina</i> .

4.2.2.2 Condition States and Alignment with BC Act and EPBC Act Listed TECs

This PCT has been mapped as occurring within the following four condition states within the Development Footprint.

i. Condition Zone 1 – Scattered Trees

This condition state represents the areas of the Development Footprint which contain a canopy of scattered eucalypts over an understorey composed of derived native grassland.

This condition zone corresponds to the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the BC Act and the EPBC Act, where surrounded by areas of PCT 483 Condition Zone 2 Moderate Condition Derived Native Grassland and Condition Zone 3 Moderate to Low Condition Derived Native Grassland. This is due to the floristic assessment of these areas as forming patches of >0.1 ha with a predominantly native understorey with 12 or more understorey species present (excluding grasses), including at least one listed important species.

Areas of this condition zone surrounded by areas of Condition Zone 4 Low Condition Derived Native Grassland, correspond to the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the BC Act, but do not correspond to the EPBC listed variant of the CEEC due to these areas containing a predominantly exotic understorey. A photograph of this condition zone is provided as **Photo 4.1**.



Photo 4.1 PCT 483 Condition Zone 1 – Scattered Trees

ii. Condition Zone 2 – PCT 483 Moderate Condition Derived Native Grassland

This condition state represents the best condition derived native grassland areas of this PCT within the Development Footprint. Section 3.3.2 of the BAM Stage 1 Manual (NSW DPE 2022a) identifies that separate vegetation zones are required for parts of the subject land where the vegetation has a current VI Score of <15 for a PCT representative of a CEEC. This approach has been applied for stratifying the areas of derived native grassland for PCT 483 and this condition zone represents the parts of the Development Footprint where the VI score is >15.

These areas typically contain grazing native vegetation and modified pastures with no tree stratum and low shrub cover. This condition zone is characterised by a very low cover of high threat exotics and litter cover was typically present in higher levels than lower quality condition zones.

This condition zone corresponds to the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the BC Act, and EPBC Act. There is no condition threshold for this CEEC under the BC Act. The condition thresholds for this CEEC under the EPBC Act are met, as this condition zone contains a predominantly native understorey, occurs in patch sizes of > 0.1 ha and more than 12 native understorey species (including one listed important species) are present. A photograph of this condition zone is provided as **Photo 4.2**.



Photo 4.2 PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland

iii. Condition Zone 3 – Moderate to Low Condition Derived Native Grassland

This condition state represents an intermediate condition zone of PCT 483, between areas of moderate and low condition composed of derived native grassland. Section 3.3.2 of the BAM Stage 1 Manual (NSW DPE 2022a) identifies that separate vegetation zones are required for parts of the subject land where the vegetation has a current VI Score of <15 for a PCT representative of a critically endangered ecological community. This approach has been applied for stratifying the areas of derived native grassland for PCT 483 and this condition zone represents the highest of two condition zones for PCT 483 where the VI score is <15.

These areas contained modified pastures with no trees and low shrub species richness and cover. Native grasses and forbs occur with a mixture of exotic flora species and with low cover and species richness of native ferns and other native plants. These areas have been degraded by agricultural use and the invasion of exotic species. This condition zone typically has poor overall function attributes, with some level of native vegetation resilience still present.

This condition zone also corresponds to the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the BC Act, and EPBC Act. There is no condition threshold for this CEEC under the BC Act. The condition threshold under the EPBC Act for this CEEC is met, as the understorey is predominantly native, all patches are > 0.1 ha in size and more than 12 native understorey species (including one listed important species) are present. A photograph of this condition zone is provided as **Photo 4.3**.



Photo 4.3 PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland

iv. Condition Zone 4 – PCT 483 Low Condition Derived Native Grassland

This condition state represents the lowest derived native grassland condition state of PCT 483 and is composed of areas of highly degraded agricultural land, which has been cropped or subject to high levels of pasture improvement and now contain a high cover of exotic flora species. There are no native trees, and the understorey typically has a low cover of native species. Section 3.3.2 of the BAM Stage 1 Manual (NSW DPE 2022a) identifies that separate vegetation zones are required for parts of the subject land where the vegetation has a current VI Score of <15 for a PCT representative of a CEEC. This approach has been applied for stratifying the areas of derived native grassland for PCT 483 and this condition zone represents the lowest of two condition zones for PCT 483 where the VI score is <15.

This condition zone contains highly disturbed and typically exotic dominated grassland vegetation, characteristic of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. Mostly only low levels of native groundcover species are still present. It is the intent of the NSW Threatened Species Scientific Committee that all occurrences of the ecological community independent of their condition be covered by the listing under the BC Act and therefore these areas are considered a highly disturbed example of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC which has no realistic potential for recovery.

The condition threshold under the EPBC Act for this CEEC is however not met, as the patches of this condition zone do not have a predominantly native understorey, as determined by floristic plot surveys. A photograph of this condition zone is provided as **Photo 4.4**.



Photo 4.4 PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland

4.2.2.3 Justification for PCT Selection

The NSW BioNet Vegetation Classification identifies that this PCT is characterised as a-high to tall open woodland or woodland dominated by a Grey Box (*Eucalyptus moluccana*) x White Box (*Eucalyptus albens*) intergrade forming a *Eucalyptus albens* x *moluccana* intermediate taxon. The trees tend to be closer to Grey Box than White Box over most of this region. Few other tree species occur with Rough-barked Apple (*Angophora floribunda*) and Yellow Box (*Eucalyptus melliodora*) occurring on footslopes and valley flats. Shrubs are absent or very sparse and include *Sclerolaena muricata*, *Sida trichopoda* and *Pimelea curviflora*. The ground cover is dense after rain but mid-dense to sparse in dry times. Grass species include *Austrostipa bigeniculata*, *Bothriochloa macra*, *Austrostipa aristiglumis*, *Anthosachne scabra*, *Cynodon dactylon* and *Panicum queenslandicum* var. *queenslandicum*. The sedge *Cyperus gracilis* may be present. Forb species include *Boerhavia dominii*, *Oxalis perennans*, *Chamaesyce drummondii*, *Hibiscus trionum*, *Einadia nutans* subsp. *nutans*, *Asperula conferta*, *Rumex brownii*, *Mentha diemenica*, *Geranium solanderi* var. *solanderi* and *Calotis lappulacea*.

This PCT is described in the BioNet Vegetation Classification as occurring on brown to black earth, chocolate loam to clay soils derived from basalt on hillslopes, hillcrests, footslopes and valley flats on rolling hills and low hills on the Merriwa Plain and lower southern slopes of the Liverpool Range in the upper Hunter Valley in the far south-eastern corner of the Brigalow Belt South Bioregion.

The allocation and mapping of this PCT and condition zones was based on the presence of a grassy understorey with a scattered tree canopy dominated by *Eucalyptus moluccana*, *Eucalyptus albens* and the associated intermediate form between the two species. Other flora species identified in the BioNet Vegetation Classification for this PCT which are present include *Pimelea curviflora*, *Austrostipa bigeniculata*, *Bothriochloa macra*, *Boerhavia dominii*, *Oxalis perennans*, *Anthosachne scabra*, *Cynodon dactylon*, *Chamaesyce drummondii*, *Einadia nutans*, *Austrostipa aristiglumis*, *Asperula conferta*, *Rumex brownii*, *Cyperus gracilis*, *Geranium solanderi*, *Calotis lappulacea* and *Chloris truncata*.

The following other PCTs were considered, but excluded from occurring from areas mapped as this PCT:

- PCT 618 White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley: This PCT was considered but excluded due to lack of diversity in the canopy, particularly the absence of *Eucalyptus blakelyi*, *Angophora floribunda*, *Eucalyptus tereticornis*, *Eucalyptus melliodora* and *Eucalyptus eugenioides*.
- PCT 1304 White Box - Narrow-leaved Ironbark grassy woodland of the Capertee Valley, Sydney Basin Bioregion: This PCT was considered but excluded due to the mismatch of several canopy species and the landscape position of basal Permian sediments of the Capertee Valley Floor.
- PCT 1606 White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter: is described as a forest or woodland with a canopy of *Eucalyptus albens* and *Eucalyptus crebra*. Both of these species are present within this PCT, however PCT 1606 does not include *Eucalyptus moluccana* or *Eucalyptus albemol* which occur within the Development Footprint.
- PCT 1609 White Box - White Cypress Pine - Native Olive woodland of upper Hunter and northern Wollemi: This PCT was considered and excluded due to mismatch in canopy floristics (*Callitris glaucophylla* absent) and understorey which is not strongly dominated by grasses.

- PCT 1610 White Box - Black Cypress Pine shrubby woodland of the Western Slopes: This PCT was considered and excluded due to mismatch in canopy floristics (*Callitris endlicheri* not present) and landscape position of lower slopes and flats of the Central Western Slopes.
- PCT 1691 Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter: This PCT was considered, it has a canopy of *Eucalyptus crebra* and *Brachychiton populneus* occurring with *Eucalyptus moluccana*, however *Eucalyptus albens* and *Eucalyptus albemol* are not identified as characteristic species. PCT 1691 is also described as occurring on coal bearing sedimentary geologies which are not present.

4.2.3 Description of PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin

4.2.3.1 PCT Description

PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin is described in the BioNet Vegetation Classification (NSW DPE 2023c) as an Ironbark Open Forest with a moderately dense to sparse mid-stratum and a grass/forb ground stratum. It generally occurs on sandstone hills in the Cassilis; Merriwa; Scone area and is found in the Goulburn River NP; Durrigere SCA and in the hills west of Scone on elevation ranges from about 250 to 500 m. This PCT is not associated with any threatened ecological communities.

Within the Development Footprint this PCT replaces PCT 483 Grey Box x White Box grassy open woodland in areas of higher sandstone influence. The characteristics of PCT 1661 are summarised in **Table 4.3**.

Table 4.3 Overview of PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin Characteristics

PCT ID	1661
PCT name	Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forest
Percent cleared value (%)	50
Condition States and Extent within Development Footprint (ha)	Condition Zone 1 – Scattered Trees: 2.66 ha Condition Zone 2 – Moderate to Low Condition Derived Native Grassland: 37.65 ha Condition Zone 3 – Low Condition Derived Native Grassland: 54.98 ha Total Area: 95.29 ha
Location	This PCT occurs in areas of sandstone influence, particularly around the edges of the Development Footprint and in lower elevation parts which have not been subject to nutrient enrichment associated with Basalt derived soils and geology.
Floristic Description – Canopy Stratum	Where a canopy stratum is present the dominant tree species are <i>Eucalyptus crebra</i> and <i>Allocasuarina luehmannii</i> with an absence of other eucalypts.
Floristic Description – Mid Stratum	The mid stratum is typically absent due to historical clearing and ongoing pasture improvement and cattle grazing.

PCT ID	1661
Floristic Description - Ground Stratum	The understorey is dominated by grasses including <i>Sporobolus creber</i> , <i>Chloris ventricosa</i> , <i>Austrostipa verticillata</i> and <i>Eremophila debilis</i> with varying levels of exotics such as <i>Sida rhombifolia</i> , <i>Gomphocarpus fruticosus</i> and <i>Senecio madagascariensis</i> .

4.2.3.2 Condition states and Alignment with BC Act and EPBC Act Listed TECs

v. Condition Zone 1 – Scattered Trees

This condition zone represents the areas of the Development Footprint which contain a canopy of scattered eucalypts over an understorey composed of derived native grassland.

This PCT and condition zone do not correspond to any threatened ecological communities listed under the BC Act or the EPBC Act. A photograph of this condition zone is provided as **Photo 4.5**.



Photo 4.5 PCT 1661 Condition Zone 1 – Scattered Trees

vi. Condition Zone 2 – PCT 1661 Moderate to Low Condition Derived Native Grassland

This condition state represents the best quality areas of derived native grassland for this PCT, however are still in an overall low condition with a vegetation integrity score of <15.

These areas contained grazed native vegetation / modified pastures with no trees and low shrub species richness and cover. Native grasses and forbs occur with a mixture of exotic flora species and with low cover and species richness of native ferns other native plants. These areas have been degraded to some extent by agricultural use and invasion of exotic species.

This PCT and condition zone do not correspond to any threatened ecological communities listed under the BC Act or the EPBC Act. A photograph of this condition zone is provided as **Photo 4.6**.



Photo 4.6 PCT 1661 Condition Zone 1 – Moderate to Low Derived Native Grassland

vii. Condition Zone 3 – PCT 1661 Low Condition Derived Native Grassland

This condition state represents the lowest derived native grassland condition state of PCT 1661 and is composed of areas of highly degraded agricultural land, which has been subject to high levels of pasture improvement and now contain a high cover of exotic flora species. There are no native trees and the understorey typically has a low cover of native species. This condition state represents the lowest condition zone of PCT 1661 composed of derived native grassland, with a very low vegetation integrity score.

This PCT and condition zone do not correspond to any threatened ecological communities listed under the BC Act or the EPBC Act. A photograph of this condition zone is provided as **Photo 4.7**.



Photo 4.7 PCT 1661 Condition Zone 1 – Low Condition Derived Native Grassland

4.2.3.3 Justification for PCT Selection

The NSW VIS describes PCT 1661 as an ironbark open forest with a moderately dense to sparse mid-stratum and a grass/forb ground stratum, occurring on sandstone hills.

The site vegetation corresponds with PCT 1661 as it has a canopy dominated by *Eucalyptus crebra*, occurs on similar topography to adjoining undisturbed areas which have *Callitris endlicheri* as a dominant sub-canopy species, occurs in areas with visible sandstone outcropping, associated with Narrabeen Sandstone geology, occurs in the Merriwa area, and is surrounded by the Goulburn River National Park and matches the elevation range for the PCT of 250 to 500 m.

The lineage for this PCT shows that it is replaced by two PCTs, including PCT 3768 Upper Hunter Ranges Enriched Ironbark Forest which corresponds floristically with the areas of PCT 1661 present and is mapped on the State Vegetation Type Map in areas adjoining the Development Footprint.

The following other PCTs were considered, but excluded from occurring from areas mapped as this PCT:

- PCT 1654 Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley: Considered and excluded due to mismatch in canopy floristics, specifically the lack of *Eucalyptus punctata* and *Angophora floribunda* within the Development Footprint and adjoining areas.
- PCT 1672 Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin: Considered and excluded due to floristic mismatch, including the lack of *Eucalyptus fibrosa* and *Eucalyptus punctata* within the Development Footprint.
- PCT 1674 Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin: Considered and excluded due to lack of *Eucalyptus fibrosa* and *Corymbia trachyphloia*.

4.2.4 Other PCTs Surveyed within the Project Area

The following PCTs were surveyed as part of a previous iteration of the Development Footprint which was larger and was subsequently reduced. The areas these PCTs are in will now be retained as a part of the impact avoidance measures implemented for the Project:

- PCT 1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter: This PCT occurs in the south-western section of the Project Area along an ephemeral drainage line. The tree stratum is intact and dominated by *Angophora floribunda* and *Eucalyptus crebra* with *Allocasuarina luehmannii* as a sub-dominant. The shrub stratum is sparse where present and dominated by *Notelaea microcarpa* and *Ozothamnus diosmifolius*, and the understorey consists of grazed land dominated by *Microlaena stipoides* with a variety of other herbs and forbs. It does not correspond to any BC Act or EPBC Act listed TECs.
- PCT 1655 Grey Box – Slaty Box shrub – grass woodland in sandstone slopes of the upper Hunter and Sydney Basin: The surveyed areas of this PCT consist of a patch of remnant *Eucalyptus dawsonii* trees, the shrub stratum is sparse to absent and the understorey consists of grazed land dominated by grasses including *Austrostipa verticillata*, *Microlaena stipoides* and *Chloris truncata*. This patch will be retained within the northern part of the Development Footprint.

PCT 1655 is associated with the Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion vulnerable ecological community (VEC). There are floristic similarities between this PCT and the Central Hunter Valley Eucalypt Forest and Woodland which is listed as a CEEC under the EPBC Act, however the key diagnostic feature of occurring on lower hillslopes and low ridges or valley floors in undulating country on soil derived from Permian sedimentary rocks is not met, as this PCT occurs on the Wollar Road Soil Landscape, which is characterised by ironstone-rich Triassic sandstone of the Narrabeen Group adjacent to basalt (NSW DPIE 2022d).

4.2.5 Cleared Land and Waterbodies

The Development Footprint contains approximately 2.75 ha mapped as cleared land which is mostly composed of vehicle tracks and structures, 0.17 ha mapped as exotic vegetation around the existing dwelling and 0.14 ha mapped as waterbodies associated with farm dams.

4.3 Threatened Ecological Communities

One MNES TEC, the critically endangered White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland, occurs within the Development Footprint. This CEEC corresponds to areas mapped as PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley. The BC Act listing of this CEEC includes all mapped condition zones, as the final determination identifies that it is the intent of the NSW Threatened Species Scientific Committee that all occurrences of the ecological community independent of their condition be covered by the listing under the BC Act.

The EPBC Act listing for this CEEC includes the following condition zones:

- PCT 483 Condition Zone 1 – Scattered Trees (excluding those areas which are surrounded by low condition derived native grassland vegetation zone and contain a predominantly exotic understorey).
- PCT 483 Condition Zone 2 – Moderate condition derived native grassland.
- PCT 483 Condition Zone 3 – Moderate to low condition derived native grassland.

The condition threshold for the EPBC Act for this CEEC is not met for the vegetation condition zone, PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland. This is due to these patches not having a predominantly native understorey, as determined by the floristic plot surveys completed.

Threatened ecological community associations for the PCTs observed are discussed in **Section 4.2** of this report. The details of the threatened ecological communities identified within the Development Footprint are also listed in **Table 4.4** and the extent of the TEC is mapped in **Figure 4.3A** for the Development Footprint and **Figure 4.3B** for the retained parts of the Project Area.

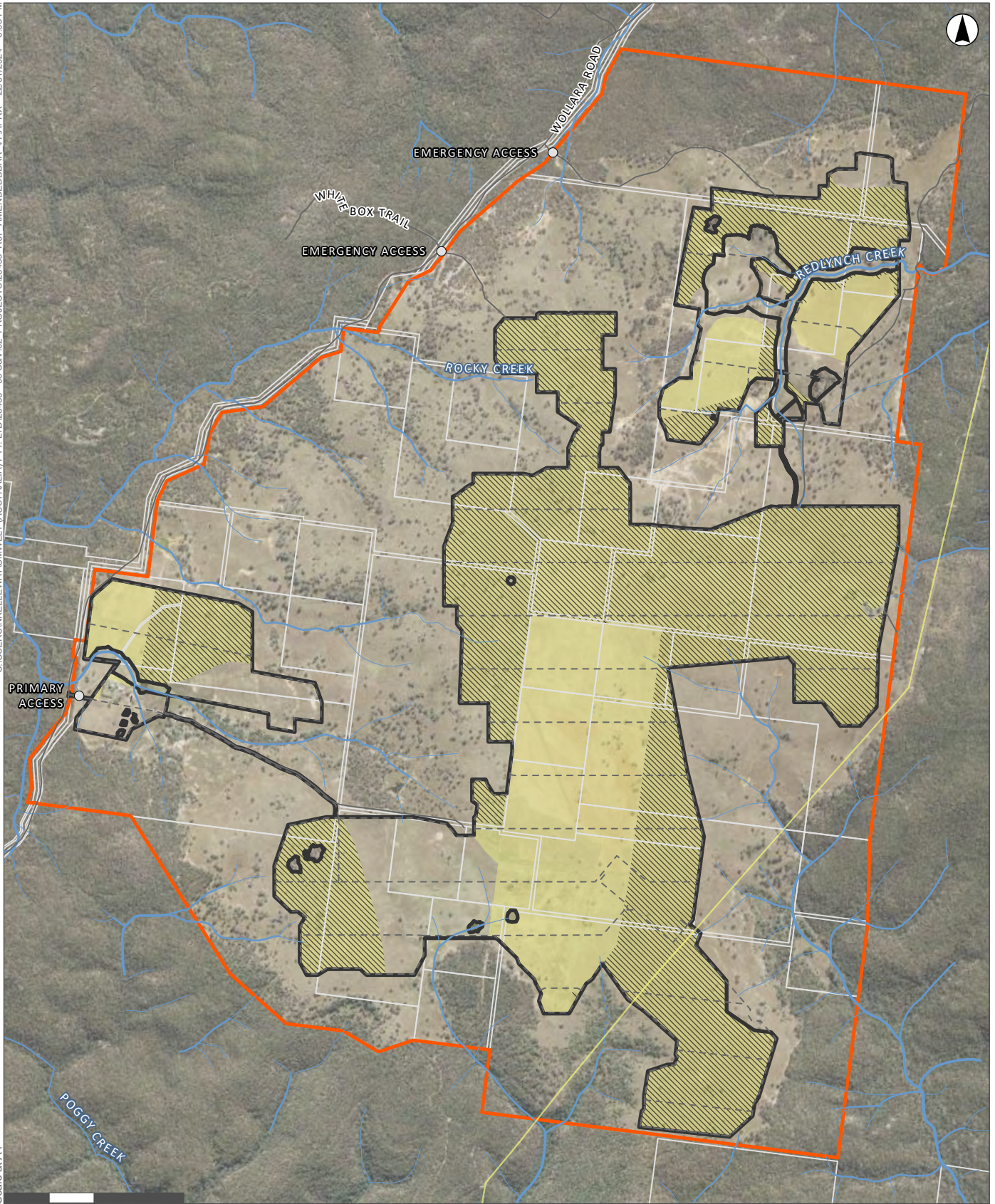
Table 4.4 TECs within the Development Footprint

TEC Name	Profile ID (from TBDC)	Act and Listing Status	Associated PCTs and vegetation condition zones within the Development Footprint	Area within Development Footprint (ha)
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	10837	Critically Endangered Ecological Community Listed under the BC Act	PCT 483 Condition Zone 1 – Scattered Trees (22.49 ha) PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland (165.36 ha) PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland (310.03 ha) PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland (195.98 ha)	693.86 ha
White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands	20392	Critically Endangered Ecological Community Listed under the EPBC Act	PCT 483 Condition Zone 1 – Scattered Trees (excluding areas surrounded by PCT 483 Condition Zone 4) (18.43 ha) PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland (165.36 ha) PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland (310.03 ha)	493.82 ha



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03 S&V02 PROJECTS\23485 R07 AMENDEDBAR V7 APRX 22/01/2024 6:55 PM

1:30,000
Scale at A4

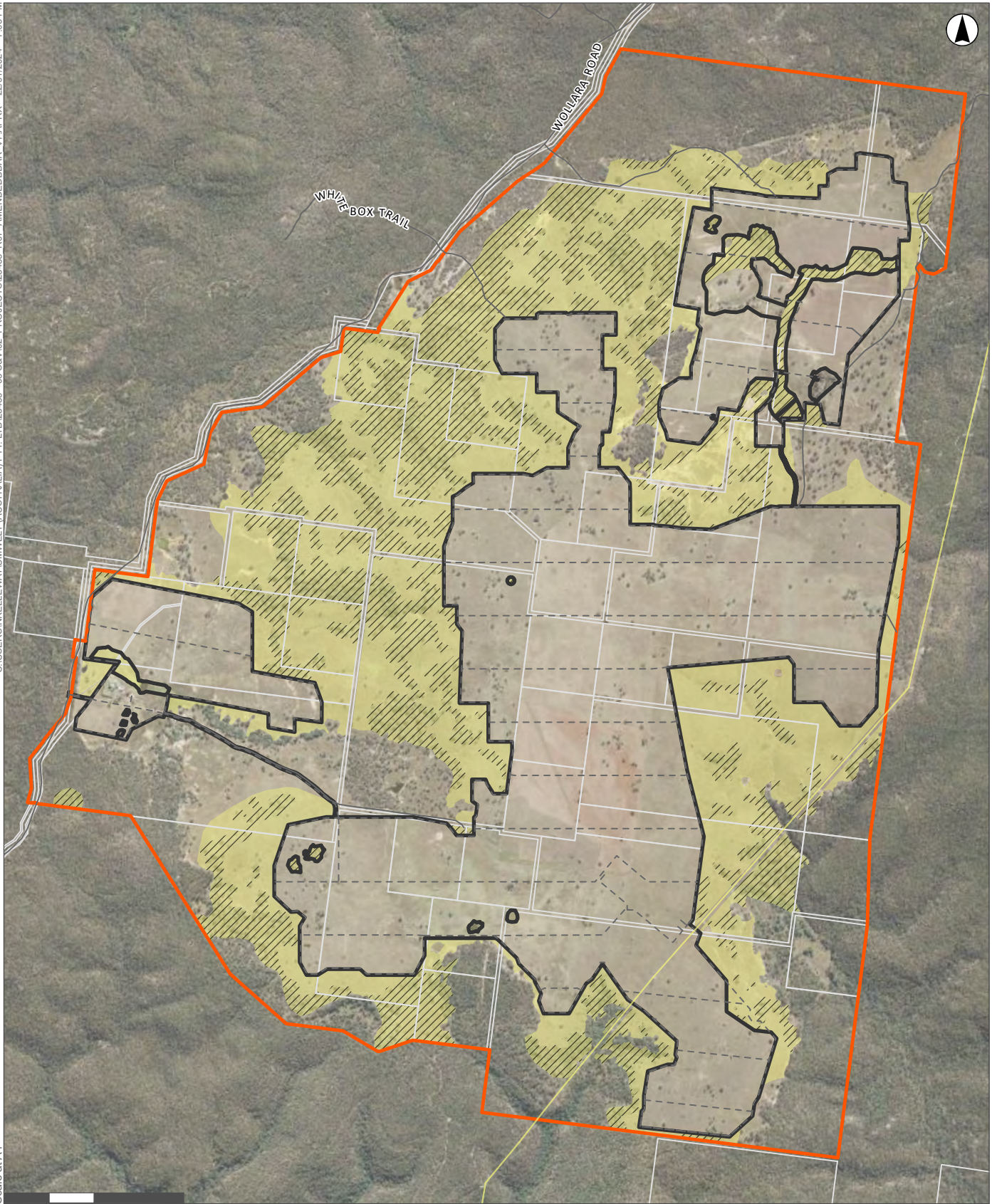


- Legend**
- Access Points
 - - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Electricity Transmission Line
 - Property Boundaries
 - ▬ Development Footprint
 - ▭ Project Area

- Threatened Ecological Communities Impacted within the Development Footprint**
- ▨ White Box - Yellow Box - Blakely's Red Gum
Grassy Woodland and Derived Native
Grassland VEC - EPBC Act
 - ▨ White Box - Yellow Box - Blakely's Red Gum
Grassy Woodland and Derived Native
Grassland CEEC - BC Act

FIGURE 4.3A

Threatened Ecological Communities within the Development Footprint



- Legend**
- Electricity Transmission Line
 - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - Development Footprint
 - Project Area

Threatened Ecological Communities Retained within the Project Area

- White Box - Yellow Box - Blakely's Red Gum
Grassy Woodland and Derived Native Grassland VEC - EPBC Act
- White Box - Yellow Box - Blakely's Red Gum
Grassy Woodland and Derived Native Grassland CEEC - BC Act

FIGURE 4.3B

Threatened Ecological Communities Retained within the Project Area

4.4 Vegetation Zones

A description of each vegetation Condition Zone within the Development Footprint is provided in **Section 4.2** of this report. A map of the vegetation condition zones is provided in **Figure 4.2A** and the details of each Condition Zone including area, patch size class and the BAM survey plots required and completed are provided in **Table 4.5**.

Table 4.5 Vegetation Condition Zones and Patch Sizes

Vegetation Condition Zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	Plot IDs of vegetation integrity plots used in assessment
PCT 483 - 1	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Scattered Trees	22.49	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	4	5	P18, P20, P21, P22, P45
PCT 483 - 2	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate condition derived native grassland	165.36	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	6	18	P6, P8, P44, P51, P52, P61, P62, P63, P64, P65, P66, P67, P68, P69, P79, P80, P81, P82
PCT 483 - 3	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate to low condition derived native grassland	310.03	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	7	19	P7, P9, P10, P11, P16, P17, P34, P36, P37, P41, P53, P55, P56, P57, P58, P70, P73, P74, P75
PCT 483 - 4	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Low condition derived native grassland	195.98	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	6	10	P15, P38, P39, P40, P42, P46, P54, P83, P84, P85
PCT 1661 - 1	1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Scattered Trees	2.66	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	3	4	P2, P23, P26, P43

Vegetation Condition Zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	Plot IDs of vegetation integrity plots used in assessment
PCT 1661 - 2	1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Moderate to low condition derived native grassland	37.65	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	4	11	P1, P4, P5, P27, P30, P50, P59, P60, P76, P77, P78
PCT 1661 - 3	1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Low condition derived native grassland	54.98	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	5	5	P3, P28, P29, P71, P72

4.5 Vegetation Integrity (Vegetation Condition)

4.5.1 Vegetation Integrity Survey Plots

Details on the number of BAM plots (floristic and vegetation integrity survey plots) required and completed for each vegetation condition zone, in accordance with Table 3 of the BAM, are provided in **Table 4.6**. The vegetation integrity plot survey locations are shown in **Figure 2.1**. A summary of the BAM VI plot data is contained in **Appendix C** and a digital copy of the data has been forwarded to BCD. The Development Footprint is mostly composed of grazed areas of derived native grassland which are subject to ongoing agricultural management. The floristic and vegetation integrity plots were completed during warmer months and a period which coincided with a significant La Niña weather event between 2021 and early 2023 when plots were likely to deliver elevated condition scores comparative to the current site conditions. A visual comparison of the differing conditions encountered is provided in **Photo 4.8**. BAM plots were completed under conditions represented by the left of the photo.



Photo 4.8 Visual comparison of differing conditions encountered for derived grassland vegetation related to rainfall over the survey period

4.5.2 Scores

The vegetation integrity condition scores for the BAM Plots completed are provided in **Table 4.6**. This table represents the combined scores from all plots completed for each vegetation condition zone, including the vegetation integrity score and the presence of hollow bearing trees.

Table 4.6 Vegetation Integrity Condition Scores

Vegetation Zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
PCT 483 Condition Zone 1 – Scattered Trees	80.2	85.1	69.6	78	Yes
PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland	58.1	67.5	9.3	33.1	No

Vegetation Zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland	61.5	65.5	0.5	12.4	No
PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland	37.5	36	0.7	9.9	No
PCT 1661 Condition Zone 1 – Scattered Trees	59.5	27.6	81	51.1	Yes
PCT 1661 Condition Zone 2 – Moderate to Low Condition Derived Native Grassland	40.6	17.1	3.3	13.2	No
PCT 1661 Condition Zone 3 – Low Condition Derived Native Grassland	32.3	16.1	0.1	3.3	No

4.5.3 Use of Benchmark Data

The V1.1 Benchmarks (<https://www.lmbc.nsw.gov.au/bamcalc/app/assets/version1.1-benchmarks.csv>) were utilised for this assessment in accordance with the current transitional arrangements for BAM-C Cases in progress on 31 January 2023 (case opened 10/05/2022). Screenshots of the benchmark values used are provided in **Appendix G**.

5.0 Habitat Suitability for Threatened Species

5.1 Identification of Threatened Species for Assessment

5.1.1 Ecosystem Credit Species

The ecosystem credit species predicted to occur on or use the Development Footprint are identified in **Table 5.1**. Justification is provided for any species from the BAM-C automatically populated list excluded from assessment. The exclusions applied for this assessment for ecosystem credit species related to situations where identified habitat constraints were obviously absent, such as lack of listed foraging resources (*Casuarina* sp. for Glossy Black-Cockatoo and mistletoe for Painted Honeyeater) in areas of derived native grassland.

Table 5.1 Predicted Ecosystem Credit Species

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within	Sensitivity to gain class
		BC Act	EPBC Act							
Regent Honeyeater (Non-important habitat)	<i>Anthochaera phrygia</i>	CE	CE	Yes	BAM-C	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High
Glossy Black-Cockatoo (Foraging habitat)*	<i>Calyptorhynchus lathami</i>	V	-	Yes	Observed during surveys	Presence of <i>Allocasuarina</i> and <i>Casuarina</i> species	Yes / Partial	No <i>Casuarina</i> or <i>Allocasuarina</i> present within DNG Condition zones	PCT 483 Scattered PCT 1661 Scattered	High
Speckled Warbler	<i>Chthonicola sagittata</i>	V	-	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	High
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	V	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	High
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	High
Black Falcon	<i>Falco subniger</i>	V	-	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-	No	BAM-C	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within	Sensitivity to gain class
		BC Act	EPBC Act							
Painted Honeyeater	<i>Grantiella picta</i>	V	V	No	BAM-C	Mistletoes present at a density of greater than five mistletoes per hectare	Partial	Excluded from PCT 483 DNG condition zones as habitat constraints not met	PCT 483 scattered trees condition zone	Moderate
White-throated Needletail	<i>Hirundapus caudacutus</i>	-	V	No	BAM-C	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High
Square-tailed Kite (Foraging habitat)	<i>Lophoictinia isura</i>	V	-	Yes	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	V	V	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
Turquoise Parrot	<i>Neophema pulchella</i>	V	-	No	BAM-C	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High
Barking Owl (Foraging habitat)	<i>Ninox connivens</i>	V	-	Yes	BAM-C	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within	Sensitivity to gain class
		BC Act	EPBC Act							
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	High
Scarlet Robin	<i>Petroica boodang</i>	V	-	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
Flame Robin	<i>Petroica phoenicea</i>	V	-	No	BAM-C	-	Yes	-	PCT 1661 all condition zones	Moderate
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	-	V	No	Supplementary SEARs	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High
Grey-headed Flying-fox (Non-breeding habitat)	<i>Pteropus poliocephalus</i>	V	V	Yes	Supplementary SEARs	-	Yes	-	PCT 483 all condition zones PCT 1661 all condition zones	High

5.1.2 Species Credit Species

5.1.2.1 Flora Species Credit Entities

The flora species credit species predicted to occur on the Development Footprint are identified in **Table 5.2**. The May 2023 version of the BDAR described targeted surveys for an additional three species, namely:

- Pine Donkey Orchid
- *Ozothamnus tessellatus*
- *Commersonia rosea*.

As detailed in **Section 2.3.2** and **Section 2.3.3** above, these species are considered to have a low likelihood of occurring within the Project Area due to an absence of suitable habitat, including differences between preferred floristic associations and those present within the Development Footprint. They are not associated with any PCTs present within the Development Footprint. Notwithstanding, these species have been targeted and reported on as part of the May 2023 version of the BDAR, and Umwelt considers the survey effort carried out to be adequate to demonstrate their absence.

As detailed within Section 5.2.1 (2) of the BAM, candidate species are determined through a set of criteria, including but not limited to plant community type associations and previous site records, using the data contained in the BioNet Atlas Threatened Species Data Collection (TBDC). Pine Donkey Orchid, *Ozothamnus tessellatus*, and *Commersonia rosea* do not meet the criteria for inclusion as a candidate species under the BAM, therefore, notwithstanding their inclusion in the May 2023 version of the BDAR for completeness and on a precautionary basis, they have not been considered further within this amended BDAR.

Justification is provided for any species from the BAM-C automatically populated list excluded from assessment. The permitted reasons for excluding species credit species are geographic limitations, habitat constraints, degradation or lack of suitable microhabitats.

For threatened flora species in NSW, DPIE (2020b) identify that only the suitable habitat for the target species within the Development Footprint needs to be surveyed. This includes areas in the Development Footprint supporting any listed habitat constraints and PCTs associated with that species in the TBDC. In this context NSW DPIE (2020b) also identify that suitable habitat for threatened flora may encompass entire PCTs or be restricted to niches determined with consideration of habitat constraints, land use history, disturbance events and climatic factors. The TBDC and the Threatened Species Profile website, along with appropriate published or peer-reviewed references and/or data must be used to determine suitable habitat (NSW DPIE 2020b).

The Draft Land Categorisation Mapping for the Development Footprint also identifies large areas of Category 1 - Exempt Land. Areas of PCT 483 correspond to a CEEC and are therefore excluded from consideration as Category 1 - Exempt Land under the BAM, however areas of derived native grassland condition zones for PCT 1661 contain areas which correspond to Category 1 - Exempt Land. Where surveys within PCT 1661 areas which correspond to Category 1 – Exempt Land have been undertaken, these were completed as a precautionary measure and the land categorisation mapping has not been relied upon.

Table 5.2 Candidate Flora Species Credit Species Determination

Common Name	Scientific Name	Listing Status		Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species retained within / associated with
		BC Act	EPBC Act					
<i>Commersonia procumbens</i>	<i>Commersonia procumbens</i>	V	V	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Piliga Sandstone	No	Habitat constraints not met as the Development Footprint is not on Piliga Sandstone.	None.
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment	<i>Cymbidium canaliculatum</i>	E Pop.	Not listed	<input type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey <input checked="" type="checkbox"/> Other / SEARs	Epiphytic in a range of eucalypts, Acacia and Angophora, Fallen/standing dead timber including logs Hunter catchment as defined by Australia's River Basins (Geoscience Australia 1997)	Yes	-	PCT 483 Scattered Trees Condition Zone PCT 1661 Scattered Trees Condition Zone
Bluegrass	<i>Dichanthium setosum</i>	V	V	<input type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey <input checked="" type="checkbox"/> Other / SEARs	None listed	No	Vagrant from the IBRA Subregion and not associated with any of the PCTs present.	None.

Common Name	Scientific Name	Listing Status		Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species retained within / associated with
		BC Act	EPBC Act					
Fairy Bells	<i>Homoranthus darwinioides</i>	V	V	<input type="checkbox"/> BAM-C <input checked="" type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	N/A	Yes		PCT 1661 Scattered Trees and limited areas of PCT 1661 Moderate to Low Condition Derived Native Grassland where shrubs potentially present.
Large-leafed Monotaxis	<i>Monotaxis macrophylla</i>	E	Not listed	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	N/A	No Targeted surveys for suitable habitat were carried out as part of detailed habitat assessment	The Development Footprint is assessed as too disturbed to support this species. This is due to a long history of agricultural land use including clearing, pasture improvement, grazing, exclusion of natural fire regimes through fuel reduction and lack of suitable microhabitats (rocky ridges).	None
Scant Pomaderris	<i>Pomaderris queenslandica</i>	E	Not listed	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	N/A	Yes	-	PCT 1661 Scattered Trees and limited areas of PCT 1661 Moderate to Low Condition Derived Native Grassland where shrubs potentially present.

5.1.2.2 Threatened Fauna Candidate Species

The fauna species credit species predicted to occur on the Development Footprint are identified in **Table 5.3**. The May 2023 version of the BDAR described effort and results of targeted surveys for additional species, namely:

- Large Forest Owls, including Powerful Owl and Masked Owl
- Squirrel Glider
- Gang-gang Cockatoo.

As detailed in **Section 2.3.2** and **Section 2.3.3** above, these species are considered to have a low likelihood of occurring within the Project Area due to an absence of suitable habitat, including differences between preferred floristic associations and those present within the Development Footprint and/or absence of suitable breeding habitat. They are not associated with any PCTs present within the Development Footprint. Notwithstanding, these species were targeted during surveys and reported on as part of the May 2023 version of the BDAR, and Umwelt considers the survey effort carried out to be adequate to demonstrate their absence. Notably, additional survey effort conducted for this amended BDAR (including spotlighting and thermal drone surveys) is also appropriate for these additional species, which were not observed. The thermal drone surveys successfully identified non-threatened hollow-dwelling fauna (Brush-tail Possum, Owllet Nightjar) and roosting parrots (Sulphur Crested Cockatoo, Pink Galah, Eastern Rosella), suggesting that threatened parrots, gliding mammals and perching forest owls would have had a high likelihood of being observed, if present.

As detailed within Section 5.2.1 (2) of the BAM, candidate species are determined through a set of criteria, including but not limited to plant community type associations and previous site records, using the data contained in the BioNet Atlas Threatened Species Data Collection (TBDC). None of the aforementioned species meet the criteria for inclusion as a candidate species under the BAM, therefore, notwithstanding their inclusion in the May 2023 version of the BDAR for completeness and on a precautionary basis, they have not been considered further within this amended BDAR.

Justification is provided for any species from the BAM-C automatically populated list excluded from assessment. The permitted reasons for excluding species credit species are geographic limitations, habitat constraints, degradation or lack of suitable microhabitats.

The Draft Land Categorisation Mapping for the Development Footprint also identifies large areas of Category 1 - Exempt Land. Areas of PCT 483 correspond to a CEEC and are therefore excluded from consideration as Category 1 - Exempt Land under the BAM, however areas of derived native grassland condition zones for PCT 1661 correspond to Category 1 - Exempt Land. Where surveys within PCT 1661 areas which correspond to Category 1 – Exempt Land have been undertaken, these were completed as a precautionary measure.

The 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (NSW OEH, 2018) defines potential habitat as the area of the Development Footprint that support any listed habitat constraints and PCTs associated with the target species as per the TBDC. This approach to habitat assessment and surveying has been adopted for target threatened microbat species.

Umwelt noted a revised version of 'Species Credits' threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPI (2021) guideline with respect to development of species polygons for threatened microbat species.

Table 5.3 Candidate Threatened Fauna Species Credit Species Determination

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT vegetation condition zones species retained within
		BC Act	EPBC Act						
Regent Honeyeater (Important Habitat)	<i>Anthochaera phrygia</i>	CE	CE	Yes	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	-	Yes	N/A	Assessed by Important Habitat Mapping
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	V	V	No	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Rocky areas or within 50 m of rocky areas	Yes	N/A	All PCTs and Condition Zones with surveys stratified to areas with rocks
South-eastern Glossy Black-Cockatoo (Breeding Habitat)	<i>Calyptorhynchus lathami</i>	V	V [^]	Yes	<input type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input checked="" type="checkbox"/> Current survey	Hollow bearing trees with hollows >15 cm >8 m AGL	Yes	Excluded from derived native grassland condition zones for PCT 483 and 1661 due to lack of trees for nesting.	PCT 483 Scattered trees PCT 1661 Scattered Trees
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	No	<input type="checkbox"/> BAM-C <input checked="" type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels	Yes	No previous records present within the Development Footprint and no associated PCTs present. The species has been recorded within the Project Area, including by Umwelt on 13 and 14 December	No associated PCTs present.

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT vegetation condition zones species retained within
		BC Act	EPBC Act						
								2022. BCD have requested additional surveys of a dilapidated cottage and farm sheds.	
Striped Legless Lizard	<i>Delma impar</i>	V	V	No	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	-	No-	<p>Until recently, it was thought that a subpopulation of <i>Delma impar</i> occurred in the Hunter Valley, however it was determined to be a separate species, <i>Delma vescolineata</i>, which is not a subpopulation or part of a species complex with <i>Delma impar</i>.</p> <p><i>Delma impar</i> (Fisher 1892) and <i>Delma vescolineata</i> have been excluded from further assessment under the BAM on the basis that the Development Footprint falls outside the known and modelled geographic ranges, such the species should be considered vagrant.</p> <p>Refer to Section 5.1.2.2 for a detailed justification for</p>	-

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT vegetation condition zones species retained within
		BC Act	EPBC Act						
								its exclusion from further assessment.	
Little Eagle (Breeding Habitat)	<i>Hieraetus morphnoides</i>	V	Not listed	Yes	<input type="checkbox"/> BAM-C <input checked="" type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Potential nest trees - live (occasionally dead) large old trees within vegetation)	Yes	Excluded from derived native grassland condition zones for PCT 483 and 1661 due to lack of trees for nesting.	PCT 483 Scattered trees PCT 1661 Scattered Trees
Square-tailed Kite (Breeding Habitat)	<i>Lophoictinia isura</i>	V	Not listed	Yes	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Potential nest trees	Yes	Excluded from derived native grassland condition zones for PCT 483 and 1661 due to lack of trees for nesting.	PCT 483 Scattered trees PCT 1661 Scattered Trees
Barking Owl (Breeding Habitat)	<i>Ninox connivens</i>	V	Not listed	Yes	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Hollow bearing trees with hollows >20 cm diameter and >4 m AGL	Yes	Excluded from derived native grassland condition zones for PCT 483 and 1661 due to lack of trees for nesting.	PCT 483 Scattered trees PCT 1661 Scattered Trees
Southern Greater Glider	<i>Petauroides volans</i>	E	V	No	<input type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey <input checked="" type="checkbox"/> Other /SEARs	Hollow bearing trees	Yes	No associated PCTs present and site is too disturbed due to spacing between canopy trees.	-

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT vegetation condition zones species retained within
		BC Act	EPBC Act						
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E	V	No	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey <input checked="" type="checkbox"/> Other / SEARs	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	No	No associated PCTs present and the Development Footprint is heavily degraded.	--
Koala	<i>Phascolarctos cinereus</i>	V	E ²	Yes	<input checked="" type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Presence of koala use trees	Yes	Excluded from derived native grassland condition zones for PCT 483 and 1661 due to lack of suitable habitat trees.	PCT 483 Scattered trees PCT 1661 Scattered Trees
Grey-headed Flying-fox (Breeding Habitat)	<i>Pteropus poliocephalus</i>	V	V	Yes	<input type="checkbox"/> BAM-C <input type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey <input checked="" type="checkbox"/> Other / SEARs	Breeding camps	No	Habitat constraints / breeding camps are not present. No associated PCTs are present. The closest Nationally Important camp is located is Muswellbrook.	-
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	Not listed	No	<input checked="" type="checkbox"/> BAM-C <input checked="" type="checkbox"/> TBDC / BioNet Atlas <input type="checkbox"/> Previous survey <input type="checkbox"/> Current survey	Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines, tunnels, old buildings or sheds	Yes	No previous records present within the Development Footprint and no associated PCTs present. BCD have requested additional surveys of a dilapidated cottage and farm sheds.	No associated PCTs present.

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT vegetation condition zones species retained within
		BC Act	EPBC Act						

Key to Listing Status

V = Vulnerable, E = Endangered, CE = Critically Endangered.

^{^1} = Species listed under EPBC Act after decision on referral.

^{^2} = Species listing status increased under EPBC Act after decision on referral.

5.2 Presence Determination for Candidate Species Credit Species

5.2.1 Threatened Flora Species

No threatened flora species were observed within the Development Footprint and targeted surveys were completed for all candidate threatened flora species. A summary of the methods used and determination of presence for candidate threatened flora species credit species is provided in **Table 5.4**. Further details of the targeted surveys completed for threatened flora species are provided in **Section 5.3.1**.

Table 5.4 Determination of Presence of Candidate Flora Species Credit Species on the Development Footprint

Common Name Scientific Name	Listing Status		Method used to determine presence	Present?	Further assessment required?
	BC Act	EPBC Act			
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment (<i>Cymbidium canaliculatum</i>)	EP	-	Targeted threatened species survey	No	No
Fairy Bells (<i>Homoranthus darwinioides</i>)	V	V	Targeted threatened species survey	No	No
Scant Pomaderris (<i>Pomaderris queenslandica</i>)	E	-	Targeted threatened species survey	No	No

5.2.2 Threatened Fauna Species

The following threatened fauna species have been assessed for species credits within the Development Footprint:

- Regent Honeyeater (not observed / assessed by mapped important habitat).
- Barking Owl (observed).

A summary of the methods used and determination of presence for candidate threatened fauna species credit species is provided in **Table 5.5**. Further details of the targeted surveys completed for threatened flora and fauna species are provided in **Section 5.3.1** and **Section 5.3.2**, within **Tables 5.6** and **Table 5.7** respectively.

Table 5.5 Determination of Presence of Candidate Fauna Species Credit Species within the Development Footprint

Common Name	Scientific Name	Listing Status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Regent Honeyeater Mapped Important Habitat	<i>Anthochaera phrygia</i>	CE	CE	Within important habitat mapped area	Not observed during surveys / assessed via important habitat mapping	Yes
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	V	V	Targeted threatened species survey	No	No
Glossy Black-Cockatoo Breeding Habitat	<i>Calyptorhynchus lathami</i>	V	Not listed	Targeted threatened species survey	No	No
Large-eared Pied-bat	<i>Chalinolobus dwyeri</i>	V	V	Foraging and breeding habitat excluded as further documented in Section 5.3.2 . Surveys of potential structures completed as per BCD request.	Recorded within the Project Area (but not the Development Footprint) on 13 and 14 December 2022.	Assumed to be present but no species polygon generated as further documented in Section 5.3.2 . Surveys of potential roost structures completed as per outcome of consultations with BCD.
Striped Legless Lizard	<i>Delma impar</i>	V	V	Targeted threatened species survey	No	No, it is noted that this species has been previously incorrectly regarded as synonymous with the currently unlisted and recently described Hunter Valley Delma (<i>Delma vescolineata</i>). See Table 5.7 below (Section 5.3.2). Neither species were observed during surveys.
Little Eagle Breeding Habitat	<i>Hieraaetus morphnoides</i>	V	Not listed	Targeted threatened species survey	No	No
Square-tailed Kite Breeding Habitat	<i>Lophoictinia isura</i>	V	Not listed	Targeted threatened species survey	No	No

Common Name	Scientific Name	Listing Status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Barking Owl Breeding Habitat	<i>Ninox connivens</i>	V	Not listed	Targeted threatened species survey	Yes	Yes
Koala	<i>Phascolarctos cinereus</i>	V	V	Targeted threatened species survey	No	No
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	-	Foraging and breeding habitat excluded as further documented in Section 5.3.2 . Surveys of potential structures completed as per BCD request.	Calls from <i>Vespadelus</i> sp. were recorded on 13 and 14 December 2022. As the calls of <i>Vespadelus</i> sp. cannot be readily identified to species level, it is assumed that the call is from <i>Vespadelus troughtoni</i> .	Assumed to be present but no species polygon generated as documented in Section 5.3.2 . Surveys of potential roost structures completed as per outcome of consultations with BCD.

5.3 Threatened Species Surveys

5.3.1 Candidate Threatened Flora Species Surveys

A summary of the targeted surveys completed for candidate threatened flora species is provided in Table 5.6.

Table 5.6 Candidate Threatened Flora Species Survey Details

Flora Survey Details
<p><i>Cymbidium canaliculatum</i> Endangered Population in the Hunter Catchment</p> <p>Habitat Description: Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from the ground. Within the Hunter Catchment, <i>Cymbidium canaliculatum</i> is most commonly found in <i>Eucalyptus albens</i> (White Box) dominated woodlands (including those dominated by the intergrade <i>E. albens-moluccana</i>) (NSW DPE 2023c).</p> <p>Associated PCTs: None listed.</p> <p>Habitat or Geographical Constraints: Epiphytic in a range of eucalypts, Acacia and Angophora, cut stumps or logs.</p> <p>Survey Requirement: This species is an epiphytic orchid which can be surveyed year-round. Parallel field traverses at 20 m spacing are recommended for open vegetation.</p> <p>Survey period: All year.</p> <p>Surveys Completed: Targeted searches completed using both 20m wide parallel traverse surveys and grid-based surveys during 2022. Further surveys were undertaken during 2023 using a vehicle and a spotter. A vehicle was used to increase efficiency and ensure survey adequacy due to the large gaps of unsuitable habitat between potential host trees. The surveys completed were aided by the use of binoculars where required. Strict adherence to parallel traverse spacing as per the guidelines was not practical for the surveys for this species as the areas of potential host habitat were widely dispersed. Across the survey methods of parallel traverse, grid-based, and vehicle-based, all suitable trees within the Development Footprint were checked for the presence of this species.</p> <p>Results: This species was not observed during surveys and this species has been assessed as not present.</p>
<p><i>Pomaderris queenslandica</i> Scant Pomaderris</p> <p>Habitat Description: Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks (NSW DPE 2023c).</p> <p>Associated PCTs: 1661.</p> <p>Habitat or Geographical Constraints: None listed.</p> <p>Survey Requirement: This species is a medium shrub (1–6 m) which requires parallel field traverses at 10 m spacing in dense vegetation and 20 m spacing in open vegetation. Survey all year. Flowers are useful to identify, as easily confused with <i>P. intermedia</i>, however species can be distinguished by leaf morphology - <i>P. intermedia</i> generally has a much larger leaf compared to <i>P. queenslandica</i>.</p> <p>Survey period: All year.</p> <p>Surveys Completed: Targeted parallel traverse surveys completed on 13-14 October 2021 and 23 November 2021 primarily targeting areas of PCT 1661 that had shrub cover or potential for shrub cover, noting that many areas of the site contain derived grassland which is heavily managed and devoid of shrubs. This species was surveyed using parallel traverses at a maximum spacing of 20 m.</p> <p>Results: This species was not observed during surveys and this species has been assessed as not present.</p>

Flora Survey Details
<p><i>Homoranthus darwinioides</i> Fairy Bells</p> <p>Habitat Description: Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand.</p> <p>Associated PCTs: 1661.</p> <p>Habitat or Geographical Constraints: None listed.</p> <p>Survey Requirement: This species is a medium shrub (1–1.5 m) which requires parallel field traverses at 10 m spacing in dense vegetation and 20 m spacing in open vegetation. Survey from March to December. Flowers sporadically between March–December. Survey a number of times throughout the year if not flowering when initially surveyed.</p> <p>Survey period: March–December.</p> <p>Surveys Completed: Targeted parallel traverse surveys completed on 13-14 October 2021 and 23 November 2021 primarily targeting areas of PCT 1661 that had shrub cover or potential for shrub cover, noting that many areas of the site contain derived grassland which is heavily managed and devoid of shrubs. This species was surveyed using parallel traverses at a maximum spacing of 20 m.</p> <p>Results: This species was not observed during surveys and this species has been assessed as not present.</p>

5.3.2 Candidate Threatened Fauna Species Surveys

Details of targeted surveys completed for candidate threatened fauna species are provided in **Table 5.7**.

Table 5.7 Candidate Threatened Fauna Species Survey Details

Fauna Survey Details
<p>Regent Honeyeater <i>Anthochaera phrygia</i></p> <p>Credit Type: Dual credit species with mapped important habitat assessed for species credits and as potential SAIL Entity and non-important habitat assessed for ecosystem credits.</p> <p>Habitat Description (mapped important habitat): The mapped areas include areas identified in the National Recovery Plan (DoE 2016) as critical to the survival of the species formed the basis of the mapping for use in the BAM. These were refined to only include areas of suitable habitat based on expert opinion PCTs associated with the species (as per the TBDC). A dataset of occurrence records was generated from BioNet, BirdLife Australia, Australian National University Difficult Bird Research Group and expert opinion of historic, unrecorded breeding. Records were overlaid on the refined areas. All woodland vegetation within 200 m of a record was added. Records of known breeding events that occurred outside of the polygons created above were identified. Radial buffers of 1 km were applied to single breeding events (once off breeding at a location) and 5 km buffers applied to multiple breeding events (multiple events in the same year or over multiple years at one location). All woodland vegetation was selected within 1 km buffers. Within 5 km buffers, PCTs associated with the species were selected, along with all woodland vegetation within 200 m of a record.</p> <p>Associated PCTs: Not applicable, assessed via mapped important habitat.</p> <p>Survey Requirements: No surveys are required for species assessed via mapped important habitat.</p>

Fauna Survey Details

Survey Methods Employed: The BAM identifies that the species polygon for a species identified in BAM Subsection 5.2.4(2.d.), must include the entire area mapped on the important habitat map that occurs within the subject land. BCD have advised that an assessment of the suitability of the habitat within the mapped important habitat area is not required or permitted to refine the mapping.

Assessment Approach and Justification: This species has been assessed via the available important habitat mapping which overlaps with parts of the Development Footprint including areas of both scattered trees and derived native grasslands. Further assessment on the potential impacts to the Regent Honeyeater is also provided in the Expert Assessment and Conservation Advice Report prepared by the recognised species expert, Dr. Ross Crates contained within **Appendix H**.

Results: In accordance with the BAM, Regent Honeyeater **is assumed to be present** within the mapped Important Habitat that falls within the Development Footprint.

Pink-tailed Legless Lizard *Aprasia parapulchella*

Credit Type: Full species credit.

Habitat Description: Areas of suitable habitat are typically well-drained, with rocky outcrops or scattered, partially-buried rocks (NSW DPE 2023c).

Habitat or Geographical Constraints: Constrained to rocky areas within 50 m of rocky areas.

Associated PCTs: 483.

Survey Requirements: The EPBC Threatened Reptile Survey Guide (DSEWPC, 2011a) was relied upon as this was the best practice guideline at the time that the surveys were completed. The EPBC Guide identifies that peak activity is likely to be late spring and early summer under warm, but not overly dry, conditions. It is not active on the ground surface by day and would only be active between sheltering sites at night. Diurnal hand searches turning a total of 150–200 rocks need to be undertaken to be reasonably confident of determining the species' presence.

These surveys were completed prior to the release of the Threatened Reptiles BAM Survey Guide (DPE 2022d) which require rolling of 200 rocks per 50 ha x 4 replicates within 2 hrs after sunrise or before sunset when temps are <25°C and cloud cover is <50% during September to November.

Surveys Completed: Rock rolling hand searches were undertaken by turning over suitably sized rocks in areas of suitable habitat at eight survey locations on 23 and 24 November 2021. Approximately ~ 150 to 200 rocks were turned at each location surveyed with a total of 1591 rocks rolled in total, with searches taking approximately 40 person minutes per transect.

The rock-rolling surveys were completed on the following dates:

- 23 November 2021, partly cloudy, 14–25°C, no rain, light east-south east breeze.
- 24 November 2021, 16–26°C, partly cloudy with short afternoon storm.

Some survey locations were adjacent to the final Development Footprint Areas, due to revisions associated with impact avoidance.

Assessment Approach and Justification: This species was not observed during surveys and has been **assessed as not present**.

South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami lathami*

Credit Type: Dual credit species with breeding habitat assessed for species credits and foraging habitat assessed for ecosystem credits.

Habitat Description: Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur (NSW DPE 2023c).

Fauna Survey Details

Habitat or geographical constraints: Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground for species credit breeding habitat component and presence of *Allocasuarina* or *Casuarina* species for ecosystem credit foraging habitat component.

Associated PCTs: None. Species included as a candidate species due to observed presence within the Development Footprint.

Survey Requirements: Survey requirements are specified in the TBDC. This is a dual credit species. The identification of breeding habitat will require survey or an expert report. Survey period is January to September, however the survey requirements specify April to August as the period to detect breeding activity.

Step 1. Assessors should look for signs 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.

Step 2. Where signs of breeding on site are present, potential nest trees should be identified. Potential nest trees contain hollows that are; (i) at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees, and may be near-vertical or vertical.

Step 3. Where potential nest trees are identified on site, monitor for this species during the breeding season (April–August) to confirm the presence of any actual nest trees on site. DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

Step 4. If actual nest trees are confirmed on site, then the species polygons are to be drawn around those actual nest trees (i.e. trees that birds of the species are known to have used for nesting). The species polygons should be circular in shape and must include a buffer radius of 200 m around each actual nest tree. The purpose of the buffer is to identify the essential area for breeding and minimise disturbance/avoid clearing for a development application, or conserve and improve habitat for a biodiversity stewardship agreement. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, subject land under assessment is linear, and the nest tree is already located near the edge of the wooded area.

Surveys Completed: Diurnal bird surveys in accordance with Step 1 of the survey requirements were undertaken during the breeding period of April to August over 49.75 hrs by 2 persons on the following dates:

- 9 August 2021, 5–18°C, light ESE breeze, no rain. 6.25 hrs x 2 persons (10:15–16:30)
- 10 August 2021, 2–21°C, light WNW breeze, no rain. 9.5 hrs x 2 people (07:30–17:00)
- 11 August 2021, 3–23°C, light WNW breeze, no rain. 9.25 hrs x 2 people (07:30–16:45)
- 12 August 2021, 12–20°C, light WNW breeze, no rain. 6.75 hrs x 2 people (07:45–14:30)
- 23 August 2021, 12–20°C, light WNW breeze, no rain. 4.5 hrs x 2 people (13:00–17:30)
- 24 August 2021, 7–10°C, light WNW wind 11.6 mm rain, 4.5 hrs x 2 people (12:00–16:30)
- 25 August 2021, 3–15°C, WNW wind, 4.4 mm rain, 5 hrs x 2 people (12:30–17:30)
- 26 August 2021, 1–18°C, WSW breeze, no rain, 4 hrs x 2 people (10:30–14:30).

This species was not observed within the Development Footprint during the April to August breeding period.

Observations were made of this species flying over the site on 14 October 2021–31 January 2022 with behaviours consistent with foraging and not breeding activity.

Assessment Approach and Justification: Use of the site as breeding habitat by this species was not observed during surveys and the presence of breeding habitat has been **assessed as not present**.

Fauna Survey Details

Striped Legless Lizard *Delma impar*

Credit Type: Full species credit.

Habitat Description: Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component (NSW DPE 2023c). In New South Wales, this species occurs in the Southern Tablelands, the South Western Slopes and possibly in the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas, and from Tarcutta (DSEWPac 2011b). The species was once understood to occur within the Hunter Valley however the individuals within this locality have recently been described as a separate species, *Delma vescolineata* (Hunter Valley Delma) (Mahony *et al.*, 2022). Under the BAM suitable habitats are defined by NSW DPE (2022) as all PCTs on the subject land associated with the species in the TBDC.

Habitat or geographical constraints: None listed.

Associated PCTs: 483.

Survey Requirements: Survey guidelines for Australia's threatened reptiles (DSEWPC 2011a) (primary reference available at time of Solar Farm site surveys):

- Surveys primarily undertaken during the active period of the species (between September and May). Some survey techniques (such as active searching) may be undertaken during the cooler months of the year, but often with less success.
- In areas with surface rock, artificial shelter site surveys or rock turning should be the primary technique (with supplementary techniques employed as appropriate).
 - Artificial cover method detail:
 - Tiles installed at least three months prior to survey (i.e., before June).
 - September to December.
 - >30 ha, guideline suggests 10 tile grids. Each grid should be comprised of 10 x 5 tiles with 5 m spacing between tiles. For (i.e.,) a Development Footprint such as Goulburn River Solar Farm, this would equate to 500 tiles.
 - Tiles checked weekly for 8 weeks.
 - Rock rolling method detail:
 - No minimum effort suggested, noted that success rate averages 1 positive observation per 150 rocks turned.

Threatened reptiles Biodiversity Assessment Method survey guide (DPE 2022c) (released following solar farm surveys):

- Habitat surveys (including turning over rocks) combined with either pitfall traps or artificial cover.
- Artificial cover:
 - Tiles installed at least three months prior to survey (i.e., before June).
 - September to December.
 - >50 ha, guideline suggests 10 tile grids. Each grid should be comprised of 10 x 5 tiles with 5 m spacing between tiles. (i.e.,) a Development Footprint such as Goulburn River Solar Farm, this would equate to 500 tiles.
 - Tiles checked weekly for 8 weeks.

Fauna Survey Details

Surveys Completed: Habitat searches / rock rolling was carried out in line with within Survey guidelines for Australia's threatened reptiles (DSEWPac 2011a) which identifies that in areas of surface rock, artificial shelter site surveys or rock turning should be the primary technique (with supplementary techniques employed as appropriate). Whilst the guidelines caution that rock rolling can be detrimental to *Delma impar*, given that monitoring was not long-term or intended to be undertaken regularly, and the amount of surface rock present, habitat searches (including rock rolling) was determined to be appropriate to the Project Area.

No minimum survey effort is specified for rock rolling, however DSEWPac (2011a) notes that success rate averages 1 positive observation per 150 rocks turned. Habitat surveys (searching around grass tussocks and rock rolling) are a key component of DSEWPC (2011a) and a mandatory requirement of the recently released DPE (2022c) for *Delma impar*.

Surveys were carried out concurrently with surveys for the Pink-tailed Legless-lizard. Surveys completed for *Delma impar* do not meet the requirements of the Threatened Reptiles BAM Survey Guide (DPE 2022c), however this guideline was released in November 2022, after the surveys for the species were carried out. BOS Update 36 confirms that assessors are expected to apply new or amended survey guides to all assessments for which the survey component has yet to be completed; which is consistent with the approach taken.

Rock rolling hand searches were undertaken by turning over suitably sized rocks in areas of suitable habitat at 8 survey locations on 23 and 24 November 2021. Approximately 150 to 200 rocks were turned at each location surveyed with a total of 1591 rocks rolled in total with searches taking approximately 40 person minutes per transect.

The rock-rolling surveys were completed on the following dates:

- 23 November 2021, partly cloudy, 14–25°C, no rain, light east-south east breeze.
- 24 November 2021, 16–26°C, partly cloudy with short afternoon storm.

Assessment Approach and Justification: No observations of any *Delma* species were made during the surveys undertaken.

Until recently, it was thought that a subpopulation of *Delma impar* occurred in the Hunter Valley, however it was determined to be a separate species, *Delma vescolineata*, which is not a subpopulation or part of a species complex with *Delma impar*. This is supported by DCCEEW (2023b) through reference to a scientific peer reviewed journal article (Mahony et al., 2022), which includes the results of morphological, molecular and phylogenetic analyses. The study and advice from DCCEEW (2023b) demonstrate that individuals previously and incorrectly attributed to *Delma impar* in the Hunter Valley and Liverpool Ranges are a separate species now described as the Hunter Valley Delma (*Delma vescolineata*) (DCCEEW 2023b).

Delma impar (Fischer 1892) is listed as a threatened entity under Schedule 1, Part 3, Division 1 of the BC Act. It is known from Southern NSW, The Australian Capital Territory, Victoria and South Australia. *Delma vescolineata* (Mahony et al. 2022) has been described as a separate taxon following observations of *Delma* individuals in the Hunter Valley in 2012, north of any known *Delma impar* distribution. Only one other *Delma* species, *Delma plebeia*, is known from the Hunter Valley and Liverpool Plains, and individuals of *Delma vescolineata* may have previously been misidentified as *Delma plebeia* or *Delma impar*. The status of *Delma vescolineata* (Mahony et al. 2022) is as a new taxon, separate to *Delma impar*, requiring no change to the taxonomy of *Delma impar* (Fischer 1892). *Delma vescolineata* (Mahony et al. 2022) has not been split out of *Delma impar* and as such, *Delma impar* (Fisher 1892) remains listed under the BC Act as per the 1892 published description. Accordingly, *Delma vescolineata* has never been part of any broader species concept of *Delma impar*, with individuals likely misidentified as *Delma impar* and *Delma vescolineata* cannot be assessed as that species.

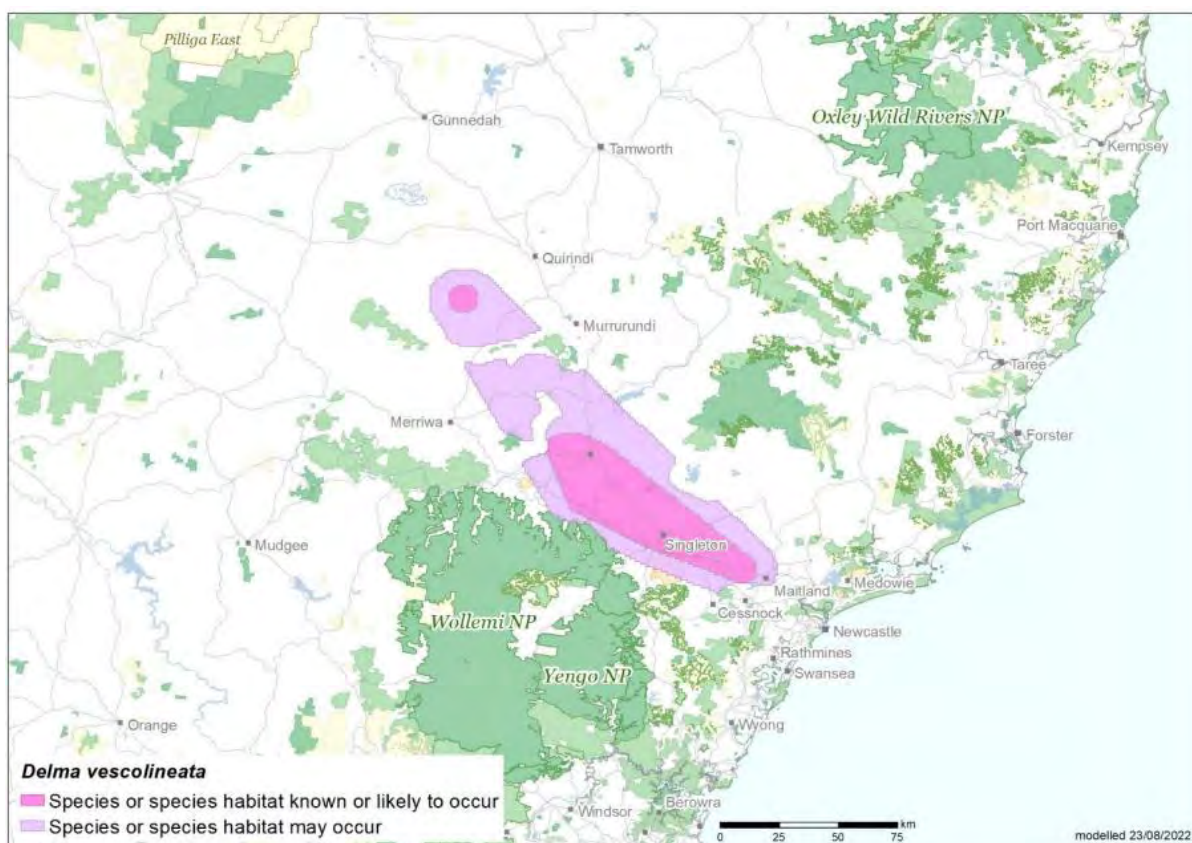
Fauna Survey Details

Delma vescolineata is not currently listed under the BC Act. Notwithstanding, BCD have advised that ‘all occurrences within the *Delma impar* species complex are to be identified and assessed as *Delma impar* for NSW planning matters until a formal assessment of *D. vescolineata* has been completed by the NSW Threatened Species Scientific Committee’. The species is not currently listed under the EPBC Act, although it is currently under consideration for listing. Entities listed under the EPBC Act after the referral decision is made, are not required to be further assessed.

As required by BCD advice, this assessment has considered *Delma impar* as a species complex, with due consideration given to both what is currently recognised as *Delma impar* (Fischer 1892) and what was previously understood to be the Hunter Valley population of the species, now known and herein referred to as *Delma vescolineata*.

The Development Footprint is significantly outside of the accepted range and associated climatic conditions (habitats and microhabitats), known to be inhabited by *Delma impar* (Fischer 1892). *Delma impar* (Fischer 1892) is known from patchy distribution throughout south-eastern NSW as well as within the ACT, Victoria and South Australia. (Mahony et al., 2022) notes that the geographic ranges of *Delma impar* (Fischer 1892) and *D. vescolineata* are allopatric with 250 km break between the two ranges, primarily corresponding to the extensively eroded valleys and tablelands of the Greater Blue Mountains that occur between the southern NSW grasslands and the grassland of the Hunter Valley and Liverpool Plains. Mahony et al. (2022) conclude that all records previously assigned to *Delma impar* (Fischer 1892) from the Hunter Valley region were in fact *Delma vescolineata*, with no evidence of *Delma impar* (Fischer 1892) present in the region.

Delma vescolineata is known from a 25 km wide corridor within a 60 km² area between Maitland and Muswellbrook that is assumed to be within one sub-population (DCCEEW 2023b; Mahony et al., 2022). The outlying record (single observation) 80 km to the north near Parraweena on the Liverpool Plains is currently conservatively considered to be a separate subpopulation. The Development Footprint is also located outside of the areas of modelled known, likely and potential habitat for *Delma vescolineata* mapped by DCCEEW (2023b) and reproduced below.



Fauna Survey Details

Whilst it is possible that *Delma vescolineata* is more widely distributed across the Hunter Valley and Liverpool Plains than is currently known (Mahony et al. 2022) this uncertainty has been accounted for in the modelled distribution map prepared by DCCEEW (2023b) (Figure 2). The modelled distribution map for *Delma vescolineata* shows that the Development Footprint is approximately 45 km from where habitat for this species may occur, and approximately 55 km from known or likely habitat.

Delma vescolineata is associated with secondary native grassland in association with sparse box-gum or ironbark woodland (Mahony et al. 2022, DCCEEW 2023b). The species is reliant on a diverse grass ground cover layer containing multiple species (*Austrostipa* spp., *Bothriochloa* spp. and *Chloris* spp) (Mahony et al. 2022). Sites where this species has been confirmed include rehabilitated mine sites and pastoral land used for cattle grazing (Mahony et al. 2022). This indicates that *Delma vescolineata* is tolerant to disturbance. The species has been observed crossing roads, sheltering in roadside verges, and on featureless grazing paddocks, under cow pats, discarded rubbish, and rocks (DCCEEW 2023b).

The Development Footprint currently provides secondary grassland, aligning broadly with the habitat vegetative preference of *Delma vescolineata*.

It is considered that *Delma vescolineata* may be relatively restricted in range. The estimated area of occupancy for the species (48 km²) does not encompass the Development Footprint (DCCEEW 2023b). The information published by Mahony (2022) and DCCEEW (2023b) suggests that geographic limitations on the species' distribution means it is unlikely that *Delma vescolineata* historically occurred or currently occurs within the Development Footprint.

Additionally, a precautionary approach was adopted to assess the possible presence of a non-listed species with a low likelihood of occurrence. *Delma* sp. were surveyed for using a method (habitat searches) which is consistent with the available guidelines at the time of assessment, and is a method which has been proven to positively identify *Delma vescolineata* within the Hunter Valley region. No *Delma* sp. were found to occur within the Development Footprint during current surveys.

Delma impar (Fisher 1892) and *Delma vescolineata* have therefore been **excluded from further assessment** under the BAM on the basis that the Development Footprint falls outside the known and modelled geographic ranges, such the species should be considered vagrant.

Little Eagle *Hieraetus morphnoides*

Credit Type: Dual credit species with breeding habitat (nests) assessed for species credits and foraging habitat assessed for ecosystem credits.

Habitat Description: Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter (NSW DPE 2023c).

Habitat or geographical constraints: Nest trees – live (occasionally dead) large old trees within vegetation.

Associated PCTs: None, included as identified in BioNet Search and suitable habitat is present.

Survey Requirement: Survey August to October. Breeding habitat is live (occasionally dead) large old trees within suitable vegetation and the presence of a male and female; or any adult with nesting material; or an individual on a large stick nest in the top half of the tree canopy; or pairs displaying (soaring, diving, engaging in chases, or a male observed calling in flight with a female begging from tree).

DPE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

Surveys Completed: Habitat searches looking for birds and signs of large stick nests were undertaken across several dates in August, totalling 78.25 hrs x 2 people hours of survey. A break down is included below:

Fauna Survey Details

- 9 August 2021, 5–18°C, light ESE breeze, no rain. 6.25 hrs x 2 persons (10:15–16:30)
- 10 August 2021, 2–21°C, light WNW breeze, no rain. 9.5 hrs x 2 people (07:30–17:00)
- 11 August 2021, 3–23°C, light WNW breeze, no rain. 9.25 hrs x 2 people (07:30–16:45)
- 12 August 2021, 12–20°C, light WNW breeze, no rain. 6.75 hrs x 2 people (07:45–14:30)
- 23 August 2021, 12–20°C, light WNW breeze, no rain. 4.5 hrs x 2 people (13:00–17:30)
- 24 August 2021, 7–10°C, light WNW wind 11.6 mm rain, 4.5 hrs x 2 people (12:00–16:30)
- 25 August 2021, 3–15°C, WNW wind, 4.4 mm rain, 5 hrs x 2 people (12:30–17:30)
- 26 August 2021, 1–18°C, WSW breeze, no rain, 4 hrs x 2 people (10:30–14:30)
- 21 September 2021, 15°C, WSW breeze, no rain, 7.5 hrs x 2 people (10:00–17:30)
- 22 September 2021, 10–20°C, NW breeze, no rain, 7.5 hrs x 2 people (07:00–14:30)
- 13 October 2021, 10–20°C, ESE breeze, no rain, 10 hrs x 2 people (10:00–20:00)
- 14 October 2021, 10–25°C, SSE Breeze, no rain, 3.5 hrs x 2 people (08:00–11:30).

Assessment Approach and Justification: No Little Eagles or potential nests were observed during surveys and this species has been **assessed as not present**.

Square-tailed Kite *Lophoictinia isura*

Credit Type: Dual credit species with breeding habitat (nests) assessed for species credits and foraging habitat assessed for ecosystem credits.

Habitat Description: Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter (NSW DPE 2023c).

Habitat or geographical constraints: Nest trees.

Associated PCTs: PCT 1661.

Survey Requirement: Survey September to January. Kites will need be in attendance to confirm breeding sites. Breeding habitat is live large old trees within suitable vegetation and the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. DPE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

Surveys completed: Habitat searches looking for birds and signs of large stick nests were undertaken across several dates in August, totalling 97 hrs x 2 people hours of survey. A break down is included below:

- 9 August 2021, 5–18°C, light ESE breeze, no rain. 6.25 hrs x 2 persons (10:15–16:30)
- 10 August 2021, 2–21°C, light WNW breeze, no rain. 9.5 hrs x 2 people (07:30–17:00)
- 11 August 2021, 3–23°C, light WNW breeze, no rain. 9.25 hrs x 2 people (07:30–16:45)
- 12 August 2021, 12–20°C, light WNW breeze, no rain. 6.75 hrs x 2 people (07:45–14:30)
- 23 August 2021, 12–20°C, light WNW breeze, no rain. 4.5 hrs x 2 people (1300–1730)
- 24 August 2021, 7–10°C, light WNW wind 11.6 mm rain, 4.5 hrs x 2 people (12:00–16:30)
- 25 August 2021, 3–15°C, WNW wind, 4.4 mm rain, 5 hrs x 2 people (12:30–17:30)

Fauna Survey Details

- 26 August 2021, 1–18°C, WSW breeze, no rain, 4 hrs x 2 people (10:30–14:30)
- 21 September 2021, 15°C, WSW breeze, no rain, 7.5 hrs x 2 people (10:00–17:30)
- 22 September 2021, 10–20°C, NW breeze, no rain, 7.5 hrs x 2 people (07:00–14:30)
- 13 October 2021, 10–20°C, ESE breeze, no rain, 10 hrs x 2 people (10:00–20:00)
- 14 October 2021, 10–25°C, SSE Breeze, no rain, 3.5 hrs x 2 people (08:00–11:30)
- 24 November 2021, 16–26°C, WNW breeze, 1 mm rain, 8.75 hrs x 2 people (07:45–16:30)
- 7 December 2021, 15–26°C, WNW breeze, 2.8 mm rain, 3 hrs x 2 people (17:00–20:00)
- 8 December 2021, 14–28°C, SSW breeze, 12.2 mm intermittent rain, 7 hrs x 2 people (13:00–20:00).

Assessment Approach and Justification: No Square-tailed Kites or potential nests were observed during surveys and this species has been **assessed as not present**.

Barking Owl *Ninox connivens*

Credit Type: Dual credit species with breeding habitat assessed for species credits and foraging habitat assessed for ecosystem credits.

Habitat Description: Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Species is likely to breed and forage within very small patches of vegetation (< 5 ha), especially when the patch is riparian vegetation or where the small patch is within 400 m of another larger patch of vegetation. They are unlikely to nest in the hollows of a paddock tree if the tree is separated from a larger patch of vegetation by more than 400 m of cleared habitat (NSW DPE 2023c).

Habitat or geographical constraints: Breeding habitat constraint is living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.

Associated PCTs: 483, 1661.

Survey Requirement: Survey May to December. Where any known nest tree(s) occurs on site (e.g. known from existing data, studies or other documented evidence), a species polygon providing a circular buffer with a 100 m radius should be drawn around the known nest tree(s). In addition, or where there are no known nest trees on site, assessors should apply the following process.

Step 1. Look for signs of breeding on site as follows; suitable habitat and (a) presence of male and female or (b) calling to each other (duetting) or (c) find nest.

Step 2. Where signs of breeding on site are present, potential nest trees should be identified. Potential nest trees are living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.

Step 3. Where potential nest trees are identified on site then, night monitoring at the identified potential nest locations for a minimum of 2 nights should be undertaken to detect the presence of any owl of this species using a potential nest tree or demonstrating behaviour focussed on a potential nest tree (e.g. investigating the hollow or roosting within 10 m). DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake species surveys using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

Fauna Survey Details

Step 4. If monitoring of potential nest trees detects this owl species using, or demonstrating behaviour focused on the trees (e.g. investigation of the hollow or roosting within 10 m) on site, the species polygons should be drawn around those trees (i.e. the identified potential nest trees where any owl of this species is observed using or focussing behaviour around the tree). The species polygons should be circular in shape and must include a buffer radius of 100 m around each tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for male roosts, feeding/grooming perches and fledgling requirements. It does not account for foraging habitat. The species uses paddock trees to extend foraging area from intact woodland. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, extant vegetation is linear, and the nest tree is already located near the edge of the wooded area.

Surveys completed: Umwelt detected signs of breeding on site (presence of barking owls observed and calling individuals detected during the breeding season observed in two locations on separate dates). Potential nest trees were located throughout the Development Footprint and multiple nights were spent quiet listening and stag-watching potential nest trees. Barking Owls are known to call on dusk from the daytime roost early in the evening.

Resident pairs occupy traditional roosting trees which are used throughout the year and only nesting takes place in a hollow (Debus 2009). The survey period identified in the TBDC is May to December with Barking Owls laying somewhere between July and October with the period where an active nest may be detected being only 10 weeks (incubation of 34-38 days and nestling period of 5 weeks) (Debus 2009). Stagwatching potential nest trees for two nights each between May to December would be difficult for a large site given the large number of potential hollows and the active nesting period of only 10 weeks for this species. The surveys undertaken by Umwelt focussed on initial call playback surveys followed by stagwatching and quiet listening surveys for owls calling early in the evening from daytime roosts, centred around locations where suitable hollows were present and activity was previously detected.

Targeted nocturnal surveys for this species were undertaken on the following dates:

- 23 August 2021 – 10°C, light E wind, no rain, 2.75 hrs x 2 people (17:30–20:15) – Quiet listening, spotlighting and x2 call playback points (one Barking Owl observed near hollow-bearing trees 17 and 30).
- 25 August 2021 – 15-5°C, fine, WNW wind, no rain, 4.25 hrs x 2 people (17:30–21:45) – Quiet listening, spotlighting and x3 call playback points (no Barking Owls observed).
- 30 August 2021 – 10-5°C, fine, no wind, recent rain, 4.5 hrs x 2 people (17:00–21:30) – Quiet listening, spotlighting and x3 call playback points (two Barking Owls observed near hollow-bearing trees 4, 10, 40 and 58).
- 13 October 2021 – 10°C, fine, ESE breeze, no rain, 2 hrs x 2 people (19:00–20:00) – Quiet listening, stagwatching, spotlighting and call playback point at hollow-bearing trees 4, 10, 40 and 58 (no Barking Owls heard calling or observed).
- 23 November 2021 – 16°C, overcast, ESE breeze, no rain, 1.5 hrs x 2 people (20:00–21:30) – Quiet listening, stag watching, spotlighting (no Barking Owls heard calling or observed).
- 7 December 2021 – 15°C, overcast, WNW wind with thunderstorm activity during evening, 3 hrs x 2 people (20:00–23:00) – Quiet listening, stagwatching, call playback x 4 points, spotlighting (Barking Owl heard calling near hollow-bearing trees 17 and 30).
- 8 December 2021 – 15°C, overcast, SSW wind, intermittent thunderstorm activity during evening, 1.5 hrs x 2 people (20:00–21:30) – Quiet listening, stagwatching, call playback x 4 points, spotlighting (no Barking Owls heard calling or observed).
- 15 June 2022 – 10°C, fine, WNW breeze, no rain, 5 hrs x 2 people (16:30–21:30) – Quiet listening, stagwatching, call playback x 4 points, spotlighting (no Barking Owls heard calling or observed).

Fauna Survey Details

- 30 October 2023 – 28°C, 4/8 cloud, 28C, calm, no rain, 1.5 hrs x 2 people (19:00–20:30) – Quiet listening from vantage point at Redlynch House (dilapidated cottage) for owls calling on dusk in the northern part of the site. No Barking Owls heard calling.
- 31 October 2023 – 18–22°C, 0/8 cloud, light to moderate breeze, no rain, 1.5 hrs x 2 people (19:00–20:30) – Quiet listening for owls calling on dusk from vantage point at Redlynch House (dilapidated cottage) for owls calling on dusk in the northern part of the site. No barking owls heard calling.
- 1 November 2023 – 20°C, 0/8 cloud, moderate to fresh breeze, no rain, 1.5 hrs x 2 people (19:00–20:30) – Quiet listening for owls calling on dusk from vantage point near homestead in the southern part of the site. No Barking Owls heard calling.
- 2 November 2023 – 23°C, 0/8 cloud, moderate breeze, no rain, 1.5 hrs x 2 people (19:00–20:30) – Quiet listening for owls calling on dusk from vantage point near homestead in the southern part of the site. No Barking Owls heard calling.

No active use of nest trees by Barking Owls was detected, however activity was observed around two clusters of hollow bearing trees being 17 and 30 and 4, 10, 40 and 58, as shown on **Figure 5.2**.

Assessment Approach and Justification: Breeding habitat for this species has been **assessed as present** and a precautionary approach has been taken to mapping potential nest trees, with hollow bearing trees 17, 30 and 4, 10, 40 and 58 all included within the species polygon. Barking Owl activity during the breeding season was not detected at any other locations and no observations of an active nest tree were made during the surveys. The proponent has modified the Development Footprint to allow for the retention of the potential nest trees identified with a 100 m buffer, with the exception of an area of low condition derived native grassland which will be impacted within 100 m to the east of hollow bearing trees 17 and 30.

Koala *Phascolarctos cinereus*

Credit Type: Full species credit.

Habitat Description: Inhabits eucalypt woodlands and forests where it feeds on the foliage. It feeds on at least 70 eucalypt species and 30 non-eucalypt species, but in any one area will select a limited number of preferred browse tree species. Spends most of its time in trees, but descends to the ground to disperse or move throughout its home range which vary between 2 ha to > 100 ha (NSW DPE 2023c).

Habitat or geographical constraints: None listed.

Associated PCTs: 483, 1661.

Survey Requirement: The Koala BAM Survey Guide (DPE 2022d) was released following the completion of the initial surveys for this species. Correspondence with BCD identified that a further 4 nights of spotlighting and the completion of a comprehensive thermal drone survey in accordance with the Koala BAM Survey Guide (DPE 2022d) would meet BCD's expectations for Koala surveys.

Spotlighting surveys require a single 200 m transect for up to 5 ha of suitable habitat then two 200 m transects per 5 ha thereafter spaced at ≥ 100 m apart noting size and shape of the disturbance footprint will influence the arrangement of transects. Transects should be surveyed twice on separate nights on foot at a rate of 10 m/min (20 min / transect) or from a vehicle at a rate of 5 km/hr. The subject land contains < 30 ha of potential koala habitat (mapped as scattered trees condition zones) which requires 12 x 200 m transects (2.4 km total length).

Drone surveys require >30% side overlap between flight paths with a flight altitude of approximately 30–40 m above the canopy travelling at a maximum speed of 8 m/s. An experienced pilot must be used for the surveys and thermal camera meeting the specifications of the guideline must be used.

Surveys completed: Initial pre-Koala BAM Survey Guide spotlighting and quiet listening surveys were completed on the following dates:

Fauna Survey Details

- 23 August 2021 – 10°C, light E wind, no rain, 2.75 hrs x 2 people (17:30–20:15) – Quiet listening and spotlighting
- 25 August 2021 – 15°C, fine, WNW wind, no rain, 4.25 hrs x 2 people (17:30–21:45) – Quiet listening and spotlighting
- 30 August 2021 – 10°C, fine, no wind, recent rain, 4.5 hrs x 2 people (17:00–21:30) – Quiet listening, and spotlighting
- 13 October 2021 – 10°C, fine, ESE breeze, no rain, 2 hrs x 2 people (19:00–20:00) – Quiet listening and spotlighting
- 23 November 2021– 16°C, overcast, ESE breeze, no rain, 1.5 hrs x 2 people (20:00–21:30) – Quiet listening and spotlighting
- 7 December 2021 – 15°C, overcast, WNW wind with thunderstorm activity during evening, 3 hrs x 2 people (20:00–23:00) – Quiet listening and spotlighting
- 8 December 2021 – 15°C, overcast, SSW wind, intermittent thunderstorm activity during evening, 1.5 hrs x 2 people (20:00–21:30) – Quiet listening and spotlighting
- 15 June 2022 – 10°C, fine, WNW breeze, no rain, 5 hrs x 2 people (16:30–21:30) – Quiet listening, and spotlighting.

Additional post-Koala BAM Survey Guideline surveys consisted of:

- Transect-based spotlighting surveys.

Due to the scattered nature of the areas of suitable habitat present, parallel transects were determined to be unsuitable spotlighting surveys. For spotlighting surveys two longer continuous transects were surveyed twice each, which provided a more comprehensive site coverage and significantly exceeded the total transect distance requirements of the Koala BAM Survey Guide (DPE 2022). Pre-plotted spotlighting transects were uploaded to a GPS device prior to the surveys and were located to cover all areas of scattered trees within the Development Footprint. The transects had a combined length of approximately 60.8 km and were completed mostly from a vehicle with a driver and a spotter using a suitable spotlight, driving at a rate of <5 km / hr when passing trees (but faster when traversing cleared areas). Some sections were also spotlighted on foot where necessary. The total length of all transects surveyed was 121.6 km and the average length of each transect was 30.4 km with one transect surveyed in the northern, western and south western sections of the Development Footprint on 30 October 2023 and repeated on 31 October 2023 over a period of approximately 4 hrs and another transect surveyed within the southern and western parts of the Development Footprint on 1 November 2023 and repeated on 2 November 2023. The locations of spotlighting transects completed are shown in **Figure 2.3** and the weather conditions and survey times were as follows:

- 30 October 2023 – 28°C, 4/8 cloud, calm, no rain, 4 hrs (19:30–23:30)
- 31 October 2023 – 18–22°C, 0/8 cloud, light to moderate breeze, no rain, 4 hrs (19:30–23:30)
- 1 November 2023 – 20°C, 0/8 cloud, moderate to fresh breeze, no rain, 4 hrs (19:45–23:45)
- 2 November 2023 – 23°C, 0/8 cloud, moderate breeze, no rain, 3.5 hrs (19:30–11:00).
- Thermal drone surveys undertaken by Wildlife Drones & Ripper Corp.

Fauna Survey Details

Thermal drone surveys were completed on two nights, 7–8 November and 8–9 November 2023. A separate Thermal Drone Koala Survey Report is provided in **Appendix E**. A 30–40% overlap was achieved with an inspection height of 30 m AGL, flight speed of <6 m/s and a total flight area of 552.63 ha. Surveys were completed using hotspot detection and isothermal capability which allows for detection with a maximum overnight temperature of 25°C. Relevant thermal & RGB sensor variables included thermal sensitivity of ≤50 mK, Spectral range of LWIRor8–14µm, Thermal resolution of ≥640x512px, Focal length of 19 mm and Frame capture rate of ≥30 Hz. A spotlight mounted on the drone was also utilised to confirm species detections. No koalas were detected during drone surveys. The flight path and survey coverage areas for thermal drone surveys are mapped in **Figure 2.4**.

Assessment Approach and Justification: This species was not observed during surveys and has been **assessed as not present**.

Large-eared Pied Bat *Chalinolobus dwyeri*

Credit Type: Full species credit.

Habitat Description: This species requires a combination of roosting habitat and suitable foraging habitat within 2 km. Roosting habitat includes suitable caves, overhangs and cracks in areas with cliffs, escarpments or rocky outcrops. These areas are typically sandstone but roosts are also known from rhyolite. This species is not known to roost in tree hollows. The Large-eared Pied Bat forages in fertile valleys and plains and along watercourses, sometimes on upper slopes and crests. It occurs in a range of vegetation types, including box gum woodland, dry and wet sclerophyll forest, grassy woodland, Callitris dominated forest, tall open eucalypt forest with a rainforest sub-canopy, subtropical rainforest and small clearings adjacent to rainforest, sub-alpine woodland and sandstone outcrop country, requiring canopied habitat (DCCEEW 2023a).

Habitat or geographical constraints: Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.

Associated PCTs: none present within the Development Footprint.

Survey Requirement: Total of 16 harp trap or passive acoustic detection nights (over at least 4 nights) in areas of potential habitat per 50 ha of suitable habitat between mid-November to January. Potential habitat is all areas with the PCTs associated with the species (as per the TBDC) on the subject land where the subject land is within 2 kilometres of caves, scarps, cliffs, rock overhangs and disused mines. Potential breeding habitat is all potential habitat on the subject land where the subject land is within 100 metres of caves, scarps, cliffs, rock overhangs and disused mines. Passive acoustic detection may be used but is not suited to detecting breeding activity. If the species is present in breeding habitat, then breeding must be assumed. Harp traps placed in potential habitat, including breeding habitat, may be used and the age, sex and reproductive status of captured bats must be assessed and recorded. Traps and/or detectors should be set in woodlands, valley floors, riparian areas and relatively fertile parts of potential habitat on the subject land.

An abandoned house and several farm sheds occur in the Project Area. BCD have requested surveys of such artificial structures onsite. These structures have a small chance of being used for roosting but are unlikely to be used for breeding. Note that the abandoned house included in the May 2023 BDAR has since been removed from the Development Footprint.

Surveys completed: This species was surveyed outside of the Development Footprint within the proposed BSA in the vicinity of a rocky area, by passive acoustic detection between 13 and 26 December 2022 using one detector for 4 nights and one detector for 14 nights.

Roost surveys were also completed on 30 October and 31 October 2023 for the dilapidated cottage in the northern part of the site (now removed from the Development Footprint) and on 1 and 2 November 2023 for the work sheds surrounding the existing homestead on Pogy Station. Roost surveys consisted of a visual fly-out survey and bat detection for 30 minutes prior to sunset and 1 hr after sunset on each evening.

Fauna Survey Details

Assessment Approach and Justification: There are 4 previous records for this species within 1500 m of the Development Footprint (from December 2000) and this species was detected within the Project Area (proposed BSA) during surveys. As such, this species is **assumed as being present** within the Development Footprint.

Umwelt noted a revised version of 'Species Credits' threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPIE (2021) guideline with respect to development of species polygons for threatened microbat species.

'Potential habitat' is defined under the Threatened Bat Survey Guide (OEH 2018) as areas of the subject land that support any listed habitat constraints and plant community types associated with the target species as per the TBDC. Section 2.5 of the OEH (2018) Guide further identifies that only the 'potential habitat' of the target species within the subject land needs to be surveyed.

Section 3.3 of the DPIE (2021) threatened microbat guide identifies that the species polygon should align with the PCTs on the subject land to which the species is associated (listed in the TBDC) that are within 2 km of identified potential roost habitat. No associated PCTs for this species are present within the Development Footprint and no potential breeding habitat occurs within 100 m of the Development Footprint and a species polygon is not required in accordance with OEH (2018). A threatened species polygon has been generated to assist with the project avoidance, minimisation, and mitigation, and to demonstrate that no PCTs fall within the Development Footprint.

Eastern Cave Bat *Vespadelus troughtoni*

Credit Type: Full species credit.

Habitat Description: The habitat requirements of the Eastern Cave Bat are poorly known. It is a cave-roosting species usually found in dry open forest and woodland near cliffs or rocky overhangs. It has also been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. It is also occasionally found along cliff-lines in wet eucalypt forest and rainforest (NSW DPE 2023c).

Habitat or geographical constraints: Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.

Associated PCTs: none present within the Development Footprint.

Survey Requirement: Total of 16 harp trap or passive acoustic detection nights (over at least 4 nights) in areas of potential habitat per 50 ha between November to January. Potential habitat is all areas with the PCTs associated with the species (as per the TBDC) on the subject land where the subject land is within 2 km of caves, scarps, cliffs, rock overhangs and disused mines. Potential breeding habitat - all potential habitat on the subject land where the subject land is within 100 metres of caves, scarps, cliffs, rock overhangs and disused mines.

Passive acoustic detection is listed as a suitable survey method, however it is not suited to detecting breeding activity and cannot readily differentiate this species from the common Little Forest Bat (*Vespadelus vulturnus*) with which it shares a similar call frequency and call shape and habitat distribution. If the species is present in breeding habitat, then breeding must be assumed. Harp traps placed in potential habitat, including breeding habitat, may be used and the age, sex and reproductive status of captured bats must be assessed and recorded. Traps and/or detectors should be set in woodlands, valley floors, riparian areas and relatively fertile parts of potential habitat on the subject land.

An abandoned house and several farm sheds occur in the Project Area. BCD have requested surveys of these structures. These structures have a small chance of being used for roosting but are unlikely to be used for breeding and the abandoned house has since been removed from the Development Footprint.

Fauna Survey Details

Surveys completed: This species was surveyed outside of the Development Footprint within the Project Area (now the proposed BSA) by passive acoustic detection between 13-26 December 2022 using one detector for 4 nights and one detector for 14 nights. Roost surveys were also completed on 30 October and 31 2023 October for the dilapidated cottage in the northern part of the site (now removed from the Development Footprint) and on 1 and 2 November 2023 for the work sheds surrounding the existing homestead on Poggy Station. Roost surveys consisted of a visual fly-out survey and bat detection for 30 minutes prior to sunset and 1 hr after sunset on each evening.

Assessment Approach and Justification: There is one previous record for this species within 1500 m of the Development Footprint (from December 2000) and potential calls for this species were detected within the Project Area (now the proposed BSA) during surveys. As such, this species is **assumed as present** within the Development Footprint.

Umwelt noted a revised version of ‘Species Credits’ threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPIE (2021) guideline with respect to development of species polygons for threatened microbat species.

‘Potential habitat’ is defined under the Threatened Bat Survey Guide (OEH 2018) as areas of the subject land that support any listed habitat constraints and plant community types associated with the target species as per the TBDC. Section 2.5 of the OEH (2018) Guide further identifies that only the ‘potential habitat’ of the target species within the subject land needs to be surveyed.

Section 3.3 of the DPIE (2021) threatened microbat guide identifies that the species polygon should align with the PCTs on the subject land to which the species is associated (listed in the TBDC) that are within 2 km of identified potential roost habitat. No associated PCTs for this species are present within the Development Footprint and no potential breeding habitat occurs within 100 m of the Development Footprint and a species polygon is not required in accordance with OEH (2018). A threatened species polygon has been to assist with the project avoidance, minimisation, and mitigation, and to demonstrate that no PCTs fall within the Development Footprint.

5.3.3 Expert Reports and More Appropriate Local Data

No formal expert reports were utilised in place of targeted surveys for the purposes of determining species presence or absence.

BCD requested that Umwelt engage a recognised Regent Honeyeater Expert to further inform the assessment of impacts, impact avoidance and mitigation measures for this species. Umwelt engaged Dr Ross Crates (a recognised Regent Honeyeater expert under the BAM) at Future Fauna to prepare an Expert Assessment and Conservation Advice report which is provided as **Appendix H**. The Regent Honeyeater Expert Assessment and Conservation Advice report prepared by Dr Crates has been utilised to further inform SAll assessment for this species in **Section 9.0** of this report.

Dr Crates Assessment in **Appendix H**, concludes that:

“Although the Goulburn River Solar Farm is located within a mapped important habitat area for the Regent Honeyeater, the specific habitats within the proposed Development Footprint represent at best marginal foraging habitat for the species due to the relatively high elevation, exposed nature of the site and the low density of feed trees. It is considered very unlikely that Regent Honeyeaters would breed within the habitats that would be impacted by the GRSF, particularly given a lack of permanent water sources within the Development Footprint.

The GRSF planning process has undergone a substantial number of revisions to the extent that less than 5% of the Regent Honeyeater important areas present within the subject site is within the proposed Development Footprint. This demonstrates that a high level of effort has been made to minimise the potential impact of the GRSF on the Regent Honeyeater. There are no additional areas currently falling within the Development Footprint that are considered critical Regent Honeyeater habitat.

The habitats of most value to the Regent Honeyeater within the subject site are located within the proposed Biodiversity Stewardship Site. These habitats are considered of moderate quality potential foraging habitat for Regent Honeyeaters. Areas of the BSS within 200 m of a permanent water source are considered low to moderate quality breeding habitat for the species. The value of the BSS to Regent Honeyeaters will increase through habitat management, as the trees mature and mistletoe populations become more well established. To maximise the utility of the BSS as a potential Regent Honeyeater breeding site, it is recommended that permanent water sources are maintained within the BSS if livestock are removed from the area in future.

The Regent Honeyeater population is now so perilously small that intensive management is required to save the species from extinction within the next 15 years (Heinsohn et al., 2022). Whilst loss of potential foraging habitats are a key factor affecting the capacity of the species to recover in the long term, habitat restoration and management of noisy miners in key breeding areas, protection of nests from predation and reintroduction of zoo-bred birds to boost the wild population are currently substantially more urgent conservation measures. If conservation funds can assist the implementation of the targeted recovery actions detailed below in critical breeding areas as part of an offset agreement, it is considered the loss of Regent Honeyeater important areas within the GRSF Development Footprint is unlikely to have a significant and irreversible impact on the Regent Honeyeater.”

This assessment has also not relied upon alternative data (more appropriate local data as described under the BAM) to assess habitat suitability.

5.3.4 Area or Count, and Location of Suitable Habitat for a Species Credit Species (a Species Polygon).

5.3.4.1 Results for BC Act Listed Species Credit Entities

Species polygons have been created for the following entities:

- Regent Honeyeater
- Barking Owl.

Species polygons for the Large-eared Pied-Bat (*Chalinolobus dwyeri*) and the Eastern Cave Bat (*Vespadelus troughtoni*) have also been mapped. The species polygons were generated to assist with the project avoidance, minimisation, and mitigation, and to demonstrate that no PCTs fall within the Development Footprint. The species polygons mapped for these species do not intersect the Development Footprint.

The details for all species polygons generated are as follows.

5.3.4.2 Regent Honeyeater (*Anthochaera phrygia*) Species Polygon

The subject site is located within a known important area for the Regent Honeyeater. The locations of recent breeding activity in the locality are shown in Crates (2023) provided as Figure 1b in **Appendix H**. The nearest breeding record to the Development Footprint is 3 km away (Hulks Road), with six additional locations between 8–48 km away (Crates 2023). Mapped important habitat for this species is present within the Development Footprint, the species polygon details are provided in **Table 5.8** and the species polygon is mapped in **Figure 5.1**.

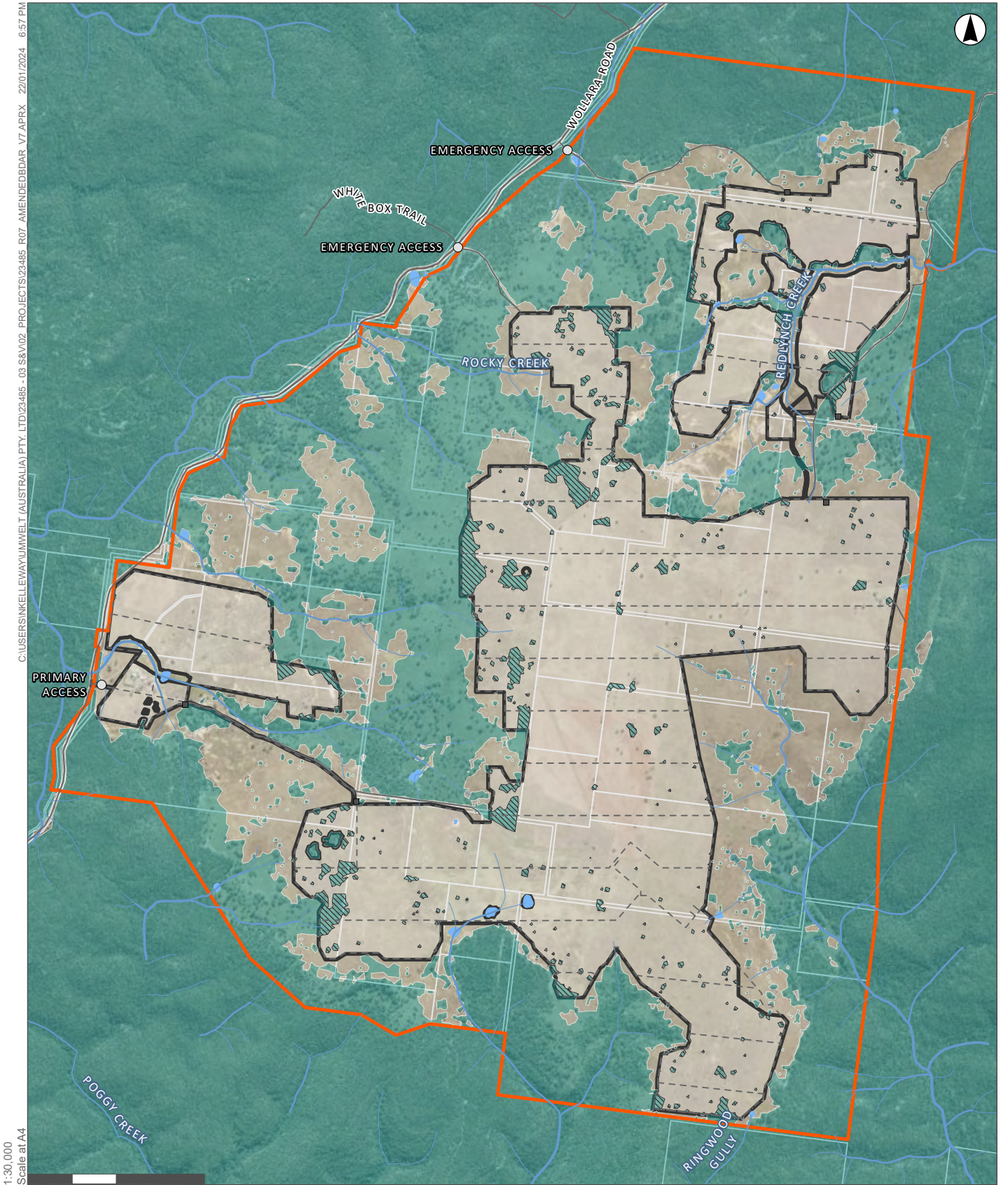
In the Development Footprint there is a total of 42.30 ha of native vegetation mapped as Regent Honeyeater Important Habitat, including 17.58 ha of scattered trees and 24.73 of derived native grassland in various condition classes (**Table 5.8**). PCT 483 covers 36.13 ha and PCT 1661 6.17 ha. The highest value habitat is 16.20 ha of PCT 483 Condition Zone 1. This habitat consists of mature to old growth Grey Box x White Box scattered trees (most trees appear to be Grey Box, but it is known to hybridise with White Box in the region) (Crates 2023). Grey Box flowers in late summer/early autumn, whereas White Box flowers in winter to early spring. Areas of derived native grassland show little tree recruitment due to grazing pressure. Other threatened woodland birds usually associated with Regent Honeyeater habitat also have not been recorded on the site (Crates 2023). More disturbed, open habitats can become dominated by aggressive Noisy Miners and are a known threat to the Regent Honeyeater and other threatened woodland birds (Crates 2023). It is unknown whether Noisy Miner have impacted on the presence of woodland birds, including Regent Honeyeater, within the Development Footprint, but the sparse nature of the vegetation indicates it could be a contributing factor. Permanent surface water, which is strongly associated with Regent Honeyeater breeding sites, is absent from the Development Footprint (Crates 2023).

Based on preliminary estimates the proposed BSA includes a total of 1195.3 ha of native vegetation, including 92% of the Regent Honeyeater Important Habitat mapped for the Project Area. Within the BSA, the vegetation is mostly immature box-ironbark regrowth but a number of mature trees and mistletoes are present (Crates 2023). The BSA generally occurs at lower elevation than the Development Footprint and it is much better connected to vegetation within Goulburn River National Park. The BSA also contains dams that are likely to be suitable for the Regent Honeyeater to drink and bathe (Crates 2023). These factors suggest that the BSA is more important to the Regent Honeyeater than the Development Footprint (Crates 2023). Small number of Noisy Miners are present within the BSA but several threatened woodland birds are also present, indicating less competition from the former species (Crates 2023), and higher quality woodland habitat.

Table 5.8 Regent Honeyeater Species Polygon Details

Information Required	Species Polygon Details
Biodiversity Risk Weighting	Very High (3)
SAIL Entity	Yes, mapped important habitat areas
Habitat constraints / microhabitats present on the Development Footprint / vegetation zone	Mapped important habitat areas

Information Required	Species Polygon Details
Extent of suitable habitat present	<p>PCT 483 Condition Zone 1 – Scattered Trees = 16.20 ha</p> <p>PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland = 11.55 ha</p> <p>PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland = 5.91 ha</p> <p>PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland = 2.47 ha</p> <p>PCT 1661 Condition Zone 1 – Scattered Trees = 1.37 ha</p> <p>PCT 1661 Condition Zone 2 – Moderate to Low Condition Derived Native Grassland = 4.34 ha</p> <p>PCT 1661 Condition Zone 3 – Low Condition Derived Native Grassland = 0.46 ha</p> <p>Total within Species Polygon= 42.30 ha</p> <p>Additional Area = Cleared Land (0.13 ha)</p>
TBDC species specific recommendations	<p>If the Development Footprint is within a mapped area, no survey is required for that species and it is assumed present. The part of the Development Footprint within the important habitat map forms the species polygon used to generate species credits. Where only part of the Development Footprint is mapped as important habitat, the remaining areas are assessed for ecosystem credits.</p> <p>BCD has advised that PCT condition zones containing derived native grassland must be included within the species polygon where they overlap with mapped important habitat within the Development Footprint.</p> <p>This approach has been applied as shown in Figure 5.1. Species was not observed during any surveys.</p>
Habitat condition (vegetation integrity score for each vegetation zone in the polygon)	<p>PCT 483 Condition Zone 1 – Scattered Trees = 78.9 ha</p> <p>PCT 483 Condition Zone 2 – Moderate Condition Derived Native Grassland = 34 ha</p> <p>PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland = 12.6 ha</p> <p>PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland = 10.3 ha</p> <p>PCT 1661 Condition Zone 1 – Scattered Trees = 51.1 ha</p> <p>PCT 1661 Condition Zone 2 – Moderate to Low Condition Derived Native Grassland = 13.3 ha</p> <p>PCT 1661 Condition Zone 3 – Low Condition Derived Native Grassland = 3.4 ha</p>



- Legend**
- Gate
 - Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - ▬ Development Footprint
 - ▭ Project Area
 - ▨ Regent Honeyeater Species Polygon
 - Regent Honeyeater Important Habitat Map

GDA 1994 MGA Zone 56

FIGURE 5.1
 Regent Honeyeater Species Polygon Map

5.3.4.3 Barking Owl (*Ninox connivens*)

The Barking Owl was detected within the Development Footprint during surveys completed on the following dates:

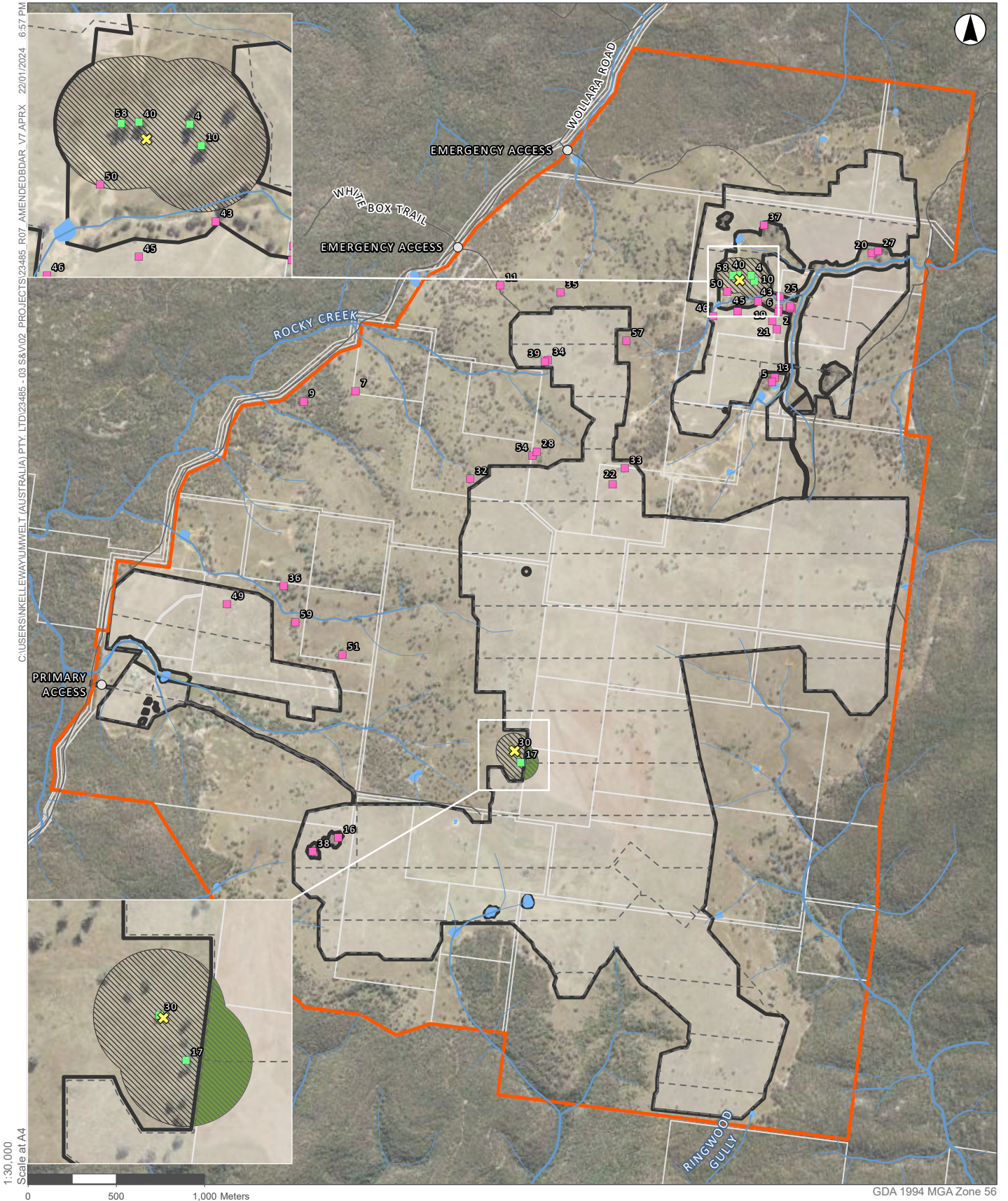
- 23 August 2021 – one Barking Owl calling in response to call playback within the vicinity of hollow-bearing trees 17 and 30. These trees were observed to contain potentially suitable characteristics for breeding and have been used for the purposes of mapping the species polygon.
- 30 August 2021 – one Barking Owl was observed on dusk near hollow-bearing tree numbers 4, 10, 40 and 58. It came in quickly to verbal calling (mimicking). A second Barking Owl was heard calling to the north-west of the individual observed outside of the Development Footprint. No individuals were observed directly existing from a hollow, however hollow-bearing trees 4, 10, 40 and 58 were observed from the ground to contain characteristics suitable for breeding and the individual observed was displaying territorial behaviour during the breeding season. These trees have been used for the purposes of mapping the species polygon.
- 7 December 2021 – a pair of Barking Owls were again heard calling in response to call playback within the vicinity of hollow bearing trees 17 and 30.
- Comprehensive targeted nocturnal survey including quiet listening and call playback throughout the remainder of the site did not detect any barking owl activity in other areas.

The Development Footprint has been revised to retain all of the trees where the Barking Owl was observed, and the Project will only impact highly disturbed grazing land within the 100 m buffer to one tree in the central part of the Development Footprint. A compensatory buffer on the western side of this tree will be retained to ensure that the suitability of the tree as nesting habitat is retained. The species polygon details are provided in **Table 5.9** and the species polygon is mapped in **Figure 5.2**.

Table 5.9 Barking Owl Species Polygon Details

Information Required	Species Polygon Details
Biodiversity Risk Weighting	High (2)
SAIL Entity	No
Habitat constraints / microhabitats present on the Development Footprint / vegetation zone	Suitable hollow trees where activity detected during the breeding season.

Information Required	Species Polygon Details
Extent of suitable habitat present	PCT 483 Condition Zone 4– Low Condition Derived Native Grassland = 1.22 ha
TBDC species specific recommendations	<p>The TBDC identifies that for the assessment of Barking Owl breeding habitat:</p> <p>Where any known nest tree(s) occurs on site (e.g., known from existing data, studies or other documented evidence), a species polygon providing a circular buffer with a 100 m radius should be drawn around the known nest tree(s).</p> <p>In addition, or where there are no known nest trees on site, assessors should apply the following process:</p> <ol style="list-style-type: none"> 1. Look for signs of breeding on site as follows; suitable habitat and (a) presence of male and female or (b) calling to each other (duetting) or (c) find nest. 2. Where signs of breeding on site are present, potential nest trees should be identified. Potential nest trees are living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground. 3. Where potential nest trees are identified on site then, night monitoring at the identified potential nest locations for a minimum of 2 nights should be undertaken to detect the presence of any owl of this species using a potential nest tree or demonstrating behaviour focussed on a potential nest tree (e.g. investigating the hollow or roosting within 10 m). NSW DPE are currently developing survey guidance for threatened bird species. In the interim, assessors must undertake species surveys using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements). 4. If monitoring of potential nest trees detects this owl species using, or demonstrating behaviour focused on the trees (e.g., investigation of the hollow or roosting within 10 m) on site, the species polygons should be drawn around those trees (i.e. the identified potential nest trees where any owl of this species is observed using or focusing behaviour around the tree). The species polygons should be circular in shape and must include a buffer radius of 100 m around each tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for male roosts, feeding/grooming perches and fledgling requirements. It does not account for foraging habitat. The species uses paddock trees to extend foraging area from intact woodland. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, extant vegetation is linear, and the nest tree is already located near the edge of the wooded area.
Habitat condition (vegetation integrity score for each vegetation zone in the polygon)	PCT 483 Condition Zone 4 – Low Condition Derived Native Grassland = 10.3 ha



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area
 - ✕ Barking Owl Observation Locations
 - Hollow Bearing Trees >20cm Opening (no Barking Owl activity detected)
 - Hollow Bearing Trees >20cm Opening (where Barking Owl activity detected)
 - <all other values>
 - ▨ Barking Owl Potential Nest Tree Buffer (100m)
 - Barking Owl Species Polygon

FIGURE 5.2
Barking Owl Species Polygon and Observation Location Map

5.3.4.4 Large-eared Pied-bat (*Chalinolobus dwyeri*)

There are four (4) previous records for this species within 1,500m of the Development Footprint on the BioNet Atlas (NSW DPE 2023c), these records are mapped in **Figure 5.3**. Large-eared Pied-bat was detected within the Project Area (specifically, the proposed BSA site) on the 13 and 14 December 2022.

The foraging and breeding habitat species polygons for this species have been mapped in **Figure 5.3**, in accordance with the requirements of DPIE (2021), however they do not intersect the Development Footprint.

Umwelt noted a revised version of 'Species Credits' threatened bats and their habitats (DPIE 2021) had been made available on the accredited assessors resource page in December 2023. It is unclear when this revised version was made available to accredited assessors as Umwelt understands that no announcement relating to the update was made. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018). Umwelt has made reference to the DPIE (2021) guideline with respect to development of species polygons for threatened microbat species.

The NSW Survey Guide for 'Species Credit' threatened bats and their habitats (OEH 2018) defines **potential habitat** as, 'the area(s) of the subject land that support any listed habitat constraints and plant community type(s) associated with the target species as per the TBDC' and **habitat** is defined as all areas of **potential habitat** on the subject land where the species is determined to be present.

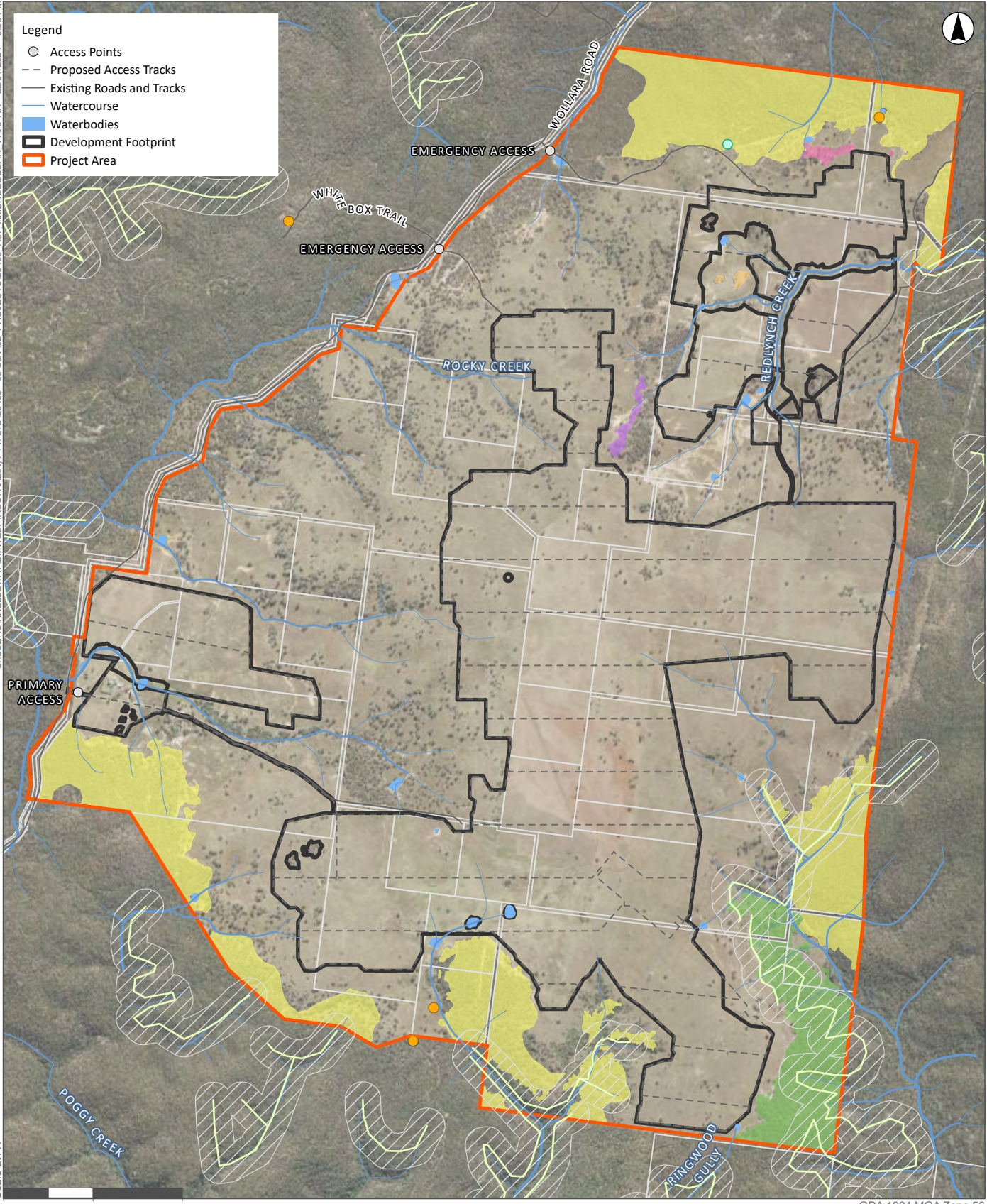
For this species the NSW Survey Guide for 'Species Credit' threatened bats and their habitats (DPIE 2021) identifies that the species polygon boundary for foraging habitat should align with PCTs on the subject land to which the species is associated (listed in the TBDC) that are within 2 km of identified potential roost habitat features. There are no PCTs associated with this species that will be impacted by the Project and species credits are therefore not required.

In regard to the species polygon for breeding habitat, potential breeding habitat is PCTs associated with the species within 100 m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Breeding habitat is considered a potential SAll under the BAM. Aerial photograph analysis and site surveys identified that these habitat features are not present within 100 m of the Development Footprint nor are they present within the Development Footprint. Roost surveys of the farm sheds and an abandoned cottage (which has been removed from the Development Footprint and will be retained) were also completed. No bats were observed roosting within any of these structures or any of the existing structures on dusk.

There are no PCTs associated with this species or breeding habitats that will be impacted by the Project and a species polygon is therefore not required. A threatened species polygon has been generated to assist with the project avoidance, minimisation, and mitigation, and to demonstrate that no PCTs fall within the Development Footprint.

C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY.LTD\23485 - 03.S&V02 PROJECTS\23485 R07 AMENDEDBOAR V7.APRX 22/01/2024 6:58 PM

1:30,000
Scale at A4



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Waterbodies
 - ▭ Development Footprint
 - ▭ Project Area



0 500 1,000 Meters

GDA 1994 MGA Zone 56

- Legend**
- Large-eared Pied-bat Location (Anabat detection)
 - Potential Location of Breeding
 - ▭ Habitat (Rock overhangs / clifflines)
 - ▭ Breeding Habitat Species Polygon (based on 100m buffer from potential breeding habitats)
 - Bionet Search Records
 - Large-eared Pied Bat
- Species Polygon**
- PCT 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter - Moderate Condition (49.5 ha)
 - PCT 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin - Scattered Trees (0.78 ha)
 - PCT 1654 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin - Moderate Condition (2.07 ha)
 - PCT 1672 Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin - Scattered Trees (1.97 ha)
 - PCT 1672 Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin - Moderate Condition (222.84 ha)

FIGURE 5.3
Large-eared Pied-bat Species Polygon and Observation Location Map

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)

5.3.4.5 Eastern Cave Bat (*Vespadelus troungtoni*)

There is one previous record for this species to the south of the Development Footprint on the BioNet Atlas (NSW DPE 2023c), this record is mapped in **Figure 5.4**. Potential *Vespadelus* sp. calls were recorded during ultrasonic call recording surveys using Anabat detectors which were located within the Project Area (specifically, the proposed BSA) on the 13 and 14 December 2022. It is noted that this species cannot be differentiated from the Little Forest Bat (*Vespadelus vulturnus*) by call between 49–53 kHz where they overlap in frequency in locations where they are sympatric, such as the Project Area. Species polygons for breeding and foraging habitat for this species have been mapped in **Figure 5.4**, in accordance with the requirements of OEH (2018), however the species polygons do not intersect the Development Footprint.

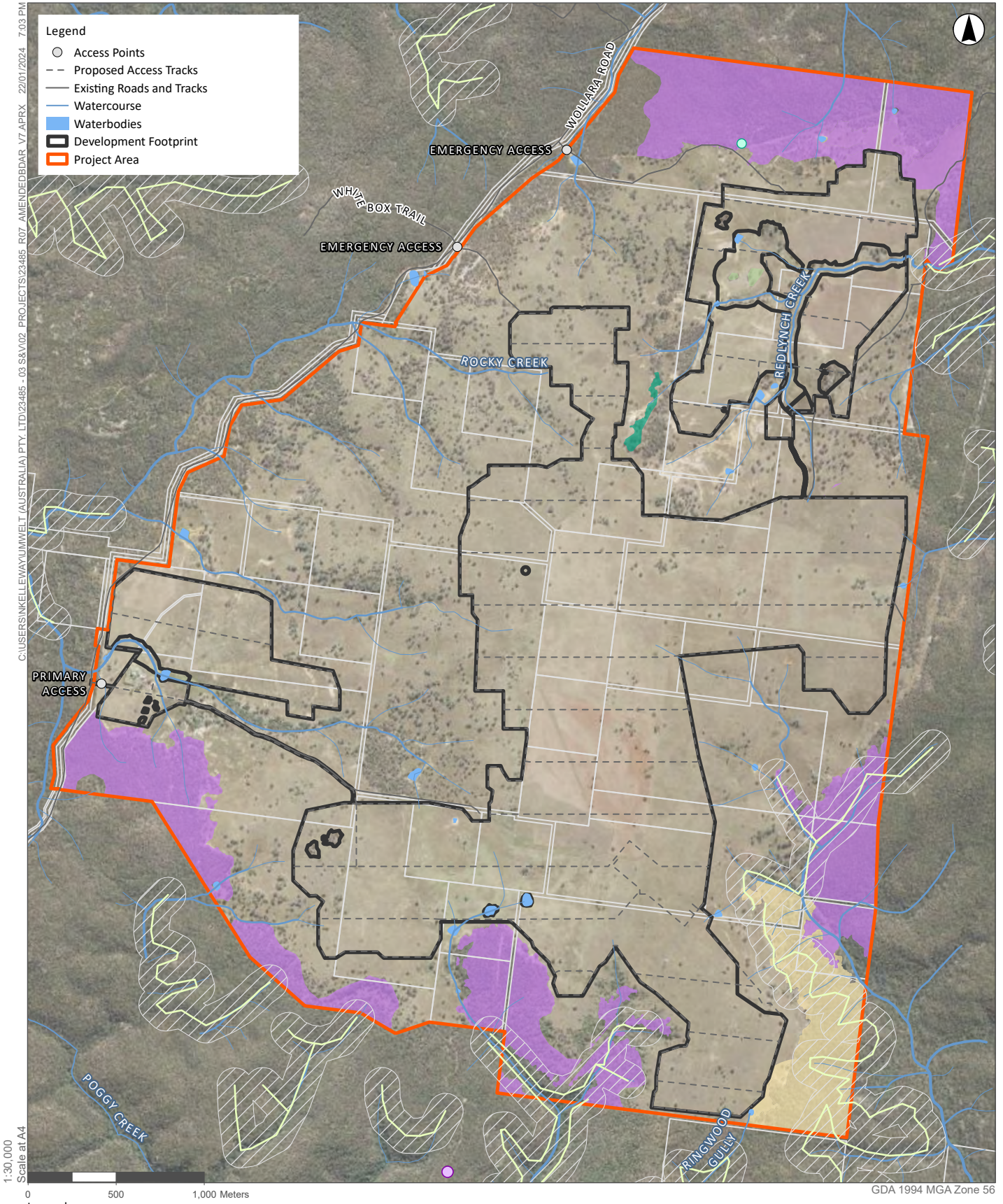
As stated above in **Section 5.3.4.4** above, a revised version of ‘Species Credits’ threatened bats and their habitats (DPIE 2021) has recently been made available on the accredited assessors resource page in December 2023. As such, identification of candidate microbat species and targeted surveys were carried out in accordance with OEH (2018), whilst the DPIE (2021) guideline has been referred to with respect to development of species polygons for threatened microbat species.

The NSW Survey Guide for ‘Species Credit’ threatened bats and their habitats (OEH 2018) defines **potential habitat** as, ‘the area(s) of the subject land that support any listed habitat constraints and plant community type(s) associated with the target species as per the TBDC’ and **habitat** is defined as all areas of **potential habitat** on the subject land where the species is determined to be present.

For this species the NSW Survey Guide for ‘Species Credit’ threatened bats and their habitats (OEH 2018) identifies that the species polygon boundary for foraging habitat should align with PCTs on the subject land to which the species is associated (listed in the TBDC) that are within 2 km of identified potential roost habitat features. There are no PCTs associated with this species that will be impacted by the Project and species credits are therefore not required.

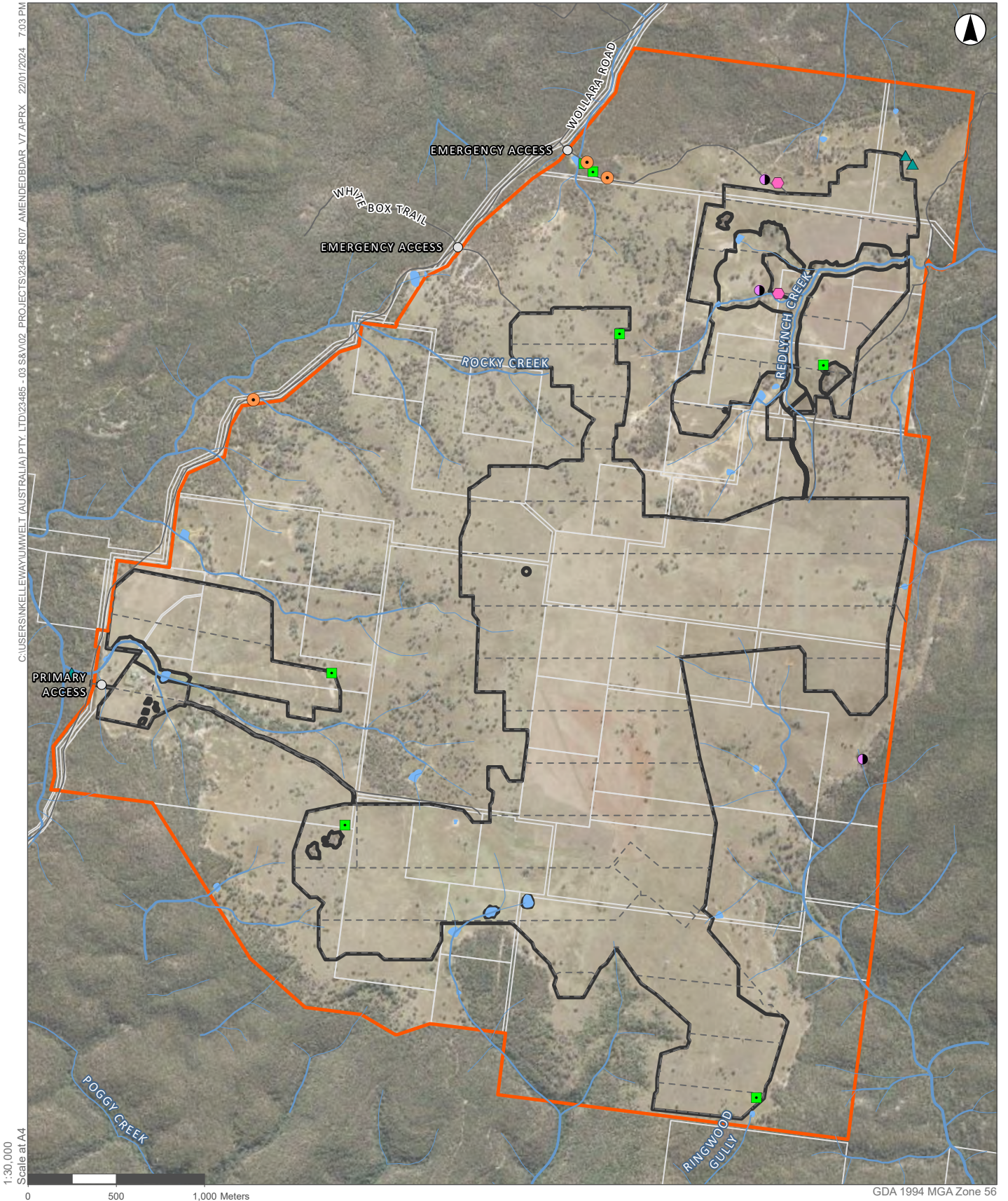
In regard to the species polygon for breeding habitat, potential breeding habitat is PCTs associated with the species within 100 m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Breeding habitat is considered a potential SAI under the BAM. Aerial photograph analysis and site surveys identified that these habitat features are not present within 100 m of the Development Footprint nor are they present within the Development Footprint. Roost surveys of the farm sheds and an abandoned cottage (which has been removed from the Development Footprint and will be retained) were also completed. No bats were observed roosting within any of these structures or any of the existing structures on dusk.

There are no PCTs associated with this species or breeding habitats that will be impacted by the Project and a species polygon is therefore not required. A threatened species polygon has been generated to assist with the project avoidance, minimisation, and mitigation, and to demonstrate that no PCTs fall within the Development Footprint.



- | | |
|--|--|
| <p>Legend</p> <ul style="list-style-type: none"> ● Vespadelus sp. Location (Anabat detection) ○ Potential Location of Breeding Habitat (Rock overhangs / clifflines) ▨ Breeding Habitat Species Polygon (based on 100m buffer from potential breeding habitats) | <p>Bionet Search Records</p> <ul style="list-style-type: none"> ● Eastern Cave Bat <p>Species Polygon</p> <ul style="list-style-type: none"> ▨ 0 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin ▨ 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter ▨ 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin ▨ 1672 Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin |
|--|--|

FIGURE 5.4
Eastern Cave Bat Species Polygon and Observation Location Map



- Legend**
- Access Points
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Waterbodies
 - ▭ Development Footprint
 - ▭ Project Area

- Ecosystem Credit Species Records**
- Diamond Firetail (7)
 - Dusky Woodswallow (3)
 - ▲ Glossy Black-Cockatoo (3)
 - Little lorikeet (3)
 - White-throated Needle-tail (2)

FIGURE 5.5

Ecosystem Credit Species Observation Locations

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)

5.3.5 Results for BC Act Listed Ecosystem Credit Species

The ecosystem credit species which were observed within the Development Footprint are described in **Table 5.10**.

Table 5.10 Ecosystem Credit Species Observation Details

Common Name	Scientific Name	Observation Details
Glossy-black Cockatoo	<i>Calyptorhynchus lathami</i>	This species was heard calling to the south-west of the Development Footprint on 14 October 2021 and was observed in the north-eastern part of the Development Footprint in two locations on 31 January 2022. The observation locations are shown in Figure 5.3 . The behaviours observed were consistent with foraging and no use of the site for breeding habitat was observed despite targeted survey in the breeding season.
Diamond Firetail	<i>Stagonopleura guttata</i>	This species was observed foraging within the Development Footprint at several locations as shown in Figure 5.3 . The observation dates were 24 August 2021, 23 November 2021, 2 February 2022 and 22 March 2022.
Dusky Woodswallow	<i>Artamus cyanopterus</i>	This species was seen within the Development Footprint on 26 August 2021 and 23 November 2021. The observation locations are shown in Figure 5.3 .
Little Lorikeet	<i>Glossopsitta pusilla</i>	The Little Lorikeet was observed foraging within the Development Footprint on 22 September 2021, 8 February 2022 and 22 March 2022. The observation locations are shown in Figure 5.3 .
White-throated Needletail	<i>Hirundapus caudacutus</i>	This species was observed flying over the Development Footprint on 23 November 2022. (8 individuals observed) and on 1 February 2022 (3 individuals observed). The observation locations are shown in Figure 5.3 .

5.3.6 Results for EPBC Act Listed Species

Details of the threatened species listed within the EPBC Act observed during surveys or mapped by important habitat are described in **Table 5.11**.

Table 5.11 Results for EPBC Act Listed Species Present (recorded within the Development Footprint)

Common Name	Scientific Name	Extent (ha) of Suitable Habitat Present On Site
Regent Honeyeater	<i>Anthochaera phrygia</i>	This species was not observed during surveys. This species is assessed by mapped important habitat which overlaps with the Development Footprint. The extent of mapped important habitat within the Development Footprint is 42.30 ha (Scattered trees = 17.58 ha, Derived grassland = 24.72 ha and Cleared Land = 0.13 ha).
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	Areas of suitable foraging habitat for this species is limited to scattered occurrences of <i>Allocasuarina</i> trees which are present within PCT 1661. This species was listed under the EPBC Act after the decision on the referral was made and further consideration under the EPBC Act is not required. Additionally, no use of the site for breeding habitat was observed despite targeted survey in the breeding season.

Common Name	Scientific Name	Extent (ha) of Suitable Habitat Present On Site
White-throated Needle-tail	<i>Hirundapus caudacutus</i>	This species was recorded during surveys on 23 November 2022 (8 individuals observed) and on 1 February 2022 (3 individuals observed). The entire area of the Development Footprint is considered to provide suitable aerial foraging habitat for this species.
Diamond Firetail	<i>Stagonopleura guttata</i>	The entire area of the Development Footprint, excluding water and cleared land and exotic vegetation is considered to provide suitable foraging habitat for this species. This species was listed under the EPBC Act after the decision on the referral was made and further consideration under the EPBC Act is not required.

5.4 SEPP (Biodiversity and Conservation) 2021

Chapters 3 and 4 of State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021 (the SEPP) contain provisions for assessing impacts to Koalas for Local Council assessed development applications. This SEPP is not directly relevant to State Significant Development. Notwithstanding, Chapter 3 of the SEPP has been considered below in the identification of potential Koala habitat and breeding habitat to support further assessment under State and Commonwealth legislation.

For RU1 Primary Production zoned land, Chapter 3 Koala Habitat Protection 2020 of the SEPP describes:

- Potential habitat as areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.
- Core Koala habitat as area of land with a resident population of Koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population.

This assessment of Koala habitat has used the Koala feed tree schedule itemised in both Schedule 1 and Schedule 3 of SEPP (Biodiversity and Conservation) 2021 as the latter provides a comprehensive list of preferred feed trees based on recent studies. Four of the tree species listed in Schedule 3 of the SEPP have been recorded within the Project Area. These tree species represent 15% or greater of the total number of trees within any PCT in the Subject Land and, as such, all PCTs across the Subject Land represent potential Koala habitat. **Table 5.12** lists the Koala feed trees present within the Development Footprint.

Table 5.12 Koala Feed Tree Present within Project Area

Scientific Name	Common Name
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus melliodora</i>	Yellow Box

Despite the Development Footprint containing potential habitat for the Koala, the Koala was not recorded in the Project Area despite extensive ecological surveys. In addition, a review of the BioNet Atlas of NSW Wildlife reveals three records of this species within 5 km of the Project Area (including one from within the Project Area dated 1957), with six records within 20 km of the Subject Land. These records range from 1957 to 2016. There are no records of koala within 1.5 km of the Development Footprint.

As a result, the Subject Land does not represent core Koala habitat as the Koala was not recorded in the Project Area and very few Koalas have been recorded within 5 km within the last 18 years. No further provisions of Koala habitat protection in SEPP (Biodiversity and Conservation) 2021 apply. Notwithstanding this, the Koala is a species credit species under the BAM and has been further considered as part of this BDAR.

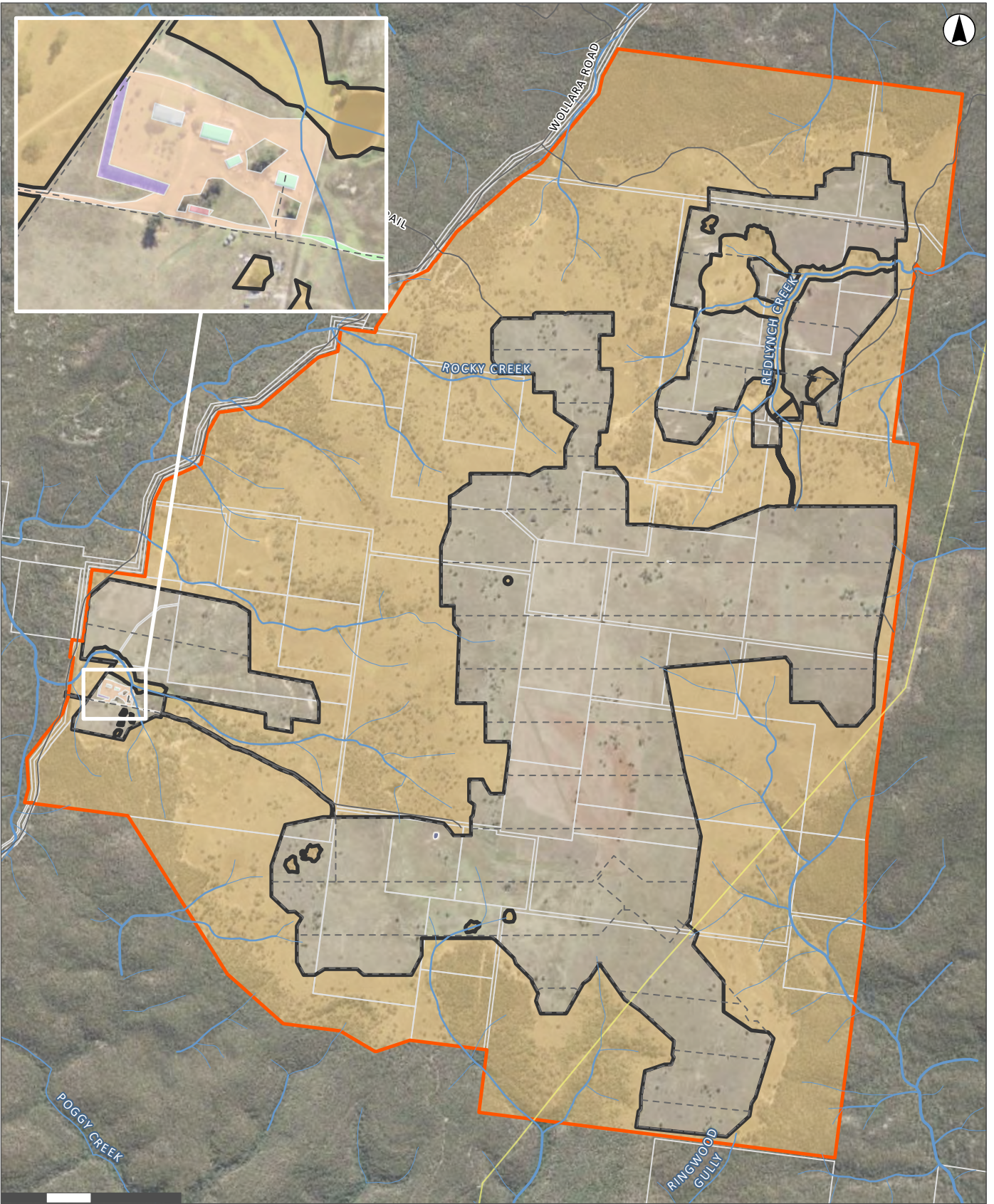
6.0 Identifying Prescribed Impacts

Prescribed impacts which are predicted to occur as a result of the proposed development are documented in **Table 6.1** and prescribed impact features are mapped in **Figure 6.1**.

Table 6.1 Prescribed Impacts Identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	<input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within the Development Footprint. There are areas of rock piles, minor rock outcropping and shallow sandstone that will be impacted by the Project. A photograph of an area of surface rock and a rock pile is provided as Photo 6.1 .	Based on the results of the surveys completed it is considered that there will be no known threatened entities using the features identified.
Human-made structures	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	There is an occupied residential dwelling and farm sheds and dog kennels within the Development Footprint proposed for removal. The farm shed locations are mapped in Figure 6.1 and photographs of the sheds are provided in Photo 6.2–Photo 6.7 .	No threatened entities were observed using or are likely to use any man-made structures that will be removed or modified by the Project.
Non-native vegetation	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	The non-native vegetation has been attributed to Category 1 - Exempt Land. This consists of land used primarily for agriculture and has poor value for threatened species.	No threatened entities were observed using or are likely to use any non-native vegetation that will be removed or modified by the Project.
Habitat connectivity	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	There will be clearing of native vegetation including canopy trees, these are mainly isolated and scattered trees, areas of derived native grassland and highly disturbed agricultural land assessed as Category 1 – Exempt Land. The Project includes corridors between the three distinct Project areas.	The threatened entities observed during surveys are highly mobile species, capable of flying over the areas proposed for development. It is likely that these species will also utilise the retained areas of connectivity between the four Project areas. These species include: <ul style="list-style-type: none"> • Barking Owl • Diamond Firetail • Dusky Woodswallow • Glossy Black-Cockatoo • Little Lorikeet • White-throated Needletail.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Waterbodies, water quality and hydrological processes	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	Ten farm dams are proposed for removal. First and second order watercourses will also be impacted. Aquatic impacts are addressed in the Aquatic Assessment prepared by Coast Ecology (2023).	No threatened entities were observed using aquatic areas.
Wind turbine strikes (wind farm development only)	<input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	This assessment is not a wind farm development.	Not applicable.
Vehicle strikes	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	Vehicle movements would be on access tracks throughout the Development Footprint and would utilise existing access tracks where possible. A low speed limit would be enforced for vehicles traveling through the Project Area.	No threatened entities are likely to be affected by vehicle strikes as vehicle movements will be at low speed.



- Legend**
- Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Electricity Transmission Line
 - Property Boundaries
 - Development Footprint
 - Project Area
 - Impact Avoidance Areas
- Prescribed Impact Features**
- Cleared Land
 - Cleared Land and non-native vegetation
 - Disused timber hut which provides no potential fauna habitat
 - Dog kennels utilised for existing farming activities
 - Existing occupied dwelling
 - Non-native Vegetation
 - Open shed utilised for existing farming activities
 - Water (dam)
 - Water (open tank)

FIGURE 6.1
Prescribed Impact Features



Photo 6.1 Example of surface rock and rock piles



Photo 6.2 Operational open farm shed located within the Development Footprint



Photo 6.3 Operational open farm shed located within the Development Footprint



Photo 6.4 Operational open farm shed containing stock feed located within the Development Footprint



Photo 6.5 Partially dismantled shed located within the Development Footprint



Photo 6.6 Abandoned cottage (Redlynch House) which has been removed from the Development Footprint



Photo 6.7 Partially dismantled shed located within the Development Footprint near Redlynch Creek

7.0 Avoid and Minimise Impacts

7.1 Avoid and Minimise Direct and Indirect Impacts

Biodiversity impacts have been avoided and minimised through refinements to the Development Footprint. From the Scoping Report (December 2021) to the present, the Development Footprint has greatly reduced in size to respond to emerging understanding of site-specific biodiversity constraints and to prioritise the avoidance of impacts on potential serious and irreversible impact entities. Development Footprint alterations have resulted in biodiversity impact avoidance through an initial avoidance of approximately 38% (reducing from 2,000 ha to 1,249 ha) of the Project Area prior to submitting the Scoping Report, a secondary approximately 30% reduction in Development Footprint area (reducing from 1,249 ha to 882 ha) and a further approximately 10% reduction in Development Footprint (882 ha to 792.19 ha). In total, 60.39% of the Project Area, including the highest value ecological areas, has been avoided. **Table 7.1** and **Figure 7.1** shows how avoidance has occurred across design iterations, based on the current PCT mapping for the Project Area as refined by recent surveys over the proposed Biodiversity Stewardship Site.

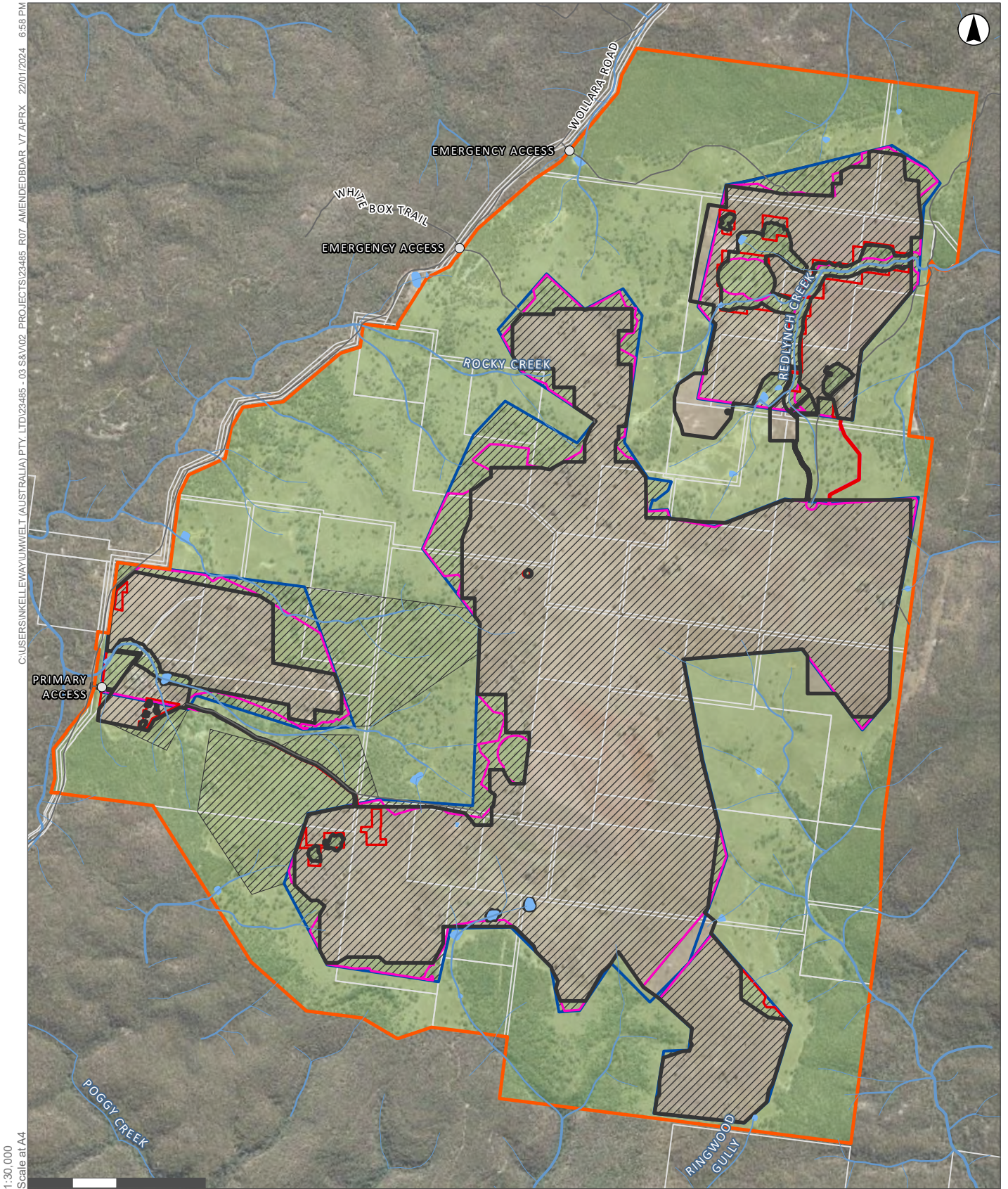
Table 7.1 Goulburn River Solar Farm Impact Avoidance

	Unit	Design A* (Dec 2021) Scoping Report & EPBC referral	Design B (Nov 2022)	Design C (May 2023) EIS	Design D (Dec 2023) Amendment Report	Difference (A to D)
Development footprint						
Development footprint	ha	930.36	868	799.50	792.19	138.14 (-15%)
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland						
PCT 483 Moderate Condition Woodland	ha	2.37	0.27	0	0	-2.37 (-100%)
PCT 483 Scattered Trees	ha	60.45	42.75	23.42	22.49	-37.96 (-63%)
PCT 483 Moderate Condition Derived Native Grassland	ha	163.00	162.53	164.99	165.36	+2.36 (+1%)
PCT 483 Moderate to Low Condition Derived Native Grassland	ha	314.61	315.11	310.07	310.03	-4.59 (-1%)
PCT 483 Low Condition Derived Native Grassland	ha	197.75	197.39	199.35	195.98	-1.77 (-1%)
PCT 483 Uncategorised (mostly moderate) condition derived native grassland mapped within proposed Biodiversity Stewardship Site Area	ha	76.32	42.96	2.27	0.00	-76.32 (-100%)

	Unit	Design A* (Dec 2021) Scoping Report & EPBC referral	Design B (Nov 2022)	Design C (May 2023) EIS	Design D (Dec 2023) Amendment Report	Difference (A to D)
Regent Honeyeater						
Regent Honeyeater Important Habitat**	ha	108.9	74.93	44.96	42.30	-66.47 (-61%)

* Design revision A was used in the Scoping Report and EPBC referral. This design revision encompassed an evolving footprint with a few different spatial iterations and as such has variously been presented as a maximum (1,249 ha) and minimum (930 ha). Impact calculations presented in the Scoping Report and EPBC referral were based on preliminary vegetation community mapping, whereas the numbers presented herein reflect the refined vegetation community mapping. As a result, the numbers for Design Revision A may not be consistent with previous reporting.

** Includes native vegetation and cleared areas.



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03_S&V02_PROJECTS\23485_R07_AMENDED\BAR_V7_APRX_22/01/2024_6:58 PM

1:30,000
Scale at A4

0 500 1,000 Meters

GDA 1994 MGA Zone 56

- Legend**
- Access Points
 - Existing Roads and Tracks
 - Watercourse
 - Waterbodies
 - Property Boundaries
 - Project Area
 - Development Footprint D (Current Development Footprint)
 - Development Footprint C (May EIS)
 - Development Footprint B (November 2022)
 - Development Footprint A (Scoping Report December 2021)
 - Initial Development Footprint Investigated
 - Impact Avoidance Areas

FIGURE 7.1

Impact Avoidance and Minimisation Locations

Between the EIS submission (May 2023) and the Amendment Report, design refinements have focused on avoiding areas of higher quality Regent Honeyeater mapped important habitat and PCT 483 (box gum woodland) scattered trees, as well as reducing impacts on watercourses. The northeast of the Development Footprint (**Figure 7.2**) has undergone the greatest change during the recent design iteration, with additional areas of SAll now avoided. Impacts to Redlynch Creek (stream order 3) have also been significantly reduced (also visible in **Figure 7.2**) excising an approximately 130 m length of this waterway from the Development Footprint and removing one of the access points. Impacts to Redlynch Creek are now limited to four discrete locations. This includes two point where it will be crossed by the solar farm security fence and adjacent access track, one additional access track crossing, and another point where underground cabling will be laid. Waterway crossings will be designed to minimise impacts on stream stability and fish passage.



Figure 7.2 Detail of changes to the Development Footprint (EIS = blue, Amendment Report = red; Regent Honeyeater important habitat is shown as orange, with box gum woodland scattered trees in green)

7.1.1 Project Location

The Project Area has been selected due to its isolated location (surrounded by Goulburn River National Park) and proximity to existing transmission line infrastructure. Due to its location the Project has minimal impacts on neighbouring residents, visual amenity, aquatic biodiversity, and agricultural land use. In particular the vegetation in Goulburn River National Park screens the Project, minimising potential visual impacts.

The existing 500 kV transmission line on site allows for access to the National electricity market with no new transmission lines required to be built to facilitate the Project.

The site selection process was the first and arguably most successful attempt at impact avoidance and mitigation, avoiding visual impacts to residents and agricultural impacts by selecting low value farmland, as well as avoiding the need for a new transmission line, while minimising biodiversity impacts. Other candidate sites considered along the entire length of the existing 500 kV transmission line (from Bayswater to Mt Piper) exhibit significantly higher potential biodiversity impacts.

The Project Area has suitable terrain as it is generally flat, with some minor undulation in the landscape. In addition to this the Project location supports high quality solar irradiance and ideal climatic conditions to maximise the benefits of a large-scale solar farm.

The total Project Area is 2,000 ha, which has provided flexibility in the design to prioritise avoidance of high value biodiversity areas. The Project Area has also undergone historic and widespread clearing for ongoing agricultural use.

7.1.1.1 Location of Surface Works in Areas with No or Low Biodiversity Values

The entire extent of the Project Area shown in **Figure 7.1** was initially investigated for the potential establishment of the Project and subject to initial ecological surveys. The Project Area (2,000 ha) has provided flexibility in design to prioritise avoidance of high value biodiversity areas. Since the early planning stages, the Proponent has sought to balance the areas of biodiversity impacts proposed with achieving retention of areas for a future Biodiversity Stewardship Agreement (BSA) to provide offsets for the Project (see **Section 11.3**).

The Development Footprint has been subject to historical widespread clearing and ongoing pasture improvement works for agricultural use. Approximately 1,000 head of cattle have been present at any one time across the whole of the Project Area, with a majority of the Development Footprint cropped for fodder pasture. The Project has been designed to take advantage of the most disturbed parts of the Development Footprint and is centred on areas of Category 1 – Exempt Land mapped on the current transitional Native Vegetation Regulatory Map.

The areas of intact forest and woodland present were avoided during the refinement of the Development Footprint in the planning process which included the following key modifications:

- Redesign the Project to minimise impacts on areas of mapped Regent Honeyeater important habitat (the generic mapping includes both areas of scattered trees and grassland).
- Alteration of the Project to reduce impacts to suitable breeding habitat for the Barking Owl.
- Alteration of the Project to avoid impact to PCTs associated with habitat for the Large-eared Pied bat and the Eastern Cave Bat.
- Reduction in the impacts to White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC to avoid areas of woodland with intact crown condition, and resulting in impact minimisation to areas of scattered trees and derived native grassland condition zones.
- Establishment of exclusion zones within the Development Footprint to avoid Redlynch Creek which crosses the Project Area, and the remains of a Slab Hut of historic heritage importance.

7.1.1.2 Location of Sub-Surface Works in Areas with No or Low Biodiversity Values

Underground cabling will be required to connect infrastructure to the substation, which is located in the south-eastern section of the central Project area. The underground cabling has been located within the footprints of the access roads and areas with low biodiversity values.

7.1.1.3 Avoidance of Wildlife Corridors

The Development Footprint contains agricultural land, predominantly comprised of grazed grasslands with remnant trees. It is surrounded by the Goulburn River National Park. Patches of retained forest and woodland vegetation are present typically in areas surrounding watercourses and on steeper or less fertile rocky habitats.

The Development Footprint contains three discrete areas which are separated by vehicle access tracks, as shown in **Figure 3.2**. The three discrete areas which form the Development Footprint will be protected with fauna exclusion fencing, however the vehicle tracks will not be fenced to avoid habitat fragmentation and ensure that connectivity for terrestrial fauna species is maintained through the Project Area.

The Project is not incorporating barbed wire into the security fence around each of the three discrete areas (**Section 8.4.6**). This will greatly reduce the risk of impacts to mobile fauna traversing across the Project Area, such as birds, microbats and flying-fox, and any gliding mammals.

7.1.1.4 Location of Works to Minimise Interactions with Threatened Entities

Reductions in the Development Footprint assessed by Umwelt are shown in **Figure 7.1** and have included design considerations to minimise impacts to breeding habitat for the Barking Owl, mapped Important Habitat for the Regent Honeyeater and the higher quality areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC associated with PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.

7.1.1.5 Location of Works to Avoid Impacts on Waterbodies and Hydrological Processes

Watercourse impacts will be limited to ephemeral first and second order streams. The main drainage trunk and the third order section of Redlynch Creek will be retained via an exclusion zone with impacts limited to designated crossing points (access tracks and security fencing).

7.1.1.6 Alternative Routes Considered

The Project has been designed to make use of the existing access tracks present throughout the site. It is considered that the use of other routes will not result in further impact minimisation or avoidance.

7.1.1.7 Alternative Sites Within the Subject Land Considered

The entire extent of the Project Area shown in **Figure 7.1** was initially investigated for the potential establishment of the Project, and subject to initial surveys. Areas of intact vegetation were avoided early in the planning process to minimise impacts to the areas with the highest biodiversity values including large areas of mapped Important Habitat for the Regent Honeyeater and the highest quality areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community.

Impact avoidance focused the Development Footprint on the previously cleared areas of historically disturbed vegetation, particularly areas with a long history of agricultural use mapped as Category 1 - Exempt Land.

7.1.2 Project Design and Planning

Design refinements have been implemented as an outcome of the environmental impact assessment process. Lightsource bp have actively refined the design and incorporated environmental and social constraints into the design and layout of the Project to avoid and/or minimise impacts to sensitive environmental features and neighbouring landholders. These refinements have been implemented as an outcome of:

- Ongoing consultation with landholders.
- Targeted ecological surveys conducted across the Project Area.
- The findings of the detailed environmental and cultural heritage assessments for the EIS.
- In response to community and stakeholder feedback during the preparation and exhibition of the EIS.

7.1.2.1 Construction Approach

The majority of land comprised of DNG within the Development Footprint would not be stripped or subject to earthworks (i.e., areas of cut and /or fill). Woody vegetation would however be removed. Earthworks within areas of PCT 483 and PCT 1661 are expected to be limited to:

- access tracks
- foundations for the BESS, inverters and on-site substation
- security fencing, including post holes
- underground cabling (trenching and installation of inverter stations)
- installation of steel posts and framing system to support the solar panels.

The access tracks, BESS, inverters and on-site substation footprints would result in complete removal of the underlying PCT, which equates to less than 10% of the Development Footprint. The remainder of the Development Footprint would be partially impacted. Increased foot and vehicle traffic during construction across the site would impact ground cover; however, it is unlikely to impact the underlying seed bank, nor would it reduce the ability of the PCT to recover through assisted natural regeneration.

The most significant infrastructure associated with the Project would be the solar panels. These do not require the ground to be flat, and would instead be erected across the natural landform, using variable height steel posts. There would be minimal areas of cut and fill required for the solar panels, limited to areas where the terrain conditions exceed the specifications for framing installation.

Clearing of DNG and ground disturbance across the bulk of the Development Footprint would largely relate to the piling of post holes (for fencing and panel installation). The post holes would likely be piled using a mobile drilling rig approximately the size of a small truck, which may have a caterpillar-like system.

Given the rocky nature of the substrate, it is likely that temporary impacts on the DNG would be no more significant than the current agricultural regime of tilling, cropping and grazing.

Where earthworks are required, the topsoil containing the seed bank would be separated, stockpiled, and re-spread within rehabilitation areas. The seed bank of the DNG is therefore anticipated to be retained within the Development Footprint, as it would be rehabilitated shortly following ground disturbance activities. The seed bank and regeneration capacity are considered to be robust, given the present extent of this vegetation community across paddocks which have been consistently grazed and cropped for decades.

Whilst some compaction impacts on DNG are likely during construction as a result of mobile plant, foot traffic, and temporary laydown of equipment and materials, trampling of native vegetation would largely be short term, and ground disturbance minimal.

7.1.2.2 Alterations to the Project Footprint

Several Project refinements have been incorporated into the design and layout of the Project since the preparation of the initial Scoping Report and the completion of biodiversity surveys, to avoid and/or minimise impacts to sensitive environmental features. These refinements have been implemented as an outcome of ongoing consultation with landholders, refining the engineering design and targeted ecological surveys conducted across the Project Area. This has resulted in several iterations to the Development Footprint to achieve the current design, shown in **Figure 7.1** and described in **Table 7.1**.

Four key design revisions are outlined below to demonstrate the ongoing consideration of environmental and social impacts in the progression of the Project design and environmental impact assessment process.

Design Revision A

Following site selection, Lightsource bp developed Design Revision A (April 2021), taking the Development Footprint from 2,000 ha to a more modest 1,249 ha Development Footprint which was developed for the Scoping Report. This design revision encompassed an evolving footprint with a number of spatial iterations. The maximum area of impact was 1,249 ha (as described in the Scoping Report), with a minimum of 930.36 ha used for the initial Project layout. Preliminary environmental and social constraint assessments informed this reduced footprint including:

- Preliminary mapping of areas of BC Act listed White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland with a high and moderate likelihood of conforming to this ecological community, where avoided where possible.
- Avoidance of impacts to canopied areas of heavily mapped Regent Honeyeater important habitat, noting that a total of 108.9 ha of mapped important habitat for Regent Honeyeater was present in the indicative Development Footprint.
- Preliminary vegetation mapping to prioritise impacts within areas of exotic vegetation.
- Preliminary Category 1 – Exempt Land mapping for the Project Area was used to inform the indicative Development Footprint, utilising these areas first.

Design Revision B

Following lodgement of the Scoping Report and EPBC referral, further environmental and social impact assessments and community consultation activities occurred. As a result, Lightsource bp developed Design Revision B (November 2022), an 886 ha Development Footprint. Key changes between Design Revision A and B included altering the layout to:

- Reduce the Project's Development Footprint from 930.36 ha to 886 ha in order to avoid and minimise impacts to biodiversity and maintain connectivity between the Project Area and the surrounding Goulburn River National Park.
- Reduce impacts on areas of mapped Regent Honeyeater important habitat, avoiding a further 33.97 ha of habitat.
- Reduce impacts to suitable breeding habitat for the Barking Owl including the incorporation of exclusions zones.
- Avoid impact to habitat for the Large-eared Pied bat and the Eastern Cave Bat.
- Reduction in the area occupied by the Project to further avoid areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community observed to be in moderate-good condition, limiting impacts to areas of scattered paddock trees and derived native grassland condition zones.
- Establishment of exclusion zones within the Development Footprint to avoid parts of Redlynch Creek which cross the Project Area and heritage values associated with the Slab Hut.

Design Revision C

Following the submission of the draft EIS for review by DPE in November 2022, further design refinements and reconfiguration of the Development Footprint was undertaken. Lightsource bp developed Design Revision C (February 2023), a 799.50 ha footprint. Key changes between Design Revision B and Design Revision C include:

- Reduction of the Development Footprint by an additional 10%; from 886 ha down to 799.5 ha.
- Further biodiversity avoidance, focussing on PCTs with moderate or higher conditions classes.
- Avoidance of additional Regent Honeyeater important habitat, reducing impacts by a further 29.97 ha.
- Avoidance of areas with overlapping habitat for SAll entities, including Regent Honeyeater and areas of both scattered tree and derived native grassland condition zone.
- Avoidance of a clustered area of PCT 483 with scattered tree condition zones, particularly on the outer boundaries of the Project Area.
- Avoidance of a number of small areas such as PCT 1607, and alignment of new roads and existing access tracks.
- Extension of the riparian buffer around Redlynch Creek.
- Adoption of higher cost, higher efficiency PV panel technology to maintain the MW capacity while enabling a reduction in the Development Footprint.

Design Revision D (current design)

A number of amendments to the Project have occurred in response to public and agency submissions received following public exhibition and progression of detailed design, which currently stands as of January 2024. These are detailed within the Amendment Report, with those that related to biodiversity impacts as follows:

- A re-alignment of the Project Area to avoid Travelling Stock Route TSR 44841.
- Relocation or removal of solar arrays within the Development Footprint and reconfiguration of an access track to further avoid SAIL, leading to a further reduction of impacts to 2.53 ha of Regent Honeyeater habitat and a further reduction of impacts to 6.25 ha of Box Gum Woodland.
- Further extension of the riparian buffer around Redlynch Creek.
- Avoidance of an Aboriginal cultural heritage site in the vicinity of Redlynch Creek (see OzArk Environment & Heritage 2023).
- Replacement of the standard security fencing (top strand barbed) with an alternative design (no barbed wire) to minimise potential impacts on wildlife.

As a result of these modifications the Development Footprint is 792.19 ha (a reduction of 7.31 ha).

7.1.2.3 Design Measures

The Project has been designed to take advantage of an existing 500 kV transmission line crossing the south-east portion of the site, allowing easy connection to the national electricity grid and avoiding the requirement for additional clearing for transmission lines.

7.1.2.4 Location of Ancillary Structures and Sheds in Areas with No Biodiversity Values, or in Areas of Poorest Habitat

All ancillary structures and sheds within the Development Footprint will be utilised during the operational stage of the Project. Additionally, staged construction works will enable the use of the Development Footprint for ancillary structures and sheds such as site facilities, storage areas and materials stockpiles.

7.1.2.5 Location of Ancillary Structures and Sheds to Avoid Habitat of Threatened Entities

All ancillary structures and sheds located within the Development Footprint will be utilised during the operational stage of the Project. Staged construction works will enable the use of the Development Footprint for ancillary structures such as site facilities, storage areas and materials stockpiles. Threatened species habitat will not be separately impacted by the location of ancillary structures.

7.1.2.6 Actions that Provide for Ecological Rehabilitation, Restoration and/or Maintenance or Retained Areas

The majority of the Project Area (1,200 ha) will be established as a BSA to generate biodiversity credits which will offset the impacts associated with the Project (see also **Section 11.3.1**). The establishment of a BSA would provide offsets in the same locality as the Project and provide an opportunity for the rehabilitation, restoration and maintenance of the residual site areas. Specific objectives would include assisted natural regeneration in areas of derived native grassland associated with the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC and monitoring, along with rehabilitation and protection of areas of mapped important habitat for the Regent Honeyeater.

7.1.2.7 Alternative Modes or Technologies Considered

The proponent considered the possibility of establishing a wind farm on the Development Footprint in lieu of a solar farm. Discussions with the proponent identified that a wind farm may have a reduced direct impact footprint, however, would likely result in increased indirect impacts to birds and bats through turbine strikes and barotrauma events. This would potentially have a higher level of impact on the Regent Honeyeater and higher visual impacts within the surrounding Goulburn River National Park.

Alternative Project layouts based on different solar farm designs using mature technology with a proven track record of large-scale implementation, have also been investigated including:

- Fixed versus tracking options for PV module mounting: A single-axis tracking system was chosen for the Project as it allows for more efficient electricity generation than fixed tilt options, leading to more efficient land use. Tracking systems also have a lower visual impact as they minimise glare from the sun, which can occur when the sun is at low angles in the sky and the PV modules are not facing the sun.
- Mono-facial versus bifacial PV modules: Bifacial PV modules were selected for the Project as they allow for more efficient electricity generation than traditional single-sided PV modules, leading to more efficient land use. The distance between the rows of modules is also larger for bifacial modules, which helps to minimise environmental and visual impacts of the Project and facilitate grazing.
- Selection of higher rated capacity solar panels has also been adopted to ensure that the Development Footprint is minimised, the Project obtains a capacity of a 550 MWp of solar electricity and the cost of purchasing the solar panels maintains the projects economic viability.

7.1.2.8 Project Design Constraints

The Project Area was selected for the location of a solar farm due to the presence of an existing 500 kV transmission line, which means that there will be no requirement for a new electricity transmission line or associated impacts. To ensure that the project remains economically viable, the total capacity of solar production needs to remain at or above 550 MWp of solar electricity.

The Project Area is also characterised by suitable terrain and topography, high quality solar irradiance and ideal climatic conditions with access to major transport networks for delivery of construction materials. There is only one surrounding land holder (the NSW Government, as the National Parks and Wildlife Service (NPWS)) and the visual impacts associated with the Project are minimised by the existing screening provided by the Goulburn River National Park.

7.2 Avoid and Minimise Prescribed Impacts

Prescribed Impacts are additional impacts which require assessment; however, they are not impacts which require consideration when calculating the number and classes of biodiversity credits required. Clause 6.1 of the Biodiversity Conservation Regulation defines *Prescribed Impacts* as:

- the impacts of development on the following habitat of threatened species or ecological communities:
 - karst, caves, crevices, cliffs and other geological features of significance
 - rocks

- human made structures
- non-native vegetation
- the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- the impacts of development on movement of threatened species that maintains their lifecycle
- the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
- the impacts of wind turbine strikes on protected animals
- the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

7.2.1 Project Location

Potential prescribed impacts of relevance to the Project are identified in **Section 6.0** of this report and comprise disturbances to non-native vegetation, human made structures and waterbodies such as dams and watercourses. Areas of non-native vegetation, excluded areas and human made structures are not likely to provide habitat of importance to threatened entities which should be avoided through modification to the Project location.

7.2.2 Project Design

Potential prescribed impacts of relevance to the Project are identified in **Section 6.0** of this report and comprise disturbances to non-native vegetation, human made structures and waterbodies such as dams and watercourses. Areas of non-native vegetation, excluded areas and human made structures are not likely to provide habitat of importance to threatened entities which should be avoided through modification to the Project design.

7.3 Other Measures Considered

7.3.1 Do Nothing Option

The 'Do nothing' option was considered as part of the EIS for this Project. The Project Area is currently used for livestock grazing. The 'do nothing option' would allow for the continued use of the Project Area solely for agricultural purposes. The 'do nothing option' would result in the 1,200 ha biodiversity offset area not coming under a BSA and resulting in further ongoing impacts from agricultural management practices, without the protection and enhancement provided under a BSA. The 'do nothing option' would also imply that the Project is not developed and would therefore forego the Project's identified benefits, namely:

- the provision of additional renewable energy supply to assist in reaching state and Commonwealth renewable energy targets in areas of the network that can handle large scale solar without the need for new network upgrades or powerlines such as Renewable Energy Zones

- assistance in the transition towards cleaner electricity generation and a reduction in greenhouse gas emissions
- increased energy security and supply into the Australian grid
- significant social and economic benefits created through capital investment, provision of direct and indirect employment opportunities during the construction and operation of the Project and community benefit scheme.

The adverse impacts associated with the Project are considered to be manageable through the implementation of the impact avoidance, minimisation and offsetting measures proposed.

7.3.1.1 Project Justification and Need

The development of renewable energy generation aligns with both Federal and NSW commitments to increase renewable energy generation and reduce carbon emissions.

The Project will contribute to the implementation of the NSW Electricity Strategy, which seeks to establish a reliable, affordable and sustainable electricity future for NSW. The location, design, technology, layout and size of the Project has been developed through consideration of a number of alternatives to ensure the Project would result in maximum benefits for the locality and region in the long term, whilst minimising impacts to the environment and to cultural heritage during all phases of the Project.

The Project is considered to be justified and in the public interest because:

- It is suitably located in a region with ideal climatic and physical conditions for large-scale solar energy generation.
- Contains suitable terrain and topography to support large-scale solar energy infrastructure.
- The Project Area has access to existing transmission line infrastructure that has capacity to transport the electricity to the grid. This minimises the need for construction works and disturbance associated with additional transmission infrastructure often required to connect large-scale renewable energy projects to the electricity market.
- It would not result in significant biophysical, social, cultural or economic impacts.
- Minimal visual impacts associated with the Project as the Project Area is screened by the Goulburn River National Park.
- The large, isolated Project Area (2,000 ha) provides flexibility in design to prioritise avoidance of high value biodiversity areas. This includes the possibility of the remaining areas being as an offset site under a BSA (currently being investigated).
- Potential to create employment opportunities and benefits to the local and regional economy.

Lightsource bp is committed to the long-term environmental management of the land within the Development Footprint. At the end of the Project's investment and operational life, the Development Footprint would be returned to its pre-existing agricultural land use or another land use as agreed by the host landholders at that time and in accordance with any legislative requirements or restrictions.

The consequences of not proceeding with the Project would result in:

- Loss of additional renewable energy supply to assist Australia in reaching the Large-scale Renewable Energy Target.
- Loss of opportunity to reduce greenhouse gas emissions and move towards cleaner electricity generation.
- Loss of increased energy security and supply into the Australian grid.
- Loss of significant social and economic benefits created through capital investment and provision of direct and indirect employment opportunities during the construction and operation of the Project.
- Lost opportunity in maximising existing infrastructure.
- Loss of 1,200 ha of land entered into a BSA including CEEC (PCT 483 and PCT 1661), as well as mapped Regent Honeyeater Important Habitat

7.4 Summary of Measures to Avoid and Minimise Impacts

A summary of the measures proposed to avoid and minimise direct, indirect and prescribed impacts associated with the Project is provided in **Table 7.2**.

Table 7.2 Avoidance and Minimisation Measures for Direct, Indirect and Prescribed Impacts

Action	Outcome	Timing	Responsibility
Preliminary biodiversity constraints analysis	Preliminary assessment of biodiversity constraints to inform Project design and minimise impacts to areas with high biodiversity values.	This has already been undertaken throughout the project design and biodiversity survey stage.	Project Ecologist, Planning Team and Proponent
Location and design of works in existing disturbed areas where possible	Focus impacts on areas of low biodiversity value.	This has already been undertaken throughout the project design and biodiversity survey stage.	Project Ecologist, Planning Team and Proponent
Reduction of Development Footprint boundary / impact footprint	Avoidance and minimisation of impacts to mapped important habitat for the Regent Honeyeater, areas associated with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community and Barking Owl Breeding Habitat.	This has already been undertaken throughout the project design and biodiversity survey and assessment stage.	Proponent

Action	Outcome	Timing	Responsibility
Workforce education and training	Environmental awareness for workforce.	Pre-construction, construction and operation.	Engineering procurement and construction contractor (EPC)
Implement Construction Environmental Management Plan (CEMP)	Management and minimisation of potential environmental impacts.	During construction phase.	EPC Contractor
Implementation of vegetation protection zones for areas to be retained	Protect retained habitats.	During construction phase.	Project Ecologist and EPC Contractor
Ecologist pre-clearance surveys and supervision of works	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Construction / site clearing phase.	Project Ecologist and EPC Contractor
Fencing and access control	Avoidance of unplanned human and livestock interference and disturbance to retained areas.	Construction and operational phases.	EPC Contractor
Erosion and sedimentation control	Minimise erosion and sedimentation within the site and downstream habitats through installation and maintenance of erosion and sediment controls.	Construction and operational phases.	EPC Contractor
Weed management	Prevent weed incursions and spread.	During construction, site clearing and operational phases.	EPC Contractor
Fauna exclusion	Prevent entrapment of fauna within site infrastructure.	Operational phase.	EPC Contractor and Project ecologist

8.0 Impact Assessment

8.1 Direct Impacts

8.1.1 Residual Direct Impacts

The parts of the Development Footprint which are subject to impacts associated with the Project are mapped in **Figure 8.1**. **Table 8.1** summarises the extent of proposed residual direct impacts to plant community types and threatened entities observed or assumed to be present on the Development Footprint.

Table 8.1 Summary of Residual Direct Impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	BC Act Status	EPBC Act Status	Potential SAI Entity	Project Phase/ Timing of Impact	Areas
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands	Critically Endangered Ecological Community	Critically Endangered Ecological Community	Yes	Construction phase	Derived native grassland component = 671.37 ha Scattered Trees component = 22.49 ha Total extent = 693.86 ha
Regent Honeyeater Mapped Important Habitat	Critically Endangered	Critically Endangered	Yes	Construction phase	Scattered Trees = 17.58 ha Derived Native Grassland = 24.72 ha Total extent = 42.30 ha
Barking Owl Breeding Habitat	Vulnerable	Not listed	No	Not applicable	Total / Derived Native Grassland = 1.22 ha

C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY.LTD\23485 - 03.S&V02 PROJECTS\23485 R07 AMENDEDBAR V7.APRX 22/01/2024 6:57 PM

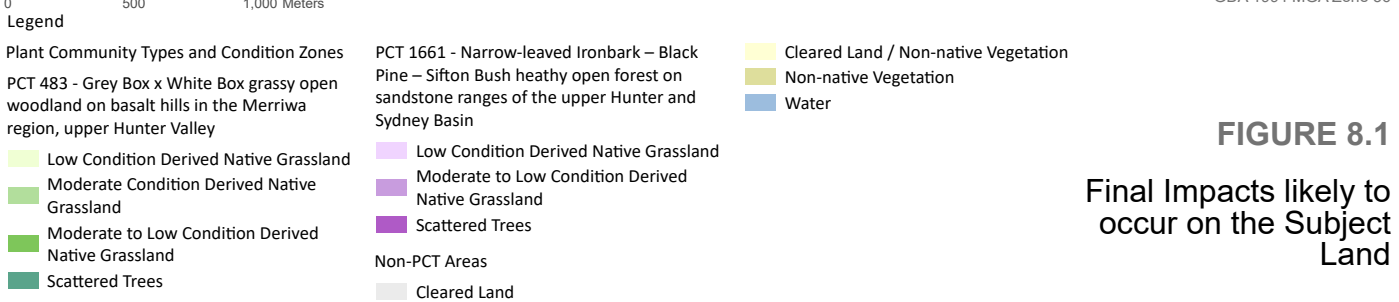
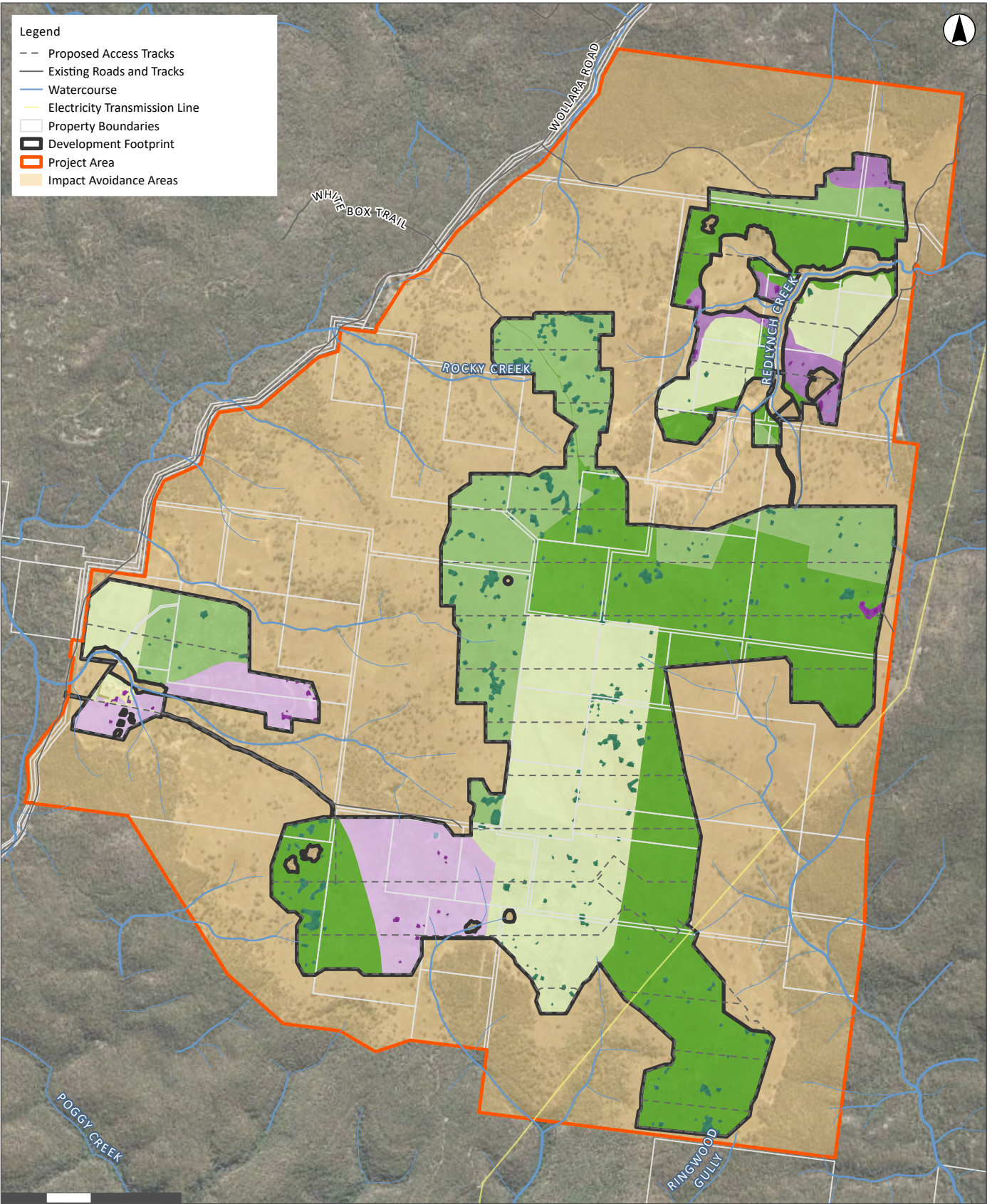


FIGURE 8.1

Final Impacts likely to occur on the Subject Land

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)

8.1.2 Change in Vegetation Integrity Score

Changes to the vegetation integrity scores as a result of the Project are presented in **Table 8.2**. For each vegetation zone the change in vegetation integrity is based on the development impacting to zero during construction. No vegetation integrity scores have been assessed as above zero after development and there would be no management actions required to maintain any remaining vegetation as it has been assumed that impact will occur to all vegetation within the vegetation zones. While this assessment is based on impacting vegetation integrity scores to zero, it is expected that the actual vegetation integrity score will not decrease to zero due to the retention of grassland areas under the solar panels and within the edges of the Development Footprint.

8.1.2.1 Vegetation Integrity Study and Biodiversity Net Gain Framework

Lightsource bp have been conducting a research project on an operational solar farm (i.e. Wellington Solar Farm) in NSW throughout 2023 to assess whether the installation and operation of solar panels results in a substantial change to the vegetation integrity score for very low to moderate condition DNG. The preliminary results of this study suggest that the post-construction vegetation integrity score of PCT 266 DNG at an operating solar farm is not zero. Additionally, the vegetation integrity score within the solar panel areas at the operating solar farm has been shown to be greater than the vegetation integrity score at control sites. The results of this vegetation integrity study should provide some confidence that impacts to DNG (particularly, to PCT 483) at Goulburn River Solar Farm are likely to have been overstated in the impact assessment.

Given the demonstrated results from the vegetation integrity study, it is anticipated that the vegetation integrity of DNG at Goulburn River Solar Farm would not be zero following construction. Taking this further, it is reasonable to hypothesise that low to moderate condition DNG would maintain pre-construction vegetation integrity scores, and the vegetation integrity score of low condition DNG may increase.

Whilst the PCT present at Wellington Solar Farm (266) differs from the predominant PCT at Goulburn River (483), both PCTs are components of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DCCEEW, 2023a) CEEC (listed under both BC Act and EPBC Act) and possess similar floristic composition and edaphic requirements, such that both PCTs may respond to the disturbance associated with the construction and operation of a solar farm in a similar manner.

Lightsource bp propose to conduct a comparable VI study at Goulburn River Solar Farm as an 'other measure' to address impacts to SAIL BGW in accordance with the BAM. Details of the study are contained within **Section 9.4**.

Biodiversity Net Gain

Lightsource bp have an internal Biodiversity Net Gain (BNG) Framework which was introduced in 2023 and applies across their portfolio of projects internationally (presently, they operate in 19 countries).

Lightsource bp's goal is to deliver a BNG on operational ground-mounted solar farms, notwithstanding the regulatory requirements within the jurisdictions of their projects. In the Australian context, offsets are an acceptable mechanism to compensate for unavoidable residual impacts. Irrespective of the offsets delivered, Lightsource bp are motivated to implement measures for biodiversity enhancement on the land around and under solar panels. Maintaining and improving VI on their NSW solar farm projects aligns with Lightsource bp's Biodiversity Policy (Lightsource bp, 2023).

Summary

Lightsource bp is committed to assuming total loss of vegetation integrity for PCT 483 within the Development Footprint as a result of the Project, and to providing offsets in accordance with the BAM. It is however considered likely that impacts are overstated by applying this approach and that vegetation integrity of PCT 483 would not be reduced to zero following construction of the Project. Lightsource bp is proposing to undertake a study of vegetation integrity pre and post construction at the Project, with the intention to collection information which could better inform future Lightsource bp projects, as well as regulators and the industry about the impacts of solar farm development on derived native grasslands (and specifically, on PCT 483).

Table 8.2 Impacts to Vegetation Integrity

PCT and Vegetation Condition Zone	Management zone	Area (ha)	Before development				After development				Change in VI score
			Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	
PCT 483 Condition Zone 1 – Scattered Trees	Development Footprint	22.49	83	85.1	69.6	78.9	0	0	0	0	-78.9
PCT 483 Condition Zone 2 - Moderate Condition Derived Native Grassland	Development Footprint	165.36	62.5	67.5	9.3	34	0	0	0	0	-34
PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland	Development Footprint	310.03	65.8	65.5	0.5	12.6	0	0	0	0	-12.6
PCT 483 Condition Zone 4 - Low Condition Derived Native Grassland	Development Footprint	195.98	41.8	36	0.7	10.3	0	0	0	0	-10.3
PCT 1661 Condition Zone 1 – Scattered Trees	Development Footprint	2.66	59.5	27.6	81	51.1	0	0	0	0	-51.1
PCT 1661 Condition Zone 2 - Moderate to Low Condition Derived Native Grassland	Development Footprint	37.65	41.2	17.1	3.3	13.3	0	0	0	0	-13.3
PCT 1661 Condition Zone 3 - Low Condition Derived Native Grassland	Development Footprint	54.98	34.8	16.1	0.1	3.4	0	0	0	0	-3.4

8.2 Indirect Impacts

Table 8.3 summarises the extent of the proposed residual indirect impacts to plant community types and threatened entities observed or assumed to be present within the Development Footprint.

Table 8.3 Summary of Residual Indirect Impacts

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
Increased site occupation	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	High	Frequent/ Ongoing	Construction and operation	Likely to occur, consequences are likely to include reduction in habitat suitability for threatened fauna.
Connectivity and corridors	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Frequent / Ongoing	Operation	A reduction in wildlife connectivity will occur, however some connectivity will be retained through planned corridor areas.
Light spill impacts	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Frequent/ Ongoing	Operation	Limited impacts may occur, consequences likely to include minor alteration to fauna behaviours including avoidance of light and opportunistic utilisation of light spill areas.
Noise impacts	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Frequent / short term	Construction	Construction noise will occur, consequences may include short term reduction in suitability of retained and adjoining habitats during construction works for sensitive fauna species.
Air quality impacts	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Infrequent / short term	Construction	Low potential to occur if appropriate dust suppression is undertaken. Consequences include physical injury to airways of fauna species and short term reduced photosynthetic capacity for impacted flora.
Water impacts	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Infrequent / long term	Construction and operation	Likely to occur. Consequences include loss of existing ephemeral watercourses within the Development Footprint.

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
Weed invasion	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Frequent / long term	Construction and operation	Likely potential to occur, although existing site use has resulted in widespread weed invasion. Consequences include introductions of new weeds and reduced grazing and suppression of existing weeds. Impacts as a result of weed invasion will be mitigated via the implementation of strict land management practices across both the Development Footprint and the BSA under relevant management plans.
Pest animal species	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Low	Frequent / long term	Construction and operation	Likely already occurring due to historical habitat modification. Low potential for increased impacts, potential consequences include reduced habitat suitability and predation of threatened fauna species.
Security fencing	Ecosystem credit species retained for assessment in Table 5.1 and species credit threatened fauna species assessed as present in Table 5.5 .	Moderate	Frequent / Long term	Construction and operation	Likely to occur. Consequences include reduction in habitat connectivity.
Offsite impacts from herbicide application	Matters protected within Goulburn River National Park.	High	Frequent/On going	Construction and operation	Unlikely to occur, given separation buffer between Development Footprint areas and the National Park boundary (a minimum of 25 m) and controls for herbicide use (Section 8.4.5).

8.3 Prescribed Impacts

Prescribed impacts associated with the Project are identified in **Section 6.0** of this report, mapped in **Figure 6.1** and are further documented below.

8.3.1 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance

8.3.1.1 Nature and Extent

The Project is not likely to impact caves, crevices, cliffs or geological features of significance. Areas of rock overhang and potential caves in the south of the Project Area have been entirely avoided by the Development Footprint.

Impacts are likely to occur to minor areas of surface rock which do not contain habitat structure for threatened bat species, shallow exposed rock and areas of piled rock which has been removed from paddocks. These impacts are likely to be long-term and permanent. Select relocation of rock piles into the neighbouring BSA (see **Section 11.3.1**) will occur to minimise potential impacts.

8.3.1.2 Duration

This is likely to be one-off, permanent impact for the life of the Project which will occur during construction.

8.3.1.3 Consequences

No threatened species have been recorded utilising these habitats and no significant consequences are predicted to occur.

8.3.2 Human Made Structures

8.3.2.1 Nature and Extent

The post-war sheds, house and ancillary structures and sheds will be repurposed for the construction compound and the disused 1900s house (Redlynch House) is no longer in the Development Footprint and will be retained. Additional structures will also be constructed to support the operations of the solar farm.

8.3.2.2 Duration

This will be a one-off, permanent impact for the life of the Project that will occur during construction.

8.3.2.3 Consequences

No threatened species have been observed utilising these structures and no significant consequences are predicted to occur. There is potential that native wildlife might utilise new structures constructed as part of the Project, for example, swallow nests or microbat roosts.

8.3.3 Non-Native Vegetation

8.3.3.1 Nature and Extent

Minor areas of non-native vegetation occur around the existing dwelling and will be removed by the Project.

8.3.3.2 Duration

This will be a one-off, permanent impact for the life of the Project that will occur during construction and site clearing.

8.3.3.3 Consequences

No threatened species have been observed utilising these habitats and no significant consequences are predicted to occur.

8.3.4 Excluded Areas – Category 1 Exempt Land

8.3.4.1 Nature and Extent

The areas of Category 1 - Exempt Land mapped within the Development Footprint are identified in **Figure 1.5**. This assessment has applied the BAM across the entire Development Footprint, including areas of mapped Category 1 – Exempt Land. As such, all areas of mapped Category 1 – Exempt Land have been assessed within this report.

8.3.4.2 Duration

This will be a one-off, permanent impact for the life of the Project that will occur during construction and site clearing.

8.3.4.3 Consequences

This impact will reduce the extent of suitable habitat available to threatened species which are capable of utilising highly disturbed terrestrial agricultural environments. This impact may also modify or reduce the suitability of aerial habitats for threatened species which forage during flight such as birds and bats. These areas contain highly disturbed non-woody vegetation utilised for agricultural purposes including cattle grazing.

8.3.5 Habitat Connectivity

8.3.5.1 Nature and Extent

The Project has potential to affect habitat connectivity for flora and fauna species. The Development Footprint contains agricultural land, predominantly comprised of grazed grasslands with remnant trees. It is surrounded by the Goulburn River National Park. Patches of retained forest and woodland vegetation are present typically in areas surrounding watercourses and on steeper or less fertile rocky habitats.

Current opportunities for wildlife movement across the Development Footprint (and much of the Project Area) are limited to more mobile species such as medium to large sized birds and mammals. As the majority of the Development Footprint is expanses of land with limited vegetation cover for protection and camouflage, movement by prey species (i.e., small mammals) is expected to be minimal. Scattered trees (**Figure 4.2**) would provide stepping stones for mobile fauna movement, however are spaced too far apart to facilitate ready movement by gliding mammals or protection for other species sensitive to large gap crossings (such as small forest birds).

The Development Footprint contains three connectivity pathways which will be retained to enable wildlife movement, as shown in **Figure 3.2**. The three areas which form the Development Footprint will be fenced for safety and security purposes, as well as to exclude fauna. The access tracks connecting the three areas of the Development Footprint will not be fenced, to prevent habitat fragmentation and ensure that access for terrestrial fauna species is maintained across the Project Area.

8.3.5.2 Duration

This will be a one-off, permanent impact for the life of the Project that will occur during construction and site operation.

8.3.5.3 Consequences

The consequences include reduced wildlife connectivity, however all areas likely to be important for habitat connectivity for woodland species have been maintained. The Project is unlikely to have any substantive impacts to connectivity as the Development Footprint is already substantially degraded by clearing, tree thinning and agricultural management, such that species utilising these areas for connectivity are already highly mobile and disturbance tolerant. Due to the nature and layout of the site, which is surrounded by undeveloped land, there will be no overall changes to landscape connectivity for wildlife movement.

8.3.6 Waterbodies, Water Quality and Hydrological Processes

8.3.6.1 Nature and Extent

Some first order ephemeral watercourses present within the Development Footprint will be impacted by the Project, however the impacts are limited to headwaters of streams which are typically dry and only convey limited amounts of runoff immediately following rainfall events. The third order parts of Redlynch Creek and most of the watercourses present have been avoided where practicable, and will be retained. Some small farm dams will also be filled to facilitate the Project, however these have limited aquatic ecology value (see **Appendix E**, Aquatic Assessment, within the Amendment Report).

8.3.6.2 Duration

This will be a one-off, permanent impact for the life of the Project that will occur during construction and site operation.

8.3.6.3 Consequences

The impacts associated with waterbodies and watercourses include reduced availability of habitat for aquatic species, altered hydrology and increased erosion and sedimentation within the Development Footprint. Suitable environmental controls will be implemented to prevent impacts to downstream environments within the Goulburn River National Park.

8.3.7 Vehicle Strikes

8.3.7.1 Nature and Extent

The Project includes the construction of several access roads through the site which will be utilised in the day-to-day operation of the Solar Farm. Vehicles driven through the site will adhere to appropriate speed limits to minimise impacts associated with vehicle strikes.

8.3.7.2 Duration

There will be an ongoing potential, however low probability of this impact occurring for the life of the Project.

8.3.7.3 Consequences

There is no reasonable probability that threatened entities will be impacted by vehicle strikes as vehicle movements will be at low speed.

8.4 Mitigating Residual Impacts – Management Measures and Implementation

The following management measures are proposed to mitigate the residual impacts (direct, indirect and prescribed) associated with the Project. The impact mitigation measures proposed for residual impacts are also further summarised in **Table 8.4**, with implementation details provided in **Table 8.5**.

8.4.1 Workforce Education and Training

The development of education packages and training can help to mitigate anthropogenic impacts on biodiversity resulting from the construction and operation of the Project. The ability of non-ecological personnel to identify key threatened species or key ecological threats can help to mitigate impacts on threatened species. The following mitigation actions will be implemented for the Project to develop a greater understanding and awareness of biodiversity issues in non-ecological trained personnel:

- Inductions for the workforce will be undertaken to make them aware of the key ecological issues present in the Development Footprint to aid in their understanding of their role and responsibilities in the protection and/or minimisation of impacts to all native biodiversity.
- Inductions will identify the location of sensitive flora and fauna, including any defined exclusion / no-go areas, and the policies being implemented to protect the biodiversity values of such areas.
- Responsibilities with respect to weed management and biosecurity.

8.4.2 Implementation of Vegetation Protection Zones for Areas to be Retained

During construction, temporary exclusion fencing or another form of suitable marking measure, will be used to demarcate vegetation in locations where necessary to avoid accidental damage to areas of vegetation outside of the Development Footprint. Access control is an important feature in protecting and demarcating areas outside the Development Footprint from vehicle access, human access, and accidental disturbance.

Proposed measures include:

- appropriate temporary fencing (or other form of suitable marking measures) and signposting of areas to prevent the uncontrolled entry of people, accidental disturbance and to minimise vehicular and human traffic
- clear and visible signage is to be appropriately located to inform the workforce and others of the restricted access or otherwise of areas outside the Development Footprint
- worker education and awareness of exclusion areas, including as delivered through site induction information
- the use of GPS enabled machinery (where available) to help prevent accidental disturbance of exclusion areas.

8.4.3 Ecologist Pre-Clearance Surveys and Supervision of Works

Pre-clearance surveys and tree felling supervision will be undertaken by an appropriately qualified and experienced ecologist to minimise potential impacts to fauna species, particularly hollow-dependent fauna. A detailed tree-felling supervision protocol is to be developed and documented as part of the CEMP for the Project. Large piles of rocks which have already been gathered within the paddocks within the site should also be retained and relocated outside the Development Footprint prior to construction to retain habitat value. Salvageable hollows felled from trees will be relocated to areas of retained vegetation in order to provide additional habitat in adjacent areas managed under the proposed BSA where appropriate (i.e. in areas with a paucity of similar habitat structures; to be determined by the Project Ecologist).

8.4.4 Erosion and Sedimentation Control

A Stormwater Management Plan including an Erosion Sediment Control Plan (ESCP) will be prepared to appropriately limit post development flows and manage downstream water quality as part of the site establishment and clearing works. Measures to be implemented include:

- Minimising the area of disturbance (as far as practicable).
- Diverting run-off water around disturbed areas.
- Installation and ongoing maintenance of temporary erosion and sediment controls (e.g., sediment fencing) throughout the duration of the construction of the Project.
- Design, implementation, and ongoing maintenance of permanent operational phase controls (e.g. catch drains) during the operational phase of the Project.
- Stabilisation (i.e., landscaping and revegetation) of all disturbed areas not required for the operation of the Project, to reduce the potential for future erosion.

The ESCP will be drafted with regard to the Managing Urban Stormwater: Soils and Construction (Volume 1) standard or to the standard of any equivalent replacement to this standard available at the commencement of construction.

8.4.5 Weed Management

Weed species could be inadvertently brought into the Development Footprint or surrounding habitats with imported materials, on vehicles and mobile plant, or could invade naturally through removal of native vegetation and the creation of a suitable growth medium. The presence of weed species has the potential to decrease the value of vegetation for native species, particularly threatened species.

Weed management controls would include:

- The survey and treatment of invasive weed species prior to the disturbance of topsoil within the Development Footprint to prevent an outbreak and / or the spread of species to previously unaffected areas within the Development Footprint.
- Ongoing environmental inspections and treatment of outbreaks of invasive weed species as required within the Development Footprint during the construction and operation of the Project.
- All machinery and equipment would be cleaned thoroughly prior to entering the Development Footprint. Cleaning must include the removal of all mud and plant matter (inside and out), followed by washing with high pressure water.

The Project would involve minimal use of herbicides to control exotic species. The proponent intends to set an objective to maintain or improve vegetation integrity in derived native grassland areas within the Solar Farm Development Footprint (see response to BCD recommendation #1). Herbicides would be applied in a targeted and sensitive manner across the Development Area, to reduce the risk of impacts on non-target species and for any pollutants to enter downstream watercourses.

The Project Biodiversity Management Plan would detail controls for herbicide use. This would include that herbicide application would be kept to a minimum and be applied in accordance with relevant application guidelines. A record of herbicide application would be kept. Only herbicides registered for use near water will be used in the vicinity of waterways, including ephemeral waterways. The primary weed control within the National Park is herbicide use (NSW National Parks and Wildlife Service (2003), sensitively applied within and around watercourses. Where relevant, weed (and pest) control would be done in consultation with neighbouring land managers (specifically, National Parks and Wildlife Service).

There are not anticipated to be any direct, indirect or prescribed impacts to vegetation within the Goulburn River National Park from herbicide use in the Development Footprint.

8.4.6 Fencing, Access Control and Fauna Exclusion

The three discrete areas of the solar farm Development Footprint will each be surrounded by fencing. The primary purpose of the fencing is for security and safety, however it will also deter fauna from entering and potentially becoming trapped within the site.

The fenced areas will be connected by access tracks, which will not be fenced. This will allow for continued fauna movement across the Project Area.

The Proponent is committing to an atypical fence design, in acknowledgement of the biodiversity values present in the Project Area and the surrounding national park. The fence specification will not include barbed wire. It will instead be wire mesh with galvanised bracing, to a height of 2,000 mm above ground.

8.4.7 Preparation and Implement of Construction Environmental Management Plan

A CEMP will be prepared to document the environmental impact mitigation, performance targets and monitoring requirements for the construction and operational phases of the Project.

Table 8.4 Summary of Proposed Mitigation and Management Measures for Residual Impacts (Direct, Indirect, and Prescribed)

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy
Workforce education and training	Environmental awareness for construction and operational site workers.	Construction and operation	For all new contractors and employees as part of the general site induction	EPC Contractor	Measure is likely to achieve intended outcome
Implementation of vegetation protection zones for areas to be retained	The boundary of the Development Footprint would be cleared marked on site by a surveyor prior to vegetation clearing commencing. The clearing boundary would be marked with high visibility fencing and signage.	Construction / site clearing	Prior to and during site clearing and construction Permanent fencing to remain for the life of the development	EPC Contractor and Project Ecologist	Measure is likely to achieve intended outcome
Ecologist pre-clearance surveys and supervision of works	A comprehensive clearing vegetation and fauna habitat clearance protocol would be developed as part of the CEMP. The protocol would detail requirements relating to <ul style="list-style-type: none"> • Preclearance surveys • Staged removal of vegetation • Timing of clearance activities • Relocation of rock piles. • Dam de-watering. 	Construction / site clearing	Prior to and during site clearing	EPC Contractor and Project Ecologist	Measure is likely to achieve intended outcome
Erosion and sedimentation control	Installation and maintenance of appropriate erosion and sediment controls and work practices.	Prior to and during civil works until permanent controls such as sediment basins are installed and established.	Temporary erosion and sediment controls would be installed prior to commencement of construction and permanent measures such as stormwater detention basins would be maintained for the life of the development.	EPC Contractor	Measure is likely to achieve intended outcome

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy
Weed management	<p>Development of a weed management protocol as part of the CEMP.</p> <p>A vehicle and machinery hygiene protocol will be prepared as part of the CEMP, the strategy would include details of washdown stations.</p> <p>Weeds would be appropriately disposed of in a suitable waste management facility.</p>	All stages of the development.	As needed	EPC Contractor / Project Ecologist	Measure is likely to achieve intended outcome
Fencing, Access Control and Fauna exclusion	Installation of a permanent security fence of the three individual Development Footprint polygons.	During operation	For the life of the development	EPC Contractor	Measure is likely to achieve intended outcome
Preparation and Implementation of CEMP	<p>Develop plan to adequately manage environmental impacts during construction including:</p> <ul style="list-style-type: none"> • dam dewatering controls • fencing and access control • weed management • erosion and sediment control. 	To prepared prior to the commencement of works and implemented for all construction works and for the life of the development as necessary.	For the life of the development	Proponent / EPC Contractor	Measure is likely to achieve intended outcome

Implementation details for the proposed impact mitigation and management measures are provided in **Table 8.5**.

Table 8.5 Implementation Details for Proposed Impact Mitigation and Management Measures

Measure/Action	Monitoring and Evaluation Strategy	Performance Criteria	Adaptive Management Threshold	Adaptive Management Response
Workforce education and training	Completion and maintenance of a site induction register.	Induction of all construction workers.	Failure of EPC Contractor to induct workers.	Breaches to be reported in accordance with notification procedures (7 days). Suspension of the relevant works until construction workers are inducted.
Implementation of vegetation protection zones for areas to be retained	Monitoring to be undertaken by the Project Ecologist prior to commencement and monthly during construction works.	Establishment of no-go zones around vegetation to be retained. Establishment of a vegetation clearing permit protocol to reduce the risk of unauthorised clearing.	Clearing of vegetation within no-go zones. Clearing of vegetation without an approved clearing permit (unauthorised clearing).	Breaches to be reported in accordance with notification procedures (7 days). Suspension of the relevant works until appropriate protection measures are implemented and appropriate remedial actions to remedy any adverse impacts are completed.
Ecologist pre-clearance surveys and supervision of works	Reporting on pre-clearance surveys and works supervision to be undertaken by Project Ecologist.	Ecologist must be present on-site during pre-clearance surveys and works requiring ecological supervision.	Completion of clearing works without Project ecologist supervision.	Suspension of relevant works until Project Ecologist supervision is available. Breaches to be reported in accordance with notification procedures (7 days).
Erosion and sedimentation control	Monitoring to be undertaken in accordance with requirements of CEMP.	Temporary erosion and sediment controls to be installed prior to works. Permanent controls to be maintained for the life of the development.	Monitoring detects lack or failure of required temporary or permanent erosion and sediment controls.	Breaches to be reported in accordance with notification procedures (7 days). Erosion and sediment controls to be installed and/or improved.
Weed management	Monitoring to be undertaken in accordance with requirements of CEMP.	Weed density is maintained below trigger level detailed within the CEMP.	Weed density exceeds the density limits set within the CEMP	Increase in frequency of weed treatment until weed density falls below relevant triggers.
Fencing, Access Control and Fauna exclusion	Monitoring to be undertaken in accordance with requirements of CEMP.	Exclusion of all target fauna species.	Repair or upgrade to fencing.	Fencing design to be improved to achieve effectiveness.

Measure/Action	Monitoring and Evaluation Strategy	Performance Criteria	Adaptive Management Threshold	Adaptive Management Response
Preparation and Implementation of CEMP	Implementation to be supervised by Project Ecologist or suitable environmental consultant with regular reporting to DPE during construction.	Completion of all proposed environmental protection works and monitoring inspections.	Monitoring detects breach or failure to implement CEMP.	Breaches to be reported in accordance with notification procedures (7 days).

8.5 Adaptive Management Strategy for Uncertain Impacts (Where Relevant)

It is considered that the potential impacts associated with the Project are generally predictable and known. Adaptive strategies for impact mitigation measures are provided in **Table 8.5**. Further adaptive management strategies will be provided in the CEMP for the Project.

9.0 Serious and Irreversible Impacts

9.1 Assessment for Serious and Irreversible Impacts on Biodiversity Values

The determination of a SAIL on biodiversity values is to be made by the decision maker in accordance with the principles set out in the BC Regulation 2017. Under Clause 6.7 (2) of the BC Regulation 2017, 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 of one of the following four principles:

- Principle 1: The impact 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, or
- Principle 2: the impact 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, or
- 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, or
- 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.

SAIL on biodiversity values of proposed development or activity means SAIL on biodiversity values as determined under section 6.5 of the BC Act, that would remain after the measures proposed to be taken to avoid or minimise the impact on biodiversity values of the proposed development.

If the Minister for Planning is of the opinion that proposed SSD is likely to have SAIL on biodiversity values, the Minister is required to:

- take those impacts into consideration, and
- determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.

A summary of the entities of relevance to this assessment which are listed as at risk of a SAIL is provided in **Table 9.1**.

Table 9.1 Entities at Risk of an SAI

Common Name	Scientific Name	Principle	Reason for Inclusion in Assessment
Regent Honeyeater	<i>Anthochaera phrygia</i>	1 & 2	Included in current list of entities at risk of an SAI and is likely to be impacted by the proposal
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.	-	1 & 2	Included in current list of entities at risk of an SAI and is likely to be impacted by the proposal

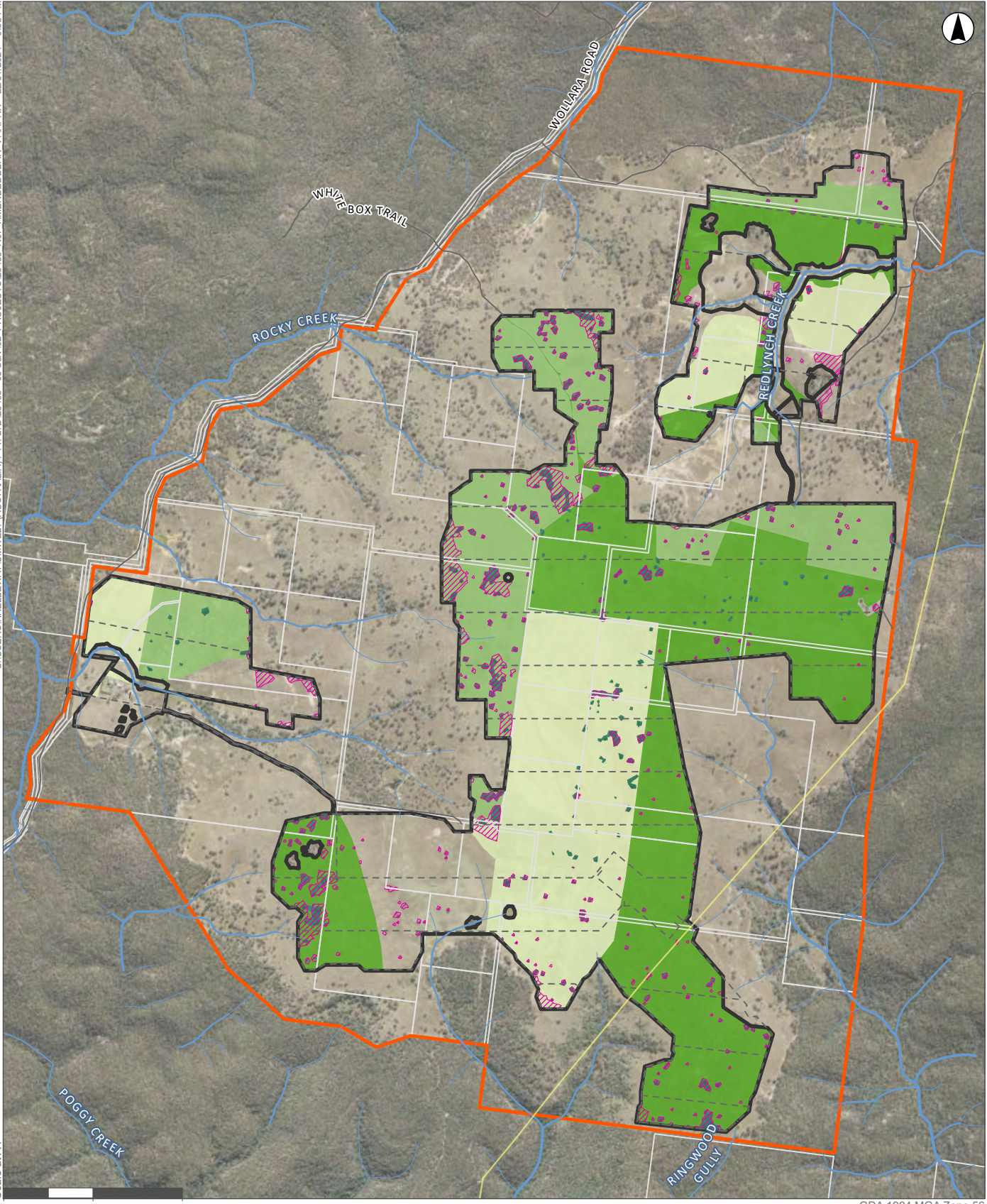
The locations of mapped important habitat for the Regent Honeyeater and the extent of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Development Footprint are mapped in **Figure 9.1**.

The SAI additional impact assessment provisions (AIAPs) from the 2020 version of the BAM are addressed in **Section 9.2** of this report. These AIAPs were updated in the 2020 version of the BAM from the AIAPs provided in the 2017 version of the BAM which are also currently reproduced in Appendix B of the DPIE (2019) Guidance to assist a decision maker to determine serious and irreversible impacts.



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03_S&V02_PROJECTS\23485_R07_AMENDED\BAR_V7_APRX_22/01/2024_6:56 PM

1:30,000
Scale at A4



- Legend**
- Existing Roads and Tracks
 - - Proposed Access Tracks
 - Watercourse
 - Electricity Transmission Line
 - Property Boundaries
 - ▭ Development Footprint
 - ▭ Project Area

- Potential SAIL Entities**
- ▨ Regent Honeyeater Mapped Important Habitat
 - ▭ White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland
 - ▭ Low Condition Derived Native Grassland
 - ▭ Moderate Condition Derived Native Grassland
 - ▭ Moderate to Low Condition Derived Native Grassland
 - ▭ Scattered Trees

FIGURE 9.1

Serious and Irreversible Impact Entities within the Development Footprint

9.2 Additional Impact Assessment Provisions for TECs at Risk of an SAI

9.2.1.1 White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions

The additional impact assessment provisions for TEC at risk of an SAI have been addressed for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC in **Table 9.2**. The location of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Development Footprint is shown in **Table 9.1**. **Figure 9.2** illustrates how this community has been further avoided by the Amended Project (between the May 2023 BDAR and current). This ecological community is listed as critically endangered under the BC Act and the EPBC Act. The NSW extent of this CEEC based on the NSW State Vegetation Type Mapping is shown in **Figure 9.3**.

Table 9.2 SAI Impact Assessment – Box White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

Response to BAM Section 9.1.1 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAI (or reference to where these have been addressed in the relevant section of the BDAR).
<p>A detailed description of the actions and measures proposed to avoid direct and indirect impacts on biodiversity values in general are documented in Section 7.0 of this report. A discussion of the measures taken to avoid and minimise impacts to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is provided herein.</p> <p>The 2,000 ha Project Area has provided flexibility during the design phase in order to prioritize the avoidance of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The Development Footprint has been located within an area of historical clearing and ongoing pasture improvement for agricultural use. Up to an 1,0000 head of cattle have been present across the Development Footprint at any one time, with much of the footprint cropped for fodder pasture. As a result, the Development Footprint has been located within the portions of the Project Area that are the most disturbed, and therefore has been centred within areas of Category 1 – Exempt land mapped on the Draft NVR map reproduced in Figure 1.5 of this report. As such, areas of higher quality White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Project Area have been retained within what is proposed to be a future BSA to provide offsets for the Project (see Section 11.3).</p> <p>The project has gone through four key design revisions which demonstrate the ongoing consideration of impacts to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC throughout the design and environmental impact assessment phases. The four design revisions are described in detail within Section 7.1.2.1, but are summarised in relation to the CEEC below:</p> <ul style="list-style-type: none"> • Design Revision A: During Design Revision A, the Development Footprint was reduced from 2,000 ha to between 1,249 ha (max) and 930 ha (min) through a series of spatial design iterations. These design revisions were focussed around reducing impacts on White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC and other areas of high biodiversity values, such as Regent Honeyeater important habitat mapping.

Response to BAM Section 9.1.1 Criteria

- **Design Revision B:** The Development Footprint was reduced from 1,249 ha (max) and 930 ha (min) to 868 ha following the lodgement of the Scoping Report and EPBC Referral. This design iteration reduced the proposed impacted area by approximately 30%, further avoiding areas of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC in moderate to good condition, and limiting the Development Footprint to areas of scattered paddock trees and derived native grassland forms of the CEEC.
- **Design Revision C:** Further refinements and reconfiguration to the Development Footprint after the draft EIS for review by DPE saw the footprint area reduced from 868 ha to 799.5 ha. Key changes between this design iteration and Design Revision B include further avoidance of areas of scattered trees and derived native grassland forms of the CEEC within Vegetation Condition Zones with higher VI scores.
- **Design Revision D:** In response to public and agency submissions received following public exhibition and progression of detailed design the Development Footprint has been further reduced by 7.28 ha to 792.19 ha. The final design revision has avoided an additional 6.25 ha of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC.

From Design Revision A (based on the 930 ha footprint) to the current footprint, impacts to the woodland form of this TEC have been reduced by 100%. Impacts on scattered trees have reduced by 62%. Impacts on derived native grassland (all condition zones) have reduced by more than 10%.

2. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:

a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)

b. The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:

- Change in community structure
- Change in species composition
- Disruption of ecological processes
- Invasion and establishment of exotic species
- Degradation of habitat
- Fragmentation of habitat.

c. Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC’s geographic range in NSW according to the:

- extent of occurrence
- area of occupancy
- number of threat defined locations.

d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).

The TBDC has been reviewed in relation to the information available for the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC. Additional sources relied upon are referenced within the text below.

a. The current extent of the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC and the estimated reduction in the geographic extent since 1970 is not available in the TBDC.

Response to BAM Section 9.1.1 Criteria

Threatened Species Scientific Committee

An assessment completed by Threatened Species Scientific Committee (TSSC) (2006) and reproduced by Tozer and Simpson (2020) estimate that the pre-1750 area of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC was 3,717,366 ha, which has been reduced to a current extent in 2020 of just 250,729 ha. This represents a 93% reduction since 1750. Tozer and Simpson (2020) note that the very large historical decline in the geographical distribution of the CEEC has been corroborated by other sources, however, the uncertainty still exists around both the current extent of the community as well as its pre-1750 distribution and the current totals are not likely to capture most of the low quality derived native grassland component of the community.

State Vegetation Type Map

Umwelt has utilised the current available State Vegetation Type Mapping (SVTM) which identifies an estimate of the per 1750 and current extent of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland using the best currently available mapping. The SVTM pre-1750 area of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is between 1,895,058 ha and 2,403,693 ha and the current SVTM extent of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland is between 1,267,603 ha and 1,639,571 ha. The variance in the SVTM upper estimate is due to some mapped PCTs being identified as only partly being associated with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.

Annual Loss and Reduction in Extent Since 1970

Tozer and Simpson (2020) have identified that the loss of the woodland component of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC across NSW between 2009 and 2018 was 9,802 ha or 1,089.1 ha per annum distributed disproportionately between years.

Using an annual loss rate of 1,089.1 ha, an estimate of the loss over the 1970 to 2020 period of 32,673 ha of the woodland component of the CEEC has been obtained. However, it is considered the rate of loss prior to 2009 is likely to have been much greater than 1,089.1 ha per annum due to a non-linear rate of clearing attributed to less legislative restrictions protecting White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland prior to its listing. Tozer and Simpson (2020) note that the rate of clearing of the CEEC has increased in recent years, with impacts to the CEEC from agriculture increasing up 340% (of the 2009-2016 average) for the period between 2017 and 2018, whilst impacts from infrastructure increased by 378% (of the 2009-2016) average between 2017 and 2018.

b. The following information has been obtained from the Conservation Assessment of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC prepared by Tozer and Simpson (2020).

Changes in community structure

In relation to community structure, Tozer and Simpson (2020) note that there are essentially no remaining areas that are fully intact and most of the remaining extent has lost its understory, been invaded by exotic species, lost entire suites of species or lost its structure in terms of the loss of tree, shrub and/or ground layers.

Changes in species composition

Species composition has been adversely affected by degradation and fragmentation which has caused the loss of suites of species such as understorey components or faunal components such as reptiles, mammals and/or woodland birds. The species lost are sometimes replaced by more common species such as aggressive noisy miners, exotic flora or monocultures of native grasses.

Response to BAM Section 9.1.1 Criteria

Disruption of ecological processes

The ecological community has undergone or is likely to undergo within a time frame appropriate to the life cycle of the habitat characteristics of its component species a very large disruption of biotic processes or interactions. The changes have been such that reestablishment of the ecological processes, species composition and community structure of the original ecological community is not likely to be possible, even with immediate positive human intervention.

Invasion and establishment of exotic species

Weeds have invaded most of the remaining areas of the original pre-1750 extent of this ecological community and result in continuing detrimental change. Extensive areas have experienced elevated soil nitrogen as a result of the application of chemical fertilisers, which is associated with the invasion of weeds and eventual conversion of native to exotic pasture.

Degradation of habitat

The ecological community continues to be degraded at both the patch and landscape scale. This ongoing modification, while not necessarily leading to the destruction of all elements of the ecological community, threatens it with extinction. Cumulatively, the disruption of biotic processes and interactions caused by the implementation of management for agricultural production is very severe and less than 10% of the original distribution of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland is likely to have avoided the long-term impacts of pastoralism.

Fragmentation of habitat

The community has been extensively cleared throughout its range and remnants are typically small, isolated, highly fragmented and occur in predominantly cleared landscapes and exhibit highly modified understoreys.

c. The extent of occurrence of White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland throughout its entire range in Australia is identified by Tozer and Simpson (2020) as 702,800 km². The extent of occurrence within NSW is not identified in the TBDC or separately assessed by Tozer and Simpson (2020).

The current geographic extent of this CEEC across its range is estimated by Tozer and Simpson (2020) (reproduced from TSSC 2006) as 576,654 ha, which includes an area of occupancy of 250,729 ha within NSW.

No threat defined locations are specifically identified in the TBDC profile. It is not likely that a single threatening event in a geographically or ecologically distinct area would rapidly affect all occurrences of this CEEC.

d. This principle (principle 4) is not applicable to the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC. The ecological community does respond to management, with some successful management measures are outlined in the document titled ‘A Guide to Managing Box Gum Grassy Woodlands’ (Rawlings, Freudenberger and Carr 2010).

Whilst the CEEC does respond to management, not all extents of the CEEC respond to management in a linear manner. Good et al. (2021) describe state and transitional models for grassy eucalypt woodlands across Australia and demonstrate the non-linear and multidirectional nature of the interaction between different woodland states with respect to management practices. For example, ‘Simplified 4 Woodlands’, such as the derived native grassland form of the CEEC within the Development Footprint, are very unlikely transition to the ‘Simplified 1 Woodland’ or ‘Simplified Woodland 2’ (i.e. better quality) states even with management, however, are likely to degrade into low quality states when current land management practices change.

While not directly relevant to the Project the following management actions are also listed within the TBDC:

- Undertake control of rabbits, hares, foxes, pigs and goats (using methods that do not disturb the native plants and animals of the remnant).

Response to BAM Section 9.1.1 Criteria

- Manage stock to reduce grazing pressure in high quality remnants (i.e. those with high flora diversity or fauna habitat).
- Do not harvest firewood from remnants (this includes living or standing dead trees and fallen material).
- Leave fallen timber on the ground.
- Erect on-site markers to alert maintenance staff to the presence of a high quality remnant or population of a threatened species.
- Encourage regeneration by fencing remnants, controlling stock grazing and undertaking supplementary planting, if necessary.
- Undertake weed control (taking care to spray or dig out only target species).
- Protect all sites from further clearing and disturbance.
- Ensure remnants remain connected or linked to each other; in cases where remnants have lost connective links, re-establish them by revegetating sites to act as steppingstones for fauna, and flora (pollen and seed dispersal).
- Mark remnants onto maps (of the farm, shire, region, etc) and use to plan activities (e.g. remnant protection, rehabilitation or road, rail and infrastructure maintenance work). On-site markers can alert maintenance staff to the presence of a threatened species.

3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR.

The NSW White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is not identified as 'unknown' or 'data deficient' in the TBDC.

4. The following questions are addressed in relation to the impacts from the proposal of the TEC.

a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:

- i. in hectares
- ii. as a percentage of the current geographical extent of the TEC in NSW

b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:

- i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the Development Footprint or equivalent area for other types of proposals
- ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:
 - distance between isolated areas of the TEC, presented as the average
 - distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and
 - estimated maximum dispersal distance for native flora species characteristic of the TEC, and
 - other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development
- iii. Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.

Response to BAM Section 9.1.1 Criteria

a. The Project will impact approximately 693.86 ha of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. This is comprised of the following condition zones described in the table below.

Vegetation Condition Zone ID	PCT ID	Condition	Area impacted	VI Score
PCT 483 - 1	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Scattered Trees	22.49	78.9
PCT 483 - 2	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate condition derived native grassland	165.36	34
PCT 483 - 3	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate to low condition derived native grassland	310.03	12.6
PCT 483 - 4	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Low condition derived native grassland	195.98	10.3

Of the 693.86 ha of CEEC to be impacted by the Project, 506.01 ha or 72.9% occurs within PCT 483-3 and PCT 484-4, Vegetation Condition Zones comprised of derived native grassland in moderate to low condition. In accordance with Section 9.2.1(1)(a) of the BAM, offsets do not need to be calculated for vegetation condition zones with a VI score of <15. PCT 483-3 and PCT 484-4 have VI scores of 12.6 and 10.3 respectively. As such, the impacts within Vegetation Condition Zones PCT 483-3 and PCT 484-4 do not need to be offset.

The Project would result in the removal of 165.36 ha of PCT 483-2, White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in moderate condition. Impacts to this vegetation condition zone make up approximately 23.83% of the overall Project related impacts to the CEEC.

The Project would also result in the removal of 22.49 ha of PCT 483-1, White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland containing scattered paddock trees. Impacts to this open woodland form of the CEEC make up approximately 3.2% of the overall Project related impacts to the CEEC. The VI scores for PCT 483-1 and PCT 483-2 are ≥ 15 , therefore impacts within these vegetation condition zones must be offset.

Assuming an area of occupancy of 250,729 ha as estimated by Tozer and Simpson (2020), the Project will impact approximately 0.28% of the geographic extent of this CEEC. Of this,

- impacts to highly degraded low and low to moderate condition derived native grassland which does not generate an offset requirement would impact 0.2% of the geographical extent of the CEEC, noting that the reported geographic extent of this community is not likely to include patches of the community in such a highly degraded condition state
- impacts to moderate condition derived native grassland would impact 0.06% of the geographical extent of the CEEC
- impacts to the CEEC containing scattered paddock trees would impact 0.009% of the geographical extent of the CEEC.

Response to BAM Section 9.1.1 Criteria

Due to the avoidance and minimisation measures carried out as part of the design revisions described above and within Section 7 of this report, impacts to White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland primarily occur within areas of the CEEC which are comprised of derived native grassland in low condition. The VI scores for vegetation within these areas is <15, which falls under the offset threshold set within Section 9.2.1(1)(a) of the BAM such that these impacts do not need to be offset.

b. The Project will not isolate any areas of the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC, as four discreet Project areas are proposed with connecting areas to be retained both between these areas and around the outside of the Development Footprint.

The Project will fragment areas of the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC in derived native grassland form within the south-eastern section of the site from other retained areas of the CEEC within the northern and western sections of the site but, as stated, not isolate these from surrounding native vegetation. However, these areas were already separated by highly disturbed agricultural use areas. The fragmentation will occur through the removal of areas of highly degraded derived native grassland vegetation and scattered trees. The retained areas will remain connected through other vegetation communities both within the Project Area and the adjoining Goulburn River National Park.

The separation distance that will result between the retained areas of White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC in the western and south-eastern parts of the Project Area is approximately 560 m to >1300 m. These areas would remain connected through a highly disturbed agricultural landscape if the Project was to not proceed.

The main dispersal mechanisms for flora species associated with the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC are inferred to be by one or a combination of dispersal mechanisms, including animals, wind, water runoff, and gravity.

Eucalypts within the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton *et al.* 2004).

The maximum dispersal distance for native flora species characteristic of the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland ecological community is estimated to be at least 1,000 m and potentially much further.

The Project will increase the area to perimeter ratio of the remaining areas of derived native grassland associated with the Box Gum TEC, as the Project area is situated centrally within an occurrence of mostly derived native grassland associated the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC.

Within the Development Footprint, areas of the White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC correspond to PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley. All of these areas have been degraded over a relatively long time period by agricultural management, which has included clearing of trees and understorey vegetation, grazing and pasture improvement.

Due to the avoidance and minimisation measures carried out as part of the design revisions described above and within Section 7 of this report, impacts to White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland primarily occur within areas of the CEEC which are comprised of derived native grassland in low condition. The VI scores for vegetation within these areas is <15, which falls under the offset threshold set within Section 9.2.1(1)(a) of the BAM such that these impacts do not need to be offset. These vegetation condition zones are likely to be (at best) equivalent to the ‘Simplified 4 Woodland’ state of grassy woodland communities as described by Good *et al.* (2021). These woodland states are highly unlikely to improve to ‘Simplified 1 Woodland’ or ‘Exemplar’ states even with management, but are likely to degrade further should ongoing agricultural land management practices change.

Response to BAM Section 9.1.1 Criteria

The change in vegetation integrity of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland derived native grassland as a result of the Project has been assumed to be total (i.e., all vegetation integrity across the entire Development Footprint reduced to zero). This is a precautionary approach to assessing impact and calculating the resulting credit obligation, however it is unlikely to be the case in practice. Of the 693.86 ha of PCT 483 within the Project Footprint only approximately 7% would be fully impacted. The access tracks, BESS, inverters and on-site substation footprints would result in complete removal of the underlying PCT. This equates to 48.2 ha of permanent (for the life of the Project) impacts to PCT 483.

The remaining 93% (645.66 ha) would be partially impacted. Clearing and ground disturbance across the bulk of the Development Footprint would largely relate to post holes (for fencing and panel installation). The post holes would likely be dug using a mobile drilling rig approximately the size of a small truck, which may have a caterpillar-like system. Given the rocky nature of the substrate, it is likely that temporary impacts on the DNG would be no more significant than the current regime of tilling, cropping and grazing.

Where earthworks are required, the topsoil would be separated, stockpiled, and re-spread within rehabilitation areas. The seed bank of the derived native grassland is therefore anticipated to be retained within the Development Footprint. The PCT 483 seed bank and regeneration capacity is considered to be robust, given the present extent of this vegetation community across paddocks which have been consistently grazed and cropped for decades.

Whilst some compaction impacts on PCT 483 are likely during construction as a result of mobile plant, foot traffic, and temporary laydown of equipment and materials, trampling of native vegetation would largely be short term, and ground disturbance minimal.

The Project would be required to carry out ongoing management of the land within the Development Site as part of any biodiversity management plan prepared for project operation. As such, the Project would as a minimum retain a the same ‘Simplified 4 Woodland’ state of the CEEC onsite, and possibly improve the condition of the CEEC within the Development Footprint.

The proponent is proposing to undertake a study of vegetation integrity pre and post construction, to test the hypothesis of whether the installation and operation of solar panels results in a substantial change to the VI score for very low to moderate condition derived native grasslands (specifically, PCT 483).

The Vegetation Condition Zones and relevant composition, structure and function condition scores for each vegetation zones making up White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in the Development Footprint PCT are detailed below:

Vegetation Condition Zone ID	Composition	Structure	Function	VI Score
PCT 483 - 1	83	85.1	69.6	78.9
PCT 483 - 2	62.5	67.5	9.3	34
PCT 483 - 3	65.8	65.5	0.5	12.6
PCT 483 - 4	41.8	36	0.7	10.3

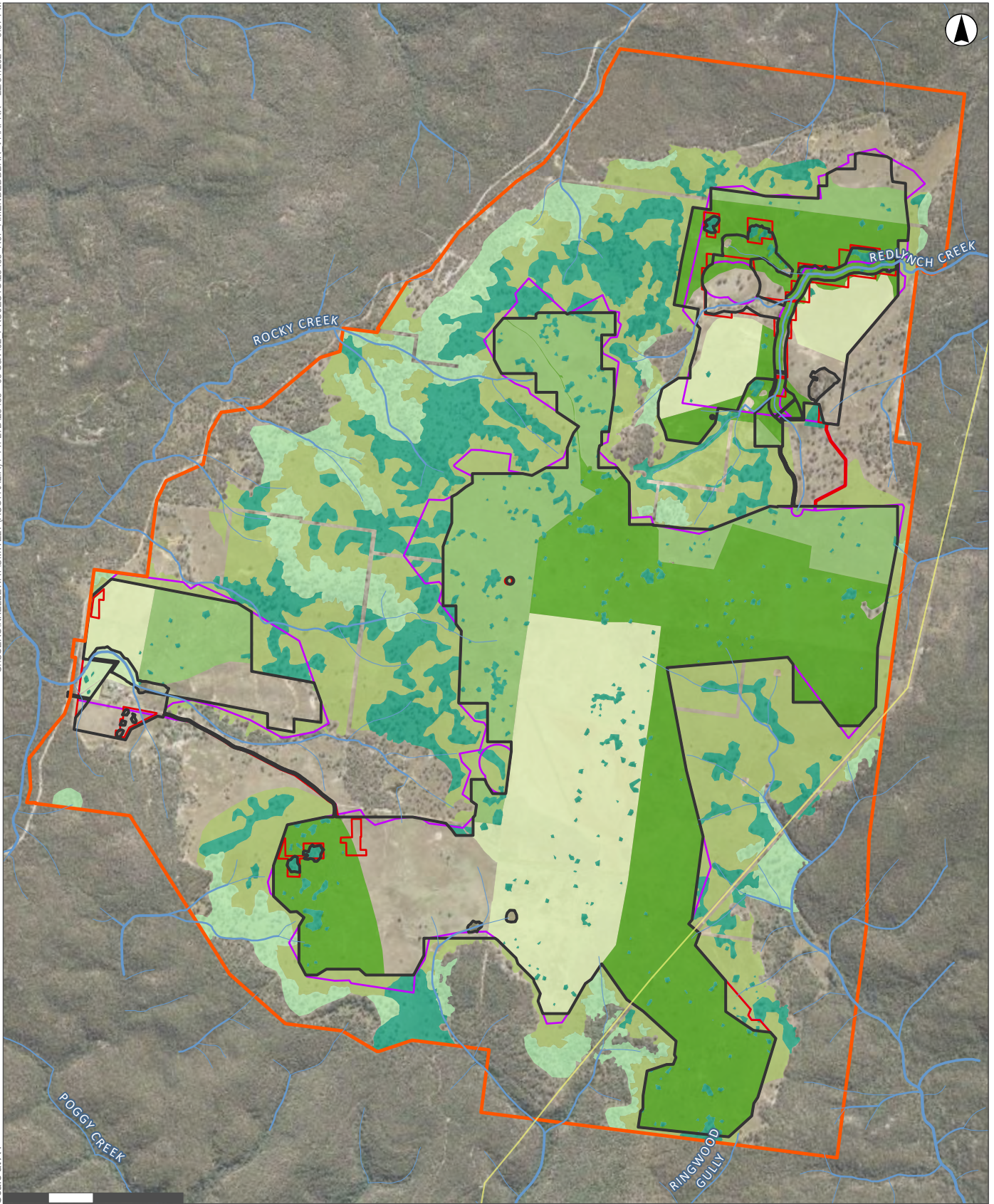
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAI is not accurate.

Not applicable.



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03_S&V02_PROJECTS\23485_R07_AMENDED\BAR_V7_APRX_22/01/2024_6:57 PM

1:30,000
Scale at A4



0 500 1,000 Meters

GDA 1994 MGA Zone 56

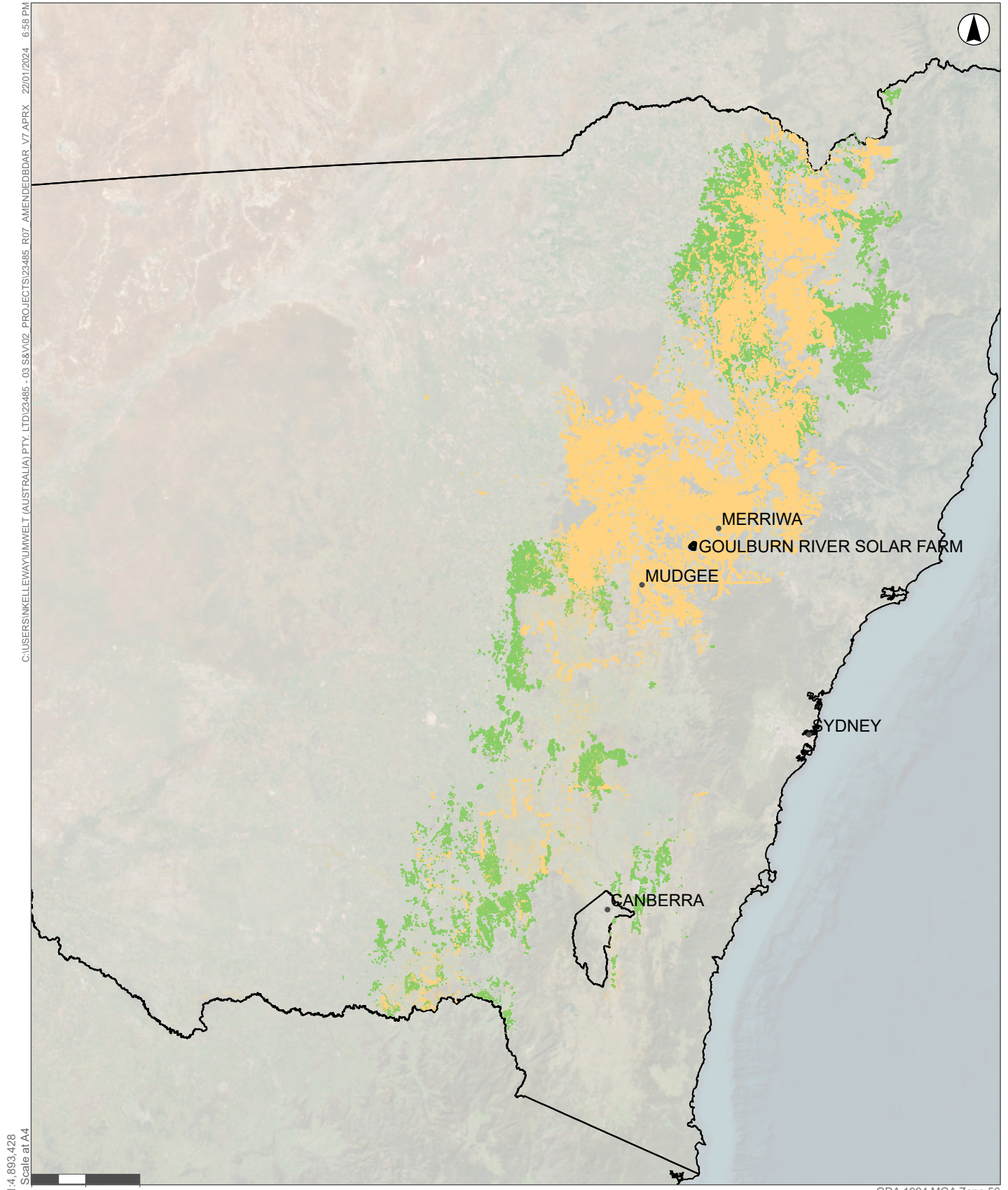
Legend

- Electricity Transmission Line
- Watercourse
- Soft Lodgement Development Footprint
- EIS Development Footprint
- Final Development Footprint
- Project Area

- Box Gum Woodland CEEC**
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland**
- Low Condition Derived Native Grassland
 - Moderate Condition
 - Moderate Condition Derived Native Grassland
 - Moderate to Low Condition Derived Native Grassland
 - Derived Native Grassland
 - Scattered Trees

FIGURE 9.2

Box Gum Woodland CEEC Impact Avoidance



1:4,893,428
Scale at A4

GDA 1994 MGA Zone 56

- Legend**
- Populated Place
 - ▭ State Borders
 - ▭ Project Area
- Box Gum Woodland CEEC NSW Distribution (based on NSW State Vegetation Type Map)**
- Part Association
 - Full Association

FIGURE 9.3

Box Gum Woodland CEEC NSW Distribution (based on NSW State Vegetation Type Map)

9.3 Additional Impact Assessment Provisions for Threatened Species at Risk of an SAI

9.3.1 Regent Honeyeater (*Anthochaera phrygia*)

The additional impact assessment provisions for threatened species at risk of an SAI have been addressed for the Regent Honeyeater in **Table 9.3**. The SAI assessment for Regent Honeyeater has been prepared by Dr. Crates as part of the Expert Assessment and Conservation Advice Report contained within **Appendix H** of this report as well as replicated in **Table 9.3** below (**Appendix H** for references). This species is listed as critically endangered under the BC Act and the EPBC Act. Areas of impacts and impact avoidance for this species are mapped in **Figure 9.4**, which demonstrate genuine impact avoidance.

Table 9.3 All Impact Assessment – Regent Honeyeater

Response to BAM Section 9.1.2 Criteria			
<p>1. The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAI, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAI. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.</p>			
<p>Whilst the species was not observed during the survey, 42.30 ha of native vegetation mapped as important habitat for the regent honeyeater is within the Development Footprint. This species is listed as critically endangered under the BC Act and EPBC Act, and is an entity with the potential for serious and irreversible impact. Of the 42.30 ha impacted, only 17.58 ha is treed, with the remainder mapped over grassland and cleared areas. The Project will retain 1195.76 ha of native vegetation within the BSA, excluding water bodies, of which 824.72 ha is included within the regent honeyeater important area mapping (Figures 6-8). The BSA encompasses approximately 92.18% of all of the regent honeyeater important areas contained within the Project Area. Biodiversity impacts have been avoided and minimised through refinements to the Development Footprint. From the Scoping Report (December 2021) to the present, the Development Footprint has greatly reduced in size to respond to emerging understanding of site-specific biodiversity constraints and to prioritise the avoidance of impacts on potential serious and irreversible impact entities. The Development Footprint has been reduced by 456.5 ha from the Scoping Report (where it covered 930.36 ha of the Project Area) to present day (792.19 ha). This represents a 15% reduction in developable area. Table 1 shows how avoidance has occurred across design iterations. The Project has managed to avoid 38.75% of the initially proposed mapped regent honeyeater important habitat important area, a reduction of 67.08 ha.</p>			
Regent Honeyeater Important Habitat Development Footprint Impacts			
Design Revision A (Scoping Report)	Design Revision B	Design Revision C	Design Revision D
109.51 ha	79.02 ha	45.09 ha	42.30 ha
<p>Between May 2023 (EIS submission) and the Amendment Report, design refinements have focused on avoiding areas of higher quality Regent Honeyeater mapped important habitat and PCT 483 (box gum woodland) scattered trees, as well as watercourses. The northeast of the Development Footprint (Figure 9) has undergone the greatest change during the recent design iteration, with additional areas of mapped important regent honeyeater habitat now avoided. Impacts to Redlynch Creek (a third order stream) have also been significantly reduced, now limited to tracks and two places where it will be crossed by the solar farm security fence.</p>			

Response to BAM Section 9.1.2 Criteria

The following key impact avoidance and minimisation measures have been applied:

- Selection of higher rated capacity solar panels to ensure that the Development Footprint is minimised, the Project retains a capacity of a 550 MWp of solar electricity and the cost of purchasing the solar panels maintains the Project's economic viability.
- Designing the Project layout in such a way that landscape scale connectivity between the Project Area and surrounding Goulburn River National Park will be maintained, along with continued local connectivity across the Project Area. This has been done by focussing the Project infrastructure in discrete fenced areas, linked by access tracks which will not be fenced and will therefore allow for wildlife movement.
- Designing the Development Footprint to avoid Redlynch Creek in the north east of the Project Area by creating a 60 m corridor that will enable wildlife movement along the riparian corridor as well as protect water quality.
- Redesign of the Project to minimise impacts on areas of mapped regent honeyeater important habitat (the generic mapping includes both areas of scattered trees and grassland).
- Reduction and alteration of the Development Footprint to minimise impacts to areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. This included impact avoidance measures targeted at retaining areas of woodland with intact crown condition, areas of scattered trees and higher quality derived native grassland condition zones.
- Prioritising areas for avoidance which are both mapped regent honeyeater important habitat and CEEC woodland.
- Reduction of the Development Footprint to entirely avoid impacts to areas of PCT 1607 Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter.
- Reduction of the Development Footprint to entirely avoid impacts to areas of PCT 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin which corresponds to the Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion vulnerable ecological community (VEC).

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including:

a. Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:

- i. Decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or**
- ii. Decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites**

b. Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:

- i. An estimate of the species' current population size in NSW, and**
- ii. An estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and**
- iii. Where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations**

c. Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:

Response to BAM Section 9.1.2 Criteria

- i. Extent of occurrence
- ii. Area of occupancy
- iii. Number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and
- iv. Whether the species' population is likely to undergo extreme fluctuations

d. Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:

- i. Known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., Species is clonal) on, a biodiversity stewardship site
- ii. The species is reliant on abiotic habitats which cannot be restored or replaced (e.g., Karst systems) on a biodiversity stewardship site, or
- iii. Life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g., Frogs severely impacted by chytrid fungus).

2(a)(i) The regent honeyeater population continues to decline in NSW. Due to the species' life-history attributes, its small population size, large range and irregular, long-distance movement patterns (Commonwealth of Australia DoE 2016), it is challenging to estimate with confidence the size of the NSW regent honeyeater population and the rate at which it is declining. Best estimates suggest that the NSW regent honeyeater population may have halved over the past decade, with a contemporary population comprising between 150 and 300 individuals (Garnett et al. 2021). A population viability analysis based on parameters derived from monitoring of the wild population since 2015 predicts that the species could be extinct in the wild within two decades (Heinsohn et al., 2022).

2(a)(ii) In addition to the information provided in response to 2(a)(i) above, there is evidence of a decline in the geographic distribution of the regent honeyeater over the past decade. Regent honeyeaters have not been seen and have not bred in the Pilliga / Warrumbungles region since 2015, whilst sightings in the NSW Northern Tablelands and the NSW South Coast regions have continued to dwindle (Crates et al. 2021, NRHMP, unpublished data). There has been a substantial decline in the quality of known breeding habitat over recent years. The 2019/20 drought led to widespread eucalypt die-off in the Bundarra-Barraba area (Losso et al., 2022). Recent observations show that needle-leaf mistletoe *Amyema cambagei* – a key breeding resource for Regent Honeyeaters- suffered widespread mortality associated with low rainfall and high temperatures (Crates et al., 2022). Consequently, there is good evidence that on top of an observable population decline and range contraction over the past decade, regent honeyeaters have also experienced a decline in the quality and quantity of known breeding and foraging habitat in recent years.

2(b)(i) The contemporary, wild regent honeyeater population is estimated to consist of 150–200 individuals in NSW (Crates et al. 2019, Garnett et al. 2021). The NSW population has been recently supplemented by the reintroduction of 80 zoo-bred birds into the lower Hunter Valley in 2020–21 and of 14 birds into the Capertee Valley in 2023. It is not known how many of the zoo-bred birds released in the Hunter Valley at the time of writing (November 2023) are still alive, although three zoo-bred females released in the Hunter Valley have been located with wild males elsewhere in 2023. Therefore, it is estimated that the NSW regent honeyeater population currently comprises 100-300 individuals.

2(b)(ii) The available evidence from sightings data and population viability analysis suggests that the NSW population has declined by approximately 30–50% in three years. In 2017 (the last productive season for the species), the National Regent Honeyeater Monitoring Program (NRHMP) managed by the Australian National University detected approximately 140 mature wild individuals in NSW. In 2021, with conditions comparable to 2017, the NRHMP has located approximately 80 mature wild individuals and in 2023 the NRHMP has located approximately 45 wild birds. These figures represent a 43% decrease in the population over four years and a 68% decrease over 6 years. Capacity to identify the extent to which the population has declined in the short-term is hindered by the species' small population size, large range and irregular settlement patterns.

Response to BAM Section 9.1.2 Criteria

2(b)(iii) The majority of the NSW Regent Honeyeater population occurs within the greater Blue Mountains region, encompassing key breeding areas such as the Capertee, lower Hunter, Goulburn River area in the Upper Hunter, Burratorang and Widden River valleys. Colour banding data confirm individual birds frequently move between these areas within the greater Blue Mountains (Commonwealth of Australia 2016). The population is known to undergo extreme fluctuations based on environmental conditions. During drought conditions, the birds do not occupy their regular breeding areas and the number of individuals sighted by the public or through the NRHMP falls substantially. There is little information available on what areas regent honeyeaters occupy during drought years and what impact droughts have on regent honeyeater breeding productivity.

Genetic data suggest that the NSW regent honeyeater population comprises a single genetic management unit, but there is evidence of some weak population genetic structure (Kvistad et al. 2015, Crates et al. 2019). Song data shows that the Blue Mountains and Northern Tablelands populations have distinct vocal dialects, though there is vocal evidence that some birds from the Northern Tablelands immigrate into the Blue Mountains population (Crates et al. 2021b).

2(c)(i) Regent honeyeaters do not have a limited geographic range in NSW. NSW DPE Biodiversity Assessment Method (BAM) support have indicated that extent of occurrence measures are not relevant to regent honeyeater SAI assessments.

2(c)(ii) Regent honeyeaters do not have a limited geographic range in NSW. NSW DPE BAM support have indicated that area of occupancy measures are not relevant to regent honeyeater SAI assessments.

2(c)(iii) Although regent honeyeaters are known to repeatedly occur and breed in a small number of important areas when conditions allow, the population is generally not concentrated in threat-defined locations given the species' high mobility. The most important areas for the species include the Capertee Valley, parts of the lower Hunter Valley, the Burratorang Valley and the upper Hunter Valley including Merriwa, the Goulburn River valley and Widden River valleys. When breeding in these areas, regent honeyeaters tend to form small nesting aggregations where multiple pairs will breed in relatively close proximity (Geering and French 1998, Crates et al. 2019). Were a single threatening event such as a bushfire or severe thunderstorm to occur in any of these locations (particularly during a breeding event), it would have a significant impact on subsequent species' occurrences in that location. However, because the regent honeyeater is highly mobile, with birds tending to nest in (a small number of) different locations each year, a single threatening event could have a significant impact on the population but is only likely to impact a proportion of the population. Megafires are a possible exception (Crates et al. 2021a).

2(c)(iv) The number of regent honeyeaters detected in NSW through the NRHMP and through public sightings undergoes extreme fluctuations. For example, since 2015 the number of mature regent honeyeaters detected through the NRHMP has ranged from 140 in 2017 to around 30 in 2019. Whilst there are recent records of regent honeyeaters in Queensland (BirdLife Australia, unpublished data), it is assumed that most birds remain within NSW during droughts and that the fluctuation in numbers reflects a current lack of knowledge on the areas regent honeyeaters occupy during drought events.

2(d)(i) The nomadic movement and unpredictable settlement patterns of regent honeyeaters make it extremely challenging to implement management actions that will positively benefit the species in the short term. Noisy miner suppression in recent years has successfully reduced threats in some key breeding areas such as the Capertee Valley and Goulburn River localities (Crates et al., 2018, 2023), however it is considered unlikely that regent honeyeaters would respond positively to management to the extent that population declines observed over recent decades may be reversed (Heinsohn et al., 2022). Increased efforts to protect regent honeyeater nest from predation in the 2023 breeding season is showing promising results, but implementing nest protection measures is only ever likely to benefit a proportion of the population that can be located early each breeding season.

Habitat restoration and biodiversity stewardship will benefit regent honeyeaters in the longer term and are undoubtedly required at a large scale if the species is to achieve long-term population recovery. However, given the observed rate of population decline and population viability predictions (Heinsohn et al., 2022) restoration and / or biodiversity stewardship are considered measures more complementary to targeted actions to help save regent honeyeaters from extinction in the coming decades.

Response to BAM Section 9.1.2 Criteria

2(d)(ii) Regent honeyeaters are not dependent upon abiotic habitats which cannot be restored or replaced, however the species' is extremely selective in terms of its breeding habitat. Even within the upper Hunter Valley, known breeding activity is limited to a very small proportion of the species' mapped important habitat (c/f figure 1b). Loss of known breeding habitat is very unlikely to be replaced on a biodiversity stewardship site in the short to medium term; the time frame in which the species' conservation needs are most pressing.

2(d)(iii) Life-history traits of the regent honeyeater are relatively well-known (Franklin et al. 1989), however knowledge of the species' movement patterns is a major knowledge gap. Some of the threats faced by regent honeyeaters such as high rates of nest predation (Crates et al. 2019) and exclusion from habitats by noisy miners (Mac Nally et al., 2012) can in theory be managed through predator suppression (Crates et al. 2020). Exclusion from foraging habitats by larger nectarivorous bird species is also a threat that is very challenging to manage, particularly when regent honeyeaters occur by themselves or in small flocks (Crates et al. 2017).

The biggest challenge in terms of managing threats facing regent honeyeaters at biodiversity stewardship sites is to encourage the birds to occupy those sites. Regent honeyeaters are now extremely rare and have very specific habitat requirements, and so the probability that birds would occupy stewardship sites is small, as is the case for the majority of the species' mapped important habitat in NSW. It is considered unlikely that regent honeyeaters will respond positively to management to the extent that population declines observed over recent decades may be reversed (Heinsohn et al., 2022).

3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.

The TBDC does not specifically indicate that data is unknown or deficient for this species.

4. In relation to the impacts from the proposal on the species at risk of an SAIL, the assessor must include data and information on:

a. The impact on the species' population (Principles 1 and 2) presented by:

- i. An estimate of the number of individuals (mature and immature) present in the subpopulation on the Development Footprint (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and
- ii. An estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or
- iii. If the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal

b. Impact on geographic range (Principles 1 and 3) presented by:

- i. The area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW
- ii. The impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted
- iii. To determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., Seed dispersal) and pollination distance for the species

Response to BAM Section 9.1.2 Criteria

iv. To determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections.

4(a)(i) The most likely number of individual regent honeyeater occupying the GRSF Development Footprint at any given time is zero. It is considered based on the precautionary principle very unlikely that more than 5 regent honeyeaters could on very rare occasions forage within the GRSF Development Footprint, which would represent between 1.7 and 5% of the New South Wales population.

4(a)(ii) The most likely percentage of the NSW regent honeyeater population to be impacted by the GRSF is zero. The habitats within the GRSF Development Footprint are only considered to represent marginal foraging habitat for regent honeyeaters. It is therefore envisaged based on the precautionary principle that as worst-case scenario the proposal could lead to a minimal reduction in the extent of foraging habitat for between 1.7 and 5% of the NSW population at any one time.

4(a)(iii) There are 541,997 ha of mapped important habitat for the regent honeyeater in NSW (BAM support 2021). The proportion of mapped important habitat to be impacted within the GRSF Development Footprint therefore represents 0.008% of the total mapped habitat in NSW. It is noted that approximately 56% of the 42.41 ha of important regent honeyeater habitat mapped within the Development Footprint is derived native grassland, and therefore does not contain regent honeyeater feed tree species.

4(b)(i) The GRSF Development Footprint will lead to the loss of 42.41 ha of mapped important regent honeyeater habitat, representing 0.008% of mapped important regent honeyeater habitat within NSW. BAM support have indicated that the percentage of AOO or EOO within NSW is not relevant for regent honeyeater SAIL assessments.

4(b)(ii) The GRSF Development Footprint will result in the loss of some foraging habitat, but it is not anticipated than any individual regent honeyeaters will be directly impacted by the development.

4(b)(iii) It is difficult to estimate the amount of habitat required to support the remaining regent honeyeater population, particularly considering that the population appears to be declining even with the amount of habitat currently available. The Goulburn River Valley and its tributaries located adjacent to the GRSF Development Footprint are a key breeding area for the regent honeyeater (Commonwealth of Australia 2016, Crates, Rayner, et al., 2019). Whilst it is acknowledged that the GRSF Development Footprint is private property, the fact that no regent honeyeaters have previously been detected occupying or breeding within the Development Footprint, despite its proximity to these key areas, suggest that higher quality habitats than are present within the GRSF Development Footprint are available within the broader area. Some of these sections of higher quality habitat are present within the adjacent GRSF Biodiversity Stewardship Site.

Expert assessment of the habitats within the Development Footprint considers the 42.41 ha of mapped important regent honeyeater habitat to be of relatively low priority for the species, considering both the quality and quantity of available habitat elsewhere within the upper Hunter Valley and within the greater Blue Mountains area more broadly.

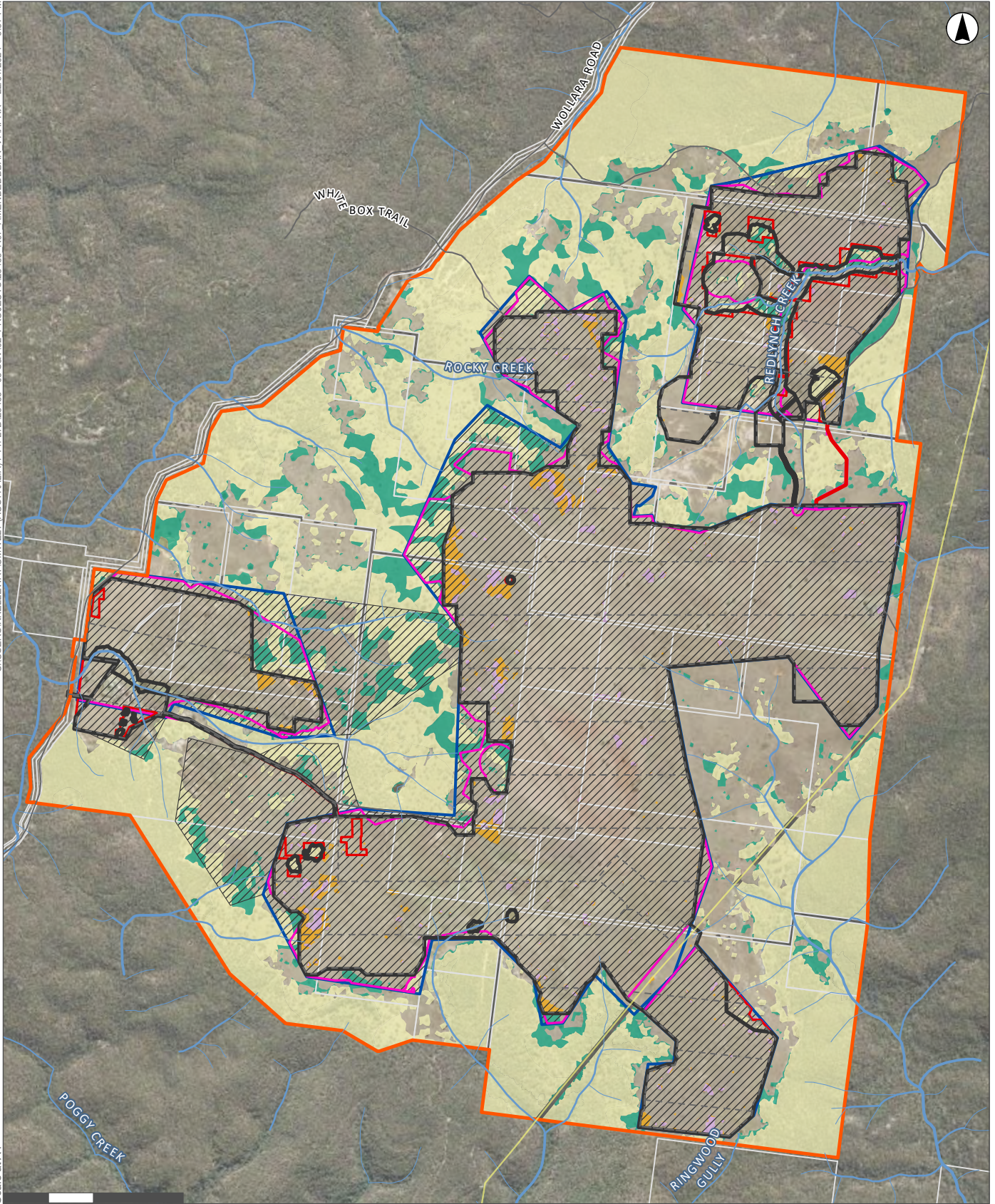
Regent Honeyeaters are a highly mobile species that regularly undertake long-distance movements. As such it is not considered that the loss of 42.41 ha of mapped regent honeyeater habitat within the GRSF Development Footprint will result in additional fragmentation of the local or regional regent honeyeater subpopulation to the extent that the (sub)population becomes (more) unviable. The potential for the viability for the regent honeyeater (sub)population to be impacted negatively by cumulative impacts of loss of small proportions of mapped important habitat from multiple developments should be taken into consideration, however.

Response to BAM Section 9.1.2 Criteria
<p>4(b)(iv) The primary threat associated with fragmentation of habitats arising as a result of the GRSF development are potential increases in the local population of noisy miners. Noisy miners are edge specialists (Piper & Catterall 2003) and can prevent regent honeyeaters occupying potential foraging or breeding habitats when their numbers exceed a threshold density of approximately 0.65 birds per hectare (Thompson et al. 2015). Noisy miners are already present in some areas of mapped important habitat adjacent to the Development Footprint. Because the Development Footprint is already heavily cleared and fragmented, it is considered unlikely that the GRSF would lead to a substantial increase in the local population of noisy miners.</p> <p>It is not envisaged that the proposed development would lead to changes in other threats to the remaining regent honeyeater population, such as hydrology, pollutants, fragmentation, disturbance, disease or parasites. Threats should be considered in the context that the probability of regent honeyeaters occurring within and surrounding the GRSF Development Footprint are considered to be low.</p>
<p>5. The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAI, is inaccurate.</p>
<p>Not applicable.</p>



C:\USERS\KELLEWAY\UMWELT (AUSTRALIA)\PTY_LTD\23485 - 03_S&V02_PROJECTS\23485_R07_AMENDED\BDAR_V7_APRX_22/01/2024_6:57 PM

1:30,000
Scale at A4



GDA 1994 MGA Zone 56

Legend

- Electricity Transmission Line
 - - Proposed Access Tracks
 - Existing Roads and Tracks
 - Watercourse
 - Property Boundaries
 - Project Area
 - Development Footprint D (Current Development Footprint)
 - Development Footprint C (May EIS)
 - Development Footprint B (November 2022)
 - Development Footprint A (Scoping Report December 2021)
 - Initial Development Footprint Investigated
- Regent Honeyeater Important Habitat**
- Impacted Areas with Tree Canopy Cover
 - Impacted Areas without Tree Canopy Cover (grassland and cleared areas)
 - Retained Areas with Tree Canopy Cover
 - Retained Areas without Tree Canopy Cover (grassland and cleared land)
 - Retained Easements (PCTs Unmapped)

Regent Honeyeater Impact Avoidance

9.4 Additional conservation measures for impacted SAI entities

The Project will potentially result in a significant impact on two SAI; White Box – Yellow Box Blakely’s Red Gum Grassy Woodland and Derived Native Grassland and Regent Honeyeater Mapped Important Habitat. General Project mitigation and management measures are described in **Section 7.0**, **Section 8.4** and **Section 8.5**. The Proponent is also committed to mitigation measure which are specific to each of these SAI (**Table 9.4**). Residual impacts will be offset in accordance with **Section 11.0**.

Table 9.4 Conservation measures for SAI with potential to be significantly impacted by the Project

SAI Entity	SAI specific conservation measure	Relevant guideline/ literature
<p>White Box – Yellow Box Blakely’s Red Gum Grassy Woodland and Derived Native Grassland</p>	<p>Rural land management pressures would be removed from the 1,200 ha BSA, which is proposed over the remainder of the Project Area. Notably, this includes cessation of grazing (up to 1,000 head of cattle have been present in the Project Area), no further intensification of agricultural practices and prevention of vegetation clearing, including woody vegetation, which has historically been cleared within the Project Area for firewood and fence post harvesting. Additional nutrients will no longer be applied within the Project Area (Development Footprint and BSA), and stock will be removed from the BSA. Soil disturbance from livestock and heavy machinery will cease in the BSA.</p> <p>Assisted natural regeneration across the Project Area and outside of the Development Footprint would increase landscape functionality. Through the committed management period of the BSA, woodland integrity and structural diversity expected to improve.</p> <p>Increasing landscape functionality across the Project Area through targeted assisted natural regeneration across degraded connectivity areas.</p> <p>Important key habitat features associated with BGW would be salvaged, with a commitment to relocate rock piles and habitat logs/fallen timber to the BSA, as well as to salvage and re-install hollows from mature trees to the BSA.</p> <p>Lightsource bp propose to conduct a VI study, comparable being carried out at Wellington Solar Farm, at Goulburn River Solar Farm to address impacts to SAI BGW in accordance with the BAM.</p> <p>The proposed VI study would incorporate baseline plots prior to construction, but following detailed design, so that survey sites can be established where panel array locations are confirmed. This study would extend for a minimum of three (3) years of solar farm operation. The study question would be comparable to that at Wellington Solar Farm - Does the installation and operation of solar panels result in a substantial change to the VI score for very low to moderate condition derived native grasslands? The results of the study would be shared with the DPE and more broadly across the industry.</p>	<p>Conservation Advice for the White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. (DCCEE 2023)</p>

SAIL Entity	SAIL specific conservation measure	Relevant guideline/ literature
<p>Regent Honeyeater (Mapped Important Habitat)</p>	<p>The extent and quality of Regent Honeyeater habitat will be improved through active management and protection within the BSA. The BSA will encompass 92% of the mapped important habitat for this species within the Project Area.</p> <p>Additional mitigation measures for Regent Honeyeater have been proposed by a species expert (Dr Crates) for consideration by the proponent, relevant to the Project Area and drawing on conservation advice and the national recovery plan (DoE 2015; DoE 2016) as well as from emerging research.</p> <p>The proponent is committed to supporting additional measures for Regent Honeyeater, to be confirmed in further consultation with a relevant species' expert. As suggested by Dr Crates (Appendix H, Solar Farm BDAR), offsite measures would offer the greatest benefit to the species. This will likely take the form of financial support (\$25,000 pa) over a fixed time period (five years) for a program such as:</p> <ul style="list-style-type: none"> • Noisy Miner management in known Regent Honeyeater breeding areas. • Habitat restoration within Noisy Miner management areas. • Nest protection from predation. • Zoo-breeding and release. 	<p>Conservation Advice <i>Anthochaera phrygia</i> Regent Honeyeater (DoE 2015).</p> <p>National Recovery Plan for the Regent Honeyeater (<i>Anthochaera phrygia</i>) (DoE 2016)</p> <p>Crates et al., (2020; 2023b)</p> <p>Heinsohn et al., (2022)</p>

10.0 Impact Summary

10.1 Determining an Offset Requirement for Impacts

10.1.1 Impacts on Native Vegetation and TECs (Ecosystem Credits)

The PCTs and associated condition zones which do not require an offset (as per BAM Subsection 9.2.1(3.)), are listed in **Table 10.1** and the PCTs which require ecosystem credits are listed in **Table 10.2**.

Table 10.1 Impacts that Do Not Require Offset – Ecosystem Credits

Vegetation zone	PCT name	TEC	Impact area (ha)	TEC Association	Entity at risk of an SAIL?	Current VI score
PCT 483 Condition Zone 3 – Moderate to Low Condition Derived Native Grassland	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Yes / CEEC	310.03	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Yes	12.6
PCT 483 Condition Zone 4 - Low Condition Derived Native Grassland	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Yes / CEEC	195.98	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Yes	10.3
PCT 1661 Condition Zone 2 - Moderate to Low Condition Derived Native Grassland	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	No	37.65	None	No	13.3
PCT 1661 Condition Zone 3 - Low Condition Derived Native Grassland	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	No	54.98	None	No	3.4

Table 10.2 Impacts that Require an offset – Ecosystem Credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
PCT 483 Condition Zone 1 – Scattered Trees	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Yes	22.49	78.9	0	-78.9	2.5	1,109
PCT 483 Condition Zone 2 - Moderate Condition Derived Native Grassland	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Yes	165.36	34	0	-34	2.5	3,509
PCT 1661 Condition Zone 1 – Scattered Trees	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	No	2.66	51.1	0	-51.1	1.75	59
Total Ecosystem Credits								4,677

10.1.2 Impacts on Threatened Species and their Habitat (Species Credits)

Table 10.3 provides a summary of the species credit threatened that require an offset (as per BAM Subsection 9.2.2(2.)) and identifies the amount of credits required. The area within the Development Footprint which was included within the total of all species polygons is shown in **Figure 10.1**.

Table 10.3 Impacts that Require an Offset – Species Credits

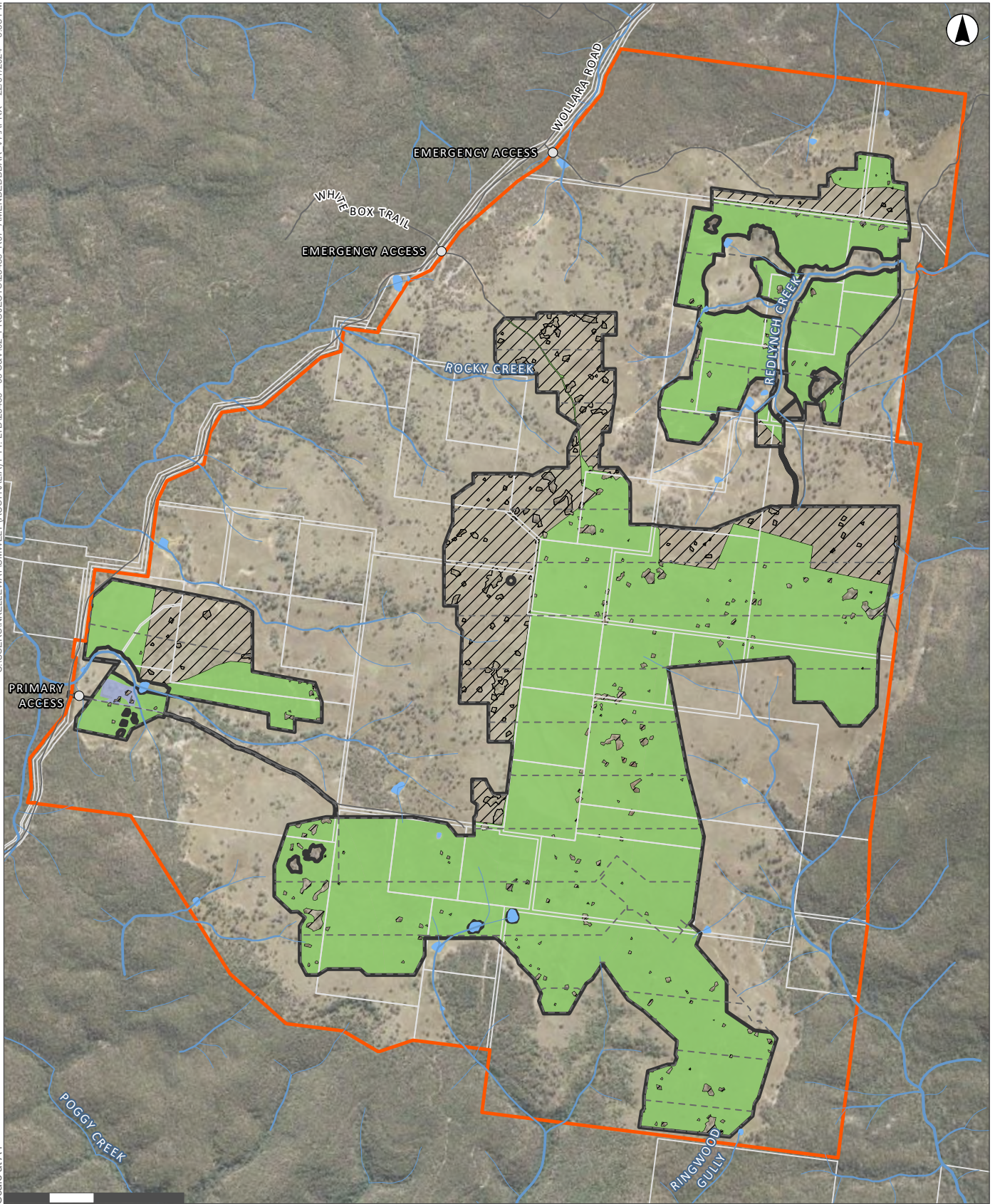
Common Name	Scientific Name	BC Act Status	EPBC Act Status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	44.96	3	1424
Barking Owl	<i>Ninox connivens</i>	V	-	1.22	2	6
Total Species Credits						1,430

10.1.3 Indirect and Prescribed Impacts

No offsets are required or proposed for indirect and prescribed impacts.

10.2 Impacts That Do Not Need Further Assessment

Areas within the Development Footprint that do not contain native vegetation do not need to be assessed for ecosystem credits (as per BAM Section 9.3(1–2.)). Areas assessed as not containing native vegetation are limited to waterbodies, particularly farm dams, land which is totally cleared of all vegetation such as frequently used existing vehicle tracks and a small area of exotic vegetation around the existing dwelling.



GDA 1994 MGA Zone 56

Legend

- Access Points
- - - Proposed Access Tracks
- Existing Roads and Tracks
- Watercourse
- Waterbodies
- Property Boundaries
- Development Footprint
- Project Area
- Impact Areas containing Native Vegetation above the VI Score
Offset Threshold (ecosystem credits required)
- Impact Areas containing Native Vegetation below the VI Score
Offset Threshold (no ecosystem credits required)
- Impact Areas which do not contain Native Vegetation (no offsets required)
- Impact Avoidance Areas (no offsets required)

FIGURE 10.1

Thresholds for Assessing and Offsetting Impacts

11.0 Biodiversity Credit Reports

Biodiversity Credit Reports which identify the like-for-like and variation credit requirements are provided in **Appendix E**.

11.1 Ecosystem Credits

The ecosystem credit requirements and those that could be retired in accordance with the offset rules are listed in **Table 11.1**.

Table 11.1 Ecosystem Credit Class and Matching Credit Profiles

Ecosystem Credit	Attributes shared with matching credits							
	Rule Type	PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion (in which proposal is located)
PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley 4,618 credits (includes credits for part of PCT which does not correspond to EPBC Act Listed CEEC)	Like for Like	74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698	Grassy Woodlands	Western Slopes Grassy Woodlands	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC	1,109 credits = yes 3,509 credits = no	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
PCT 1661 Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin 59 credits	Like for Like	54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	No	Western Slopes Dry Sclerophyll Forests - ≥ 50%– < 70% cleared group (including Tier 3 or higher threat status).	Yes	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. Or Any IBRA subregion that is within 100 km of the outer edge of the impacted site.

11.2 Species Credits

The species credit requirements and those that could be retired in accordance with the offset rules are listed in **Table 11.2**.

Table 11.2 Species Credit Class and Matching Credit Profiles

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
Regent Honeyeater 1424 Credits	Like for Like Rules: Regent Honeyeater	Fauna	Critically endangered	Critically endangered	Like for Like Rules: Any in NSW
Barking Owl 6 Credits	Like for Like Rules: Barking Owl	Fauna	Vulnerable	-	Like for Like Rules: Any in NSW

11.3 Biodiversity Offset Strategy

Lightsource bp is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project.

Section 7.0 describes how Lightsource bp has altered the Project to avoid and minimise ecological impacts through an iterative planning process. A suite of impact mitigation measures have been committed to (**Section 8.4**) in order to further reduce impacts on ecological values, prior to considering offsets for the residual impacts.

Lightsource bp has considered the merits of all options available under the BOS to satisfy the offsetting requirements for the Project. The offset options available under the BC Act and BC Regulation include:

- land based offsets through the establishment of new Biodiversity Stewardship Sites or by retiring credits from existing Stewardship Sites, and/or
- purchasing credits from the market, and/or
- paying into the Biodiversity Conservation Fund (BCF).

The offset strategy has also taken into account the fact that PCT 483 is a TEC under the EPBC Act (critically endangered White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland) and therefore must be offset with like for like.

The biodiversity offset strategy for Goulburn River Solar Farm consists of the following:

- Establishment of an approximately 1,200 ha Biodiversity Stewardship Agreement (BSA) over the residual parts of the Project Area, covering the credit requirement for PCT 1661 and Regent Honeyeater, and partly covering the majority of the PCT 483 credit obligation.
- Retirement of residual PCT 483 credits across two existing BSAs.
- Payment into the BCF.

The components of the Goulburn River Solar Farm biodiversity offset strategy are summarised below.

11.3.1 Goulburn River BSA

Lightsource bp are purchasing the two properties that together comprise the Project Area. They are committed to maximising the area for conservation and are establishing a BSA over the majority of the Project Area, outside of the Development Footprint. Approximately sixty per cent (60%) of the total Project Area will be protected as a BSA.

The Goulburn River BSA will meet the entire credit obligation for PCT 1661 and Regent Honeyeater. It will also meet approximately 60% of the credit obligation for PCT 483 (2,632 credits, as well as generate credits for several other species and PCTs).

11.3.1.1 BSA Status and Tenure

Surveys of the proposed BSA have occurred across 2023 and the Biodiversity Stewardship Site Assessment Report (BSSAR) is intended to be submitted to the Credit Supply Taskforce (CST) in early 2024. Lightsource bp and Umwelt have been in consultation with the CST and NPWS, including both the Reserve Establishment and the local (Mudgee) area teams.

The outer edge of the BSA abuts Goulburn River National Park on all sides. and Lightsource bp have been in discussion with NPWS about how to best align management practices for consistency and enhanced outcomes (i.e., timing of pest animal management, etc). Discussions have been held about potential to hand the land over to NPWS once the BSA is well established and solar farm construction has been completed. If the option to hand the BSA over to NPWS does not eventuate, the land will still be managed as a BSA, regardless.

11.3.1.2 Values of the BSA

The BSA site contains significantly more habitat diversity and areas of higher ecological value than the Development Footprint. There is 824.73 ha of Regent Honeyeater mapped Important Habitat within the BSA, compared to 42.30 ha in the Development Footprint. Whilst there is only 22.49 ha of PCT 483 scattered trees condition zone within the Development Footprint, the BSA contains 325.08 ha of PCT 483 in a woodland and scattered tree condition state and 50% of all White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Project Area.

In addition to areas of PCT 1661 and 483, the BSA also contains PCTs 616, 1604, 1607, 1655 and 1672. There is greater complexity of habitat and variety of landforms within the BSA, including significant sandstone geological features in the south of the Project Area, which the Development Footprint has been able to entirely avoid.

The Goulburn River BSA will benefit threatened species and a diversity of non-threatened native species which are known or likely to occur. Both Large-eared Pied Bat and Eastern Cave Bat have been recorded within the proposed BSA, and maybe utilising the breeding habitat present within the site. Threatened species confirmed within the Project Area (and therefore likely to be also present in the BSA) include:

- Regent Honeyeater mapped important habitat – listed as critically endangered under the EPBC Act and BC Act
- Large-eared Pied Bay – listed as vulnerable under the BC Act, and endangered under the EPBC Act

- Eastern Cave Bat – listed as vulnerable under the BC Act
- White-throated Needle-tail – listed as vulnerable under the EPBC Act
- Glossy-black Cockatoo - listed as vulnerable under the BC Act and EPBC Act
- Diamond Firetail – listed as vulnerable under the BC Act
- Dusky Woodswallow – listed as vulnerable under the BC Act
- Little Lorikeet – listed as vulnerable under the BC Act
- Barking Owl – listed as vulnerable under the BC Act.

11.3.1.3 BSA management actions

Habitat will be enhanced by the translocation of habitat features from the Development Footprint. Salvageable hollows from felled trees will be relocated to areas of retained vegetation in order to provide additional habitat. Rock piles and fallen timber will be translocated into adjacent areas of the BSA (where appropriate (i.e., in areas with a paucity of similar habitat structures))

It is expected that the following are likely to be outcomes of the establishment of the BSA across the suitable retained parts of the Project Area.

- Increase in recruitment, height and general health of trees and other woody vegetation through the removal of grazing pressure.
- Increase in soil quality and commensurate reduction in erosion, through removal of cattle.
- Improved water quality in dams and watercourses, through removal of cattle.
- Increase in the existing protected area estate (regardless of the ultimate land tenure) and improvement in wildlife connectivity.
- Reduction in edge effects on the national park, such as the weed incursion and pest animal predation/competition which currently occur.

11.3.2 Existing Stewardship Site(s)

Lightsource bp have entered into an agreement with a credit provider to retire up to 2,010 residual credits for Box Gum Woodland (PCT 483). These will be retired across two properties, which are both within 100 km of the Project Area (**Table 11.3**). Site 1 is an approved BSA, with Site 2 going through the BSA application process at the time of BDAR preparation. Site 2 is expected to be established by mid-2024 and will align with the expected construction commencement for the Project.

Table 11.3 Existing Sites for Residual Credit Retirement

Name	IBRA Sub-region	PCT ID	TEC	Offset Trading Group	HBT Credits	Credit Volume (anticipated)
Site 1	Hill End	266	Yes	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	No	322
Site 2	Peel	434, 528, 534, 563, 589, 599,	Yes	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Both HBT and non-HBT	1,688

11.3.3 Payment into the BCF

The six credits for Barking Owl will be paid into the BCF.

11.3.4 Summary of Biodiversity Offset Approach

The key benefits of the Goulburn River Solar Farm biodiversity offset strategy include:

- Certainty. There is a feasible and well progressed plan to address the credit liability from the solar farm Project.
- It is anticipated that only six credits are proposed to be paid into the BCF, out of a total credit obligation of 6,107 credits (4,677 ecosystem credits and 1,430 species credits).
- Removal of the burden on the Credit Supply Taskforce to deliver credits, which would have been the alternative outcome if a payment was made to the BCF.
- Timely offset delivery, with credits to be retired at the Goulburn River BSA and existing stewardship sites prior to construction commencing; an outcome that would not be possible if the BCF was relied on.

Offsets which are:

- Direct and largely land based.
- Like for like, with impacts to PCT 1661 and the majority of PCT 483 offset with the same PCTs.
- Locally relevant. The bulk of the credit obligation will be met within immediate proximity to the impact site, maintaining the same species and genetic diversity, and providing habitat for any wildlife displaced by construction.
- Net conservation gain. The majority of the Project Area will be protected in perpetuity and actively managed for conservation.

12.0 References

Australian Bureau of Meteorology (BOM) 2023 Climate Data Online, Rainfall and Temperatures, Australian Government, Accessed December 2023 online:

<<http://www.bom.gov.au>>http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=2021&p_c=-751265162&p_stn_num=061287>

Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023a. Conservation Advice for *Chalinolobus dwyeri* (large-eared pied bat). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from:

<<http://www.environment.gov.au/biodiversity/threatened/species/pubs/183-conservation-advice-15112023.pdf>>

Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023a. Conservation Advice for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Canberra: Department of Climate Change, Energy, the Environment and Water. Available from:

<<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/43-conservation-advice.pdf>>

Australian Government Department of Environment and Heritage (DEH) 2006a. EPBC Act Policy Statement 3.5 – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands.

Available from: <<https://www.dcceew.gov.au/environment/epbc/publications/white-box-yellow-box-blakelys-red-gum-grassy-woodlands-and-derived-native-grasslands>>

Australian Government Department of Environment and Heritage (DEH) 2006b. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List.

Available online: Species list for the EPBC Act policy statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands - last updated 22 May 2006.

Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) 2010a, Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act.

Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) 2010b Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act.

Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) 2010c, Survey guidelines for Australia's threatened bats: Guidelines for detecting birds listed as threatened under the EPBC Act. Commonwealth of Australia, Canberra. Available from: <[Survey guidelines for Australia's threatened bats \(dcceew.gov.au\)](http://www.dcceew.gov.au)>

Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) 2011a. Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act.

Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) 2011b. Referral guidelines for the striped legless lizard, *Delma impar*. Canberra, ACT:

Commonwealth of Australia. Available from: <Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable striped legless lizard. *Delma impar* (dcceew.gov.au)>

Australian Government Department of the Environment (DoE) 2015. Conservation Advice: *Anthochaera phrygia* Regent Honeyeater. Canberra, ACT: Commonwealth of Australia. Available from: <https://www.environment.gov.au/biodiversity/threatened/species/pubs/82338-conservation-advice.pdf>

Australian Government Department of the Environment (DoE) 2016, *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)*, Commonwealth of Australia.

Bell S.A.J., 2021, Do all fire ephemerals warrant listing under threatened species legislation?, *Australian Plant Conservation*, 30(2), 15–18.

Colquhoun G.P., Hughes K.S., Deysing L., Ballard J.C., Folkes C.B, Phillips G., Troedson A.L. & Fitzherbert J.A. 2021, *New South Wales Seamless Geology dataset (Single Layer)*, version 2.1 [Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW, Maitland.

Crates, R., Rayner, L., Webb, M., Stojanovic, D., Wilkie, C., & Heinsohn, R. (2020). Sustained and delayed noisy miner suppression at an avian hotspot. *Austral Ecology*, 45(5), 636–643. <https://doi.org/10.1111/aec.12878>

Crates R. 2023, Goulburn River Solar Farm Expert Assessment and Conservation Advice for the Regent Honeyeater, Unpublished Report prepared by Future Fauna for Umwelt (Australia).

Crates, R., McDonald, P. G., Melton, C. B., Maron, M., Ingwersen, D., Mowat, E., Breckenridge, M., Murphy, L., & Heinsohn, R. (2023). Towards effective management of an overabundant native bird: The noisy miner. *Conservation Science and Practice*, 5(2), 1–16. <https://doi.org/10.1111/csp2.12875>

Debus S. 2009, *The Owls of Australia- A field guide to the Australian night birds*, Envirobook, Canterbury NSW.

Good, M., Fraser, H., Gould, E., Vesk, P., Rumpff, L., 2021, A practical guide for conservation planning using the General Ecosystem Model for Southern Australian Woodlands. NESP Threatened Species Recovery Hub Project 7.2, Brisbane.

Heinsohn, R., Lacy, R., Elphinstone, A., Ingwersen, D., Pitcher, B. J., Roderick, M., Schmelitschek, E., Van Sluys, M., Stojanovic, D., Tripovich, J., & Crates, R. (2022), Population viability in data deficient nomadic species: What it will take to save regent honeyeaters from extinction. *Biological Conservation*, 266(January), 109430. <https://doi.org/10.1016/j.biocon.2021.109430>

Lake Macquarie City Council (LMCC) 2014, *Interim Lake Macquarie Large Forest Owl Planning and Management Guidelines 2014*, Lake Macquarie City Council.

Law B., Chidel M., and Mong A., 2005, Life under a sandstone overhang: the ecology of the eastern cave bat *Vespadelus troughtoni* in northern New South Wales, *Australia Mammalogy*, 27(2), 137–145.

Mahony, Stephen V., Cutajar, Timothy & Rowley, Jodi J. L., 2022, A new species of *Delma* Gray 1831 (Squamata: Pygopodidae) from the Hunter Valley and Liverpool Plains of New South Wales, *Zootaxa* 5162 (5), pp. 541–556.

McRae R.H.D. and Cooper M.G. 1985, *Vegetation of the Merriwa Area, New South Wales*, *Cunninghamia* 1(3), 351–369.

Meek P. and Fleming, P. (eds) 2014, *Camera Trapping. Wildlife Management and Research*. Australasian Wildlife Management Society and the Royal Zoological Society of NSW. Melbourne, Victoria.

National Parks and Wildlife Service (2003) Goulburn River National Park and Munghorn Gap Nature Reserve Plan of Management, February 2003, available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/goulburn-river-national-park-plan-of-management-030117.pdf>

National Parks and Wildlife Service (2003) Goulburn River National Park and Munghorn Gap Nature Reserve Plan of Management, February 2003. Available online: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/goulburn-river-national-park-plan-of-management-030117.pdf>

NSW Department of Planning and Environment (DPE) 2022a, *Biodiversity Assessment Method Operational Manual – Stage 1*, NSW Department of Planning, Industry and Environment, Parramatta.

NSW Department of Planning and Environment (DPE) 2022b, *Guidance for the Biodiversity Development Assessment Report Template (including the template)*, NSW Department of Planning and Environment, Parramatta.

NSW Department of Planning and Environment (DPE) 2022c. *Threatened reptiles - Biodiversity Assessment Method survey guide*, Department of Planning and Environment, Parramatta.

NSW Department of Planning and Environment (DPE) 2022d, *Koala (*Phascolarctos cinereus*) - Biodiversity Assessment Method survey guide*, Department of Planning and Environment, Parramatta.

NSW Department of Planning and Environment (DPE) 2023a, *Determining Native vegetation Land Categorisation for Application in the Biodiversity Offsets Scheme*, NSW DPE.

NSW Department of Planning and Environment (DPE) 2023b, *Biodiversity Assessment Method Operational Manual – Stage 2*, NSW Department of Planning and Environment, Parramatta.

NSW Department of Planning and Environment (DPE) 2023c, *NSW BioNet (incorporating BioNet Atlas, BioNet Vegetation Classification Database and Threatened Species Data Collection)* Available from: <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet>.

NSW Department of Planning and Environment (DPE) 2023d, *NSW State Vegetation Type Map Version C2.0M2.0*. Available from: <https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map/resource/fb0850f2-fea5-47b3-a077-a8c7c13d541c>

NSW Department of Planning Industry and Environment (DPIE) 2020a, Biodiversity Assessment Method, NSW Department of Planning, Industry and Environment, Parramatta.

NSW Department of Planning Industry and Environment (DPIE) 2020b, Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method, NSW Department of Planning, Industry and Environment, Parramatta.

NSW Department of Planning Industry and Environment (DPIE) 2020c, BAM Flora species with specific survey requirements spreadsheet. Online:

<https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.lmbc.nsw.gov.au%2Fbamcalc%2Fapp%2Fassets%2FSurveyMonthsConditions_BAMC_Version1.1.xlsx&wdOrigin=BROWSELINK>.

NSW Office of Environment and Heritage (OEH) 2017, Biodiversity Assessment Method (BAM) Calculator User Guide. Office of Environment and Heritage, Sydney.

NSW Threatened Species Scientific Committee 2020a, Notice and Reason for the Final Determination for the White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community. 17 July 2020. Available from: <<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/2020/white-box-yellow-box-final-determination-ceec.pdf?la=en&hash=DD6076E55435D715E7E90B1A901EEB83D488563B>>

NSW Threatened Species Scientific Committee 2020b, Conservation Assessment of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. 22 June 2020. Available from:

<<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/2020/white-box-yellow-box-final-determination-conservation-assessment.pdf?la=en&hash=F8E09AABE537A9AB6CBBBD7A38BCE44956C0D986>>

OzArk Environment and Heritage (2023) Aboriginal Cultural Heritage Assessment Report Goulburn River Solar Farm, May 2023. Report to Umwelt on behalf of Lightsource BP.

Rawlings K., Freudenberger D., and Carr D. 2010, A Guide to Managing Box Gum Grassy Woodlands, Department of Environment, Water, Heritage and the Arts, Canberra ACT.

Southerton S.G., Birt P., Porter J. and Ford H.A. 2004. Review of gene movement by bats and birds and its potential significance for eucalypts plantation forestry. *Australian Forestry*, 67(1), p.54–54.

The Royal Botanic Gardens and Domain Trust 2023, Plantnet NSW Flora Online. Available from:

<<https://plantnet.rbgsyd.nsw.gov.au/floraonline.htm>>

Tozer, M. and Simpson, C., 2020 Conservation Assessment of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. NSW Threatened Species Scientific Committee, Parramatta. Available online at: White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland <nsw.gov.au>

Umwelt (Australia) Pty Limited, Environmental Impact Statement, 2023a

Umwelt (Australia) Pty Limited, Goulburn River Solar Farm Response To Submissions, 2023b

Umwelt (Australia) Pty Limited, Goulburn River Solar Farm Amendment Report, 2023c

Umwelt (Australia) Pty Limited, Goulburn River Solar Farm Public Road and Culverts BDAR, 2024

Youngentob, K.N, Marsh, K.F., Skewes, J., 2021, A review of koala habitat assessment criteria and methods, report prepared for the Department of Agriculture, Water and the Environment, Canberra, November.
Available from: A review of koala habitat assessment criteria and methods <dcceew.gov.au>

