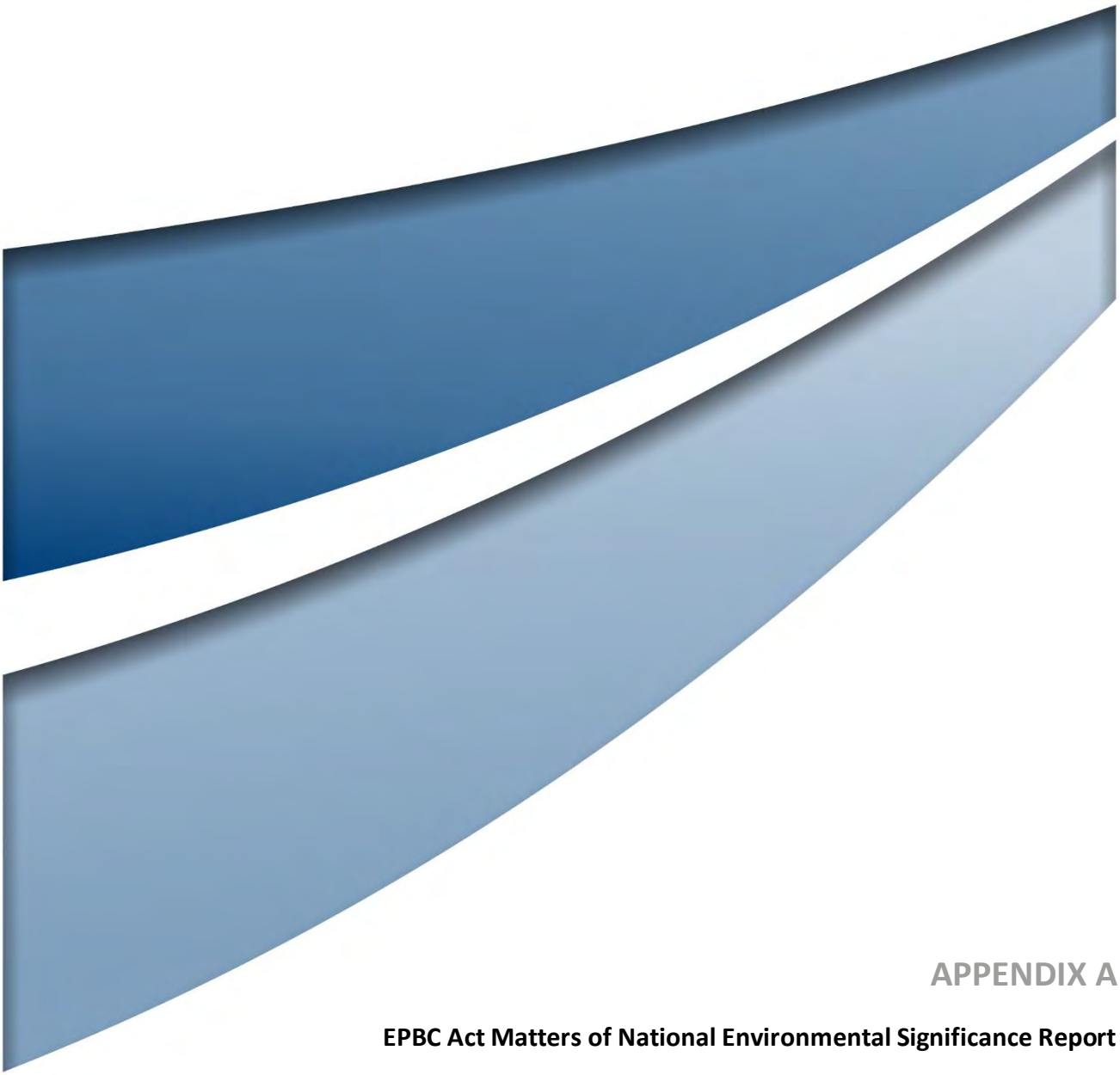

APPENDIX A

EPBC Act Matters of National Environmental Significance Report

umwelt
Environmental & Social Consultants

lightsource bp

GOULBURN RIVER SOLAR FARM

Matters of National Environmental Significance Assessment Report

FINAL

January 2024

GOULBURN RIVER SOLAR FARM

Matters of National Environmental Significance Assessment Report

FINAL

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

Project Director: Malinda Facey
Project Manager: Jessica Henderson
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Technical Manager: Jacob Manners
Report No. 21507/R14/Appendix A
Date: January 2024

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.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Rachel Musgrave	2 May 2023	Rachel Musgrave	2 May 2023
V2	Rachel Musgrave	22 January 2024	Alistair Campbell	22 January 2024

Abbreviations

Abbreviation	Definition
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BESS	Battery Energy Storage System
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
BSA	Biodiversity Stewardship Agreement
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
Development Footprint	The area of land that is directly impacted by a proposed development.
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 proposal (synonymous with Development Footprint).
EIS	Environmental Impact Statement
GIS	Geographic Information Systems
Ha	hectares
km	kilometres
LGA	Local Government Area
m	metres
mm	millimetres
MNES	Matters of National Environmental Significance
MWh	Megawatt hour
MWp	Megawatt peak
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
Project Area	The broader property area that the subject land is located within.
the Project	Goulburn River Solar Farm
SEARs	Secretary's Environmental Assessment Requirements
TEC	Threatened Ecological Community
TSSC	Commonwealth Threatened Species Scientific Committee

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1.0 Introduction

1.1 Background

Lightsource Development Services Australia Pty Ltd (Lightsource bp; the proponent) has engaged Umwelt to prepare this Matters of National Environmental Significance (MNES) Report for the proposed Goulburn River Solar Farm (the Project) within the locality of Merriwa, NSW.

The Solar Farm component of the Project has been determined to be a controlled action and requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Decision on Referral Letter from the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) (formerly Department of Agriculture, Water and the Environment (DAWE), now superseded) (Reference 2021/9102), identifies that the Project has the potential to impact on several nationally listed threatened species and ecological communities which are further assessed within this Report.

This MNES Report consolidates the DCCEEW assessment requirements, as provided in the supplementary Secretary's Environmental Assessment Requirements (SEARs) for the Solar Farm project, issued on 2 February 2022 as part of the controlled action determination (EPBC 2021/9102).

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 the former Department of Planning and Environment (DPE) (now the Department of Planning, Housing, and Infrastructure, DPHI) and the Commonwealth DCCEEW. The Public Road and Culvert Upgrade BDAR Road Upgrades Biodiversity Development Assessment Report (BDAR) (Umwelt 2024a) includes the assessment of potential impacts to MNES associated with the road improvements.

The Biodiversity Assessment Method (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.

1.2 NSW and Commonwealth Bilateral Agreement

The Bilateral Agreement made under Section 45 of the EPBC Act relating to environmental assessment between the Commonwealth of Australia and NSW was signed by both parties in 2015. This Agreement enables NSW to conduct a single environmental assessment process. When the assessment process is complete, NSW provides a report to the Australian Government assessing the likely impacts on MNES listed under the EPBC Act.

An Amending Agreement between the Commonwealth and NSW was entered into on 24 March 2020, which endorses the NSW BAM (DPIE 2020a). Offsets are required under the EPBC Act for any residual significant adverse impacts on MNES. The Assessment Bilateral Agreement applies to all NSW projects that require EPBC Act approval to achieve streamlining benefits for projects that use the Biodiversity Offset Scheme (BOS).

Both the Solar Farm BDAR (Umwelt 2024b) and Road Upgrades BDAR (Umwelt 2024a) have been prepared in accordance with the BAM, to assess the biodiversity related impacts associated with the Project.

Relevant information and results obtained from site surveys associated with the preparation of each BDAR have been reviewed and incorporated into this report.

1.3 EPBC Act Referral Outcome and Advice

The Project has been determined to be a Controlled Action and requires approval under the EPBC Act. The 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.
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered.

DCCEEW have also identified that additionally 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 have 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.
- Regent Honeyeater (*Anthochaera phrygia*) – 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.

Biodiversity requirements included in the supplementary SEARs are reproduced in **Table 1.1**, which lists the relevant section of this report and the Solar Farm BDAR (Umwelt 2024b) that specifically addresses that requirement.

The Biodiversity Conservation Division (BCD) provided a submission on the Project EIS which included comments in relation to MNES and the bilateral assessment. These comments have been addressed throughout this MNES report, with **Table 1.2** summarising the approach taken.

Table 1.1 Commonwealth supplementary SEARs for Solar Farm component of the Project

Key Issue	SEARs Requirement	Relevant Section in this document	BDAR Reference
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 1 of the EIS.**	**Appendix 1 of the EIS.**
General requirements – Project description	6. The title of the action, background to the action and current status.	**Section 1.4.1**	**Section 1.0**
	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.	**Section 1.4.2**	**Section 1.2**
	8. How the action relates to any other actions that have been, or are being taken in the region affected by the action.	**Section 1.4.3**	**Section 1.4.3**
	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 1.4.4**	**Section 1.2**
General requirements – Impacts	10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; iii. analysis of the significance of the relevant impacts; and iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	**Section 4.0**	**Section 8.0**
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: v. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures, vi. any statutory policy basis for the mitigation measures; vii. the cost of the mitigation measures;	**Section 4.0**	**Section 7.0** and **Section 8.4**

Key Issue	SEARs Requirement	Relevant Section in this document	BDAR Reference
	viii. 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; ix. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.		
	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.	**Section 2.2** **Section 4.0**	**Section 2.0** **Section 4.0** **Section 5.0** **Section 6.0** **Section 9.0** **Section 10.9**
Biodiversity (threatened species and communities and migratory species)	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.	**Section 2.2**	**Section 2.3** **Section 2.4** **Section 5.1** **Section 5.2**
	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: • 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;	**Section 2.0** **Section 3.0** **Section 4.0**	**Section 2.0** **Section 4.0** **Section 5.0** **Section 7.0** **Section 8.0** **Section 10.0** **Section 11.0**

Key Issue	SEARs Requirement	Relevant Section in this document	BDAR Reference
	• 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. 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.		
	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.)	**Section 4.0**	**Section 11.0**

Table 1.2 Submission on the MNES Assessment for the Project and how each comment has been met

Issue	Summary of approach	Relevant Section in this document
Provide new maps that show the locations of MNES entities in relation to the project's construction and operational footprint. These must include the MNES entity information provided in Figure 4.3 'Threatened Ecological Communities' shows the location of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland VEC under the EPBC Act within the development footprint', Figure 5.1 'Candidate Species-credit Species Records and Species Polygon – Regent Honeyeater' and Figure 5.3 'Other Threatened Species Observation Locations.'	Maps have been provided which show the Development Footprint (relevant to both construction and operation) and: • TEC extent. • Regent Honeyeater habitat. • MNES species records (from desktop assessment).	Note that figure numbers have changed since submission. See **Figure 2.1**, **Figure 5.1** and **Figure 5.2**.
Demonstrate how any relevant Commonwealth Survey effort requirements have been met.	Commonwealth survey guidelines have been summarised for each relevant MNES targeted in surveys.	**Table 2.4** and **Table 2.5**
Further demonstration of avoidance to Box-Gum woodland and mapped important habitat for the regent honeyeater is required – including indirect and prescribed impacts.	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 relate to biodiversity impacts as follows: • Relocation or removal of solar arrays within the Development Footprint and reconfiguration of an access track to further avoid SAII, 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). **Table 5.1** in **Section 5.0** below describes the nature, quantum, and consequence of impact of the Project on MNES.	**Section 4.1**

Issue	Summary of approach	Relevant Section in this document
Provide a table of MNES entity by relevant Commonwealth guidelines and policy statements in which applicable actions are stated. Describe how those applicable actions have been considered for each MNES entity for this project.	Applicable policies and guidelines have been listed for each of the MNES matters considered in the Project assessment. The statutory or policy basis for proposed MNES management measures has been provided, including reference to the relevant approved conservation advice, and a discussion on how the proposed measures are not inconsistent with relevant recovery plans and threat abatement plans.	**Table 2.1** **Table 4.1**

1.4 Project Description

1.4.1 The title of the action, background to the action and current status

Goulburn River Solar Farm, hereafter referred to as the Project, is situated between Merriwa and Coggan in NSW, and covers approximately 2,000 ha, with a Development Footprint of 792.19 ha. Classified as a State Significant Development (SSD) for electricity generation under the State Environmental Planning Policy, the EIS was submitted in May 2023, followed by public exhibition from 13 June to 10 July, 2023. The exhibition garnered 56 public submissions, along with inputs from two local councils and 11 government agencies. LSbp conducted a layout review post EIS exhibition, leading to optimised design changes reflected in the Amendment Report. The amendments align with state and federal renewable energy strategies, addressing the NEM's transition to renewables.

The Project involves the construction, operation and decommissioning of approximately 550 megawatt peak (MWp) of solar photovoltaic (PV) generation as well as a Battery Energy Storage System (BESS) with a maximum 1,030 MWp/2,060 megawatt hour (MWh) capacity. The Project will include a substation and connection to an existing 500 kilovolt (kV) transmission line which passes through the Project Area.
The Project will include various associated infrastructure, including road repairs and upgrades to Ringwood Road, Wollara Road, and the Golden Highway intersection, temporary construction facilities, operation and maintenance buildings, internal access roads, civil works and electrical infrastructure to connect the Project to the existing transmission line. Impacts on MNES associated with road repairs and upgrades are addressed in the separate Public Road and Culvert BDAR.

1.4.2 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

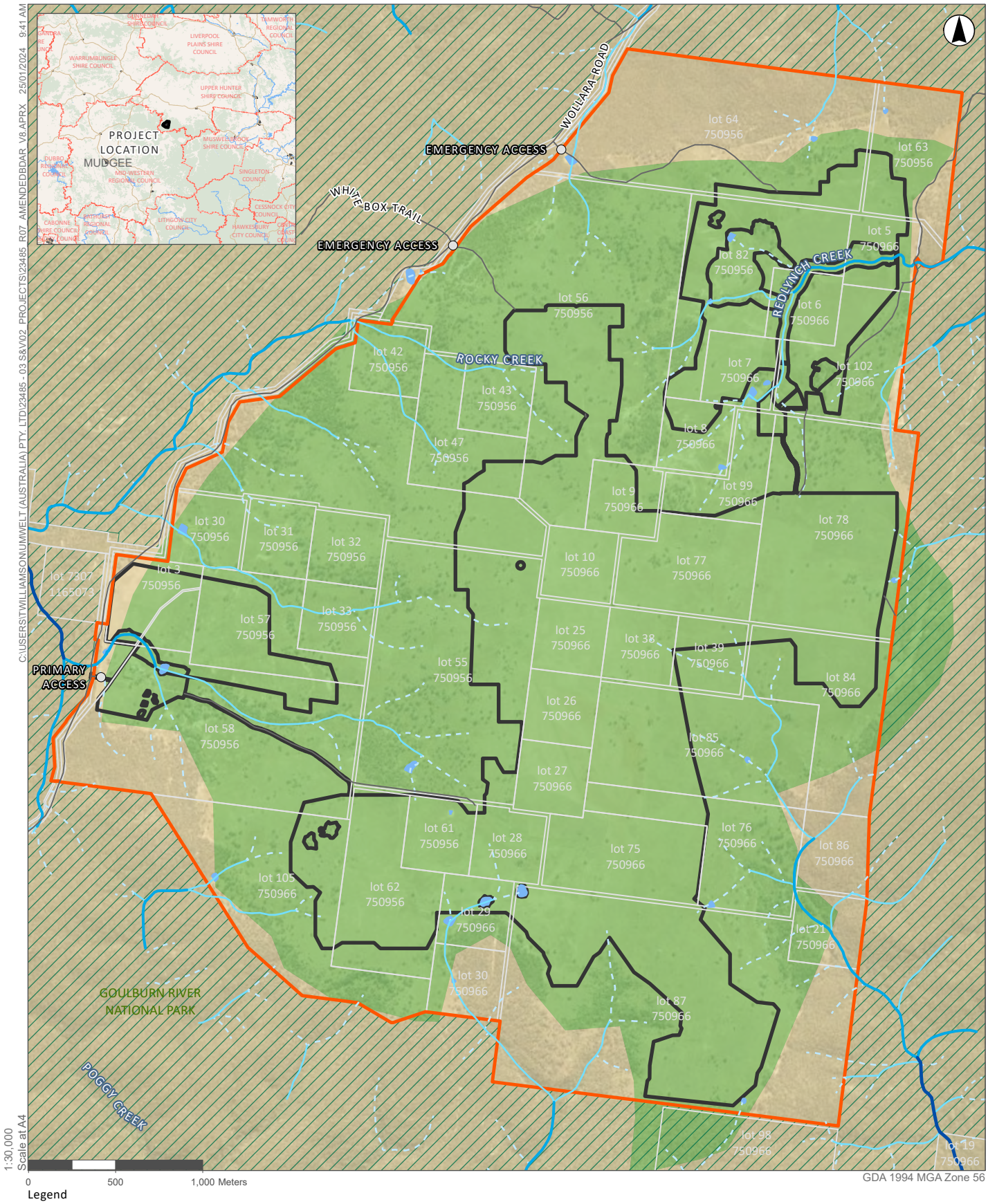
1.4.2.1 Project Location

The Project 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**.

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.

The Project will also require road upgrade works including public road and culvert upgrades on Ringwood Road between Bow River and Killoe Creek, Wollara Road, and the Ringwood Road and Golden Highway intersection. The potential impacts on MNES for this component of the Project is discussed within the Public Road and Culvert Upgrade BDAR (Umwelt 2024a).



Legend

- Access Points
- Existing Roads and Tracks
- Property Boundaries
- Project Area
- NSW National Parks
- Development Footprint

Stream Order

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

Mitchell Landscapes

- Lees Pinch Foothills
- Liverpool Range Valleys and Footslopes

APPENDIX A FIGURE 1.1

Site Map

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

1.4.2.2 Description of Works

The Development Footprint and Project Area are mapped in Figure 1.2 of the BDAR. The key components of the Project include:

- Approximately one million bifacial solar PV modules in an east-west single-axis tracking arrangement with an approximate height of 5 metres (m) above ground level.
- Three BESS options including a centralised BESS (up to 450 MWp/900 MWh), a decentralised BESS (up to 580 MWp/1160 MWh) or the option for both a centralised and decentralised BESS system combined (1,030 MWp/2,060 MWh).
- 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 tower may be erected on the current line to accommodate the grid connection.
- 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.
- Three access points to be provided along the western boundary of the Project Area, off Wollara Road. One point will be a permanent site access and the remaining two are emergency access points. 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 main development footprint areas (excluding linking roads /not the entire property), installation of crossing gates, water tanks or dams, and fencing and potential alternate secondary access points to facilitate ongoing livestock grazing.
- Road upgrades, as described and assessed in the separate Public Road and Culvert BDAR (Umwelt 2024a) include:
- Upgrades to culverts at the existing road crossings of Bow River and Killoe Creek located on Ringwood Road.
- Realignment, widening and sealing of a 4.7 km section of Wollara Road.
- Realignment, widening and sealing of 3.4 km of Ringwood Road, across two sections.
- Upgrades at the Golden Highway and Ringwood Road intersection including vegetation removal, minor lane widening, addition of an acceleration lane and formalisation of the bus stop pullover area.

These repairs will include 8 m bitumen-sealed formation with a minimum of 500 mm unsealed shoulders. The horizontal and vertical alignment of the proposed road will ensure safe sight distance, safe movement of longer vehicles, and an improved road network for the users.

1.4.3 How the action relates to any other actions that have been, or are being taken in the region affected by the action

Other projects that are, or are proposed to be taken within close proximity to the Project site, include the Merriwa Solar Farm and the Wollar Solar Farm.

The proposed Merriwa Solar Farm is located within the Merriwa area to the north of the Goulburn River National Park. Detailed impact assessment documentation and biodiversity reporting is currently being prepared and is not available for the Merriwa Solar Farm Project, however preliminary information available indicates that the site contains suitable habitat for the Regent Honeyeater and the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community (CEEC) listed under the EPBC Act.

The Wollar Solar Farm is located to the south-west of the Project Area at Tichular and is an approved project. Impact assessment documentation for the Wollar Solar Farm identifies impacts and offsetting to the following MNES also proposed to be impacted and offset by the Goulburn River Solar Farm:

- Regent Honeyeater (25.66 hectares (ha) of suitable foraging habitat).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (232 ha including 29 ha of woodland and 203 ha of derived native grassland).

1.4.4 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

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

- 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 a 550 MWp of solar electricity.
- The Project Area is also characterised by suitable terrain and topography, high quality solar irradiance and ideal climatic conditions, 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 including:

- 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 the 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 projects 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*) (listed as vulnerable under the NSW *Biodiversity Conservation Act 2016*).
- 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 NSW *Biodiversity Conservation Act 2016* (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.

2.0 Methods

The information outlined in this report is based on the results of both a desktop-based literature and database review and comprehensive biodiversity surveys undertaken over multiple years and seasons. The surveys were undertaken in accordance with the BAM and are documented in the BDAR prepared for the solar farm component of the Project. While it is acknowledged that this methodology is endorsed by the Commonwealth under the Assessment Bilateral Agreement, Umwelt has also sought to refer to the Commonwealth survey guidelines where relevant.

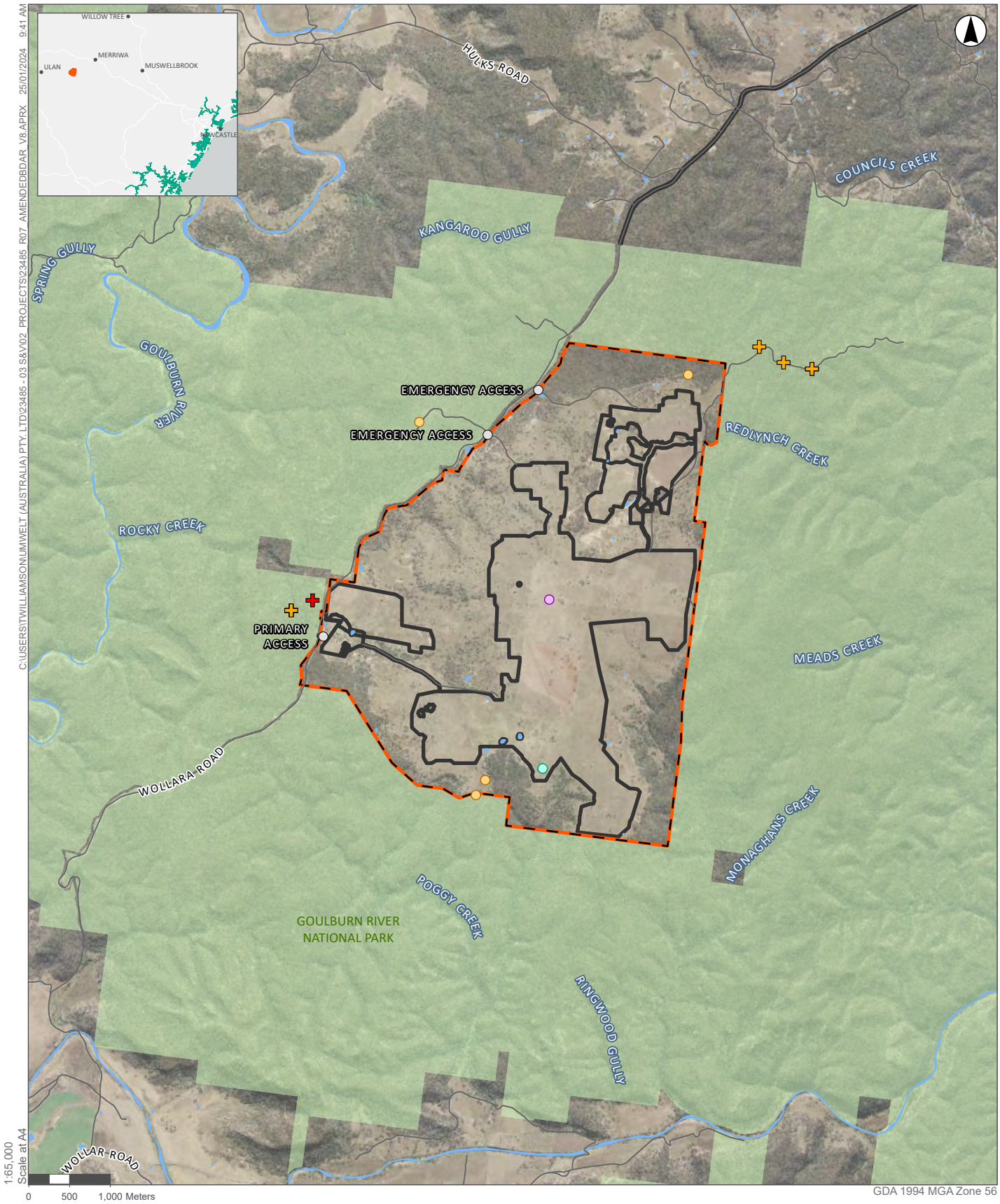
2.1 Desktop Literature and Database Review

The following key information sources containing existing ecological information related to the site have been reviewed as part of the preparation of this report:

- Biodiversity Assessment Methodology 2020 (DPIE 2020a).
- NSW BioNet (incorporating the BioNet Atlas and Threatened Species Data Collection (TBDC)) (DPE 2022a).
- NSW Department of Planning and Environment (DPE) BAM Important Areas viewer (DPE 2022b), accessible through the Biodiversity Offsets and Agreement Management System (BOAMS) portal.
- BioNet Vegetation Classification Database (DPE 2022c).
- Protected Matters Search Tool (PMST) (DCCEEW 2023b) for known/predicted EPBC Act-listed threatened and migratory species, as well as threatened ecological communities (TECs).
- National Flying Fox Monitoring Viewer (DCCEEW 2023c) – <https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>.

These reports and databases were reviewed to obtain information in relation to the PCTs, habitat constraints, microhabitats and previous site records for threatened species. **Figure 2.1** presents relevant landscape features, and MNES entities identified within this desktop review. A likelihood of occurrence assessment was completed for the nationally listed threatened species, migratory species and TECs identified from the PMST (DAWE 2022c) using the definitions provided in **Table 2.1**. The results of this assessment are provided in **Section 3.0**.

Table 2.1 summarises the Commonwealth guidelines and policy statements relating to the EPBC Act listed threatened flora, fauna and TECs considered within this MNES assessment that were reviewed as part of the literature and database review, and where they have been considered within the assessment.



Legend

- Access Points
- Existing Roads and Tracks
- Project Area
- Development Footprint
- BDAR Assessment Area
- NSW National Parks

Threatened Fauna Records (BioNet)

Vulnerable

- Large-eared Pied Bat
- South-eastern Glossy Black-Cockatoo

Endangered

- Koala

Threatened Flora Records (BioNet)

Endangered

- *Commersonia rosea*

Valnerable

- Fairy Bells

APPENDIX A FIGURE 2.1

MNES Species Records

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

Table 2.1 Commonwealth guidelines and policies reviewed for all species assessed under Section 5.2

MNES	BC Act	EPBC Act	Policy/guideline
Threatened Ecological Communities			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	CE	Conservation Advice for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (AGDCCEEW 2023a)
			Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC 2006)
			National Recovery Plan for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (AGDECCW 2010)
			Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (AGDEE 2017)
			Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPC 2011b)
			EPBC Act policy statement 3.5 – White box – yellow box – Blakely's red gum grassy woodlands and derived native grasslands (AGDEH 2006a) Including associated supporting documents: • 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 (AGDEH 2006b). • Advice on the presence of hybrids in listed ecological communities (TSSC 2011).
Fauna Species			
Anthochaera phyrgia Regent Honeyeater	CE	CE	Conservation Advice *Anthochaera phrygia* regent honeyeater (DoE 2015)
			National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia)* (DoEE 2016)
			Threat abatement plan for competition and land degradation by rabbits (DoEE 2016)
Aphelocephala leucopsis Southern Whiteface*	V	V	Conservation Advice for *Aphelocephala leucopsis* (southern whiteface) (DoCCEEW 2023)

MNES	BC Act	EPBC Act	Policy/guideline
Calyptorhynchus lathami South Eastern Glossy Black-Cockatoo*	V	V	Conservation Advice for *Calyptorhynchus lathami lathami* (South-eastern Glossy Black Cockatoo) (DoCCEEW 2022)
Chalinolobus dwyer Large-eared Pied Bat	V	V	Conservation Advice for *Chalinolobus dwyeri* (large-eared pied bat) (DoCCEEW 2023
			Survey Guidelines for Australia's Threatened Bats. EPBC Act survey guidelines 6.1 (DEWHA 2010)
Climacteris picumnus victoriae Brown Treecreeper (south-eastern)*	V	V	Conservation Advice for *Climacteris picumnus victoriae* (brown treecreeper (south-eastern)) (DoCCEEW 2023)
Dasyurus maculatus Spotted-tailed Quoll	V	E	Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll, southeastern mainland
			Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (DoE 2015)
			Threat abatement plan for predation by the European red fox. DEWHA (2008)
			Survey guidelines for Australia's threatened mammals. EPBC Act survey guidelines 6.5 (DSEWPaC), 2011)
Grantiella picta Painted Honeyeater	V	V	Conservation Advice *Grantiella picta* painted honeyeater (DoE 2015)
Hirundapus caudacutus White-throated Needletail	-	V, M	Conservation Advice *Hirundapus caudacutus* White-throated Needletail (TSSC 2019)
			Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015)
Lathamus discolor Swift Parrot	E	CE	Conservation Advice *Lathamus discolor* swift parrot (TSSC 2016)
			National Recovery Plan for the Swift Parrot (*Lathamus discolor)* Birds Australia, Melbourne (Saunders, D.L. & C.L. Tzaros (2011)
			Threat abatement plan for predation by feral cats (DoE 2015)
Melanodryas cucullata cucullata South-eastern Hooded Robin*	V	E	Conservation Advice for *Melanodryas cucullata cucullata* (hooded robin (south-eastern)) (DCCEEW 2023)
Nyctophilus corbeni	V	V	Conservation Advice *Nyctophilus corbeni* south-eastern long-eared bat (TSSC 2015)

MNES	BC Act	EPBC Act	Policy/guideline
Corben's Long-eared Bat			Survey Guidelines for Australia's Threatened Bats. EPBC Act survey guidelines 6.1 (DEWHA 2010).
Phascolarctos cinereus Koala	E	E	Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (AGDAWE 2022e)
			National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (AGDAWE 2022f)
			Identifying habitat for the endangered Koala (AGDCCEEW 2022g)
			Referral guidance for the endangered koala (AGDCCEEW 2022h)
			Revegetating koala habitat (Beale et al 2022a)
			Effects of fire on koalas and their habitat (Beale et al 2022b)
			A review of koala habitat assessment criteria and methods (Youngentob et al. 2021)
Pseudomys novaehollandiae New Holland Mouse	-	V	Approved Conservation Advice for *Pseudomys novaehollandiae* (New Holland Mouse) (DoEWHA 2010)
			Threat abatement plan for predation by feral cats (DoE 2015)
			Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomic* (DoE 2015)
Pteropus poliocephalus Grey-headed Flying-fox	V	V	Commonwealth Listing Advice on *Pteropus poliocephalus* (Grey-headed Flying-fox) (TSSC 2001)
			National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (AGDAWE 2021)
			Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps (AGDoE 2015c)
			A review of noise, light and dust impacts on grey-headed flying-fox camps (Ecosure 2021)
Stagonopleura guttata Diamond Firetail	V	V	Conservation Advice for *Stagonopleura* guttata (diamond firetail)

2.2 MNES Likelihood of Occurrence Assessment

A likelihood of occurrence assessment has been undertaken in **Table 2.1** for MNES identified from the Biodiversity Assessment Method Calculator (BAM-C), from a 1.5 km radius search of the BioNet Atlas and from a 1.5 km PMST search. 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 of relevant databases around the Project Area. As such, there may be slight change to the species considered within **Table 2.1**, however, this difference is not considered material to the assessment.

The assessment has been undertaken utilising the following likelihood of occurrence ratings and definitions:

- **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.
- **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.

Those matters identified in **Table 2.1** has having a known occurrence or a high or medium likelihood of occurrence in the Project Area are assessed further in **Section 5.2** of this Report.

Table 2.2 MNES Likelihood of Occurrence Assessment

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Wetlands of International Importance (RAMSAR Wetlands)					
Hunter Estuary Wetlands	-	Ramsar	Ramsar Wetlands - within 100–150 km of Ramsar site	Low. Hunter Estuary Wetland Areas occur approximately 100–150 km upstream of the Project Area. Disturbances in the Project Area are not expected to have any direct or indirect impact on the Hunter Estuary Wetlands Ramsar Site.	No
Threatened Ecological Communities					
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	-	E	MNES Search (may occur)	Low. Ecological community not observed during surveys.	No
Central Hunter Valley eucalypt forest and woodland	-	CE	MNES Search (may occur)	Low. Ecological community not observed during surveys.	No
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	-	CE	MNES Search (may occur)	Low. Ecological community not observed during surveys.	No
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South--eastern Australia	-	E	MNES Search (likely presence)	Low. Ecological community not observed during surveys.	No

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	-	CE	MNES Search (may occur)	Low. Ecological community not observed during surveys.	No
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	CE	MNES Search (likely presence)	Known. This CEEC was recorded onsite during the site assessment. It is associated with areas of PCT 483 which meet condition threshold requirements.	Yes.
Weeping Myall Woodlands	-	E	MNES Search (may occur)	Low. Ecological community not observed during surveys.	No
Threatened Flora Species					
Androcalva procumbens	V	V	MNES Search (may occur)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
Sandy Hollow Commersonia *Androcalva rosea* (syn. *Commersonia rosea*)	E	E	BioNet Atlas, MNES Search (known presence)	**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.	No
Bluegrass *Dichanthium setosum*	V	V	BioNet Atlas, MNES Search (likely presence)	**Low.** Denatured records mapped mostly south of the Goulburn River. Associated with PCT 483. Not predicted to occur according to the BAM-C for the solar farm project area. The Solar Farm Project Area is located within the Sydney Basin Bioregion, this species is not known or predicted to occur within the Sydney Basin Bioregion.	No
Euphrasia arguta	CE	CE	MNES Search (may occur)	**Low.** No known records within 10 km of the Project Area. No habitat within the Project Area.	No

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Fairy Bells *Homoranthus darwinioides*	V	V	BioNet Atlas, MNES Search (known)	**Moderate.** Recorded at several locations in adjoining sandstone areas of the Goulburn River National Park, however habitats within the Project Area are significantly more disturbed.	Yes
Spiny peppercress *Lepidium aschersonii*	V	V	MNES Search (may occur)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
Ozothamnus tesselatus	V	V	BioNet Atlas, MNES Search (likely presence)	**Low.** No records within 1.5 km of the Project Area. Restricted to a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth.	No
Prasophyllum sp. Wybong (C.Phelps ORG 5269)	-	CE	MNES Search (may occur)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area. Not predicted to occur within BAM-C.	No
Slender Darling-pea *Swainsona murrayana*	V	V	MNES Search (may occur)	**Low.** No known records within 10 km of the Project Area. No habitat within the Project Area. Not predicted to occur within BAM-C.	No
Austral toadflax *Thesium australe*	V	V	MNES Search (likely presence)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area. Not predicted to occur within BAM-C.	No
Tylophora linearis	V	E	BioNet Atlas, MNES Search (may occur)	**Low.** Local records are south of the Goulburn River and not predicted to occur within BAM-C.	No
Threatened Fauna Species					
Regent Honeyeater *Anthochaera phrygia*	CE	CE	BioNet Atlas, MNES Search (known presence)	Foraging habitat use: **Low to Moderate** Breeding habitat use: **Low** Site mapped as important habitat.	Yes

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Southern Whiteface* *Aphelocephala leucopsis*	V	V	MNES Search (known presence)	**Moderate.** No known records within 1.5 km of the Project Area. Suitable habitat is present within the Project Area, however, the Development Footprint does not possess the herbaceous understory preferred by the species.	Yes
Pink-tailed Legless Lizard *Aprasia parapulchella*	V	V	MNES Search (known presence)	**Low.** There are no records of the species within 1.5 km of the Project Area, however, it was recorded in 2000 approximately 7 km to the west of the Solar Farm Project Area. The species was not recorded during targeted surveys carried out for the project.	No
Sharp-tailed Sandpiper *Calidris acuminata*	-	V, M	MNES Search (may occur)	**Unlikely.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
Curlew Sandpiper *Calidris ferruginea*	E	CE, M	MNES Search (may occur)	**Unlikely.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
Gang-gang Cockatoo* *Callocephalon fimbriatum*	V	E	MNES Search (known presence)	**Moderate.** No known records recorded within 1.5 km of the Project Area. Suitable foraging habitat present within the Project Area, and suitable breeding habitat likely to be present within Goulburn River National Park.	Yes
South Eastern Glossy Black-Cockatoo* *Calyptorhynchus lathami*	V	V	BioNet Atlas, MNES Search (known presence)	**Known.** Observed during surveys for the Solar Farm Project Area.	Yes
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	BioNet Atlas, MNES Search (known presence)	**Known.** Recorded within the locality of the Solar Farm Project Area on 13 and 14 December, 2022. There are four records of 10 individuals within 1.5 km of the Project Area on the BioNet Atlas, all recorded in 2000.	Yes

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
				There are no associated PCTs present in the Development Footprint area, which is significantly disturbed and does not contain suitable breeding habitat. Associated PCTs and suitable breeding habitat present within the wider Project Area (outside the Development Footprint).	
Brown Treecreeper (south-eastern)* *Climacteris picumnus victoriae*	V	V	MNES Search (known presence)	**High.** There are 6 records (comprising 11 individuals) within 1.5 km of the Project Area. The records have been made between 2000 and 2018. Brown Treecreeper was not recorded during surveys carried out for this Project. The species is associated in BAM-C with PCT 1661.	Yes
Spotted-tailed Quoll *Dasyurus maculatus*	V	E	MNES Search (likely presence)	**Moderate.** No records of the species recorded within 1.5 km of the Project Area. Suitable habitat is present within the Project Area (outside the Development Footprint) and within Goulburn River National Park. Associated in BAM-C with PCT 1661.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.4**.
Striped Legless Lizard *Delma impar*	V	V	MNES Search (likely presence)	**Low.** No records within the locality of the Project Area. Associated with in BAM-C with PCT 483. 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.	No. Notwithstanding, targeted surveys for this species were carried out concurrently with surveys for the Pink-tailed Legless-lizard.

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
				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 vescolineata* 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.	
Grey Falcon *Falco hypoleucos*	V	V	MNES Search (likely presence)	**Low.** No records within the locality of the Project Area. Considered unlikely to occur within the Project Area.	No
Latham's Snipe *Gallinago hardwickii*	-	V, M	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No
Painted Honeyeater *Grantiella picta*	V	V	MNES Search (known presence)	**High.** There are no records for this species within 1.5 km of the Project Area. Suitable foraging habitat present within the Project Area. Associated in BAM-C with PCT 483.	Yes
Giant Burrowing Frog *Heleioporus australiacus*	V	V	MNES Search (may occur)	**Low.** No records within 1.5 km of the Project Area. No habitat within the Project Area.	No
White-throated Needletail *Hirundapus caudacutus*	-	V,M	BioNet Atlas, MNES Search (known presence)	**Known**. Observed during Solar Farm surveys. Associated in BAM-C with PCT 483 and PCT 1661.	Yes
Swift Parrot *Lathamus discolor*	E	CE	MNES Search (may occur)	**Moderate.** Suitable foraging habitat present. No records of the species within 1.5 km of the Project Area but known from elsewhere within the locality. Potential for sporadic annual occurrence.	Yes

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Malleefowl *Leipoa ocellata*	E	V	MNES Search (likely presence)	**Low.** No records of the species within 1.5 km of the Project Area. No habitat within the Project Area.	No
Booroolong Frog *Litoria booroolongensis*	E	E	MNES Search (may occur)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
South-eastern Hooded Robin* *Melanodryas cucullata cucullata*	V	E	MNES Search (known presence)	**Moderate.** No records for this species within 1.5 km of the Project Area but known to occur within the locality. Suitable habitat is present within the Project Area. Associated with PCT 1661.	Yes
Blue-winged Parrot* *Neophema chrysostoma*	-	V	MNES Search (may occur)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	No
Corben's Long-eared Bat *Nyctophilus corbeni*	V	V	MNES Search (likely presence)	**Moderate.** No records for this species within 1.5 km of the Project Area**.** The Project Area broadly contains similar floristics to species known preferences, however no associated PCTs area present within the Project Area.	Yes. Corben's Long-eared Bat is identified within the supplementary SEARs as a species at risk of a significant impact.
Greater Glider (southern and central)* *Petauroides volans*	V	V	Supplementary SEARs	**Low.** No known records within the locality of the Project Area. No suitable habitat within the Project Area - no associated PCTs present and site is too disturbed due to significant spacing between hollow bearing trees.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.24.0**.

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Brush-tailed Rock-wallaby *Petrogale penicillata*	E	V	MNES Search (may occur)	**Low.** No records for the species within 1.5 km of the Project Area. No habitat within the Project Area.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.3**.
Koala *Phascolarctos cinereus*	E	E	BioNet Atlas, MNES Search (known presence)	**Low.** Record marked on site from 1957 with questionable locational accuracy. Recent call, scat and scratching records made 5 km SW on alluvial flats associated with the Goulburn River. Associated with PCT 483 and PCT 1661.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.1**.
Superb Parrot *Polytelis swainsonii*	V	V	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area.	No
New Holland Mouse *Pseudomys novaehollandiae*	-	V	MNES Search (likely presence)	**Low.** No known records within 1.5 km of the Project Area. No habitat within the Project Area.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.5**.

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area. The closest known flying-fox camp is located at Muswellbrook.	Identified in the EPBC Act Assessment Guidance as priority management species for further assessment and considered further in **Section 5.3.6**.
Australian Painted Snipe *Rostratula australis*	E	E	MNES Search (likely presence)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No
Diamond Firetail *Stagonopleura guttata*	V	V	MNES Search (known presence)	**Known.** Observed during surveys.	Yes
Migratory Species					
Common Sandpiper *Actitis hypoleucos*	-	M	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No
Fork-tailed Swift *Apus pacificus*	-	M	MNES Search (likely presence)	**Moderate.** No known records within the locality of the Project Area. Project Suitable habitat is present.	No. Migratory species are not a controlling provision as detailed within the supplementary SEARs.
Pectoral Sandpiper *Calidris melanotos*	-	M	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No
Yellow Wagtail *Motacilla flava*	-	M	MNES Search (may occur)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No

MNES Name	Status		Desktop Assessment Source & PMST Notes for 1.5 km Search Area	Likelihood to Occur within the Project Areas (Solar Farm and Road Upgrade Areas)	Further Assessment and/or Survey Required?
	BC Act	EPBC Act			
Satin Flycatcher *Myiagra cyanoleuca*	-	M	MNES Search (likely presence)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No
Rufous Fantail *Rhipidura rufifrons*	-	M	MNES Search (known presence)	**Low.** No known records within the locality of the Project Area. No habitat within the Project Area.	No

KEY

* = species listed under EPBC Act after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.

** = species listing status under the EPBC Act has changed after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.

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

2.3 Field Surveys

2.3.1 Plant Community Type Mapping

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 was 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 PCT mapping
- confirmation of vegetation community floristic delineations based on plot data.

PCTs 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 communities.

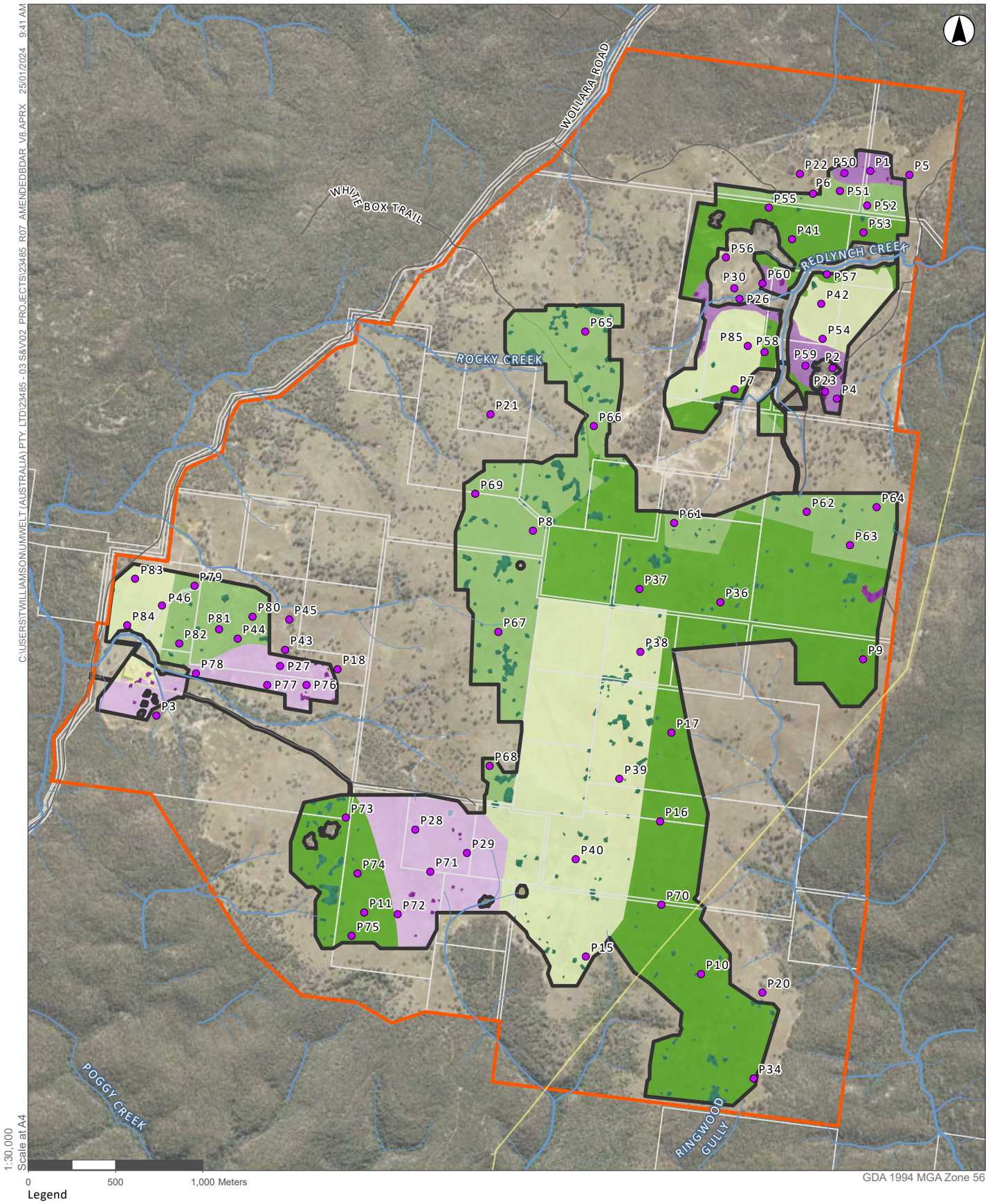
2.3.2 Plant Community and Threatened Ecological Community Surveys

Comprehensive plant community surveys have been undertaken, as documented in Section 4.0 the BDAR. A stratified plot-based floristic and vegetation integrity of the Development Footprint was undertaken in accordance with Table 3 and Section 4.2.1 of the BAM, to assess the expected environmental variation and address any gaps and verify the results of previous mapping and site information.

The BAM plots were sampled by Umwelt ecologists on the following dates:

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

BAM plot survey stratification for each plant community type is listed in **Table 2.1**. Plot locations were recorded with a hand-held Global Positioning System (GPS) device and are shown in **Figure 2.2**.



Legend

- Existing Roads and Tracks
- Watercourse
- Electricity Transmission Line
- Property Boundaries
- Development Footprint
- Project Area
- BAM Plots

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

APPENDIX A FIGURE 2.2

Field Survey Locations - Vegetation Plots

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

Table 2.3 Plant Community Type Survey Plot Stratification Details

PCT ID	PCT Name	Vegetation Condition Zone	Area (ha)	Quantity of Plots Required (BAM 2020 Table 3)	Plots Completed
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Scattered Trees	22.49	4	5
		Moderate Condition Derived Native Grassland	165.36	6	18
		Moderate to Low Condition Derived Native Grassland	310.03	7	19
		Low Condition Derived Native Grassland	195.98	6	10
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	2	4
		Moderate to Low Condition Derived Native Grassland	37.65	4	11
		Low Condition Derived Native Grassland	54.98	5	5

The PCTs mapped within the Project Area were compared to TECs listed under the EPBC Act using the Commonwealth Threatened Species Scientific Committee (TSSC) listing and conservation advice and/or policy statements. The following approach was used:

- A list of nationally listed TECs potentially occurring within the Project Area was obtained through the completion of a PMST search using a 1.5 km buffer and review of TECs listed under the EPBC Act.
- Full-floristic plot assessment, rapid assessments and meandering surveys were completed to determine floristic composition and structure of each PCT.
- For TECs with a potential occurrence within the Project Area, the TEC diagnostic characteristics and condition thresholds were analysed, as identified in the listing advice provided by the TSSC for the relevant candidate TECs assessed.
- Comparison was undertaken with published species lists, including lists of 'important species' as identified on the listing advice provided by the TSSC for potentially occurring nationally listed TECs.
- Comparison with habitat descriptions and distributions for potentially occurring nationally listed TECs was made.

Assessments were completed for the nationally listed TECs potentially occurring using any relevant guidelines and recovery plans published by the Commonwealth.

2.3.3 EPBC Act Listed Threatened Species Surveys

Biodiversity surveys have been undertaken by Umwelt in the Project Area between 2021 and 2023.

The following guidelines relevant to the BAM were utilised for the completion of habitat assessments and targeted surveys for candidate threatened and migratory listed species:

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004).
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b).
- Flora Species with Specific Survey Requirements List Version 1.
- 'Species Credit' Threatened Bats and their Habitats – NSW Survey Guide for the Biodiversity Assessment Method (OEH 2018).
- 'Species Credits' threatened bats and their habitats (NSW DPIE 2021).
- Bat Calls of NSW – Region Based Guide to the echolocation calls of microchiropteran bats (Pennay *et al*., 2004).
- Survey Guidelines for Australia's Threatened Mammals: Guidelines for Detecting Mammals Listed as Threatened under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia (DSEWPC 2011).
- Threatened Reptiles: Biodiversity Assessment Method survey guide (DPE 2022a).
- A review of koala habitat assessment criteria and methods (Youngentob et al. 2021).
- Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method survey guide (DPE 2022b).
- Survey Guidelines for Australia's Threatened Birds: Guidelines for Detecting Birds Listed as Threatened under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia (DEWHA 2010b).

Umwelt notes 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 threatened 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 determining should offset be required for threatened bat species.

The locations of surveys completed for all EPBC Act listed species are mapped in **Figure 2.3** and **Figure 2.4**.

Surveys were undertaken for the threatened species considered to have potential to occur in the Project Area based on database reviews, including the EPBC Act PMST and NSW BioNet Atlas, as well as for species generated by the BAMC-C, as outlined in the Solar Farm BDAR. Surveys included species-specific surveys and on-ground searches in suitable habitat throughout the Project Area. Additionally, opportunistic surveys were undertaken for these species in conjunction with the plant community surveys undertaken.

Targeted surveys for EPBC Act listed species-credit, ecosystem-credit and dual-credit species were undertaken over the dates provided in **Table 2.3** and **Table 2.4**.

Table 2.4 Surveys Targeting Threatened EPBC Act Listed Flora Species

Scientific Name	Listing Status		Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act				
Fairy Bells ***Homoranthus darwinioides***	V	V	• 20 m parallel traverse. • Parallel traverse within PCT 1661 in areas of lower disturbance including the Scattered Trees and parts of the Moderate to Low Derived Native Grassland condition zones. • Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.	March - Dec	10.5 hrs x 2 people over 3 days (13 and 14 October 2021, 23 November 2021)	• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b). • NSW TBDC (DPE 2022d).
Key V = Vulnerable, E = Endangered, CE = Critically Endangered.						

Table 2.5 Surveys Targeting Threatened and Migratory EPBC Act Listed Fauna Species

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
Regent Honeyeater ***Anthochaera phrygia***	CE	CE	Dual	This species is assumed to be present based on the presence of mapped important habitat within the Development Footprint.	NA	No surveys are required for species assessed via mapped important habitat.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o Area searches for 20 hours for 10 days (in areas < 50 ha). o Targeted searches for 20 hours for 5 days (targeting areas of heavily flowering trees and flocks of other blossom feeders).

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
							• NSW TBDC (DPE 2022a). • Important habitat mapping for regent honeyeater (DPE).
Pink-tailed Legless Lizard ***Aprasia parapulchella***	V	V	Species	Reptile rock-rolling searches.	Sept–Nov	• 8 x rock rolling searches of ≈ 200 rocks per search (total of ≈ 1591 rocks rolled). • 40 mins per transect, for a total of 320 mins. • 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.	• Survey guidelines for Australia's threatened reptiles (DSEWPC 2011b). o Searches restricted to an area of relatively homogeneous habitat within each site and a search beneath all rocks that can be turned is made. o Rock cover density rather than fixed area size determines a plot, and 150–200 rocks need to be turned to be reasonably confident of determining the species' presence. o Search success appears to be highest in spring and early summer on warm but not hot days, after a period of rainfall extending over several days. o During summer months surveys are carried out in the mornings or on cloudy days when soil temperatures beneath the rocks are not too high. o During late autumn and winter surveys are carried out on clear sunny days as warming of the rocks appears to attract individuals to the soil surface beneath the rocks. • NSW TBDC (DPE 2022a).

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
Gang-gang Cockatoo ***Callocephalon fimbriatum****	V	E	Dual	• Diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. • Opportunistic observation of avifauna breeding activity.	Oct – Jan	**Targeted Diurnal census & avifauna breeding activity survey –** • Total of ~ 78.25 hrs x 2 people. **Avifauna breeding activity –** • Total of ~32.25 hrs x 2 people. **Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No specific EPBC guidelines available so survey effort was as per the requirements for the Glossy Black-Cockatoo. • NSW TBDC (DPE 2022a).
Glossy Black-Cockatoo ***Calyptorhynchus lathami****	V	V	Dual	• Diurnal census. • Avifauna breeding activity, stick nest and tree hollow search. • Opportunistic observation	Jan - Sept	**Targeted Diurnal census & avifauna breeding activity survey –** • Total of ~ 78.25 hrs x 2 people. **Avifauna breeding activity –** • Total of ~32.25 hrs x 2 people. **Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o Land-based area searches for 5 hours for 1 day. o Targeted searches for 20 hours for 4 days (search for signs of feeding or nests). • NSW TBDC (DPE 2022a).
Large-eared Pied Bat ***Chalinolobus dwyeri***	V	V	Species	• Ultrasonic microbat call detection (Anabat).	Nov - Dec	• 18 recording nights with 2 Anabats (1 unit x 4 nights, 1 unit x 14 nights). • Microbat roost flyout surveys at structures (6 hrs x 2 people) over 4 nights (30 October– 2 November 2023).	• Survey guidelines for Australia's threatened mammals (DSEWPC 2011a). o A combination of techniques is recommended: ▪ Unattended bat detectors for total of 16 detector nights at a minimum of 4 nights (area <50 ha). ▪ Attended bat detectors for total of 6 detector nights for minimum of 3 nights (area <50 ha).

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					▪ Harp traps and/or mistnests total efforts of 16 trap or net nights with minimum of 4 nights (area <50 ha). • NSW TBDC (DPE 2022a).
Brown Treecreeper (south-eastern) ***Climacteris picumnus victoriae****	V	V	Ecosystem	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species.	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No relevant EPBC Act Survey guidelines have been prepared. • NSW TBDC (DPE 2022a).
Striped Legless Lizard ***Delma impar***	V	V	Species	• Reptile rock-rolling searches.	Sep - Dec	• 8 x rock rolling searches of ≈ 200 rocks per search (total of ≈ 1591 rocks rolled). • 40 mins per transect, for a total of 320 mins. • 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.	• Survey guidelines for Australia's threatened reptiles (DSEWPC 2011b). o 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. o In areas with surface rock, artificial shelter site surveys or rock turning should be the primary technique (with supplementary techniques employed as appropriate. o No minimum effort suggested, noted that success rate averages 1 positive observation per 150 rocks turned.

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
Painted Honeyeater ***Grantiella picta***	V	V	Ecosystem	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species.	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No relevant EPBC Act Survey guidelines have been prepared. • NSW TBDC (DPE 2022a).
White-throated Needletail ***Hirundapus caudacutus***	-	V	Ecosystem	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species.	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No relevant EPBC Act Survey guidelines have been prepared. o The species is a trans-equatorial migrant, breeding in the Northern Hemisphere and flying south for the boreal winter. Identify presence in Australia between late October to April as noted in the Conservation Advice (TSSC 2019). • NSW TBDC (DPE 2022a).
Swift Parrot ***Lathamus discolor***	E	CE	Dual	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species and species credit component assessed by important habitat	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o Area searches or transect surveys for 20 hours for 8 days (in reas < 50 ha). o Targeted surveys for 20 hours for 8 days (targeting areas of heavily flowering eucalypts). • NSW TBDC (DPE 2022a). • Important habitat mapping for swift

Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
				mapping which does not occur within the Project Area.			parrot (DPE).
South-eastern Hooded Robin ***Melanodryas cucullata cucullata****	V	E	Ecosystem	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species.	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No relevant EPBC Act Survey guidelines have been prepared. • NSW TBDC (DPE 2022a).
Corben's Long-eared Bat ***Nyctophilus corbeni***	V	V	Ecosystem	• No surveys required (ecosystem credit species).	N/A	• 18 recording nights with 2 Anabats (1 unit x 4 nights, 1 unit x 14 nights). • Microbat roost flyout surveys at structures (6 hrs x 2 people).	• Survey guidelines for Australia's threatened bats (DEWHA 2010). o harp traps o mistnets o ecolocation call detectors o combined efforts. • NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022a).
Koala ***Phascolarctos cinereus****	E	E	Species credit	In accordance with the NSW Koala BAM Survey Guide (2022), the minimum survey effort to detect koala presence on the subject land requires the total effort for two standard survey methods to be met.	All year	Spotlighting – • 80 person hours over 11 nights in 2021–23. Thermal drone – • Total flight area of 552.63 ha over 2 nights in 2023.	• Youngentob, K.N, Marsh, K.F., Skewes, J., A review of koala habitat assessment criteria and methods, report prepared for the Department of Agriculture, Water and the Environment, Canberra, November. CC BY 4.0. • NSW Koala BAM Survey Guide (2022) (note, not released at time of Koala survey).

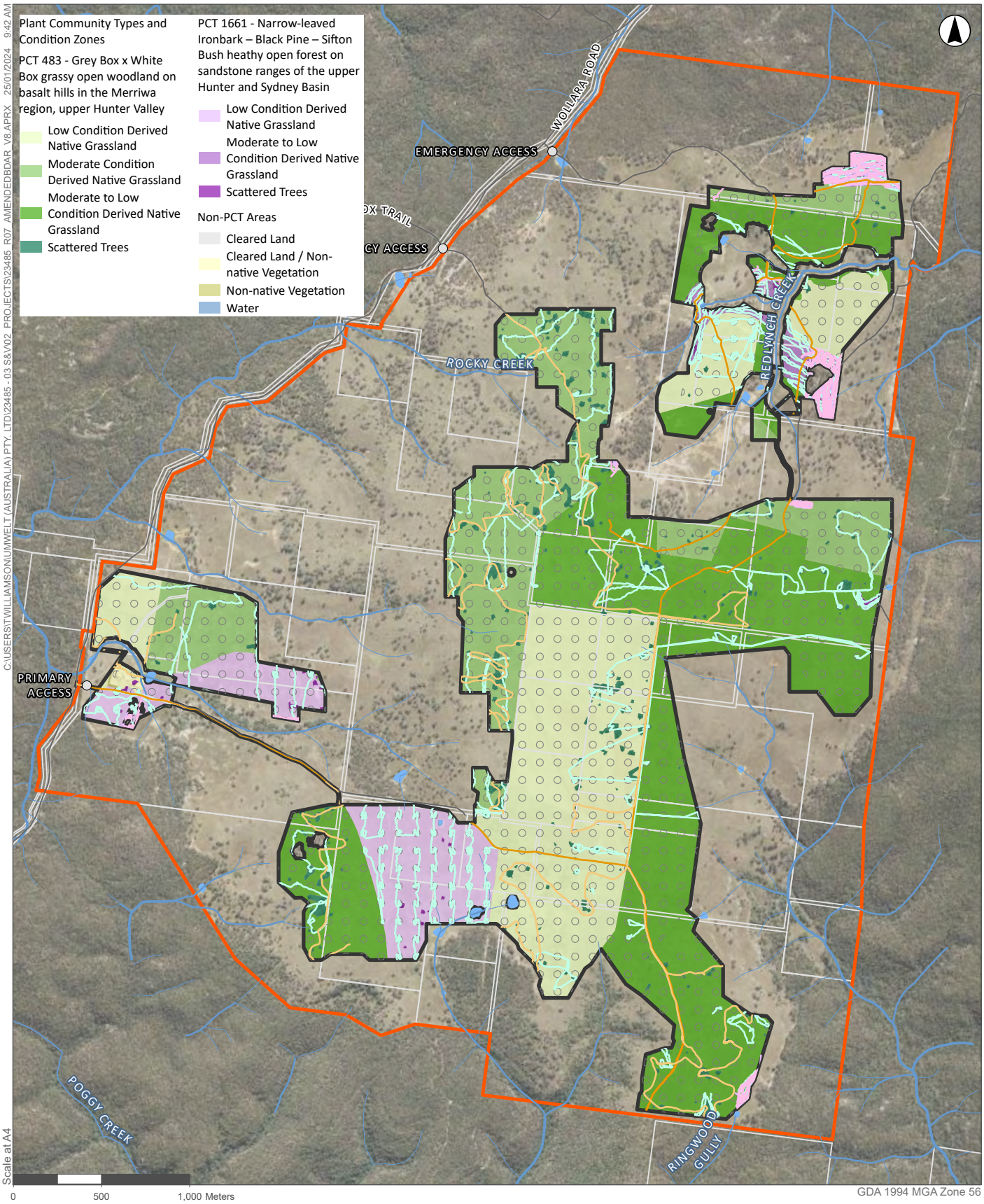
Scientific Name	Listing Status		Credit Type	Survey Method	Survey Period	Survey Effort	Relevant Guidelines and Resources
	BC Act	EPBC Act					
				A scat detection method, which may indicate past occupancy, must be paired with a non-scat detection method. Spotlighting and thermal drones were confirmed to be sufficient survey approach, in consultation with BCD.			
Diamond Firetail ***Stagonopleura guttata****	V	V	Ecosystem	• Opportunistic diurnal census undertaken although no surveys required for ecosystem credit species.	N/A	**Opportunistic Observation –** • Total of ~ 141 hrs x 2 people.	• Survey guidelines for Australia's threatened birds (DEWHA 2010b). o No relevant EPBC Act Survey guidelines have been prepared. • NSW TBDC (DPE 2022a).

KEY

* = species listed under EPBC Act after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.

** = species listing under the EPBC act as changed after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.

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



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1:30,000 Scale at A4

Legend

- Access Points
- 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

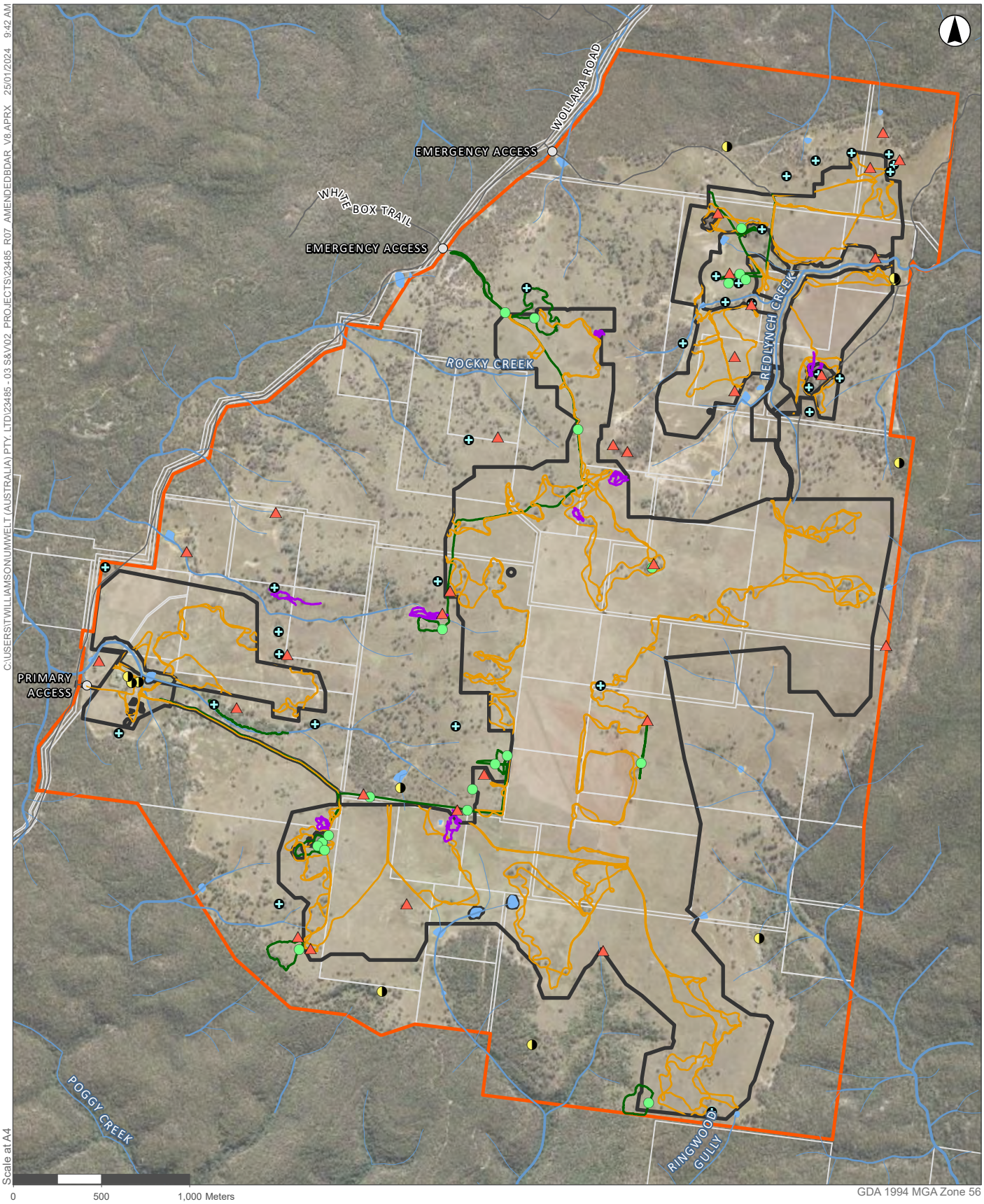
Threatened Epiphytic Orchids Broad Area Spotter Search from Vehicle – October and November 2023

- October 2023
- November 2023

APPENDIX A
FIGURE 2.3

Field Survey Locations - Threatened Flora Surveys

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



Legend

- Access Points
- 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

APPENDIX A
FIGURE 2.4

Field Survey Locations - Threatened Fauna Surveys

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

3.0 Survey Results

3.1 Threatened Ecological Communities

One EPBC Act listed TEC, the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, occurs within the Project Area. 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 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. Furthermore, approximately 4.06 ha of PCT 483 Condition Zone 1 – Scattered Trees (specifically, the areas of the vegetation zone surrounded by PCT 483 Condition Zone 4) do not meet the condition requirement for the CEEC as listed under the EPBC Act.

White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is also listed under the BC Act. 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 area of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, including associated PCT and corresponding vegetation condition zones, within the Project Area is described in **Table 3.1**. The extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Project Area mapped in **Figure 3.1** below.

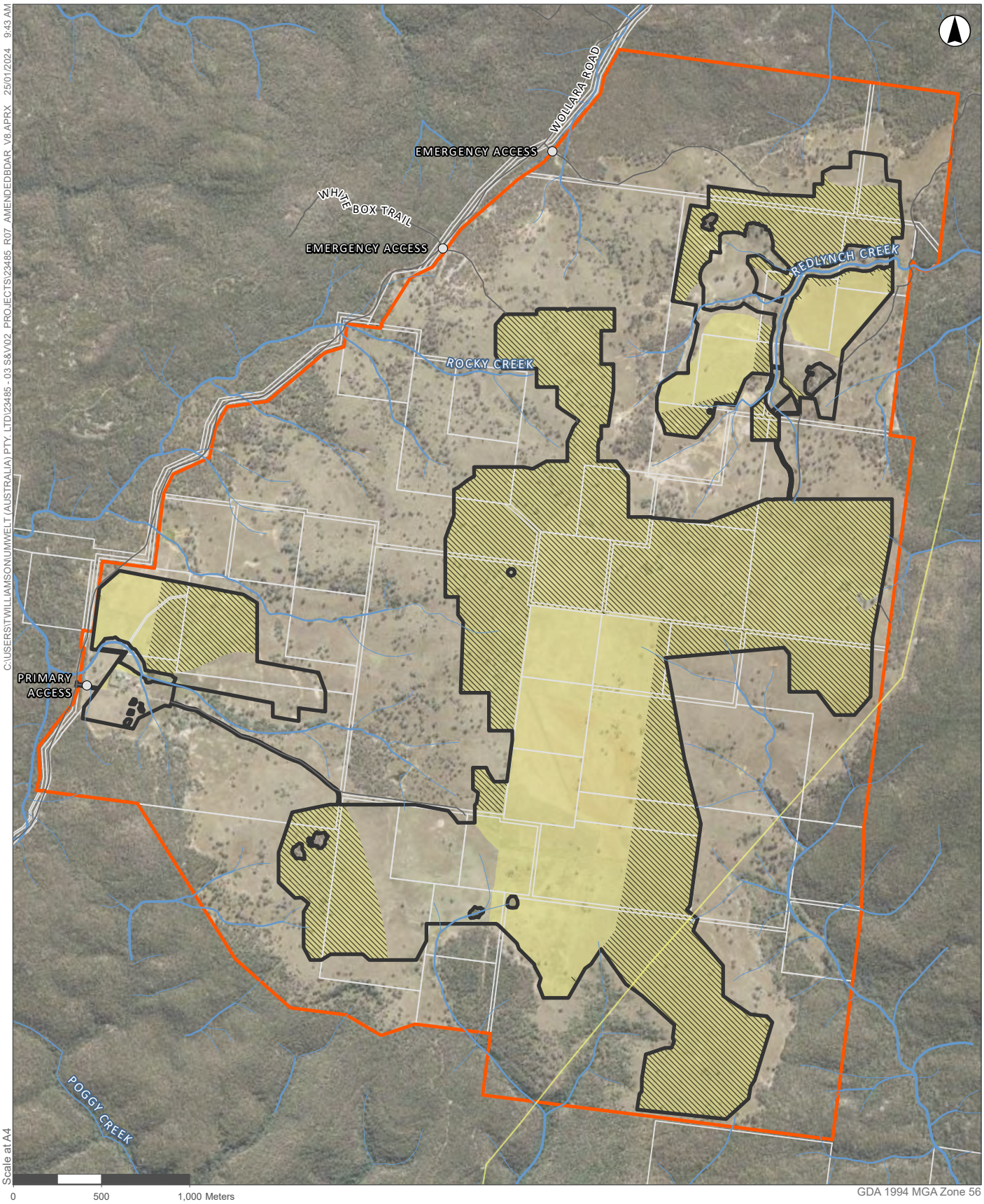
Detailed descriptions of the PCTs mapped within the Development Footprint are provided within Section 4.0 of the BDAR.

Table 3.1 TECs Listed Under the EPBC Act within the Development Footprint

TEC	PCT	Condition class	EPBC Act	Area (ha) within Development Footprint
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	PCT 483: Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Condition Zone 1 – Scattered trees*	CE	18.43
		Condition Zone 2 – Moderate Condition Derived Native Grassland	CE	165.36

TEC	PCT	Condition class	EPBC Act	Area (ha) within Development Footprint
		Condition Zone 3 – Moderate to Low Condition Derived Native Grassland	CE	310.03
Total				**493.82**

** Approximately 4.06 ha of PCT 483 Condition Zone 1 – Scattered Trees (specifically, the areas of the vegetation zone surrounded by PCT 483 Condition Zone 4) do not meet the condition requirement for the CEEC as listed under the EPBC Act.*



Legend

- Access Points
- 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

APPENDIX A
FIGURE 3.1

Threatened Ecological Communities within the Development Footprint

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

3.2 Threatened Flora Species

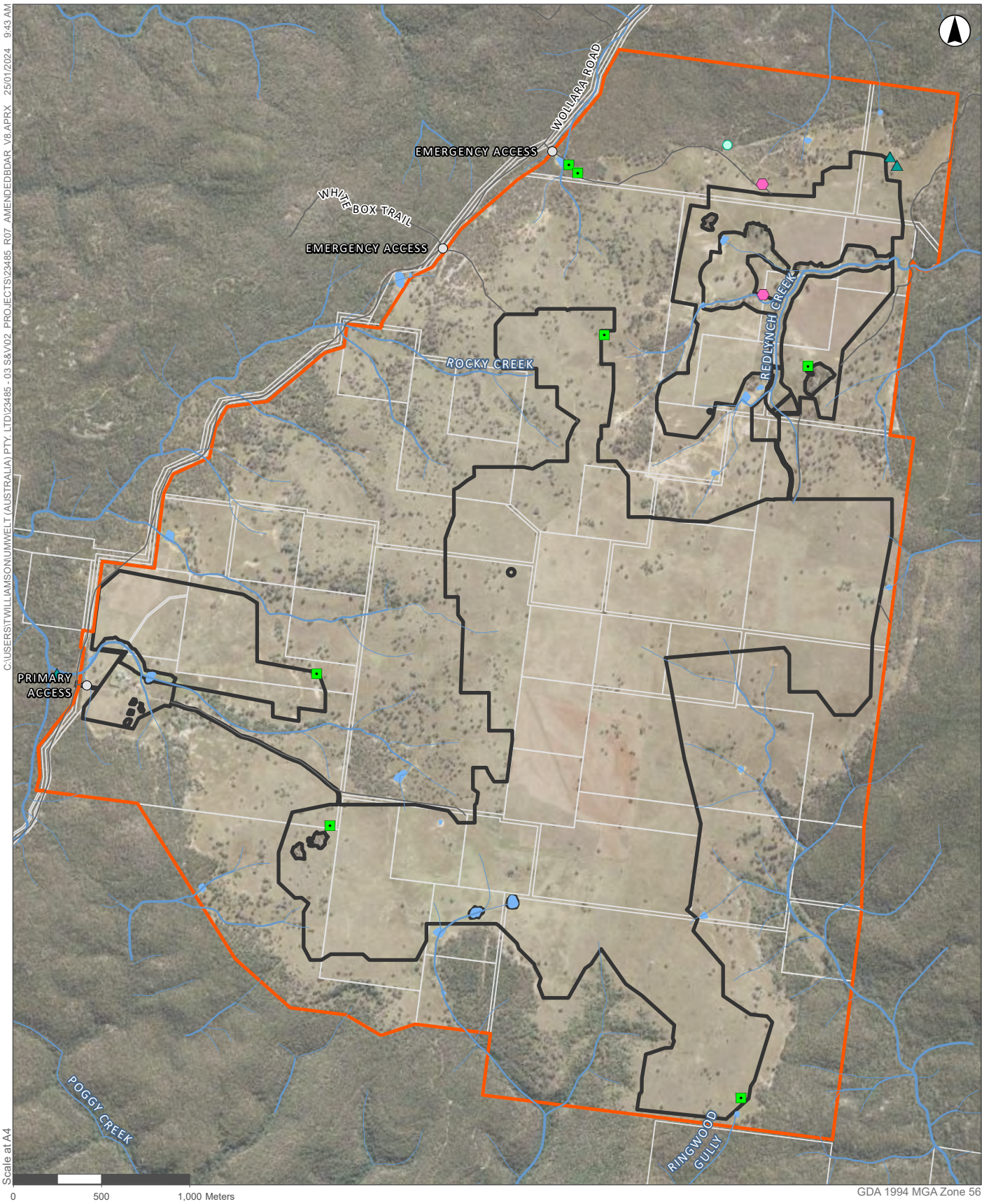
No threatened flora species listed under the EPBC Act have been observed within the Project Area and none are considered likely to occur.

3.3 Threatened Fauna Species

3.3.1 Species Credit Fauna Species Observed

The following EPBC Act-listed threatened species have been recorded in the Project Area and surrounds. The locations of the species credit species recorded within the Project Area is shown in **Figure 3.2**.

- Diamond Firetail (*Stagonopleura guttata*): This species was observed within the Development Footprint at several locations as shown in **Figure 3.2**. The observation dates were 24 August 2021, 23 November 2021, 2 February 2022 and 22 March 2022. This species was listed under the EPBC Act after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.
- White-throated Needletail (*Hirundapus caudacutus*): 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.
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*): 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 behaviours observed were consistent with foraging and no use of the site for breeding habitat was observed despite targeted survey in the breeding season. This species was listed under the EPBC Act after determination that the Project was a Controlled Action under Section 75 of the EPBC Act.



APPENDIX A
FIGURE 3.2

MNES Observation Locations

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

3.3.2 Mapped Important Habitat Species

3.3.2.1 Regent Honeyeater (*Anthochaera phrygia*)

The Project Area 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** of the BDAR. 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.

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 Biodiversity Stewardship Agreement (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.

4.0 Avoidance and Mitigation

4.1 Project Design and Avoidance

Direct, indirect and prescribed impacts to EPBC Act listed threatened species and communities have been avoided and minimised through numerous design refinements detailed in full in **Section 7.0** of the Solar Farm BDAR (Umwelt 2024b).

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 37% reduction in developable area. 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.

Between May 2023 (EIS submission) and the Amendment Report, design refinements have focused on avoiding areas of higher quality Regent Honeyeater mapped important habitat, patches of scattered trees which meet condition requirements for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland as listed under the EPBC Act, as well as watercourses. The northeast of the Development Footprint 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 been limited to four discrete locations. This includes two points 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.

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, while 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 Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion vulnerable ecological community (VEC), listed under the BC Act.
- Relocation or removal of solar arrays within the Development Footprint and reconfiguration of an access track to further avoid SAII, 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.
- 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.
- A route options analysis is detailed in Section 6.1 of the Public Road and Culvert Upgrade BDAR. The analysis details the three alternatives considered. The selected site access via the Golden Highway and Ringwood Road intersection minimises impacts such as vegetation clearance while providing an efficient transport route to site.

4.2 Management and Mitigation

Mitigation measures proposed for residual impacts (direct, indirect and prescribed) are summarised in Table 8.4 of the Solar Farm BDAR (Umwelt 2024b), Section 7.4 of the Public Road and Culvert Upgrade BDAR (Umwelt 2024a), with implementation details provided in Table 8.5 of the Solar Farm BDAR and Section 7.4 of the Public Road and Culvert Upgrade BDAR. These sections include discussion of feasible measures aimed at mitigating and/or managing impacts on EPBC Act listed threatened species and communities. These include consideration of techniques, timing, frequency, and delineation of responsibilities. Each BDAR includes measures that carry a risk of failure, and assess the potential consequences of residual impacts as well as adaptive management strategies to ensure effectiveness in monitoring and responding to impacts. Adaptive management measures are discussed in Section 8.5 of the Solar Farm BDAR and Section 7.5 of the Public Road and Culvert Upgrade BDAR.

4.3 MNES Specific Management and Mitigation Measures

The Project will potentially result in a significant impact on three MNES:

- White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Regent Honeyeater
- Painted Honeyeater.

General Project mitigation and management measures are described in **Section 4.0**. The Proponent is also committed to mitigation measure which are specific to each of these three MNES (**Table 4.1**). Residual impacts will be offset in accordance with **Section 6.0**.

Table 4.1 Mitigation measures for MNES with potential to be significantly impacted by the Project

Matter	Matter specific mitigation	Relevant guideline/ literature
Box Gum Woodland	**Rural land management pressures** would be removed from the 1,200 ha Biodiversity Stewardship Area (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. 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.** **Increasing landscape functionality** across the Project Area through targeted assisted natural regeneration across degraded connectivity areas. 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. 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 SAII BGW in accordance with the BAM. 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.	Conservation Advice for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. (DCCEEW 2023)

Matter	Matter specific mitigation	Relevant guideline/ literature
Regent Honeyeater (Mapped Important Habitat)	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. 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. 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: • Noisy Miner management in known Regent Honeyeater breeding areas. • Habitat restoration within Noisy Miner management areas. • Nest protection from predation. • Zoo-breeding and release.	Woodland and Derived Native Grassland. (DCCEEW 2023)
Painted Honeyeater	**Ecological management of woodland remnants and regrowth** within the BSA will benefit Painted Honeyeater. Protection of the BSA will enable adequate populations of mature trees and trees that host the species' preferred mistletoe species to be maintained. **Firewood collection and grazing pressure will cease** within the remaining 1,200 ha of the Project Area, in-line with the recommended conservation and management action for this species (DoE 2015). Any support for Regent Honeyeater programs (i.e., Noisy Miner management, habitat restoration) will also serve to benefit Painted Honeyeater.	Conservation Advice *Anthochaera phrygia* Regent Honeyeater (DoE 2015a). National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (DoE 2016)

5.0 MNES Impact Assessment

5.1 Determination of MNES Likely to be Impacted by the Project

The EPBC Act Listed Matters which are known to occur or have a medium to high potential to occur within the Project Area are listed in **Table 5.1**. This Table provides an assessment to determine which of these MNES are likely to be impacted by the Project. For species and communities potentially located in the Project Area or in the vicinity that are not likely to be impacted, additional evidence of why they are not likely to be impacted is provided. Additional MNES entities identified as priority management species following the 2019–2020 bushfires in the supplementary SEARs have also been identified for further assessment.

Table 5.1 Determination of MNES likely to be Impacted by the Project

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered Ecological Community	Yes / Observed	Present.	Associated PCT removal. ☒Direct ☒Indirect ☐Prescribed	A total of 493.82 ha of CEEC impacted by the project. This includes the following: • Condition Zone 1 – Scattered trees* = 18.43 ha. • Condition Zone 2 – Moderate Condition Derived Native Grassland = 165.36 ha. • Condition Zone 3 – Moderate to Low Condition Derived Native Grassland310.03 ha.	Loss and modification of the CEEC.	Yes.
Sandy Hollow Commersonia (*Androcalva rosea* (syn. *Commersonia rosea*))	Endangered	Not observed during surveys, not likely to occur	Not likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Bluegrass (*Dichanthium setosum*)	Vulnerable	–Not observed during surveys, not likely to occur	Not likely to occur / Not known from the Sydney Basin Bioregion or predicted to occur in BAM-C for solar farm Project Area. Not observed during targeted surveys for Road Works Project Area.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.
Fairy Bells (*Homoranthus darwinioides*)	Vulnerable	Not observed during surveys, not likely to occur	Not likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.
Ozothamnus tesselatus	Vulnerable	Not observed during surveys, not likely to occur	Low.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Regent Honeyeater (*Anthochaera phrygia*)	Critically Endangered	Site mapped as important habitat, moderate likelihood of occurrence	High.	Mapped Important Habitat Removal. ☒Direct ☒Indirect ☐Prescribed	42.30 ha of mapped important habitat.	Loss of potential degraded suitable foraging habitat. Species has not been recorded within the Project Area during surveys.	Yes.
Southern Whiteface (*Aphelocephala leucopsis*)*	Vulnerable	Not observed during surveys. Moderate potential for occurrence	High.	Removal of suitable habitat. ☒Direct ☒Indirect ☐Prescribed	Species not associated with any PCTs in BAM C. Impacts across the Development Footprint will include removal of 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss and modification of suitable habitat.	Yes.
Pink-tailed Legless Lizard (*Aprasia parapulchella*)	Vulnerable	Not observed during surveys, not likely to occur.	Low.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Gang-gang Cockatoo (*Callocephalon fimbriatum*)*	Endangered	Not observed during surveys, not likely to occur.	Species not observed during surveys, no impacts likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	No.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)*	Vulnerable	Observed during surveys. Potential to utilise scattered occurrences of *Allocasuarina luehmannii* trees as foraging habitat. There are present in low densities in PCT 1661.	Moderate.	Removal of suitable foraging habitat. ☒Direct ☒Indirect ☐Prescribed	Removal of scattered *Allocasuarina luehmannii* trees within the Project Area. Species is associated with PCT 483 and PCT 1661. Impacts across the Development Footprint will include removal of 22.49 ha of PCT 483 scattered trees condition zone and 2.66 ha of PCT 1661, scattered trees condition zone.	Loss of potential foraging habitat.	Yes.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Vulnerable**	Assumed presence, high likelihood of occurrence limited to use of Project Area as foraging habitat	Moderate.	No PCTs associated with this species will be impacted. ☒Direct ☒Indirect ☐Prescribed	No PCTs associated with this species will be impacted.	Modification of areas of suitable aerial foraging habitat.	Yes.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*)*	Vulnerable	Assumed presence. High likelihood of occurrence.	High.	Modification of foraging habitat. ☒Direct ☒Indirect ☐Prescribed	Species associated with PCT 1661 of which 95.29 ha will be impacted, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Modification of areas of suitable aerial foraging habitat.	Yes.
Spotted-tailed Quoll (*Dasyurus maculatus* maculatus) (South-east mainland Population)	Endangered	Not observed / Assessed as ecosystem credit entity with assumed presence	Low.	Modification of movement habitat used for landscape connectivity. ☒Direct ☒Indirect ☐Prescribed	Reduction in areas available for movement through the Project Area and loss in area of highly disturbed foraging habitat. Species associated with PCT 1661 of which 95.29 ha will be impacted, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Reduced opportunities for movement through the Project Area, species likely to persist if present within the Project Area and locality due to retention of linkage corridors and areas of highest quality suitable habitat.	Significant Impact Assessment not required, however supplementary SEARs identifies that this species is a priority management species and requires analysis of the impacts of the 2019–2020 bushfires.
Painted Honeyeater (*Grantiella picta*)	Vulnerable	Assumed presence. High likelihood of occurrence.	Moderate.	Removal of habitat. ☒Direct ☒Indirect ☐Prescribed	Species associated with PCT 483 of which 693.86 ha will be impacted, comprising 22.49 ha of scattered trees	Loss of potential degraded suitable foraging habitat. Species has not been recorded within the Project Area during surveys.	Yes

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
White-throated Needletail (*Hirundapus caudacutus*)	Vulnerable	Observed during surveys. Known to occur.	Moderate.	Modification of aerial foraging habitat and removal of potential low quality roost habitat. ☒Direct ☒Indirect ☐Prescribed	Species is associated with PCT 483 and PCT 1661 in BAM C. Impacts across the Development Footprint will include removal of 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss of potential degraded suitable foraging habitat. Species has been recorded within the Project Area during surveys.	Yes.
Swift Parrot (*Lathamus discolor*)	Critically Endangered	Moderate. Not observed. Assessed as ecosystem credit species with assumed presence.	Low to moderate.	Direct removal of suitable foraging habitat. ☒Direct ☒Indirect ☐Prescribed	No mapped important habitat will be impacted. Species is associated with PCT 483 and PCT 1661 in BAM C. Impacts across the Development Footprint will include removal of 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss of suitable foraging habitat.	Yes.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)*	Endangered	Assessed as ecosystem credit species with assumed presence. Likely to occur.	High.	Direct removal of suitable foraging habitat. ☒Direct ☒Indirect ☐Prescribed	Species associated with PCT 1661 of which 95.29 ha will be impacted, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss of suitable foraging habitat.	Yes.
Diamond Firetail (*Stagonopleura guttata*)*	Vulnerable	Observed. Know to occur.	Medium.	Removal of habitat. ☒Direct ☒Indirect ☐Prescribed	Impacts across the Development Footprint will include removal of 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss of known habitat.	Yes.
Koala (combined populations of QLD, NSW, ACT) (*Phascolarctos cinereus*)	Vulnerable**	Not observed	Low / Not likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	Yes

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Greater Glider (*Petauroides volans*)*	Vulnerable**	Not observed	Not likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	Significant Impact Assessment not required, however supplementary SEARs identifies that this species is a priority management species and requires analysis of the impacts of the 2019–2020 bushfires.
Brush-tailed Rock Wallaby (*Petrogale penicillata*)	Vulnerable	Not observed	Not likely to occur, no suitable habitat present.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	Significant Impact Assessment not required, however supplementary SEARs identifies that this species is a priority management species and requires analysis of the impacts of the 2019–2020 bushfires.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
New Holland Mouse (*Pseudomys novaehollandiae*)	Vulnerable	No suitable habitat present, not likely to occur	Not impact likely to occur.	No impact likely to occur. ☐Direct ☐Indirect ☐Prescribed	No impact likely to occur.	No impact likely to occur.	Significant Impact Assessment not required, however supplementary SEARs identifies that this species is a priority management species and requires analysis of the impacts of the 2019–2020 bushfires.
Corben's Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable	Not observed / foraging habitat assessed as ecosystem credit entity	Medium.	Removal of habitat. ☒Direct ☒Indirect ☐Prescribed	Impacts across the Development Footprint will include removal of 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.	Loss of known habitat.	Yes.

Entity	EPBC Act Status	Presence / Likelihood of Occurrence	Impact Potential	Nature of Impact (Direct/Indirect/ Prescribed)	Quantum of Impact	Consequences of Impact	Further Impact Assessment Required
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable	Not observed / foraging habitat assessed as ecosystem credit entity	Low, nearest camp site is in Mudgee.	Direct removal of suitable foraging habitat. ☒Direct ☒Indirect ☐Prescribed	Species is associated with PCT 483 and PCT 1661. Impacts across the Development Footprint will include removal of 22.49 ha of PCT 483 scattered trees condition zone and 2.66 ha of PCT 1661, scattered trees condition zone.	Loss of suitable foraging habitat in an area which is not in proximity to any known camps.	Significant Impact Assessment completed.
KEY * = species listed under EPBC Act after determination that the Project was a Controlled Action under Section 75 of the EPBC Act. ** = species listing status has changed, presented here as the status at the time of the Controlled Action determination.							

5.2 EPBC Act Significant Impact Assessments

Significant impact assessments have been provided for the following nationally listed threatened species and ecological communities that are likely to be impacted by the Project, in accordance with the Matters of National Environmental Significance - Significant Impact Guidelines 1.1 (DOE 2013) for the EPBC Act.
The species detailed below are identified in **Table 4.1** as having potential to be impacted by the Project. Assessments have been included for species which were not listed at the time of the referral decision (shown with an *). Identified species include:

- White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Regent Honeyeater
- South-eastern Hooded Robin*
- Swift Parrot
- Koala (combined populations of QLD, NSW, ACT)
- Spotted-tailed Quoll (South-east mainland Population)
- Painted Honeyeater
- Large-eared Pied Bat
- Glossy Black-Cockatoo*
- White-throated Needletail
- Diamond Firetail (*Stagonopleura guttata*)*
- Brown Treecreeper (south-eastern)*
- Southern Whiteface*
- Corben's Long-eared Bat
- Grey-headed Flying-fox.

5.2.1 White Box - Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland

5.2.1.1 Significant Impact Assessment

White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as a CEEC under the EPBC Act. The Significant impact assessment criteria for CEEC are listed below in bold font and specifically addressed for this ecological community.

Reduce the extent of an ecological community

The Project will reduce the extent of the ecological community through the removal of areas of PCT 483 Grey Box X White Box grassy open woodland on basalt hills in the Merriwa Region Upper Hunter Valley, including areas of the derived native grassland and scatted trees condition zones within the Development Footprint. This impact equates to 493.82 ha.

- Scattered trees condition zone = 18.43 ha.
- Derived native grassland moderate condition zone = 165.36 ha.
- Derived native grassland moderate to low condition zone = 310.03 ha.

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, the reduction in vegetation integrity is unlikely to be the case in practice. Of the 693.86 ha of PCT 483 (of which not all meets the condition requirements to be listed as the CEEC under the EPBC Act) 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 (of which not all meets the condition requirements to be listed as the CEEC under the EPBC Act).

The remaining 93% (645.66 ha) of PCT 483 (of which not all meets the condition requirements to be listed as the CEEC under the EPBC Act) 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 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 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.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The Project will not isolate any areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland, 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 in derived native grassland form within the south-eastern section of the site from other retained areas of the TEC 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.

Adversely affect habitat critical to the survival of an ecological community

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.
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 (see Figure 1.5 of the BDAR). As such, areas of higher quality White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland 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 of the BDAR).

Due to the high levels of degradation from the ongoing agricultural use of the Development Footprint, and the avoidance of areas of moderate to good quality habitat for this CEEC, it is considered that habitat to be impacted is not critical to the survival of the ecological community.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The majority of land comprised of derived native grasslands 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. 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.

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.

Impacts within the Solar Farm project area will result in the alteration of surface water drainage patterns, however the impacts will be limited to first and second order streams which are ephemeral and only convey limited amounts of runoff immediately following rainfall events. There is only one third order stream within the Development Footprint, Redlynch Creek. While Redlynch Creek is within the Development Footprint, much of this creek has been able to be avoided.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

The construction of the proposed solar farm will require the removal of scattered trees and result in impacts to areas of derived native grasslands. The grassland areas to be impacted have been assessed as likely to be completely removed, however there is potential that these areas may regenerate as native grasslands and persist under the panels which are proposed to be installed (see also response above to reducing the extent of an ecological community). Changes in species composition and loss of functionally important species has the potential to occur within the Development Footprint.

The Project would be required to carry out ongoing management of the land within the Development Footprint as part of the biodiversity management plan prepared for project operation. As such, the Project is expected to at a minimum retain 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).

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established, or**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**

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. 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.

Interfere with the recovery of an ecological community.

The primary land use undertaken on the Development Footprint is agriculture. This land use has resulted in the ongoing degradation of the habitats present. It is considered that the Development Footprint is not an area likely to be prioritized for the recovery of this ecological community due to its importance as agricultural land. The Project will further reduce the potential for the recovery of the ecological community within the Development Footprint, however it is considered that if the status quo is maintained the Development Footprint is not likely to be an area for the recovery of the ecological community.

5.2.1.2 Impact Avoidance Measures

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 areas of high biodiversity value. 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.

Between the EIS submission (May 2023) and the Amendment Report, design refinements have focused on avoiding areas of higher quality CEEC, including areas of 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 CEEC now avoided.

5.2.1.3 Impact Mitigation Measures

Management and mitigation measures specific to White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland are described further in **Section 4.3.**

General impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR, and include the following:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a Construction Environmental Management Plan (CEMP) incorporating appropriate monitoring and adaptive management strategies.

5.2.1.4 Impacts of the 2019–2020 bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event. Large areas of other connected National Parks and private properties along the Great Dividing Range were also impacted by this fire event.

This TEC predominantly occurs in areas on the western slopes and tablelands from Southern Queensland, through NSW and central Victoria in areas which were not impacted by the 2019–2020 bushfires.

5.2.1.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project will have a significant impact on the White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.

The proponent has committed to using the residual areas of the Development Footprint (1,200 ha) as a Biodiversity Stewardship Site to generate biodiversity credits which would directly offset impacts to this listed CEEC. Residual credit requirements would be sourced in accordance with the like-for-like requirements and would include measures such as purchase of credits from the Biodiversity Conservation Trust (BCT) or from the market.

5.2.2 Regent Honeyeater (*Anthochaera phrygia*)

5.2.2.1 Significant Impact Assessment

The Regent Honeyeater is listed as critically endangered under the EPBC Act. The significant impact assessment criteria for critically endangered species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of a population

The Goulburn River/Merriwa locality in the Upper Hunter is known as an important Regent Honeyeater breeding area. 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, Appendix H (BDAR)). Mapped important habitat for this species is present within the Development Footprint.

There is a total of 42.30 ha of native vegetation mapped as Regent Honeyeater Important Habitat within the Development Footprint, including 17.58 ha of scattered trees and 24.73 of derived native grassland in various condition classes. Conversely, the proposed BSS contains 95% (848 ha) of potential Regent Honeyeater habitat in the Project Area (Crates 2023).

The Regent Honeyeater has not been observed within the Development Footprint and it is not likely to be directly impacted by the Project. The BSS is likely to be better quality habitat as it is better connected to Goulburn River National Park (where Regent Honeyeaters are known to breed), has better tree cover, a lower abundance of Noisy Miners and possibly more permanent water (Crates 2023).

The areas proposed to be impacted by the proposal are heavily degraded and are their removal is not likely to lead to a long-term decrease in the size of a population of the Regent Honeyeater. The creation of the BSS is likely to lead to an increase in the availability of potential Regent Honeyeater foraging and breeding habitat as the vegetation matures, particularly if Noisy Miner control is undertaken.

Reduce the area of occupancy of the species

The Regent Honeyeater has a large area of occupancy compared to its population size due to its nomadic behaviour. The Project will reduce the extent of mapped important habitat for this species in the Project Area by 4.71%. However, it is not likely to breed in the Project Area due to habitat degradation, competition from Noisy Miners and lack of access to water. 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.

The proposed BSS covers 95% of the Regent Honeyeater habitat in the Project Area and is likely to see an increase in habitat quality and extent over time as the vegetation matures (Crates 2023). The Project 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 (Crates 2023). Therefore, the Project is not likely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations

The Project will not fragment any populations of the Regent Honeyeater, as this species is highly mobile and nomadic.

Adversely affect habitat critical to the survival of a species

The National Recovery Plan for the Regent Honeyeater (Department of Environment 2016) identifies that habitat critical to the survival of the Regent Honeyeater includes:

- Any breeding or foraging areas where the species is likely to occur (as mapped).
- Any newly discovered breeding or foraging locations.

The Development Footprint is mapped in or near the Mudgee Wollar breeding area shown in the National Recovery Plan and within an area where the species is likely to occur (DOE 2016). Thus, habitat critical to the survival of the Regent Honeyeater is present. However, the Regent Honeyeater is unlikely to currently forage or breed in the Project Area (Crates 2023). 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).

The loss of degraded habitat in the project footprint would be minimised and mitigated by the creation of a BSS in the Project Area. This habitat is likely to become more suitable for the Regent Honeyeater over time as the vegetation matures, particularly if Noisy Miner control is implemented. However, it light of the species' critically endangered status the loss of habitat with future recovery potential located in an important breeding areas may be considered an adverse effect on habitat critical to the survival of the Regent Honeyeater.

Disrupt the breeding cycle of a population

The Project will reduce the extent of mapped important habitat for the Regent Honeyeater. However, this species is unlikely to currently breed in the Project Area as the habitat is degraded, Noisy Miners are present and there is a lack of permanent water (Crates 2023). The nearest recent breeding record is 3 km from the development footprint. Therefore, the Project would not disrupt the breeding of this species in the Project Area, within the Goulburn River National Park or other known breeding locations nearby.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The habitat to be removed in the development footprint is degraded and unlikely to be used by the Regent Honeyeater (Crates 2023). Due to the species' high mobility, the loss of this vegetation would not result in habitat isolation. A BSS would be established which will protect the remaining 95% of Regent Honeyeater habitat within the Project Area and its quality would increase over time as the vegetation matures. Thus, the proposed development is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Regent Honeyeater is likely to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

There is a chance that the Project may increase the potential for Noisy Miner utilisation within the Project Area. Notwithstanding, this species is unlikely to currently breed in the Project Area as the habitat is degraded, Noisy Miners are present and there is a lack of permanent water (Crates 2023). As such, should Noisy Miner increase in abundance, only foraging habitat for Regent Honeyeater would be impacted.

Introduce disease that may cause the species to decline, or

The Project is not a type of development which is likely to introduce disease that may cause the Regent Honeyeater to decline.

Interfere with the recovery of the species.

Strategy 1 of the National Recovery Plan for the Regent Honeyeater aims to improve the extent and quality of Regent Honeyeater habitat (Department of Environment 2016). While the habitat in the development footprint is not currently used by the Regent Honeyeater, it does have future recovery potential as it is currently only used for grazing and scattered trees are present to provide a seed source. Development within the clearing footprint would preclude its future recovery to suitable habitat. While the majority of the Project Area is proposed for incorporation in a BSS, a significant area of edge habitat would remain around the development footprint. Habitat edges are associated with the presence of aggressive Noisy Miners, which suggests the Regent Honeyeater would be unlikely to breed near habitat edges. Given the critically endangered status of the Regent Honeyeater, these impacts may be sufficient to interfere with the recovery of the Regent Honeyeater.

5.2.2.2 Impact Avoidance Measures

The Project has been designed to minimise impacts to areas of Important Habitat mapped for the Biodiversity Assessment Method, for this species.

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, 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 BSS, excluding water bodies, of which 824.72 ha is included within the Regent Honeyeater important area mapping (Figures 6-8). The BSS 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 (792.22 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.

5.2.2.3 Impact Mitigation Measures

Management and mitigation measures specific to Regent Honeyeater are described further in **Section 4.3**. The offsetting strategy proposed will also provide opportunities to rehabilitate areas of mapped important habitat within the Project Area.

General impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR, and include the following:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.2.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event, including areas of mapped Regent Honeyeater Important Habitat.

The 2019–2020 mega fire event that impacted the east coast of Australia represent a significant pulse impact on the quality of the habitat for this species. Crates *et al*. (2020) estimated that the 2019–2020 fires burnt 71,011 square kilometres representing 13% of the species area of occupancy with high to very high burn severity identified for 54% of the burnt area. This study also identified that nest locations known since 2015 returned the most severe fire impact estimate, with 44% of 1 km grid cells where nesting has been recorded having been impacted by fire.

5.2.2.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is likely to result in a significant impact to the Regent Honeyeater.

The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a Biodiversity Stewardship Site, to generate species credits which would directly offset impacts on mapped Important Habitat for the Regent Honeyeater. Residual credit requirements would be sourced in accordance with the like-for-like requirements and would include measures such as purchase of credits from the BCT or from the market.

5.2.3 Southern Whiteface (*Aphelocephala leucopsis*)

5.2.3.1 Important Population Criteria

Southern Whiteface are a small passerine bird, about 11 cm in length with a cream-coloured eye, grey bill, brown dorsum, white belly, dark brown wings and a black tail with narrow white tip. Adults are sexually monomorphic, while juveniles are distinguishable due to a lack of black rear band on the face. Southern Whitefaces occur across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range, on ranges, foothills and lowlands, and plains. The species lives in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both, typically dominated by acacias or eucalypts. Southern whiteface forage almost exclusively on the ground, preferring habitat with low tree densities and an herbaceous understorey litter cover. Birds mainly feed on insects, spiders, and seeds, largely gleaned from the bare ground or leaf litter.

Southern Whitefaces were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences.

The Southern Whiteface is listed as vulnerable under the EPBC Act, however the species was not listed at the time the Project was determined to be a Controlled Action. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below:

- A population identified as important within a recovery plan: There are no adopted or made recovery plan for this species.
- Key source populations either for breeding or dispersal: No Southern Whiteface were observed during surveys. As such, it is unlikely that the Project Area contains a key source population for either breeding or dispersal for the species.
- Populations that are necessary for maintaining genetic diversity: No Southern Whiteface were observed during surveys. As such, it is unlikely that the Project Area contains a population which is necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range: No Southern Whiteface were observed during surveys, however, the Project Site is located on the Great Dividing Range, near the limit of the species range. As such, any individuals present within the Project Area may be considered important.

As such, it is considered that the Project Area potentially provides habitat for an important population (should a population occupy the site in the future), considering this species' range.

5.2.3.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

Southern Whitefaces were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences.

The Project Area potentially provides habitat for an important population (should a population occupy the site in the future). Whilst the wider Project Area contains suitable habitat for the species, the Development Footprint will primarily impact areas of PCT 483 and PCT 1661 comprised of low condition derived native grassland, dominated by a mix of exotic species typical of agricultural land use and native grasses. Areas of suitable habitat in better quality, containing herbaceous understory species, higher density of leaf litter and woody debris will be retained in the wider Project Area, within the proposed BSA. As such, it is unlikely that the Project would result in a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

Southern Whitefaces were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences. The Development Footprint has avoided areas of higher quality vegetation with herbaceous understory species, higher density of leaf litter and woody debris preferred by the species. The Development Footprint will remove poorer quality extents that are marginal in value. As such, it is unlikely that the Project would reduce the area of occupancy for an important population of the species.

Fragment an existing important population into two or more populations

Southern Whitefaces were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences.

The Project layout has been designed 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. As such, the Project is unlikely to fragment an important population into two or more populations.

Adversely affect habitat critical to the survival of a species

According to DCCEEW (2023f), Habitat critical to the survival of the Southern Whiteface includes areas that have:

- relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both

- habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat
- living and dead trees with hollows and crevices which are essential for roosting and nesting.

The Development Footprint has been disturbed by a history of agricultural use and does not contain habitat critical to the survival of this species.

Disrupt the breeding cycle of an important population.

Southern Whitefaces were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences. As such, the Project is unlikely to disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the removal of areas of suitable habitat for this species, however there are larger areas of suitable habitat present within proposed BSA surrounding the Development Footprint and within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.3.3 Impact Avoidance Measures

The Southern Whiteface was not observed during surveys, however, there are records of this species nearby to the Project Area.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.3.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR.
The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.3.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.2.3.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to result in a significant impact to the Southern Whiteface.

5.2.4 Glossy Black-Cockatoo (*Calyptorhynchus lathami*)

5.2.4.1 Important Population Criteria

Glossy black cockatoos are the smallest of the black cockatoos with a body length of around 48 cm and weight of 420 g. Plumage is mostly dull black, with a blackish-brown head, an inconspicuous crest and a broad bulbous bill. Adult males have bright red panels in the tail. Adult females have yellowish-red panels in the tail, and variable yellow patches on their heads. South-eastern glossy black cockatoos are uncommon but widespread. They can be found from Mitchell, Queensland, through eastern New South Wales to East Gippsland, Victoria. Their distribution is continuous through the forested parts of the Great Dividing Range but becomes more scattered inland, to as far west as the Riverina in New South Wales. Glossy black cockatoos feed almost exclusively on the seeds of *Allocasuarina* spp. and *Casuarina* spp., usually relying on one or two species within a region. The species also display a strong preference to individual feed trees and will not feed on many other proximate trees of the same tree species. Glossy black cockatoo nest in hollows within living or dead eucalypts.

Glossy Black-Cockatoo were observed during surveys. Observations were made of this species flying over the site on 14 October 2021 and 31 January 2022 with behaviours consistent with foraging and not breeding activity. Areas of suitable foraging habitat for this species is limited to scattered occurrences of *Allocasuarina* trees which are present within PCT 1661.

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.

The Glossy Black-Cockatoo is listed as vulnerable under the EPBC Act, however the species was not listed at the time the Project was determined to be a Controlled Action. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below:

- A population identified as important within a recovery plan: There are no adopted or made recovery plan for this species.
- Key source populations either for breeding or dispersal: Glossy black cockatoos were observed flying over the site and displaying behaviours consistent with foraging not breeding. No breeding individuals were recorded within the Development Footprint despite targeted surveys. As such, it is unlikely that the Project Area contains a key source population for either breeding or dispersal for the species.
- Populations that are necessary for maintaining genetic diversity: Glossy black cockatoos occurring within southern eastern Australia is comprised of two populations – a coastal population (from Queensland to Victoria), and a separate inland population within NSW Riverina area, which is listed as an endangered population under the BC Act. The individuals observed within the Project Area are part of the coastal population of the species, and it is unlikely that any individuals utilising the Project Area are part of a population which is necessary to maintain genetic diversity.
- Populations that are near the limit of the species range: The Project Area does not occur at the limit of the species range.

Development Footprint does not contain an important population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

5.2.4.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the Glossy Black-Cockatoo and the Project will not result in a long-term decrease in the size of an important population of this species.

The Project would remove approximately 25.15 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint. No breeding habitat will be impacted by the Project.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the Glossy Black-Cockatoo and the Project is not likely to reduce the area of occupancy of an important population of the Glossy Black-Cockatoo.

The Project will remove approximately 25.15 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint. No breeding habitat will be impacted by the Project.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the Glossy Black-Cockatoo and the Project is not a type of development which is likely to fragment the habitat of this mobile and migratory species.

The Project layout has been designed 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**.**

Adversely affect habitat critical to the survival of a species

According to DCCEEW (2022b), habitat critical to the survival or important habitats of a species or ecological community refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community.

Limited areas of potential foraging habitat were observed, and no areas of breeding habitat are considered to be present. The site is surrounded by substantially higher quality habitat, both across Goulburn River National Park, and within the remainder of the Project Area, which will be established as a BSS. The Project is thus considered unlikely to adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population

No breeding habitat use was observed onsite during targeted habitat surveys. Thus, the Project is considered unlikely to affect habitat critical to the survival of the species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the removal of areas of suitable habitat for this species, however there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.4.3 Impact Avoidance Measures

Glossy Black-Cockatoo was observed within the Project Area during surveys for the Project.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable foraging and breeding habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.4.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.4.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

The subspecies was severely affected by the 2019–2020 bushfires, with a significant portion of their known range burnt (Cameron et al. 2021). They were identified as a priority species post 2019–2020 bushfires, requiring urgent management interventions (Legge *et al* 2020).

5.2.4.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to result in a significant impact to the Glossy Black Cockatoo.

5.2.5 Large-Eared Pied Bat (*Chalinolobus dwyeri*)

5.2.5.1 Important Population Criteria

Large-eared Pied Bat is a medium-sized insectivorous bat measuring approximately 100 mm, including the head and tail, and weighing 7–12 g. The large-eared pied bat is patchily distributed in central-eastern NSW and south-eastern and central Queensland, from the area bounded by Shoalwater Bay north of Rockhampton (Qld), south to Ulladulla. The species' distribution is fragmented, as most individuals occur in small and relatively isolated subpopulations due to specific requirements for foraging and roosting habitat. Within NSW, the species occurs within areas comprised of Sydney sandstone, the Pilliga, Coolah Tops region, and Mt Kaputar.

There are 4 previous records for this species within 1500 m of the Development Footprint (from December 2000). Furthermore, 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. As such, this species is assumed as being present within the Development Footprint.

The Large-eared Pied Bat is listed as endangered under the EPBC Act, however at the time the Project was determined to be a Controlled Action, the species was listed as vulnerable. As such, this assessment has assessed the species according to its status at the time of Controlled Action determination. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined as a:

- population identified as important within a recovery plan
- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Large-eared Pied Bat populations have been identified as important within the species recovery plan (DERM 2011). As such, any individuals occurring within the Project Area or assumed present within the Development Footprint is considered to be part of an important population.

5.2.5.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

Large-eared Pied Bat was recorded within the Project Area in December 2022. The Project Area contains escarpments and rocky overhangs which provide suitable roost habitat for the species. It is not known maternity roosts are present within the Project Area. DCCEEW (2023g) notes that the structure of maternity roosts appears to be very specific, and the number of known maternity roosts is small (3–6). Caves need to have indentations in the roof and be high and deep enough to allow juvenile bats to learn to fly inside. Roosting bats cluster in the indentations, which most likely allow the capture of heat. As such, the specific structural requirements of maternity roosts are uncommon in the landscape.

The Project has been designed to avoid escarpments and rocky overhangs, thus no roost habitat for Large-eared Pied Bat occurs within the Development Footprint. The Development Footprint would result in the removal of potential foraging habitat for the species, however, the vegetation to be removed is not associated with the species within the TBDC. As such, the Development Footprint is unlikely to lead to a long-term decrease in the size of an important population of the species.

Reduce the area of occupancy of an important population

The Project has been designed to avoid escarpments and rocky overhangs, thus no roost habitat for Large-eared Pied Bat occurs within the Development Footprint. The Development Footprint would result in the removal of potential foraging habitat for the species, however, the vegetation to be removed is not associated with the species within the TBDC. As such, the Development Footprint is unlikely to reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations

The Project layout has been designed 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. Large-eared Pied Bat is highly mobile and capable of traversing large areas of discontinuous and unsuitable habitat. The proposed action is not likely to fragment an important population of this species.

Adversely affect habitat critical to the survival of a species

The recovery plan for the species (DERM 2011) states that sandstone cliffs and fertile wooded valley within close proximity to each other should be considered habitat critical to the survival of the species. Whilst this type of habitat occurs within the Project Area (including the proposed BSA), it does not occur within the Development Footprint.

The Development Footprint contains some areas of suitable foraging habitat for this species, and this species has been recorded historically nearby to the Development Footprint. Further refinements to the Project footprint have resulted in the retention of suitable roosting habitat and PCTs associated with the threatened microbat species Large-eared Pied Bat.

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. It is highly unlikely that vibrations from construction would affect the structural integrity of the sandstone escarpments within the Project Area.

The Development Footprint is surrounded by the Goulburn River National Park which provides larger areas of higher quality habitats for this species and contains areas where this species has been recorded.

As such, the Project is unlikely to adversely affect habitat critical to the survival of Large-eared Pied Bat.

Disrupt the breeding cycle of an important population

The Project has been designed to avoid escarpments and rocky overhangs, thus no roost habitat for Large-eared Pied Bat occurs within the Development Footprint. Furthermore, the construction methods proposed to install the solar panels would be limited to piling 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.

As such, the Development Footprint is unlikely to disrupt the needing cycle of an important population of the species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the removal of areas of suitable habitat for this species, however there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. Further refinements to the Project footprint have resulted in the retention of PCTs associated with the threatened microbat species Large-eared Pied Bat and Eastern Cave Bat. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.5.3 Impact Avoidance Measures

The large-eared Pied Bat was not observed during surveys, however there are records for this species in proximity of the Project Area.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.5.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 7.4 of the BDAR.
The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.5.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

The Conservation Advice for this species estimates that 26.6% of the species habitat occurs within areas affected by the 2019–2020 wildfires (DAWE 2021). The impact of these fires is yet to be thoroughly assessed. Individuals congregate to roost and raise young which places a reasonable proportion of a local population at a single locality. Most known cave roosts are in shallow caves or in the outer reaches of deeper mines or caves. As such, individuals are potentially susceptible to direct mortality from heat and smoke from fires. Mortality can be expected to be higher during high intensity fires or where fires occur on a regular basis. Mortality is potentially higher for creched young unable to escape smoke as adults may be able to. The longer-term impacts of fire frequency and intensity on the Large-eared Pied Bat are unknown.

5.2.5.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to result in a significant impact to the Large-eared Pied Bat.

5.2.6 Brown Treecreeper (South-Eastern) (*Climacteris picumnus victoriae*)

5.2.6.1 Important Population Criteria

Brown Treecreepers are Australia's largest treecreeper. It is a grey-brown bird with black streaking on the lower breast and belly and black bars on the undertail. There are two subspecies which grade into each other through central NSW. Brown Treecreepers are endemic to eastern Australia and occur in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, the Cumberland Plain, the Hunter Valley and parts of the Richmond and Clarence Valleys.

The species occurs in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Brown Treecreepers are sedentary, and where present, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding.

Brown Treecreepers were not observed during surveys, however, the Project Area is considered to have a moderate likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences.

The Brown Treecreeper (south-eastern) is listed as vulnerable under the EPBC Act, however the species was not listed at the time the Project was determined to be a Controlled Action. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required.
An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below::

- A population identified as important within a recovery plan: There are no adopted or made recovery plan for this species.
- Key source populations either for breeding or dispersal: No Brown Treecreepers were observed during surveys. As such, it is unlikely that the Project Area contains a key source population for either breeding or dispersal for the species.
- Populations that are necessary for maintaining genetic diversity: No Brown Treecreepers were observed during surveys. As such, it is unlikely that the Project Area contains a population which is necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range: The Project Area does not occur at the limit of the species range.

The Development Footprint does not contain an important population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

5.2.6.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the Brown Treecreeper (south-eastern) and the Project will not result in a long-term decrease in the size of an important population of this species.

The Project would remove approximately 95.29 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the Brown Treecreeper (south-eastern) and the Project is not likely to reduce the area of occupancy of an important population of the Brown Treecreeper (south-eastern).

The Project would remove approximately 95.29 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint. The removal of this foraging habitat is unlikely to reduce the area of occupancy for the species.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the Brown Treecreeper (south-eastern) and the Project is not a type of development which is likely to fragment the habitat of species.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

According to DCCEEW (2023e), habitat critical to the survival of the brown treecreeper (south-eastern) includes areas that have:

- relatively undisturbed grassy woodland with native understorey
- habitat structure should be quite open at ground level so that birds are able to feed on or near the ground and maintain vigilance against predators
- the required degree of openness is mostly likely to be created by moderate levels of disturbance by fire and/or grazing
- large living and dead trees which are essential for roosting and nesting sites and for foraging
- fallen timber which provides essential foraging habitat
- hollows in standing dead or live trees and tree stumps are also essential for nesting.

As the vegetation within the Development Footprint is highly disturbed, the vegetation largely does not meet the standard of habitat critical to the survival of this species. However, impact avoidance has been achieved for the relatively undisturbed parts of the Project Area where suitable habitat is present. Thus, the Project is unlikely to adversely affect habitat critical to the survival of this species.

Disrupt the breeding cycle of an important population.

The Development Footprint does not contain an important population of the Brown Treecreeper (south-eastern) and therefore the Project would not disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the removal of approximately 95.92 ha of suitable habitat for this species, however there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.6.3 Impact Avoidance Measures

The Brown Treecreeper (south-eastern) was not observed during surveys, however, there are records of this species nearby the Project Area.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.6.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in **Section 8.4 of the B**DAR.
The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.6.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.2.6.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to result in a significant impact to the Brown Treecreeper (south-eastern).

5.2.7 Spotted-Tailed Quoll *(Dasyurus maculatus maculatus)* (South-East Mainland Population)

5.2.7.1 Significant Impact Assessment

The Spotted-tailed Quoll (South-east Mainland Population) is listed as endangered under the EPBC Act. The significant impact assessment criteria for endangered species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of a population

The Spotted-tailed Quoll has not been observed during surveys and there are no records for this species within 1.5 km of the Development Footprint on the BioNet Atlas (NSW DPE 2022a). The Development Footprint provides areas of highly disturbed habitat for this species, however does not provide suitable habitat for denning. This species occupies a relatively large home range and there are larger areas of higher quality habitats present within the Goulburn River National Park. It is therefore considered that the Project is not likely to lead to a long-term decrease in the size of a population of this species.

Reduce the area of occupancy of the species

The Spotted-tailed Quoll has not been observed during surveys and there are no records for this species within 1.5 km of the Development Footprint on the BioNet Atlas (NSW DPE 2022a). It is therefore considered that the Project is not likely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations

The Development Footprint is already highly disturbed, and this species has not been observed during surveys. The Goulburn River National Park contains higher quality areas of suitable habitat for this species which will maintain connectivity through the locality.

The Project layout has been designed 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. Therefore, it is unlikely that the Project would fragment an existing population of this species.

Adversely affect habitat critical to the survival of a species

The National Recovery Plan for the Spotted-tailed Quoll (VDELWP 2016) identifies that, habitat that is critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey. The Development Footprint consists of highly disturbed and fragmented agricultural land which does not contain any identified denning resources. It is considered that the Development Footprint is not an area of habitat critical to the survival of the Spotted-tailed Quoll.

Disrupt the breeding cycle of a population

This species has not been observed breeding within the Development Footprint. It is considered that the Project is not likely to disrupt the breeding cycle of a population of the Spotted-tailed Quoll.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in the removal of areas available for movement through the Project Area and loss in area of highly disturbed foraging habitat. Approximately, 95.29 ha of suitable habitat woud be impacted, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.

The nearest record for the Spotted-tailed Quoll on the BioNet Atlas (NSW DPE 2022a) is approximately 10 km south of the Development Footprint. This species was not observed during surveys, and it is considered that the Project will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Project is unlikely to introduce invasive species that are harmful to the Spotted-tailed Quoll.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause the Spotted-tailed Quoll to decline.

Interfere with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.7.2 Impact Avoidance Measures

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.4 of the BDAR.

5.2.7.3 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.

- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

The offsetting strategy proposed will also provide opportunities to improve areas of suitable habitat within the Project Area.

5.2.7.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires, although parts of the Goulburn River National Park adjoining the eastern and southern parts of the Project Area were burnt. It is considered that a large proportion of the suitable habitat for this species within NSW was burnt during the 2019–2020 bushfires, with Conservation Advice (Threatened Species Scientific Committee 2020) identifying that 29 percent of the Spotted-tailed Quoll's distribution range overlaps with the fire-affected extent. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event. Despite fire-associated impacts to the Spotted-tailed Quoll across its range, it is considered that the Development Footprint is not likely to provide regularly occupied foraging or shelter habitat.

5.2.7.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to have a significant impact on the Spotted-tailed Quoll.

This species is an ecosystem credit entity under the BAM. The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a BSA, to generate ecosystem credits which would indirectly offset impacts on this species. Any residual ecosystem credit requirements would be achieved through other appropriate measures, such as purchase of credits from the Biodiversity Conservation Trust or from the market.

5.2.8 Painted Honeyeater (*Grantiella picta*)

5.2.8.1 Important Population Criteria

Painted Honeyeaters are small, distinctive passerine birds, with a black head and back, and white underparts with dark streaks on the flanks. The species is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Painted Honeyeaters inhabit Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*Acacia harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. It is a specialist feeder which relies on mistletoes growing on woodland eucalypts and acacias. It prefers mistletoes of the genus *Amyema*.

Painted Honeyeaters were not observed during surveys, however, the Project Area is considered to have a high likelihood of the species occurring given the floristic composition of the vegetation within the Project Area and the species known habitat preferences. It is likely that up to 22.49 ha of potential habitat for this species will be impacted by the Project, comprising PCT 483 Condition Zone 1 – Scattered Trees.

The Painted Honeyeater is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below:

- A population identified as important within a recovery plan: There are no important populations of Painted Honeyeater identified within the Recovery Plan.
- Key source populations either for breeding or dispersal: No Painted Honeyeaters were observed during surveys. As such, it is unlikely that the Project Area contains a key source population for either breeding or dispersal for the species.
- Populations that are necessary for maintaining genetic diversity: No Painted Honeyeaters were observed during surveys. As such, it is unlikely that the Project Area contains a population which is necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range: The Project Area does not occur at the limit of the species range.

Development Footprint does not contain an important population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

5.2.8.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the Painted Honeyeater and the Project will not result in a long-term decrease in the size of an important population of this species.

The Project would remove approximately 22.49 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint. The removal of suitable foraging habitat is unlikely result in the long-term decrease of the species.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the Painted Honeyeater and the Project is not likely to reduce the area of occupancy of an important population of the Painted Honeyeater.

The Project would remove approximately 22.49 ha of suitable foraging habitat within the Development Footprint. Better quality foraging habitat will be retained within the proposed BSA surrounding the Development Footprint. The removal of this foraging habitat is unlikely to reduce the area of occupancy for the species.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the Painted Honeyeater and the Project is not a type of development which is likely to fragment the habitat of this mobile and migratory species.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

The National Recovery Plan for this species (DAWE 2021a) identifies that habitat critical to the survival of this species can include breeding habitat, foraging habitat (both known and likely) and habitat for the long-term maintenance of the species. The Development Footprint contains some areas of suitable foraging habitat for this species, and this species has been recorded historically nearby to the Development Footprint. It is therefore considered that the Development Footprint contains habitat critical to the survival of this species. It should be noted however the suitable foraging habitat present are limited to *Amyema* mistletoes present in low densities in scattered trees in areas which have been highly disturbed by a long history of agricultural land use. This species requires mistletoes present at a density of greater than five mistletoes per hectare, which is not met across the majority of the Project Area. Furthermore, the Development Footprint is surrounded by the Goulburn River National Park which provides larger areas of higher quality habitats for this species and contains areas where this species has been recorded.

Disrupt the breeding cycle of an important population

The Development Footprint does not contain an important population of the Painted Honeyeater and therefore the Project would not disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in the removal of 22.49 ha of suitable habitat for this species, however there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.8.3 Impact Avoidance Measures

The Painted Honeyeater was not observed during surveys, however there are records for this species in proximity of the Project Area.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDARs.

5.2.8.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

The offsetting strategy proposed will also provide opportunities to rehabilitate areas of suitable habitat within the Project Area.

5.2.8.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event, however areas where this species has previously been recorded on the BioNet Atlas (NSW DPE 2022a) within approximately 10 km have largely not been affected.

5.2.8.6 Significant Impact Assessment Conclusion and Proposed Offsets

The Project would remove 22.49 ha of habitat critical to the survival of this species, as defined in the National Recovery Plan (DAWE 2021a). The Project therefore has the potential to have a significant impact on the Painted Honeyeater.

This species is an ecosystem credit species under the BAM. The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a BSA, to generate ecosystem credits which would indirectly offset any potential impacts on this species. Ecosystem credits for PCT 483 will be generated through the BSA occurring within the Project Area not required for development. Any residual ecosystem credit requirements would be achieved through other appropriate measures, such as purchase of credits from the Biodiversity Conservation Trust or from the market. No additional offset obligation beyond that stated in Section 10 of the BDAR will be required.

5.2.9 White-Throated Needletail (*Hirundapus caudacutus*)

5.2.9.1 Important Population Criteria

White-throated Needletails are a large swift with a thickset, cigar-shaped body, stubby tail and long pointed wings (20 cm in length and approximately 115–120 g in weight). Sexes are alike, with no seasonal variation in plumage. White-throated Needletails are widespread in eastern and south-eastern Australia. Within eastern Australia, the species is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. White-throated Needletails are predominantly an aerial species which utilise heights from 1 m up to 1000 m above the ground. They are most often recorded in wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. White-throated Needletail roost amongst dense foliage in tree canopies or within hollows.

White-throated Needletail were observed flying over the Development Footprint on 23 November 2022 (8 individuals observed) and on 1 February 2022 (3 individuals observed). Areas of suitable foraging habitat for the species includes PCT 483 and PCT 1661. The Project would remove 693.86 ha of suitable foraging habitat. The canopy vegetation within the Development Footprint is very sparse, such that it does not provide suitable roosting habitat for the species. Better quality roosting habitat is located within the proposed BSA (within the Project Area adjacent to the Development Footprint) and the adjoining Goulburn River National Park.

The White-throated Needletail is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below:

- A population identified as important within a recovery plan: There are no adopted or made recovery plan for this species.
- Key source populations either for breeding or dispersal: White-throated Needletail do no breed in Australia. As such, the Project Area does not contain a key source population for either breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity: White-throated Needletail do no breed in Australia. As such, the Project Area does not contain a population necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range: The Project Area does not occur at the limit of the species range.

The Development Footprint does not contain a population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

5.2.9.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the White-throated Needletail and the Project will not result in a long-term decrease in the size of an important population of this species.

The Project would remove 693.86 ha of suitable foraging habitat. The canopy vegetation within the Development Footprint is very sparse, such that it does not provide suitable roosting habitat for the species. Better quality roosting habitat is located within the proposed BSA (within the Project Area adjacent to the Development Footprint) and the adjoining Goulburn River National Park. As such, the Project is unlikely to lead to a long-term decrease in the species.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the White-throated Needletail and the Project is not likely to reduce the area of occupancy of an important population of the White-throated Needletail.

The Project would remove 693.86 ha of suitable foraging habitat. The canopy vegetation within the Development Footprint is very sparse, such that it does not provide suitable roosting habitat for the species. Better quality roosting habitat is located within the proposed BSA (within the Project Area adjacent to the Development Footprint) and the adjoining Goulburn River National Park. As such, the Project is unlikely reduce the area of occupancy for the species.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the White-throated Needletail and the Project is not a type of development which is likely to fragment the habitat of this mobile and migratory species.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

There is no current definition of habitat critical to the survival of this species (TSSC 2019).

The Development Footprint contains some areas of suitable foraging habitat for this species, and this species has been recorded historically nearby to the Development Footprint. The Development Footprint is surrounded by the Goulburn River National Park which provides larger areas of higher quality habitats for this species and contains areas where this species has been recorded.

Disrupt the breeding cycle of an important population

This species does not breed in Australia, therefore, the Development Footprint is not considered to contain any breeding habitat for this species.

The Development Footprint does not contain an important population of the White-throated Needletail and therefore the Project would not disrupt the breeding cycle of an important population.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The Project would remove 693.86 ha of suitable foraging habitat. This is comprised of c693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones. The canopy vegetation within the Development Footprint is very sparse, such that it does not provide suitable roosting habitat for the species. Better quality roosting habitat is located within the proposed BSA (within the Project Area adjacent to the Development Footprint) and the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.9.3 Impact Avoidance Measures

The White-throated Needletail was observed during surveys.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.9.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.

- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.9.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.2.9.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to result in a significant impact to the White-throated Needletail.

5.2.10 Swift Parrot (*Lathamus discolor*)

5.2.10.1 Significant Impact Assessment

The Swift Parrot is listed as critically endangered under the EPBC Act. The significant impact assessment criteria for critically endangered species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of a population

This species has not been observed within the Development Footprint and is not likely to be directly impacted by the Project. There are no areas of mapped Important Habitat for this species within the Development Footprint. The nearest record for this species on the BioNet Atlas (NSW DPE 2022a) is from 2005 and located approximately 12 km to the south-west near the Wollar Railway Tunnel.

The areas proposed to be impacted are heavily degraded and are their removal is not likely to lead to a long-term decrease in the size of the population of the Swift Parrot.

Reduce the area of occupancy of the species

The Swift Parrot has a large geographic range compared to its population size and no areas of mapped Important Habitat are present on the Development Footprint or nearby. The areas proposed to be impacted do not contain confirmed occupied habitat and are heavily degraded. It is therefore considered that the Project is not likely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations

The Project will not fragment any habitat for the Swift Parrot, as this species is highly mobile and nomadic.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

The National Recovery Plan identifies that habitat critical to the survival of the Swift Parrot includes:

- Breeding and foraging habitat in Tasmania.
- Foraging habitat on the Australian mainland which contains preferred foraging species within known and likely foraging habitat.

The Development Footprint contains potential foraging habitat and the preferred foraging species White Box (Eucalyptus *albens*) (AGDOE 2016) and therefore meets the definition for habitat which is potentially critical to the survival of the Swift Parrot.

The Project would remove 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones.

Disrupt the breeding cycle of a population

The Swift Parrot only breeds in Tasmania, therefore the Project has no potential to disrupt the breeding cycle of this species.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Swift Parrot has a large geographic range compared to its population size and no areas of confirmed breeding habitat are present on the Development Footprint. The Project would remove 693.86 ha of PCT 483 including 22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones and 95.29 ha of PCT 1661, including 2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones. This would reduce the extent of suitable foraging habitat available to this species, however suitable impact avoidance measures have been applied and the establishment of a BSA of the residual parts of the Development Footprint would provide an opportunity to improve the areas of retained habitats.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Project is unlikely to introduce invasive species that are harmful to the Swift Parrot.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause the Swift Parrot to decline.

Interfere with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.10.2 Impact Avoidance Measures

The Swift Parrot has not been observed during surveys and the Development Footprint is not mapped as Important Habitat for the Swift Parrot under the BAM. The nearest record for this species on the Bio Net Atlas (NSW DPE 2022a) is from 2005 and located approximately 12 km to the south-west near the Wollar Railway Tunnel.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.10.3 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR.
The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.
- The offsetting strategy proposed will also provide opportunities to rehabilitate areas of suitable habitat within the Project Area.

5.2.10.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event, including areas of suitable habitat for the Swift Parrot.

The 2019–2020 mega fire event that impacted the east coast of Australia represent a significant pulse impact on the quality of the habitat for the Swift Parrot. The Draft National Recovery Plan estimates that between 10–30 percent of the distribution range of the Swift Parrot was impacted to some extent, with increasing likelihood of future similar fire events as a result of climate change (AGDAWE 2021a).

5.2.10.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to have a significant impact on the Swift Parrot.

The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a BSA, to generate ecosystem credits which would indirectly offset impacts on this species.
Any residual ecosystem credit requirements would be achieved through other appropriate measures, such as purchase of credits from the Biodiversity Conservation Trust or from the market.

5.2.11 South-Eastern Hooded Robin (*Melanodryas cucullata cucullata*)

5.2.11.1 Significant Impact Assessment

The South-eastern Hooded Robin is listed as endangered under the EPBC Act however the species was not listed at the time the Project was determined to be a Controlled Action. The significant impact assessment criteria for endangered species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of a population

This species has been recorded near the Project Area but has not been observed within the Development Footprint. The areas of suitable habitat proposed to be impacted are heavily degraded and their removal is not likely to lead to a long-term decrease in the size of a population of the South-eastern Hooded Robin.

Reduce the area of occupancy of the species

The Project will reduce the extent of potential habitat for this species. The South-eastern Hooded Robin has a relatively large geographic distribution occurring in south-east Australia spanning from far south-east Queensland to York Peninsula in South Australia. The population is not severely fragmented, and the number of locations is greater than 10 (DCCEEW 2023d). The areas proposed to be impacted do not contain confirmed occupied habitat and are heavily degraded. It is therefore considered that the Project is unlikely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations

The Project will not fragment any populations of the South-eastern Hooded Robin, as the Project Area does not contain confirmed occupied habitat and are heavily degraded.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

According to the Conservation Advice (DCCEEW 2023d), habitat critical to the survival of the hooded robin (south-eastern) include areas of:

- Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas.
- Structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.
- Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging.
- Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.

- The Development footprint is substantially degraded following a history of agricultural use and this species was not observed during surveys. It is considered that it does not contain habitat critical to the survival of this species.

Disrupt the breeding cycle of a population

The Project is unlikely to disrupt the breeding cycle of any populations of the South-eastern Hooded Robin, as the Project Area does not contain confirmed occupied habitat and is heavily degraded.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that this species is likely to decline as the Project Area does not contain confirmed occupied habitat and are heavily degraded. The Development Footprint is surrounded by the Goulburn River National Park which provides larger areas of higher quality habitats for this species and contains areas where this species has been recorded.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Project is unlikely to introduce invasive species that are harmful to the South-eastern Hooded Robin.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause the South-eastern Hooded Robin to decline.

Interfere with the recovery of the species.

5.2.11.2 The Project is unlikely to interfere directly with the recovery of this species.

5.2.11.3 Impact Avoidance Measures

The South-eastern Hooded Robin was not observed during surveys, however there are records for this species in proximity of the Project Area.

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 8.4 of the BDAR.

5.2.11.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.0 of the solar farm and road upgrade BDAR Reports. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.

- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.11.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.2.11.6 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is not likely to result in a significant impact to the South-eastern Hooded Robin.

5.2.12 Diamond Firetail (*Stagonopleura guttata*)

5.2.12.1 Important Population Criteria

Diamond Firetails are a large finch with a bright red bill, and red eyes and rump. The species is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Diamond Firetails occur in in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora woodland, as well as within open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities, and lightly wooded farmland.

Diamond Firetail were observed foraging within the Development Footprint at several locations on 24 August 2021, 23 November 2021, 2 February 2022 and 22 March 2022. The Project would remove of 789.15 ha suitable habitat including 25.15 ha of scattered trees and 764 ha of derived native grassland.

The Diamond Firetail is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act, however the species was not listed at the time the Project was determined to be a Controlled Action. For vulnerable species the EPBC Act, a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below::

- A population identified as important within a recovery plan: There are no adopted or made recovery plan for this species.
- Key source populations either for breeding or dispersal: The conservation advice for the species does not indicate any particular localities or populations of the species which may be a key source for breeding or dispersal.

- Populations that are necessary for maintaining genetic diversity: The conservation advice for the species does not indicate any populations of the species which are necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range; The Project Area does not occur at the limits of the species range.

The Development Footprint does not contain an important population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

5.2.12.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the Diamond Firetail and the Project will not result in a long-term decrease in the size of an important population of this species.

The Project would remove of 789.15 ha suitable habitat including 25.15 ha of scattered trees and 764 ha of derived native grassland, however a substantial area of suitable habitat will be retained in the BSA and surrounding Goulburn River National Park such that the impact is unlikely to affect the size of the population of the species.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the Diamond Firetail and the Project is not likely to reduce the area of occupancy of an important population of the Diamond Firetail.

The Project would remove of 789.15 ha suitable habitat including 25.15 ha of scattered trees and 764 ha of derived native grassland, however a substantial area of suitable habitat will be retained in the BSA and surrounding Goulburn River National Park such that the impact is unlikely to reduce the area of occupancy of the species.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the Diamond Firetail and the Project is not a type of development which is likely to fragment the habitat of this species.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

According to DCCEEW (2023a), habitat critical to the survival of the Diamond Firetail includes areas of:

- Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats.
- Low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding.
- Drooping She-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.
- Additionally, areas that are not currently occupied by the species due to recent disturbance (e.g. fire, grazing or human activity), but which could become suitable again in the future, should also be considered habitat critical to the survival of the species.

Scattered trees with areas of high grass cover are present within the Development Footprint. Thus, the Project will affect habitat critical to the survival of the species. The Project would remove of 789.15 ha suitable habitat including 25.15 ha of scattered trees and 764 ha of derived native grassland, however a substantial area of suitable habitat will be retained in the BSA and surrounding Goulburn River National Park.

Disrupt the breeding cycle of an important population

The Development Footprint does not contain an important population of the Diamond Firetail and therefore the Project would not disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in the removal 789.15 ha suitable habitat including 25.15 ha of scattered trees and 764 ha of derived native grassland., However there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.12.3 Impact Avoidance Measures

The Diamond Firetail was observed during surveys. The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in **Section 7.0 of the BDAR.**

5.2.12.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.12.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.2.12.6 Significant Impact Assessment Conclusion and Proposed Offsets

The proposal will impact an area of suitable habitat for the Diamond Firetail, however the better-quality habitats present within the Project Area will be retained and the Project Area is surrounded by large areas of suitable habitat within the Goulburn River National Park. It is therefore considered that the proposal is unlikely to have a significant impact on this species.

5.2.13 Koala (Combined Populations of QLD, NSW, ACT) (*Phascolarctos cinereus*)

5.2.13.1 Significant Impact Assessment

The Koala is listed as endangered under the EPBC Act, however was vulnerable at the time for the Controlled Action decision. The significant impact assessment criteria for endangered species (assessed at this status level to be precautionary) are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of a population

The Koala has not been observed during surveys and the Development Footprint is identified in the Koala Habitat Information Base – Koala Likelihood Map as mostly having No Koala Records, with the exception of a 10x10 km grid cell overlapping the south-western corner which has a 0.00–0.25 likelihood of occurrence (NSW DPIE 2019). The BDAR includes detail on survey effort, including a separate Thermal Drone Koala Survey Report (BDAR, Appendix E). This species was not observed during surveys.

There is one record for the Koala on the Development Footprint from 1957, and the only recent records for this species from within the last 20 years are from approximately 4.5 km to the south-west, along the floodplain of the Goulburn River (NSW DPE 2022a).

It is therefore considered that the Project is not likely to lead to a long-term decrease in the size of a population of the Koala.

Reduce the area of occupancy of the species

Based on the lack of observations for the Koala within the Development Footprint despite targeted survey, it is considered that the Project is not likely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations

The Project will not fragment any habitat for the Koala, as this species is considered unlikely to occur within the Development Footprint or directly adjoining areas.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

Considerations for determining critical habitat for the Koala are provided in the National Recovery Plan (AGDAWE 2022). It is considered that the Development Footprint is not an area of habitat critical to the survival of the Koala.

Disrupt the breeding cycle of a population

No Koalas have been observed breeding within the Development Footprint. It is considered that the Project is not likely to disrupt the breeding cycle of a population of Koalas.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

There are no records for the Koala on the BioNet Atlas (NSW DPE 2022a) within the Development Footprint since 1957. This species was not observed during surveys and it is considered that the Project will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Project is unlikely to introduce invasive species that are harmful to the Koala. Weed management is a Project commitment during construction and operation.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause the Koala to decline.

Interfere with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.13.2 Impact Avoidance Measures

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.4 of the BDAR.

5.2.13.3 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

The offsetting strategy proposed will also provide opportunities to improve areas of suitable habitat within the Project Area.

5.2.13.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires, although parts of the Goulburn River National Park adjoining the eastern and southern parts of the Project Area were burnt.

The National Recovery Plan for the Koala (AGDAWE 2022b) identifies that the 2019–2020 bushfires killed, injured or affected an estimated 61,000 Koalas and burnt 3,659,625 ha (9%) of the area within which the listed Koala and its habitat are known or likely to occur. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event. Despite these impacts to the Koala across its range it is considered that the Development Footprint is not likely to provide occupied foraging, shelter or fire refuge habitat for the Koala.

5.2.13.5 Significant Impact Assessment Conclusion and Proposed Offsets

This species was not observed during surveys and no significant impact is anticipated to occur as a result of this Project.

5.2.14 New Holland Mouse (*Pseudomys novaehollandiae*)

5.2.14.1 Important Population Criteria

The New Holland Mouse is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined by a set of criteria detailed within the MNES Significant Impact Guidelines (DOE 2013). As assessment of the Project Area against the important population criteria as detailed by DOE (2013) is provided below:

- a population identified as important within a recovery plan
- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The New Holland Mouse occurs in open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. It requires friable soil for burrowing (DEWHA 2010). It generally peaks in abundance during early to mid-stages of vegetation succession typically induced by fire (Fox 1982; Fox *et al.* 2003, but also see Burns and Phillips 2020). The New Holland Mouse occupies floristically diversity habitats to support its varied diet of seeds, invertebrates, leaves and fungi (Wilson and Bradtke 1999).

The development footprint is heavily impacted by grazing and lacks sufficient cover and floristic diversity to provide any significant habitat for the New Holland Mouse. It is unlikely the species occurs in this area. The undeveloped portion of the Project Area, proposed as a BSS, abuts Goulburn River National Park and there may be small, disjunct areas of suitable habitat within the regrowth vegetation found there. Goulburn River National Park is expected to provide significant areas of suitable habitat, although this habitat may be patchily distributed depending on variation in the friability of the soil. It is likely that Goulburn River National Park would support an important population of the New Holland Mouse as this population would be a key source population for breeding, dispersal and maintaining genetic diversity. As the proposed BSS is continuous with the national park, any individuals occurring in this area would be part of this important population. However, the important population is not likely to be present within the development footprint due to severe habitat degradation associated with grazing.

5.2.14.2 Significant Impact Assessment

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Development Footprint does not contain an important population of the New Holland Mouse and the Project will not result in a long-term decrease in the size of an important population of this species.

Reduce the area of occupancy of an important population

The Development Footprint does not contain an important population of the New Holland Mouse and the Project is not likely to reduce the area of occupancy of an important population of the New Holland Mouse.

Fragment an existing important population into two or more populations

The Development Footprint does not contain an important population of the New Holland Mouse and the Project is unlikely to fragment the habitat of this species.

The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the New Holland Mouse is not explicitly defined. Therefore, the generic definition of critical habitat provided by the Significant Impact Guidelines 1.1 applies:

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to, habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.'

Given the grazing induced habitat degradation apparent in the development footprint, it is unlikely that habitat critical to the survival of the New Holland Mouse is present. The Project Area is on a basalt cap. Basalts typically form heavy clay soils, particularly under relatively low rainfall regimes, such as the Upper Hunter area. These soils are not likely to be suitable for burrow construction. This suggests that the Development Footprint would be unlikely to regenerate to suitable habitat if grazing pressure where to be removed (i.e. it would not be a suitable reintroduction site). Therefore, the proposed development would not adversely affect habitat critical to the survival of the New Holland Mouse.

Disrupt the breeding cycle of an important population

The Development Footprint does not contain an important population of the New Holland Mouse and therefore the Project would not disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would not modify, destroy, remove or isolate or decrease the availability or quality of suitable habitat for the New Holland Mouse. Accordingly, the Project is not likely to cause the species to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to the New Holland Mouse.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause the New Holland Mouse to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of the New Holland Mouse.

5.2.14.3 Impact Avoidance Measures

The New Holland Mouse was not observed during surveys. The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of potentially suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.14.4 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR.
The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

5.2.14.5 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on the New Holland Mouse. The species, in common with many *Pseudomys* species, is generally regarded as a post-fire opportunist, reaching peak densities several years after fire before declining as more competitive species recover in response to changing floristics and vegetation structure (Fox and Fox 1978; Fox 1982; Fox *et al.* 2003). However, its relationship with fire is complex. For example, severe fire can cause localised extinctions while the species may persist in long-unburnt habitat. Floristics and vegetation structure determine habitat suitability and while these can influenced by fire, the response to any particular fire event is determined by the interaction of factors such the existing vegetation community, pre and post-fire rainfall, burn area, severity and patchiness. Variation in rainfall is also a driver of population fluctuations (Wilson *et al.* 2018; Burns and Phillips 2020). It is likely that different New Holland Mouse populations exhibited a variety of post-fire responses depending on the interaction of pre, during and post-fire variables at a local scale.

5.2.14.6 Significant Impact Assessment Conclusion and Proposed Offsets

The proposal is not likely to have a direct impact on habitat suitable for the New Holland Mouse. Marginally better-quality habitats present within the Project Area will be retained and the Project Area is surrounded by significant areas of potential habitat within the Goulburn River National Park. Therefore, the proposal is unlikely to have a significant impact on the New Holland Mouse.

5.2.15 Corben's Long-Eared Bat (*Nyctophilus corbeni*)

5.2.15.1 Significant Impact Assessment

The Corben's Long-eared Bat is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined as a:

- a population identified as important within a recovery plan
- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The Development Footprint is near the eastern limit of this species range, and it is therefore that occurrences of this species may constitute an important population.

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Project will require the removal of suitable foraging and shelter habitats for this species. There are larger areas of suitable habitat for this species surrounding the Project Area within the Goulburn River National Park. It is therefore considered that the Project is unlikely to lead to a long-term decrease in the size of an important population of this species.

Reduce the area of occupancy of an important population

The habitats which will be impacted by the Project are highly disturbed and are surrounded by higher quality habitats within the Goulburn River National Park. Large parts of the Project Area will also be retained and may be utilised as a biodiversity offset for the Project. It is therefore considered that the Project is not likely to reduce the area of occupancy of an important population of this species.

Fragment an existing important population into two or more populations

The Project is unlikely to fragment the habitat of this highly mobile species. The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

There are larger areas of suitable habitat for this species within the adjoining Goulburn River National Park. The areas which will be impacted by the Project have been disturbed by a long history of agricultural land use and it is considered that the Project is not likely to affect habitat critical to the survival of this species.

Disrupt the breeding cycle of an important population

The Development Footprint does contain suitable breeding habitat for this species, however there are larger areas of suitable breeding habitat present within the surrounding Goulburn River National Park. It is therefore considered that the Project is unlikely to disrupt the breeding cycle of an important population of Corben's Long-eared Bat.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in the removal of areas of suitable habitat for this species. This includes 693.86 ha of PCT 483 (22.49 ha of scattered trees and 671.37 ha of derived native grassland condition zones) and 95.29 ha of PCT 1661 (2.66 ha of scattered trees and 92.63 ha of derived native grassland condition zones). However, there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.15.2 Impact Avoidance Measures

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.15.3 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

The offsetting strategy proposed will also provide opportunities to rehabilitate areas of suitable habitat for this species within the Project Area.

5.2.15.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event. This species is at the eastern edge of its distribution within the Development Footprint and most of the areas affected by the 2019–2020 bushfires are likely to be outside of this species range.

5.2.15.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is unlikely to have a significant impact on Corben's Long-eared bat.

This species is an ecosystem credit species under the BAM. The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a BSA, to generate ecosystem credits which would indirectly offset impacts on this species. Any residual ecosystem credit requirements would be achieved through other appropriate measures, such as purchase of credits from the Biodiversity Conservation Trust or from the market.

5.2.16 Grey-Headed Flying-Fox (*Pteropus poliocephalus*)

5.2.16.1 Significant Impact Assessment

The Grey-headed Flying-fox is listed as vulnerable under the EPBC Act. For vulnerable species the EPBC Act a consideration of whether the species constitutes an important population is required. An important population is defined as a:

- A population identified as important within a recovery plan: No important populations are identified within the recovery plan for Grey-headed Flying-fox.
- Key source populations either for breeding or dispersal: The Project Area does not contain any camps (maternity or otherwise), therefore the Project Area does not contain a key source population for breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity: The Project Area does not contain any camps (maternity or otherwise), therefore the Project Area does not contain a population necessary for maintaining genetic diversity.
- Populations that are near the limit of the species range: The Project Area is not located at the limit of the species range.

No Grey-headed Flying-foxes were observed during surveys, and it is considered that the Development Footprint does not contain a population which meets the above criteria, considering this species breeding and dispersal behaviours, likely genetics, and range.

The significant impact assessment criteria for vulnerable species are listed below in bold font and specifically addressed for this species.

Lead to a long-term decrease in the size of an important population of a species

The Project will require the removal of suitable foraging habitats for this species, however there were no observations of this species during surveys, nor is there known records from database searches. The Project will not impact any known roost or camp sites for this species. There are larger areas of suitable habitat for this species surrounding the Project Area within the Goulburn River National Park. It is therefore considered that the Project is not likely to lead to a long-term decrease in the size of an important population of this species.

Reduce the area of occupancy of an important population

The habitats which will be impacted by the Project are highly disturbed and are surrounded by higher quality habitats within the Goulburn River National Park. Large parts of the Project Area will also be retained and will be utilised as a biodiversity offset for the Project. It is therefore considered that the Project is unlikely to reduce the area of occupancy of an important population of this species.

Fragment an existing important population into two or more populations

The Project is unlikely to fragment the habitat of this highly mobile species. The Project layout has been designed 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.

Adversely affect habitat critical to the survival of a species

The recovery plan identifies habitat critical to the survival of the species as areas within which field surveys have identified important winter and spring flowering vegetation communities is verified in the field. Important winter and spring flowering vegetation communities include the following species: *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera*. Three species listed as important winter and spring flowering species occur within the Project Area, namely, *E. albens, E. mellidora*, and *E. crebra*. As such, the Project Area contains habitat critical to the survival of Grey-headed Flying-fox.

The Project would remove 25.15 ha of suitable foraging habitat considered to be critical for the survival of the species. Notwithstanding, the areas which will be impacted by the Project have been disturbed by a long history of agricultural land use. There are larger areas of suitable habitat for this species within the adjoining Goulburn River National Park and surrounding proposed BSA.

Disrupt the breeding cycle of an important population

The Development Footprint does not contain known breeding habitat for this species and the nearest camp site is located in Mudgee. It is therefore considered that the Project is unlikely to disrupt the breeding cycle of an important population of the Grey-headed Flying-fox.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the removal of 25.15 ha of suitable foraging habitat for this species, however there are larger areas of suitable habitat present within the adjoining Goulburn River National Park. It is considered that the Project would not affect the availability or quality of habitat that this species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The Project is unlikely to introduce invasive species that are harmful to this species.

Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause this species to decline.

Interfere substantially with the recovery of the species.

The Project is unlikely to interfere directly with the recovery of this species.

5.2.16.2 Impact Avoidance Measures

The Project has been designed and reduced by the proponent to minimise impacts to areas of intact woodland and forest habitats, including areas of suitable habitat for this species. Details of impact avoidance measures applied for the Project are documented in Section 7.0 of the BDAR.

5.2.16.3 Impact Mitigation Measures

Impact mitigation measures for the Project are documented in detail in Section 8.4 of the BDAR. The measures proposed include:

- Education and training for construction and operation phase workers.
- Implementation of vegetation protection zones for retained areas.
- Completion of pre-clearance and works supervision by an ecologist.
- Installation and maintenance of erosion and sediment controls.
- Installation of security fencing for the area containing panels.
- Preparation and implementation of a CEMP incorporating appropriate monitoring and adaptive management strategies.

The offsetting strategy proposed will also provide opportunities to rehabilitate areas of suitable habitat for this species within the Project Area.

5.2.16.4 Impacts of the 2019–2020 Bushfires

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event. The National Recovery Plan for this species (AGDAWE 2021c) identifies that although several of the impacts have not been quantified, preliminary analysis indicates that the associated impact of the fires on this species are likely to be significant in relation to foraging habitat, but only minor in relation to impacts at camp sites. The National Flying Fox Monitoring Viewer identifies that the nearest camp sites for this species are located at Mudgee, 57 km to the south-west and Muswellbrook, 71 km to the east. The National Recovery Plan (AGDAWE 2021c) identifies that this species travels as far as 40 km to feed before returning to their roost the same night. It is considered that the known camp sites nearest to the Project are at or over the limit of this species nightly flying range and it is expected that the site would only be used infrequently or during passage between camp sites.

5.2.16.5 Significant Impact Assessment Conclusion and Proposed Offsets

It is considered that the Project is not likely to have a significant impact on the Grey-headed Flying-fox.

This species is an ecosystem credit species under the BAM. The proponent has committed to undertaking investigations into the use of the residual areas of the Project Area as a BSA, to generate ecosystem credits which would indirectly offset impacts on this species. Any residual ecosystem credit requirements would be achieved through other appropriate measures, such as purchase of credits from the Biodiversity Conservation Trust or from the market.

5.3 Additional Analysis of Impacts of 2019–2020 Bushfires for Priority Management Species

The following additional Priority Management Species require analysis of the impacts of the 2019–2020 bushfires as part of this Report:

- Koala
- Greater Glider
- Brush-tailed Rock Wallaby
- Spotted-tailed Quoll
- New Holland Mouse
- Grey-headed Flying-fox.

5.3.1 Koala (*Phascolarctos cinereus*)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

The National Recovery Plan for the Koala (DAWE 2022c) identifies that the 2019–2020 bushfires killed, injured or affected an estimated 61,000 Koalas and burnt 3,659,625 ha (9%) of the area within which the listed Koala and its habitat are known or likely to occur. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event. Despite these impacts to the Koala across its range it is considered that the subject land is unlikely to provide occupied foraging, shelter or fire refuge habitat for the Koala.

5.3.2 Greater Glider (*Petauroides volans*)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

An estimated 40% of the distribution of the greater glider (southern and central) overlapped with the areas affected by the bushfires 2019–2020. A population decline analysis for the greater glider (southern and central) that incorporates spatial variation in fire severity plus estimated declines for differing fire severity classes, provided an estimate of overall decline for the taxon of 24% (range 17–31%) one year after the fire, assuming current management conditions (DCCEEW 2022a).

5.3.3 Brush-Tailed Rock Wallaby (*Petrogale penicillata*)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

The 2019–2020 bushfires overlapped with approximately 50 percent of the Brush-tailed Rock-wallaby's distribution. The Brush-tailed Rock-wallaby is considered less susceptible to direct mortality from fire than some other mammal species, because it has access to rocky shelters that can protect animals from radiant heat, however increased predation and lack of food after fires may cause additional mortality (DAWE 2021c).

5.3.4 Spotted-Tailed Quoll (*Dasyurus maculatus maculatus* – South-East Mainland Population)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

It is considered that a large proportion of the suitable habitat for this species within NSW was burnt during the 2019–2020 bushfires, with Conservation Advice (TSSC 2020) identifying that 29 percent of the Spotted-tailed Quoll's distribution range overlaps with the fire-affected extent. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event.

5.3.5 New Holland Mouse (*Pseudomys novaehollandiae*)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

There is currently no data surrounding the impacts of the 2019–2020 bushfires on this species.

5.3.6 Grey-Headed Flying-Fox (*Pteropus poliocephalus*)

The Development Footprint was not burnt in the 2019–2020 bushfires. Parts of the Goulburn River National Park to the south and south-east of the Development Footprint were impacted by this fire event.

The National Recovery Plan for this species (DAWE 2021d) identifies that although several of the impacts have not been quantified, preliminary analysis indicates that the associated impact of the fires on this species are likely to be significant in relation to foraging habitat, but only minor in relation to impacts at camp sites. The National Flying Fox Monitoring Viewer (DCCEEW 2023) identifies that the nearest camping site for this species is located at Aberdeen, and the closest nationally important flying-fox camp is located at Muswellbrook.

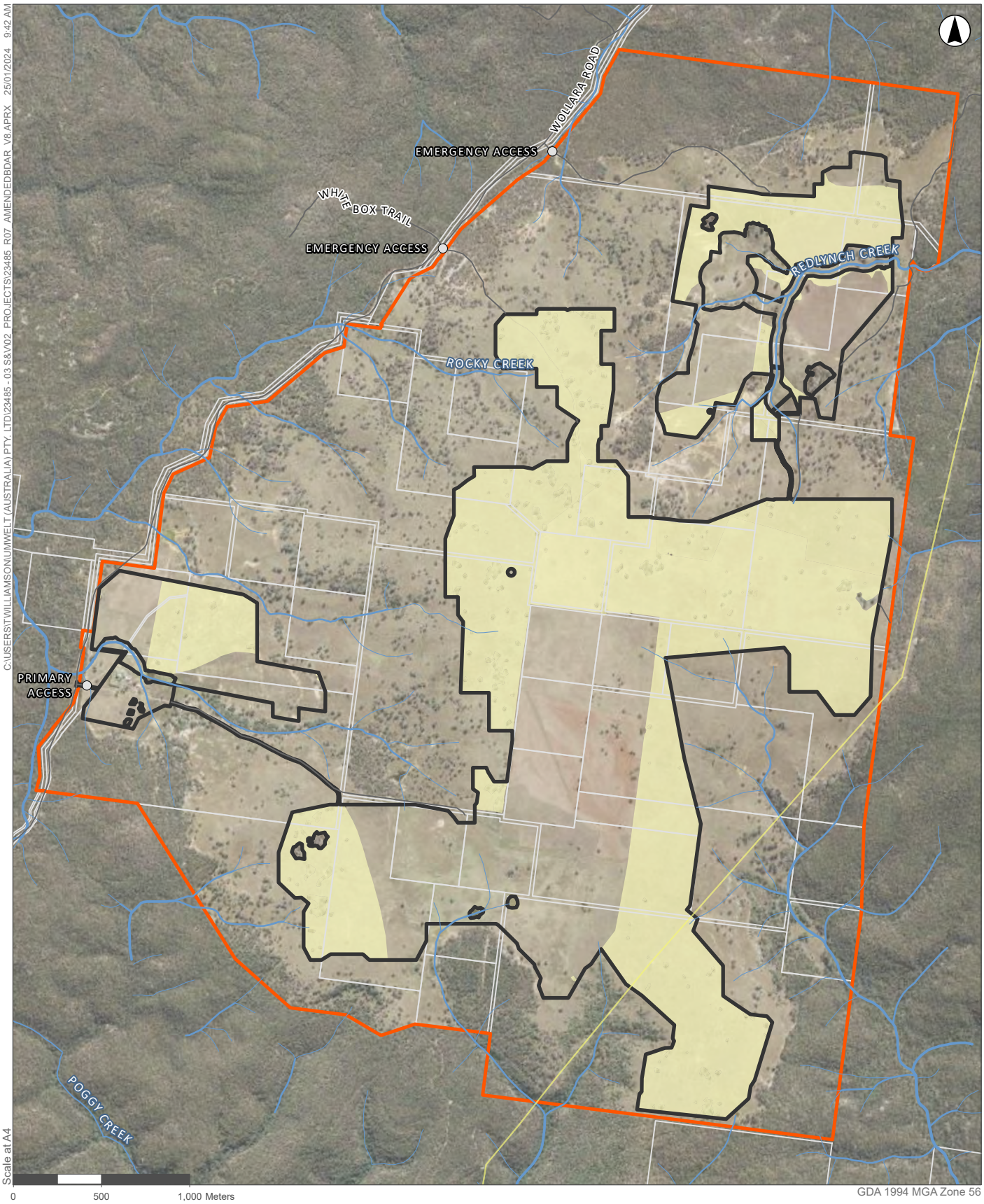
5.4 EPBC Act Significant Impact Assessment Conclusions

The assessments of significance undertaken have identified that the Project has potential to significantly impact the following listed threatened species and ecological communities:

- White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- Regent Honeyeater (*Anthochaera phrygia*).
- Painted Honeyeater (*Grantiella picta*).

The impacts of the Project will be offset in accordance with the requirements of the BAM and the Bilateral Assessment Agreement and the like-for-like biodiversity offsetting rules under the EPBC Act for all entities which are likely to be significantly impacted.

The extent of these MNES entities expected to occur within the Development Footprint is detailed in **Figure 5.1.** Areas of suitable habitat for MNES entities which require offsetting are shown in **Figure 5.1, Figure 5.2** and **Figure 5.3.**



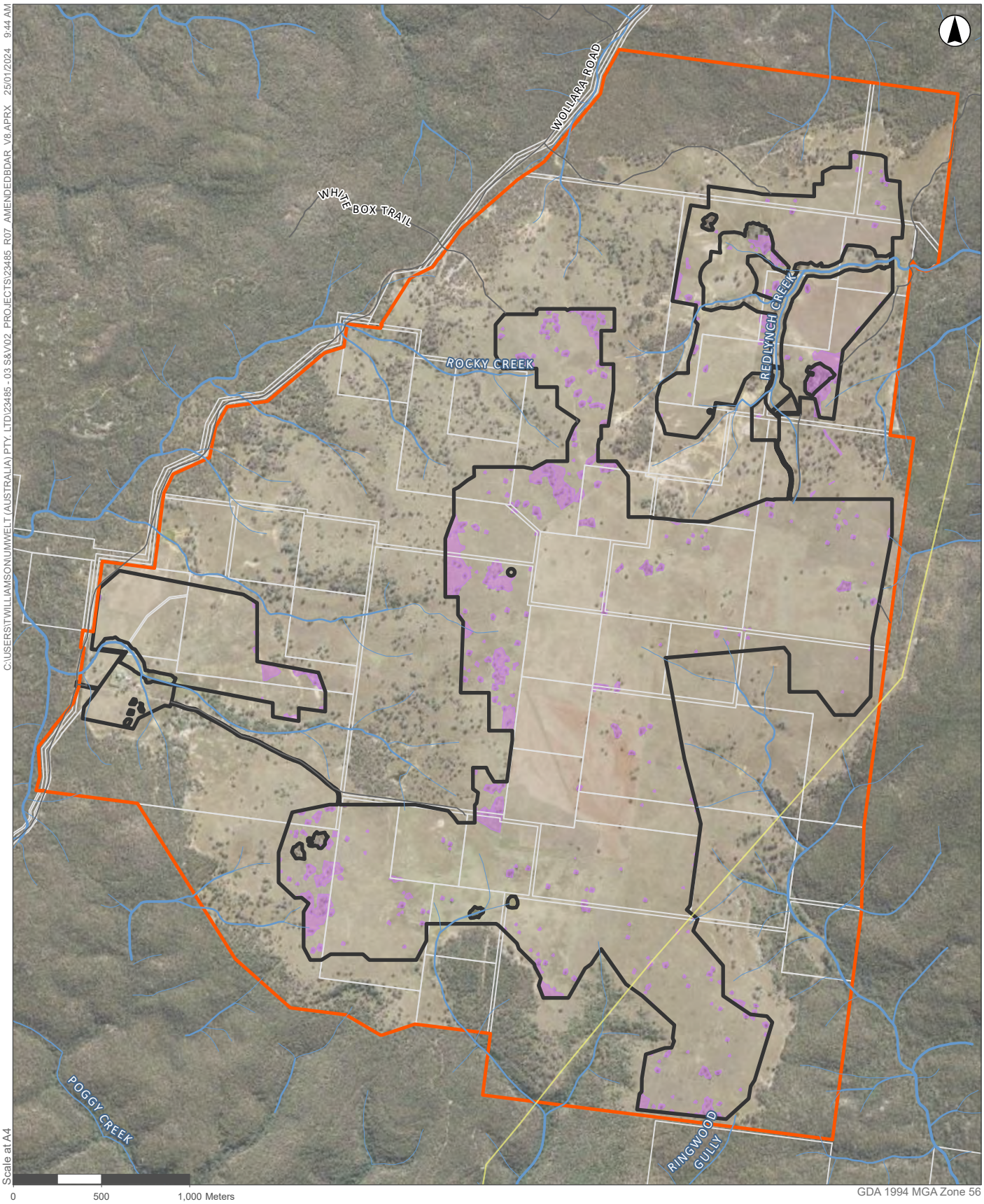
Legend

- Access Points
- Existing Roads and Tracks
- Watercourse
- Electricity Transmission Line
- Property Boundaries
- Development Footprint
- Project Area
- Impacts to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland requiring offsetting

APPENDIX A
FIGURE 5.1

Impacts to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland requiring offsetting'

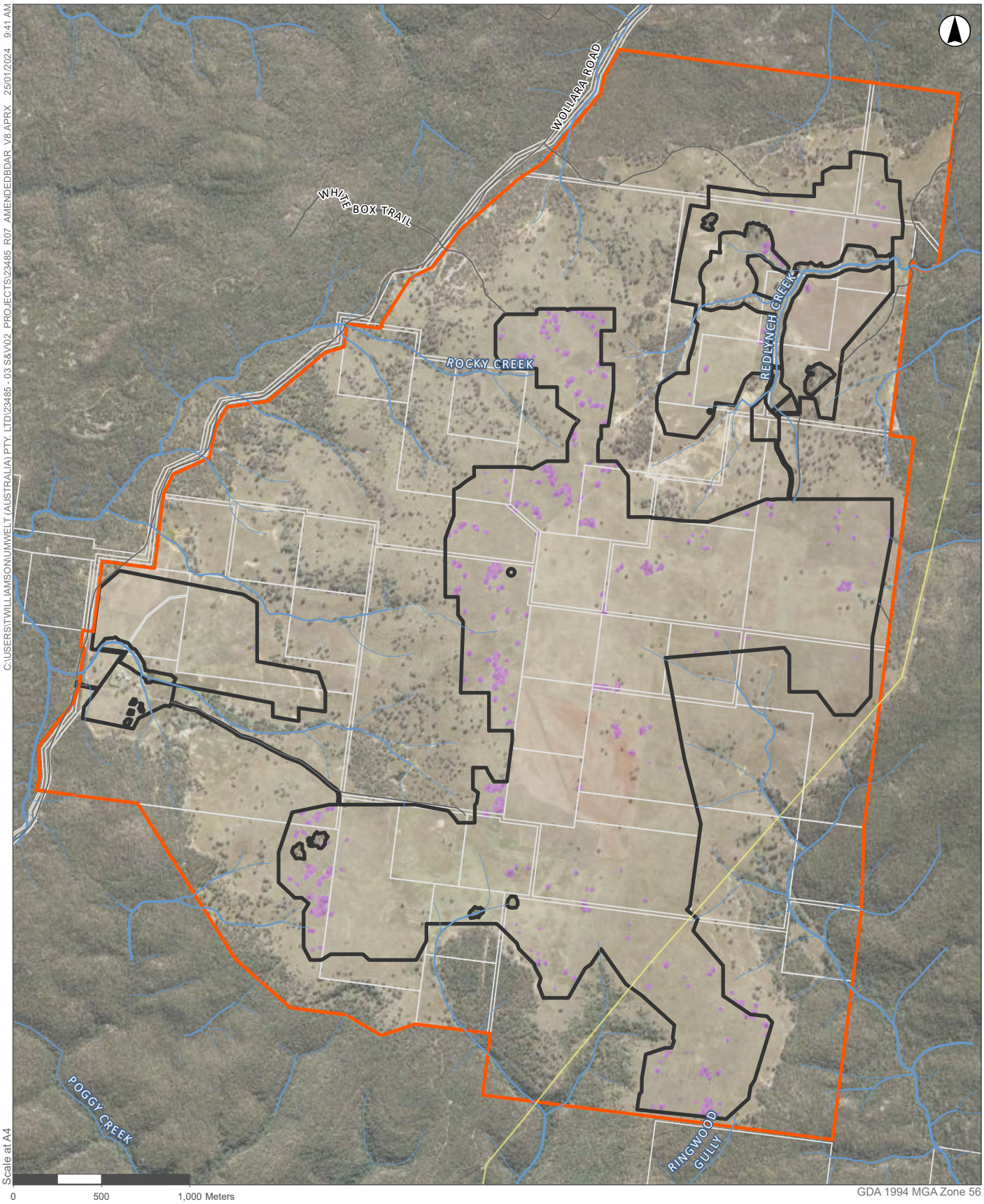
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX A
FIGURE 5.2

Impacts to Regent Honeyeater habitat requiring offsetting

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



APPENDIX A
FIGURE 5.3

Impacts to Regent Honeyeater habitat requiring offsetting

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

6.0 Offsets

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 CECC, the Regent Honeyeater (*Anthochaera phrygia*) and the Painted Honeyeater (*Grantiella picta),* requiring offsets through ecosystem and species credits under the BAM.

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 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. The residual PCT 483 credits will be retired through agreement with private landholders who have current or pending BSAs.

Table 6.1 Offset liabilities for MNES entities impacted by the Project

Threatened Species / Community listed under EPBC Act	PCTs associated with the species / ecological community (if applicable)	Area of impacts (ha)	Offsetting approach
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	Zone 1 - PCT 483 – Scattered trees	19.26 ha	Establishment of an approximately 1,200 ha Biodiversity Stewardship Agreement (BSA) over the residual parts of the Project Area. Retirement of residual credits across two existing BSAs. Payment into the BCF.
	Zone 2 - PCT 483 – Moderate condition DNG	168.48 ha	
	Zone 3 - PCT 483 – Moderate to low condition DNG	308.37 ha	
Regent Honeyeater (*Anthochaera phrygia*)	Not applicable, assessed via mapped important habitat.	42.30 ha	
Painted Honeyeater (*Grantiella picta)*	Zone 1 - PCT 483 – Scattered trees	22.49 ha	

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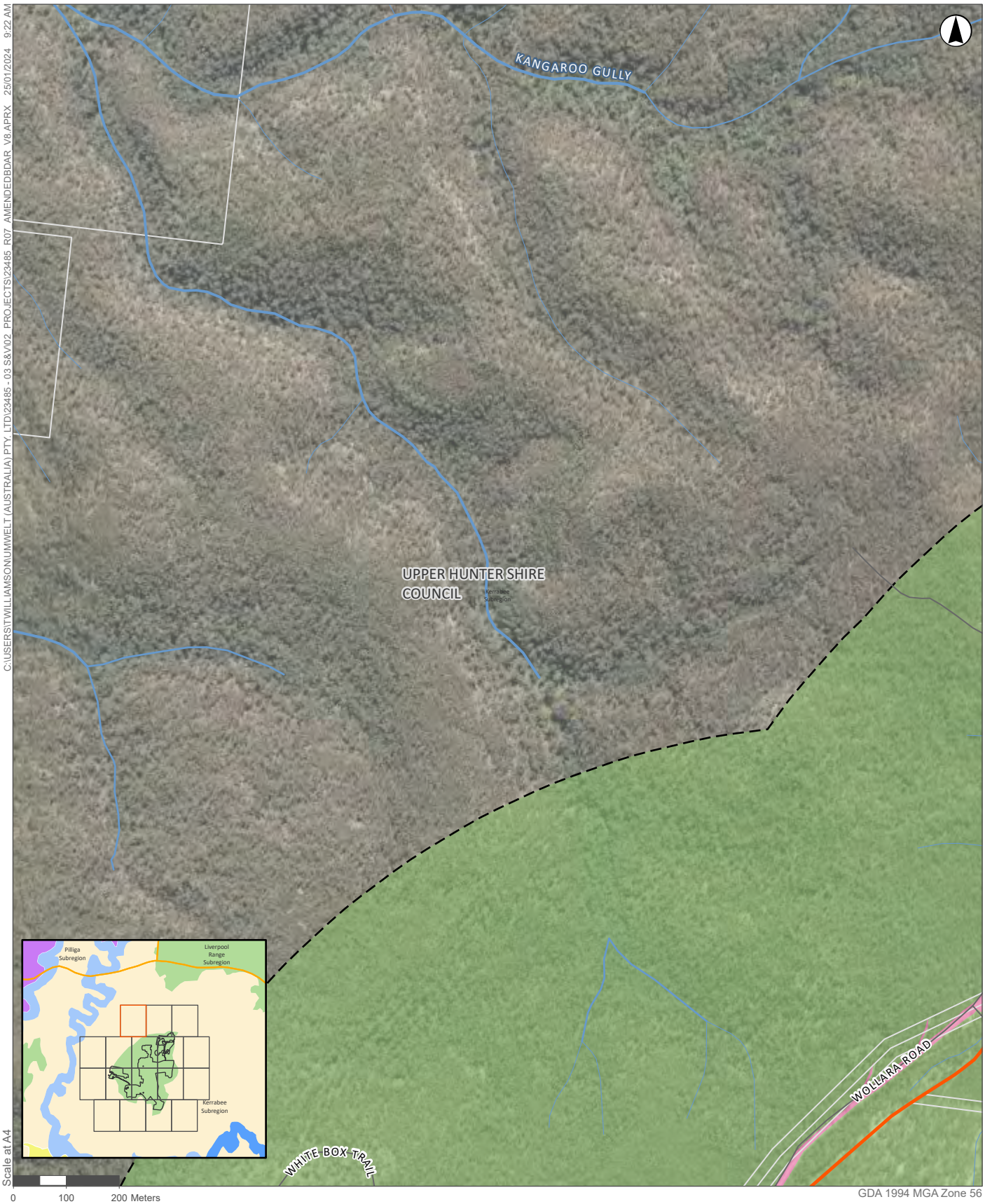
umwelt
Environmental & Social
Consultants

Umwelt (Australia) Pty Limited

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au

APPENDIX B

Location Map and Native Vegetation Extent Figures (1:10,000 Scale)



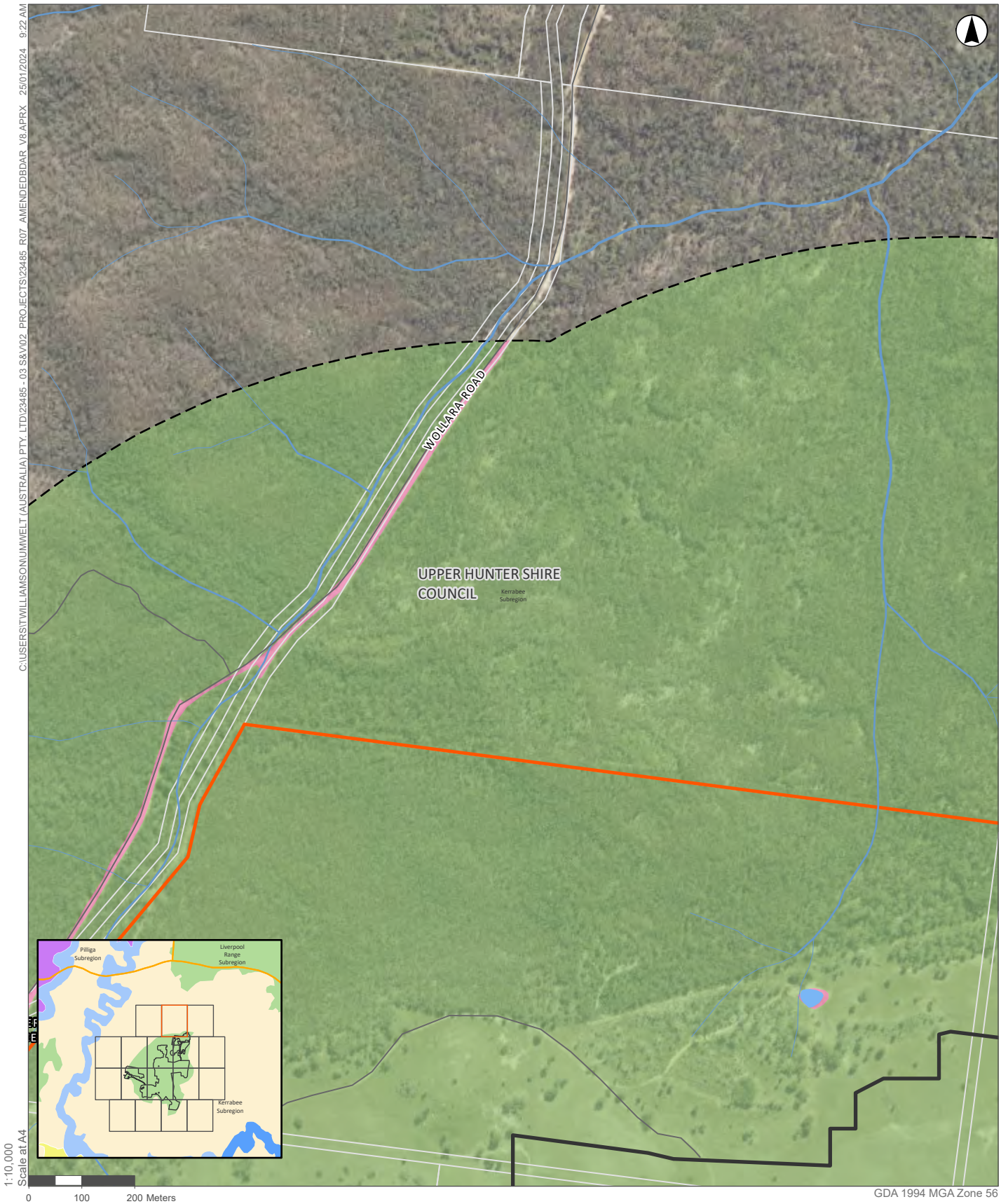
Legend

- 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

APPENDIX B FIGURE 1.2

Location Map
(page 1 of 17)

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



Legend

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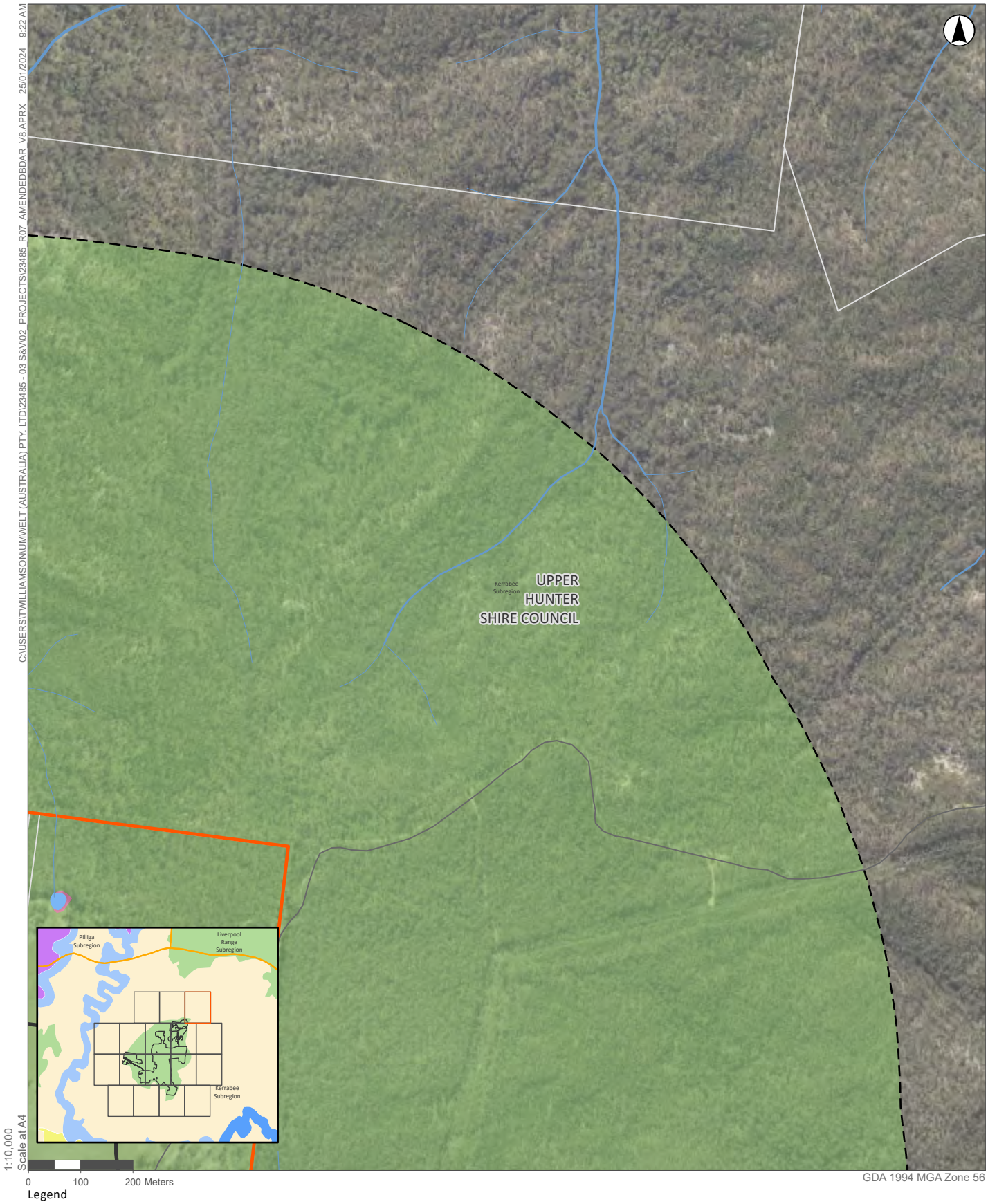

Legend

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APPENDIX B FIGURE 1.2

Location Map
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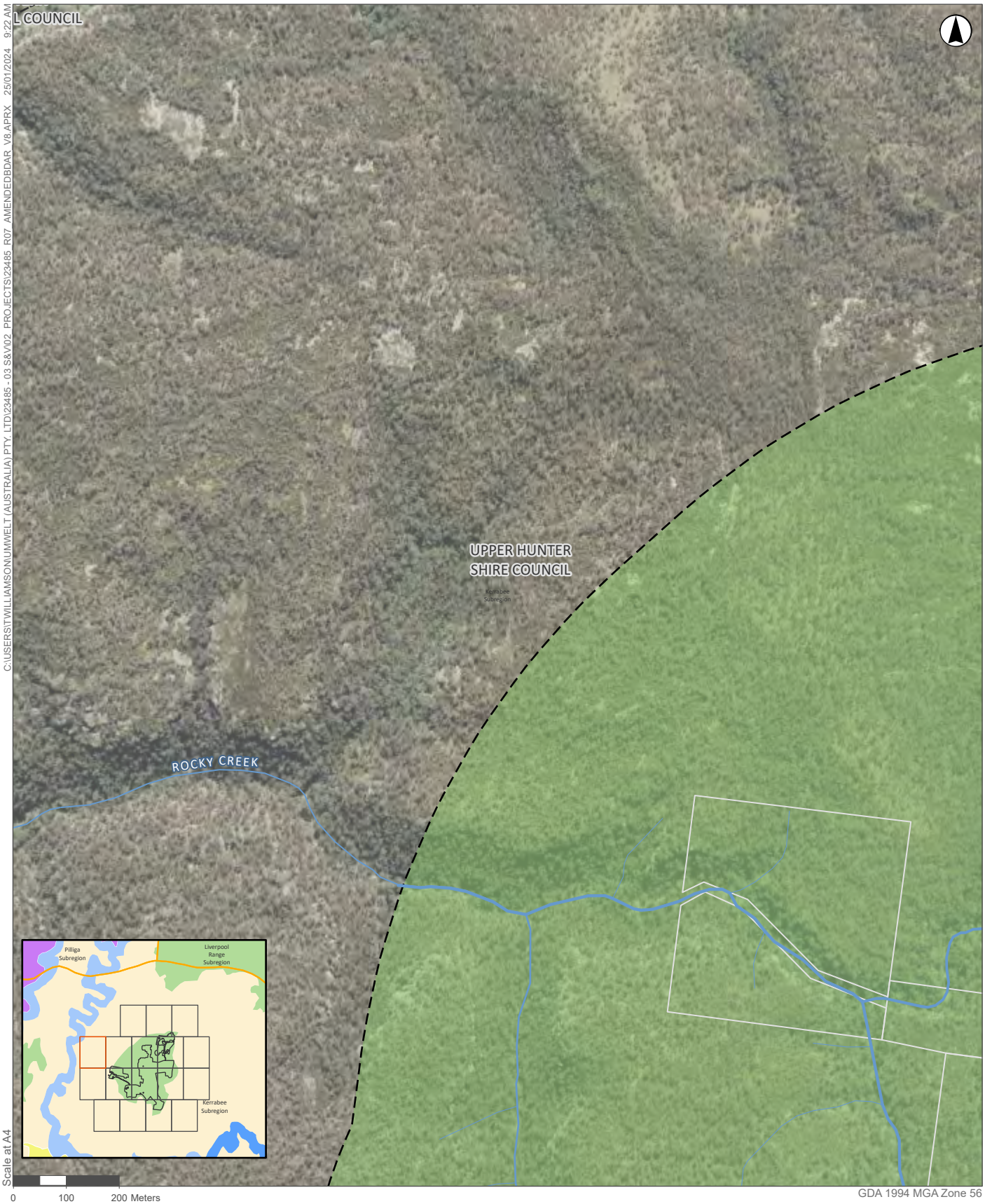

Legend

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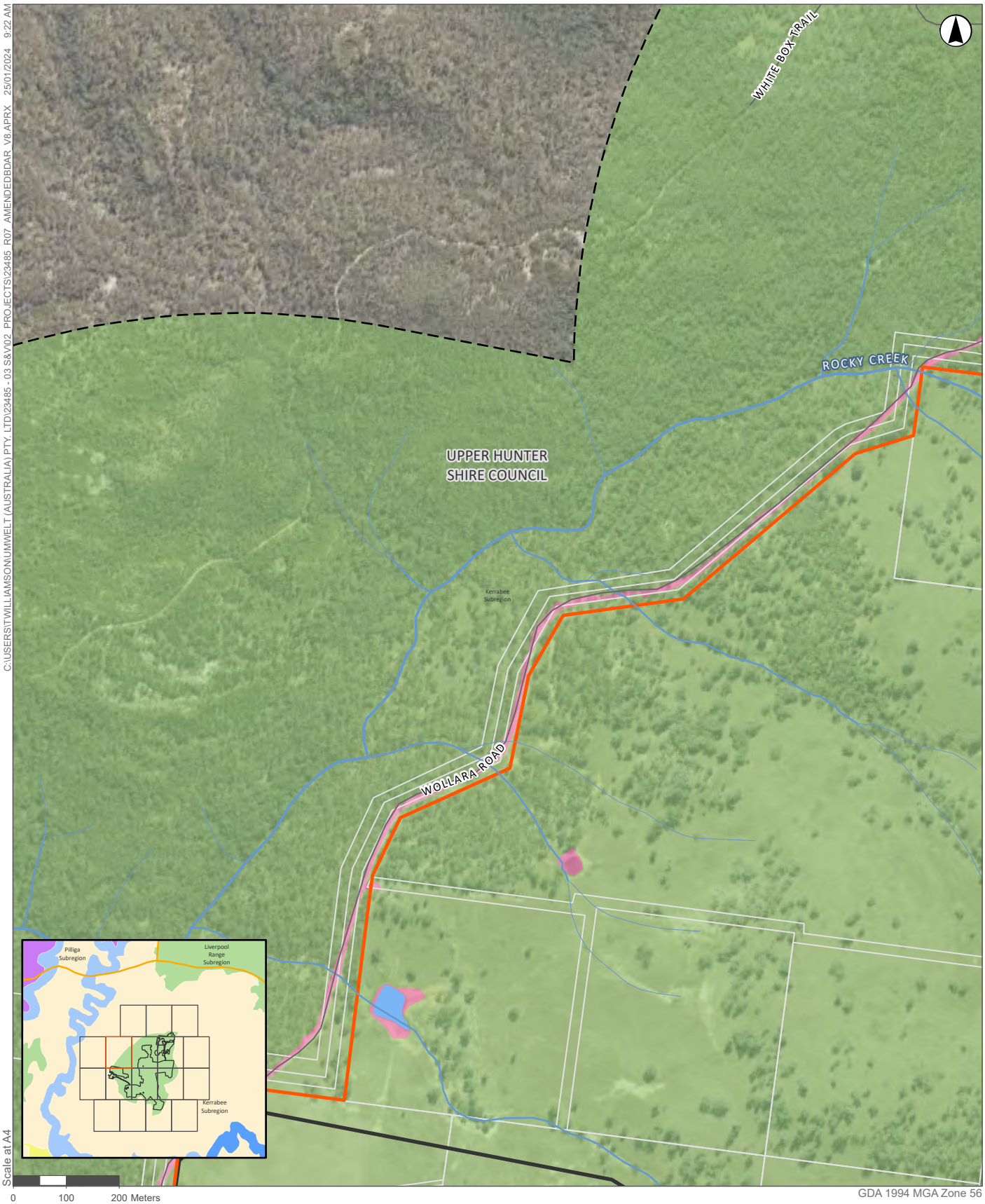
APPENDIX B FIGURE 1.2

Location Map
(page 4 of 17)

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



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Legend

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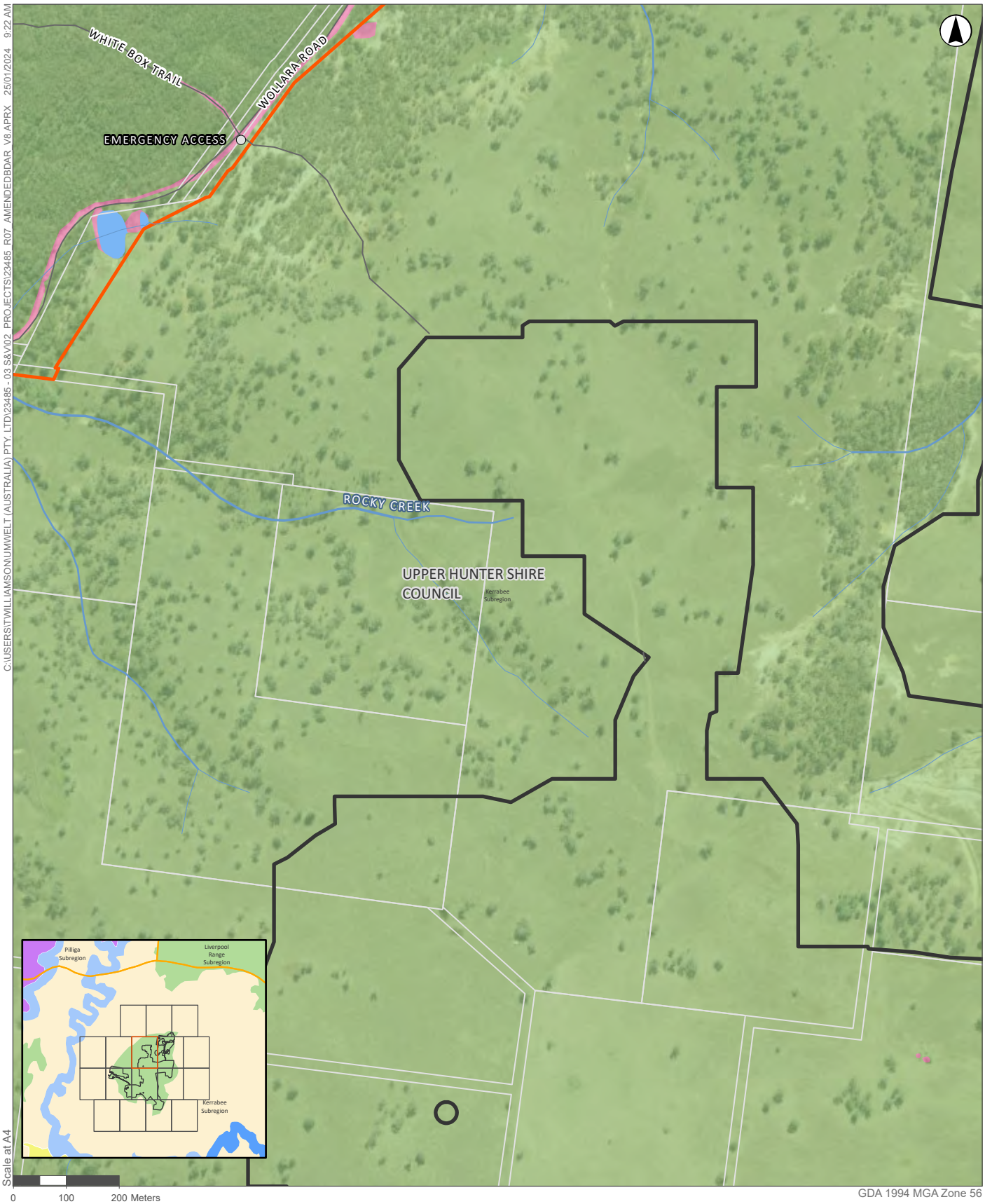
APPENDIX B FIGURE 1.2

Location Map
(page 5 of 17)

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



Legend

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APPENDIX B FIGURE 1.2

Location Map
(page 6 of 17)

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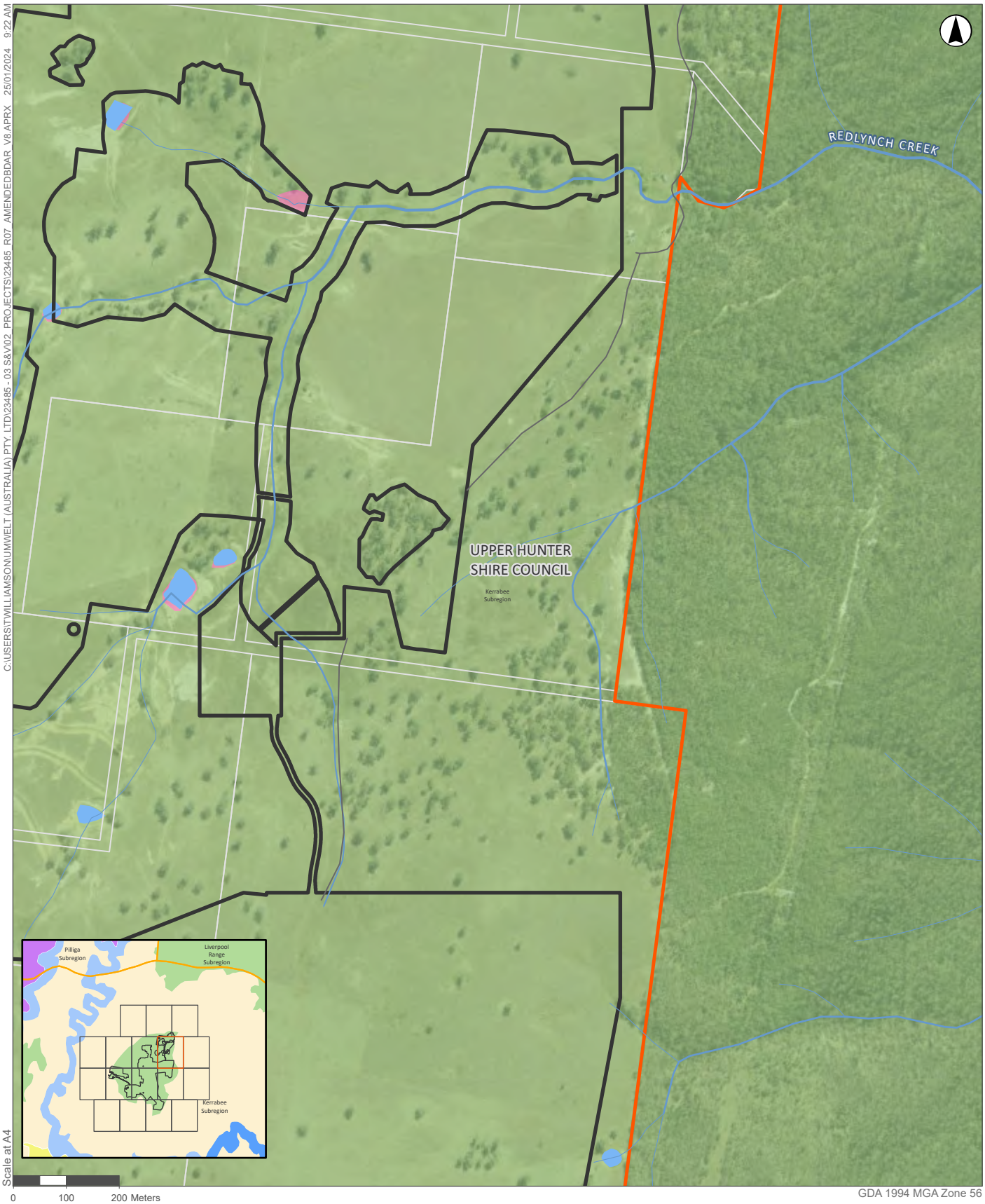

Legend

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APPENDIX B FIGURE 1.2

Location Map
(page 7 of 17)

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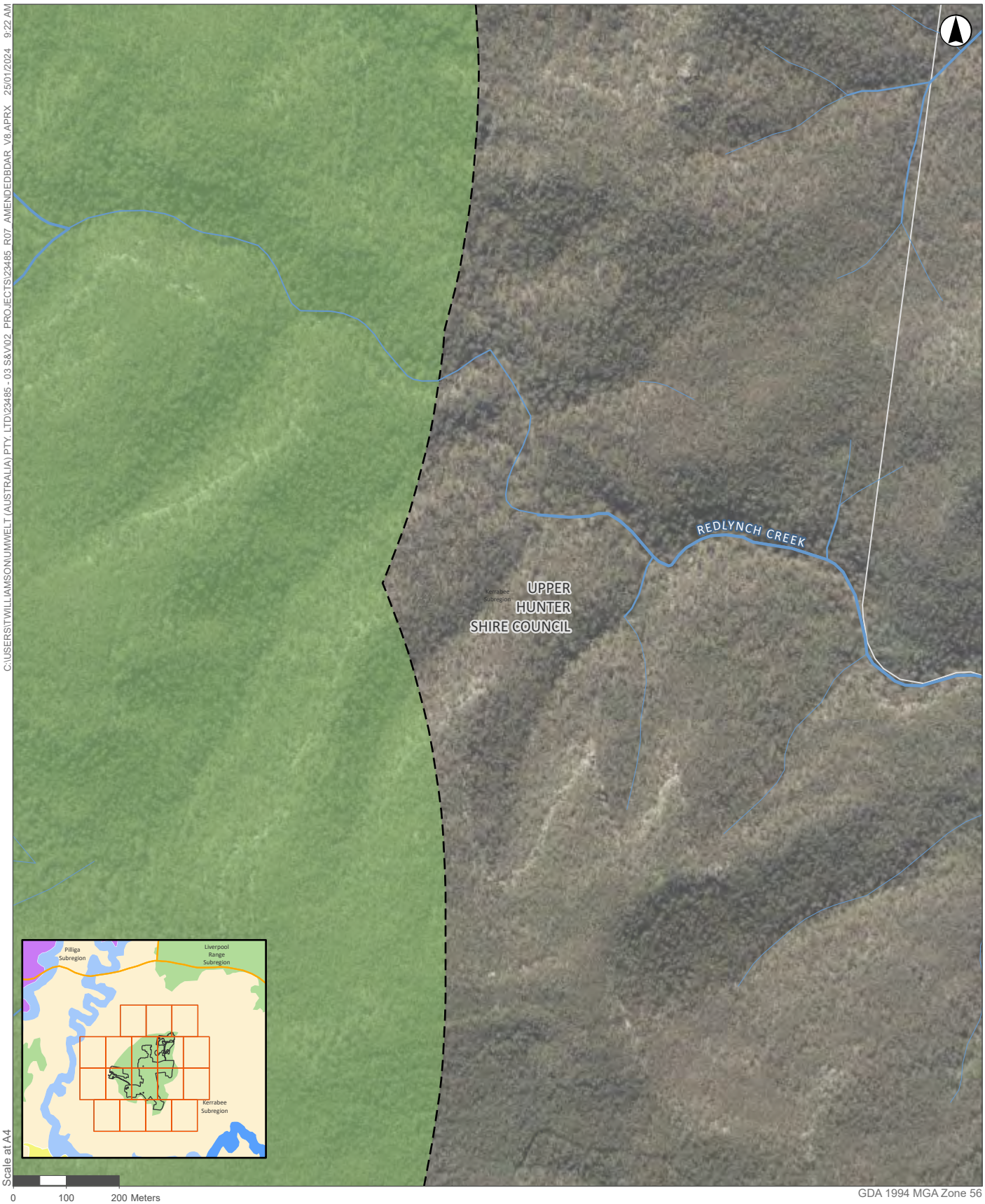

Legend

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APPENDIX B FIGURE 1.2

Location Map
(page 8 of 17)

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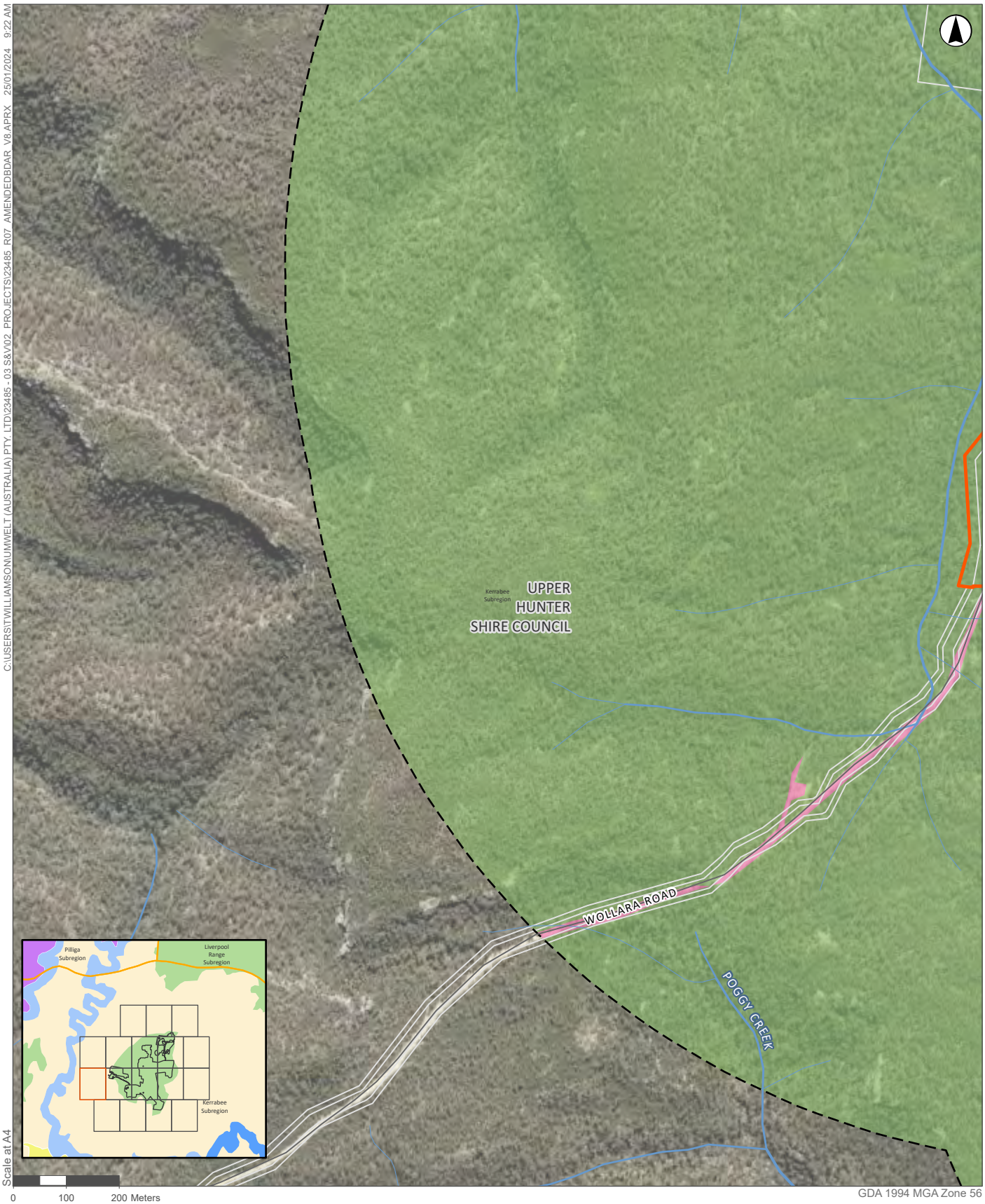

Legend

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Location Map
(page 9 of 17)

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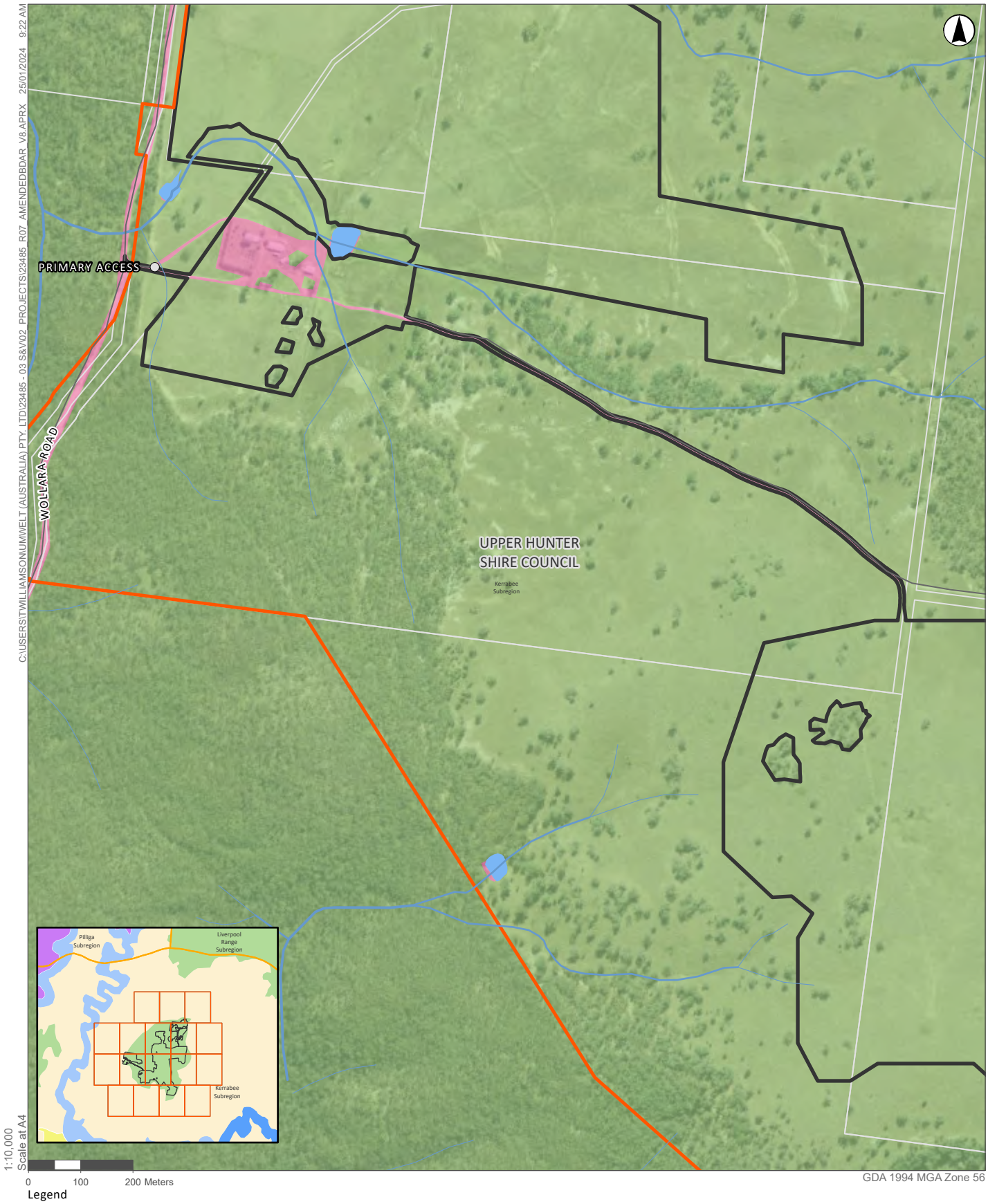

Legend

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APPENDIX B FIGURE 1.2

Location Map
(page 0 of 0)

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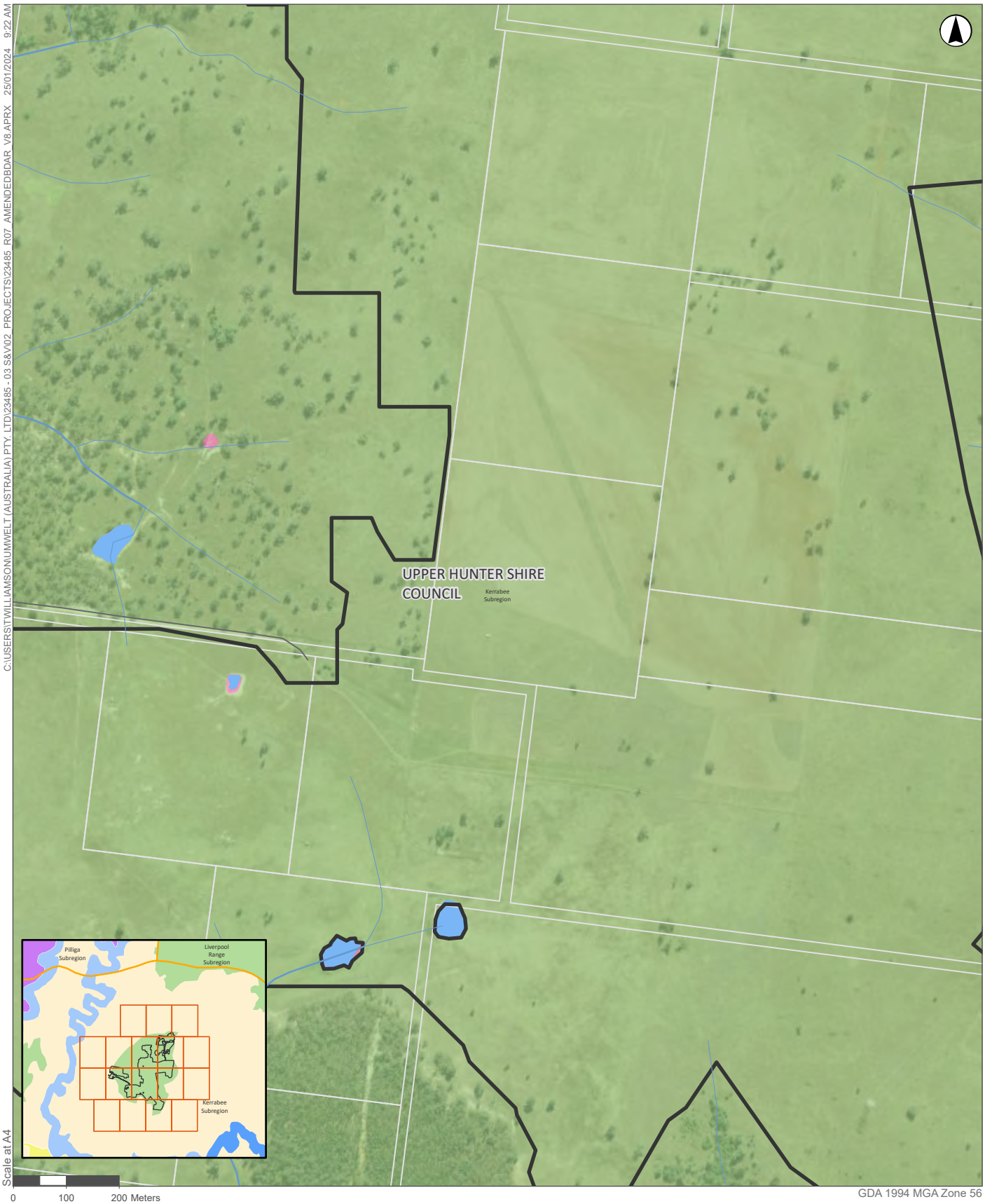

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GDA 1994 MGA Zone 56

Legend

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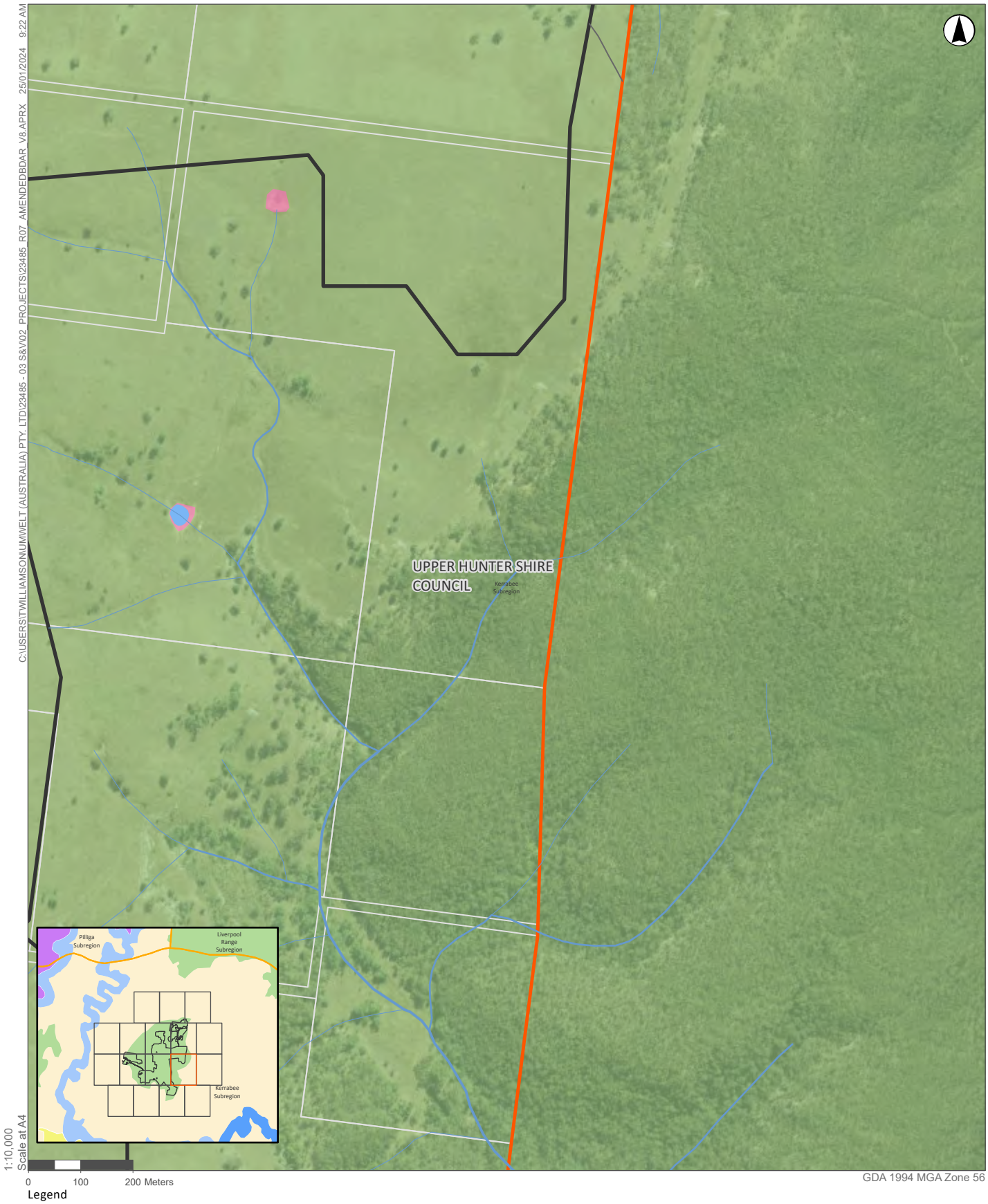
APPENDIX B FIGURE 1.2

Location Map
(page 11 of 17)

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



APPENDIX B FIGURE 1.2

Location Map
(page 12 of 17)

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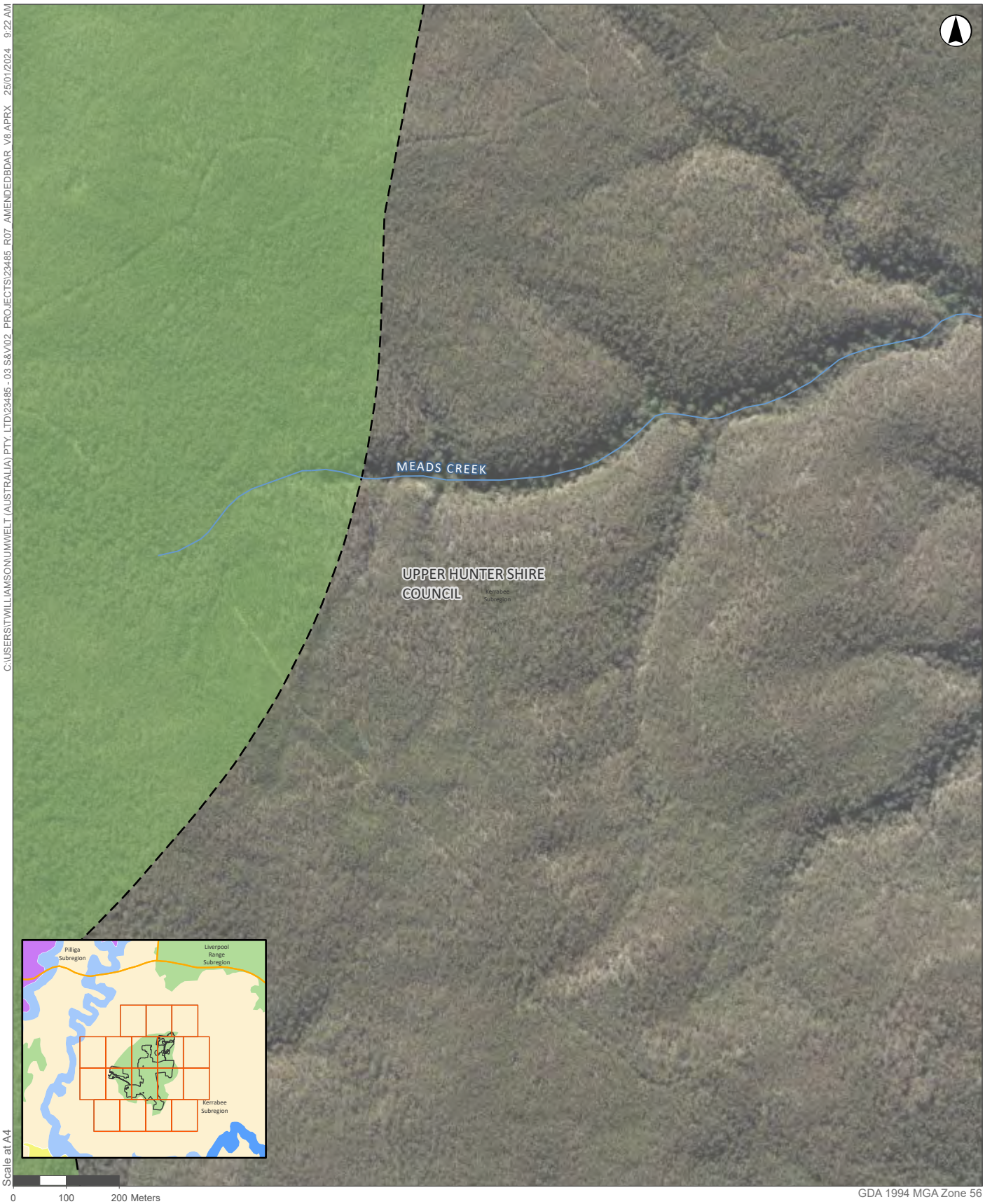

Legend

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Location Map
(page 13 of 17)

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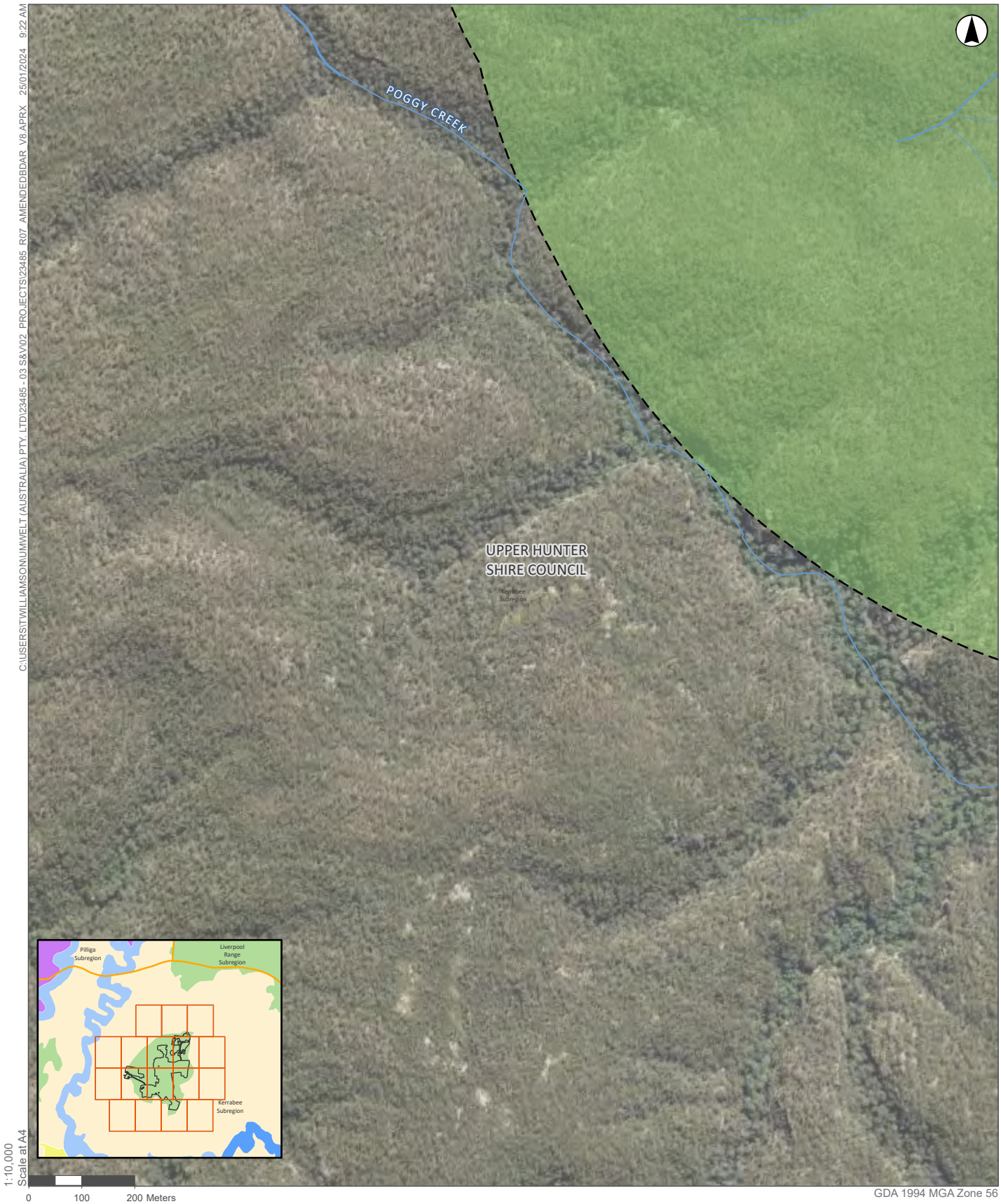

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APPENDIX B FIGURE 1.2

Location Map
(page 14 of 17)

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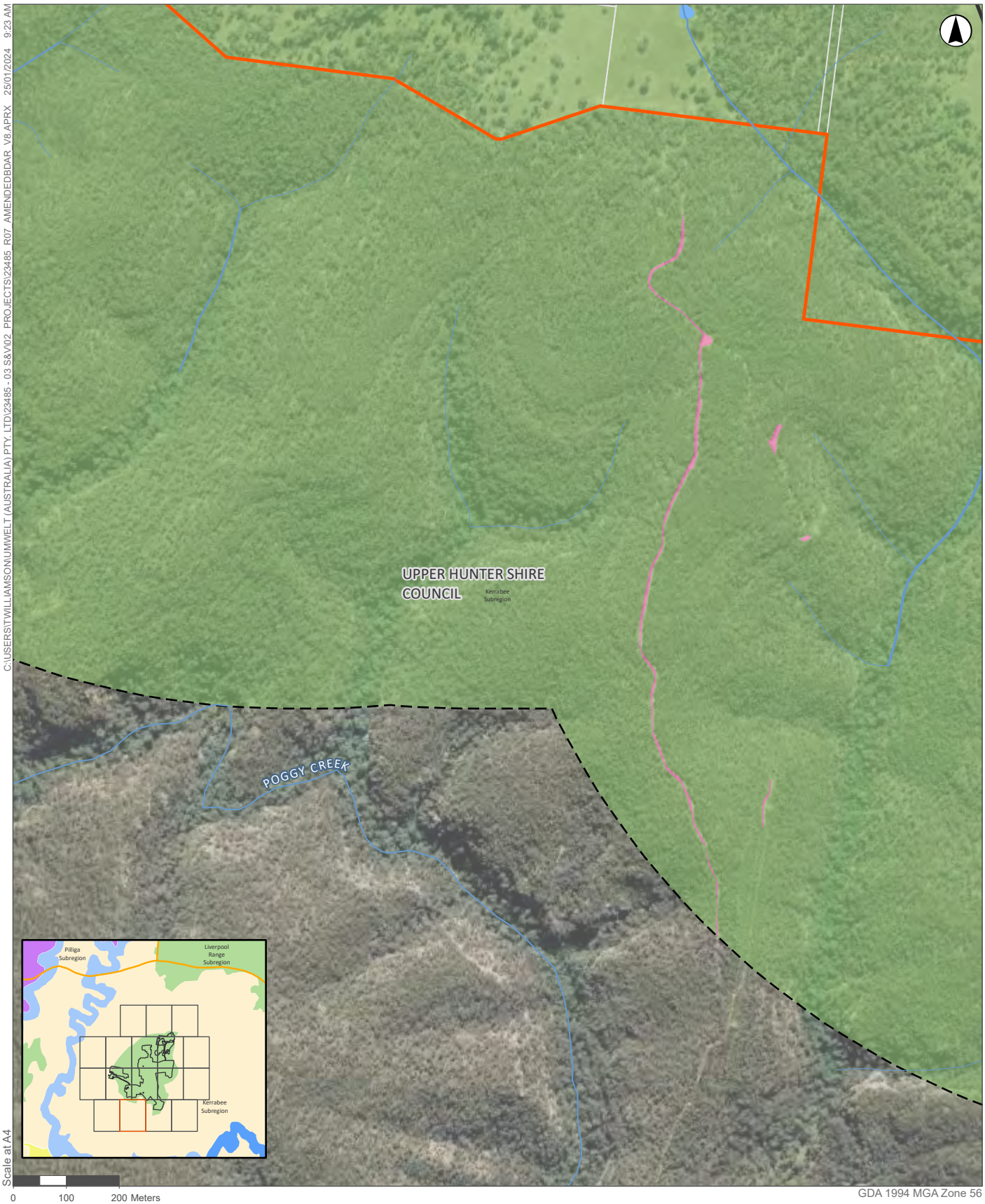

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APPENDIX B FIGURE 1.2

Location Map
(page 0 of 0)

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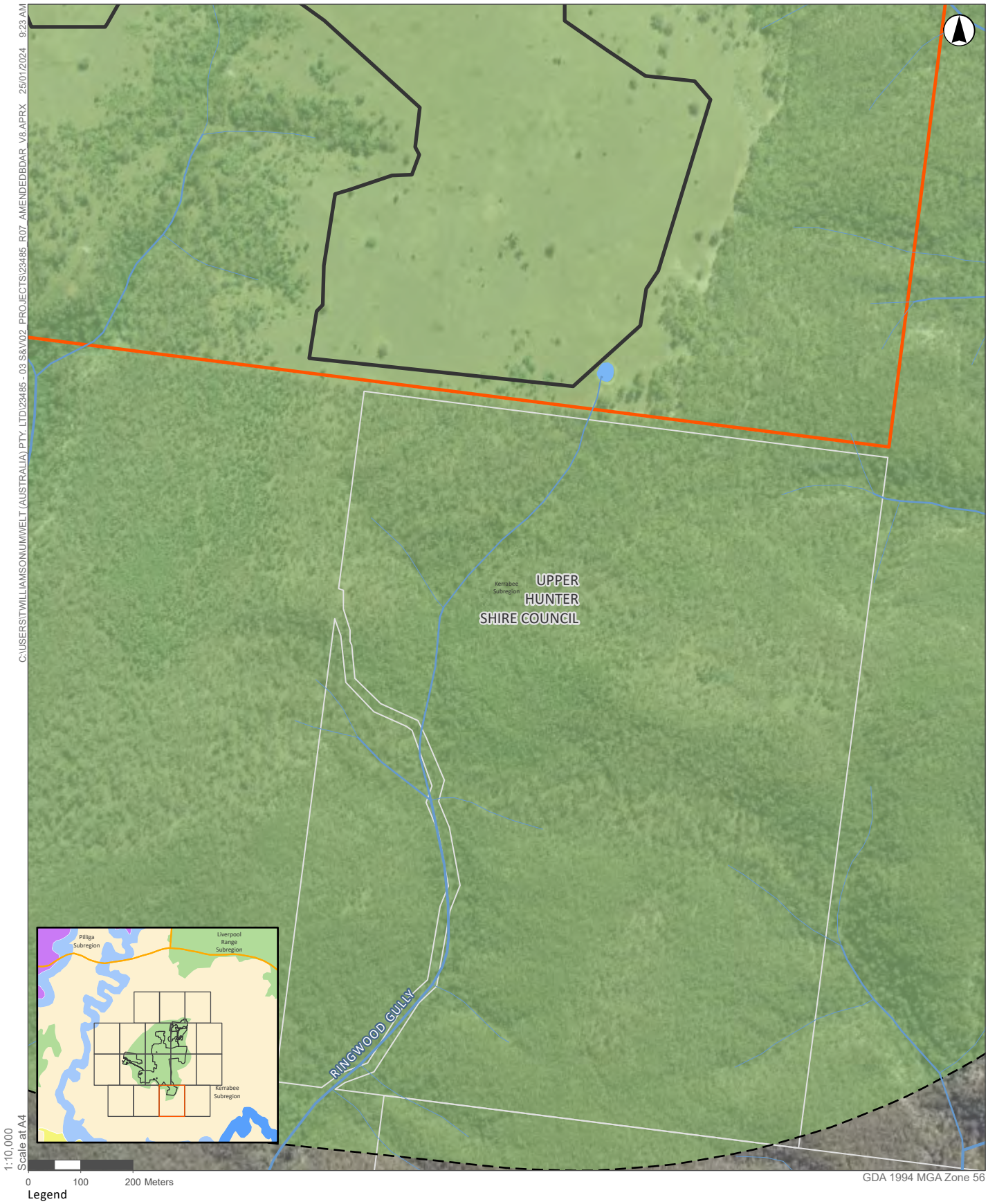

Legend

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APPENDIX B FIGURE 1.2

Location Map
(page 0 of 0)

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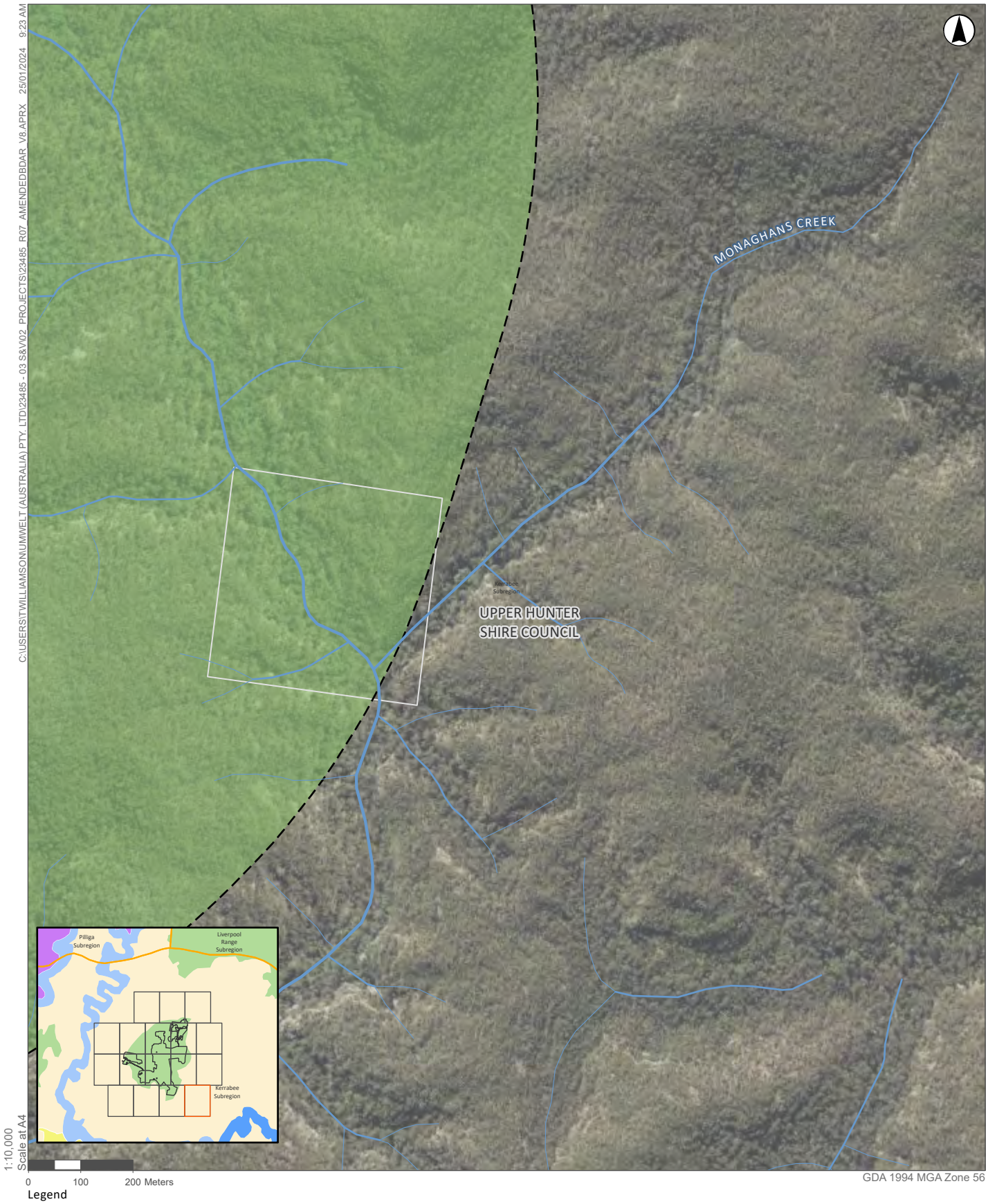

Legend

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APPENDIX B FIGURE 1.2

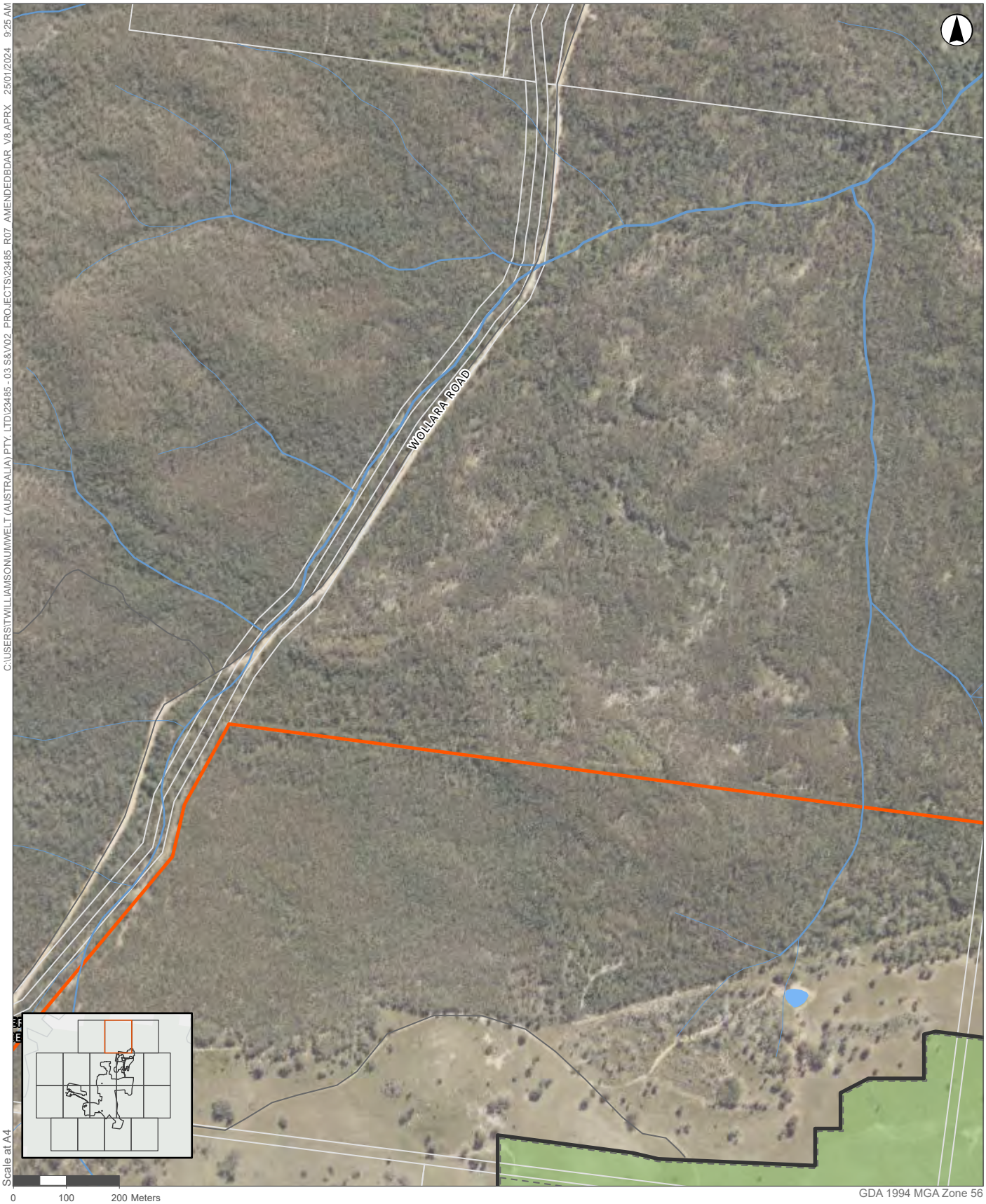
Location Map
(page 17 of 17)

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

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 1 of 17)

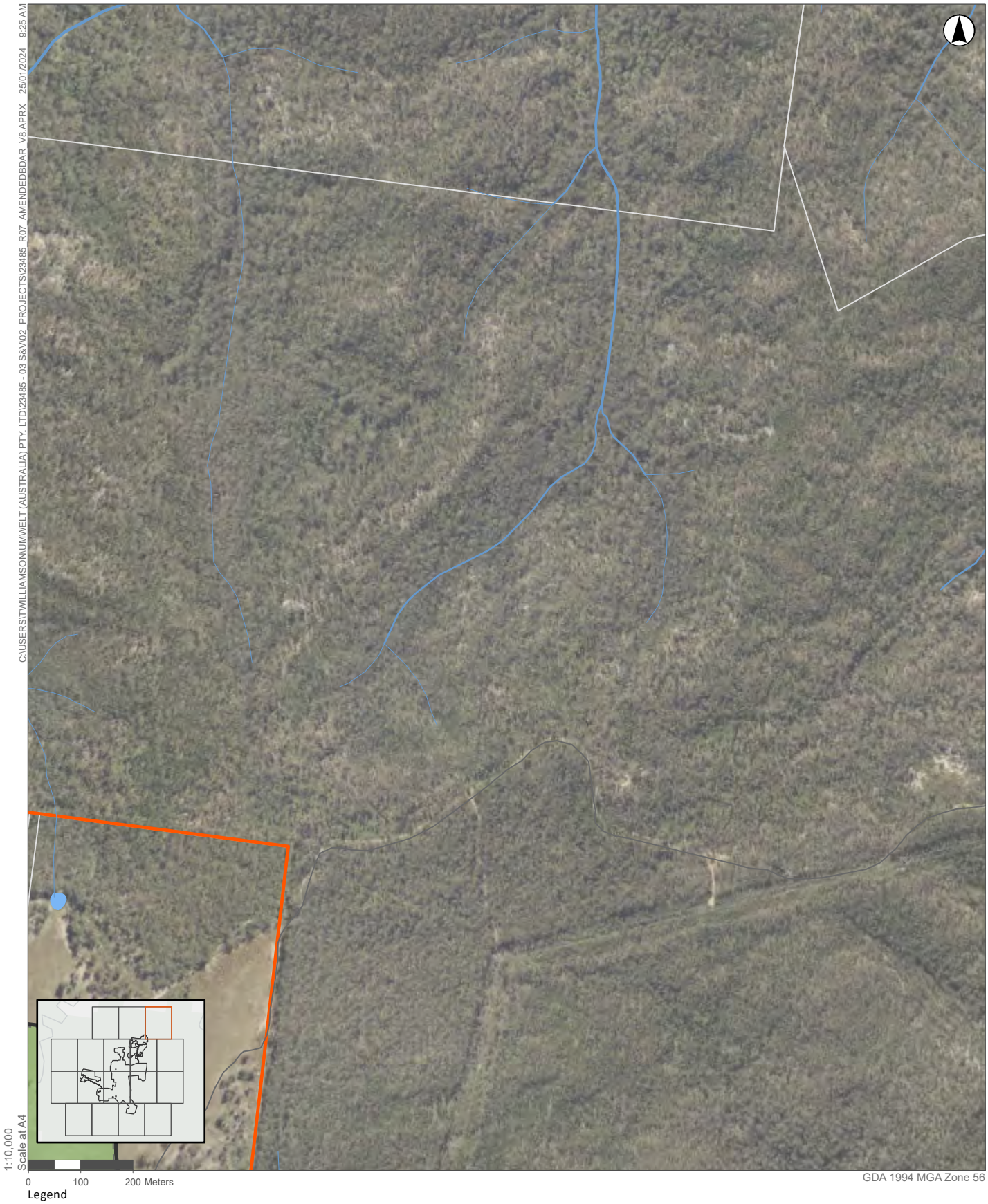
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 2 of 17)

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



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents
(page 3 of 17)

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

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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)

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 4 of 17)

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

Legend

- Access Points
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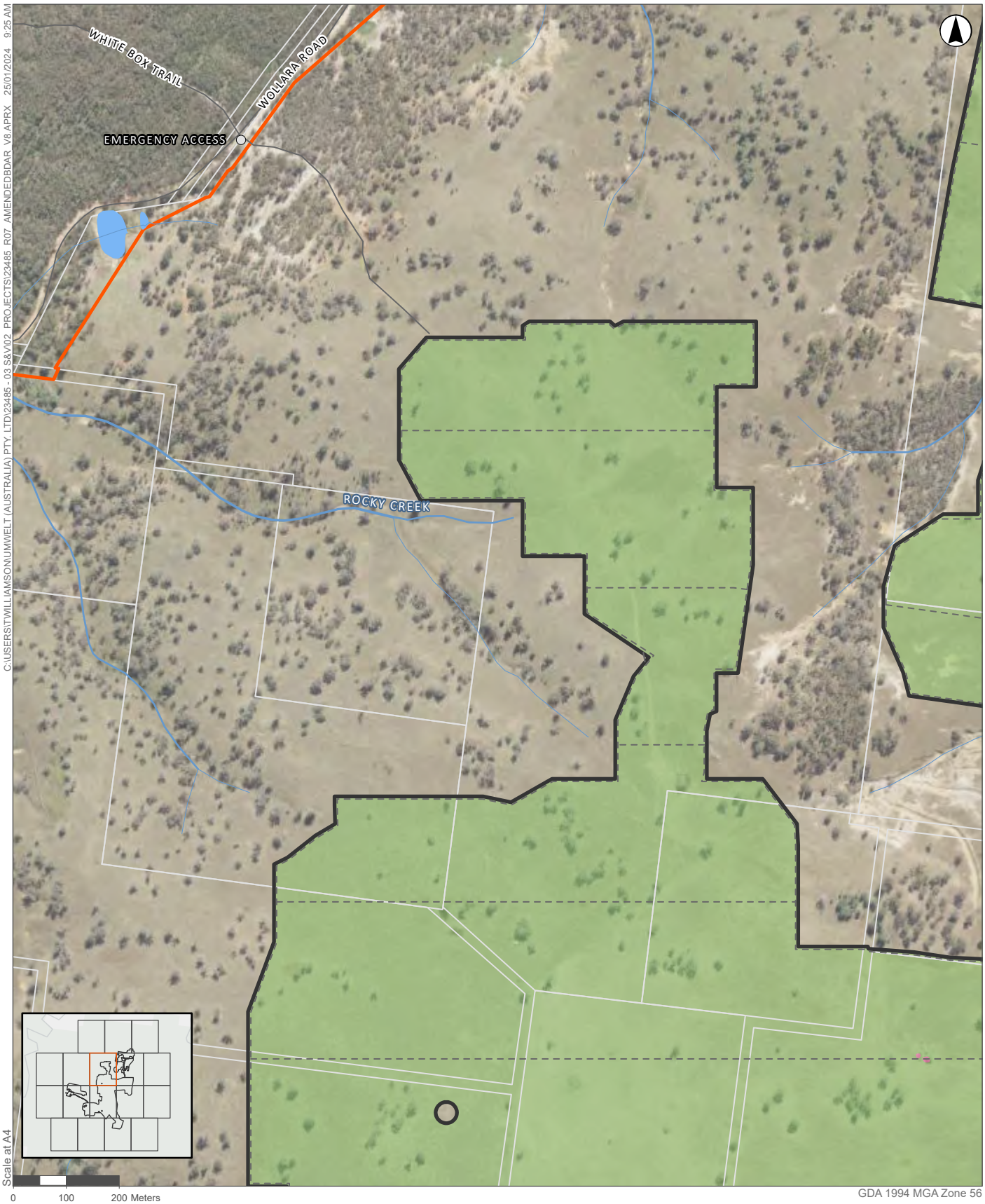
Native Vegetation

- Native Vegetation Extent (Total Area = 4570.6 ha)
- Non-Native Vegetation Extent (Total Area = 18.7 ha)

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 5 of 17)

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



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GDA 1994 MGA Zone 56

Legend

- Access Points
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- Property Boundaries
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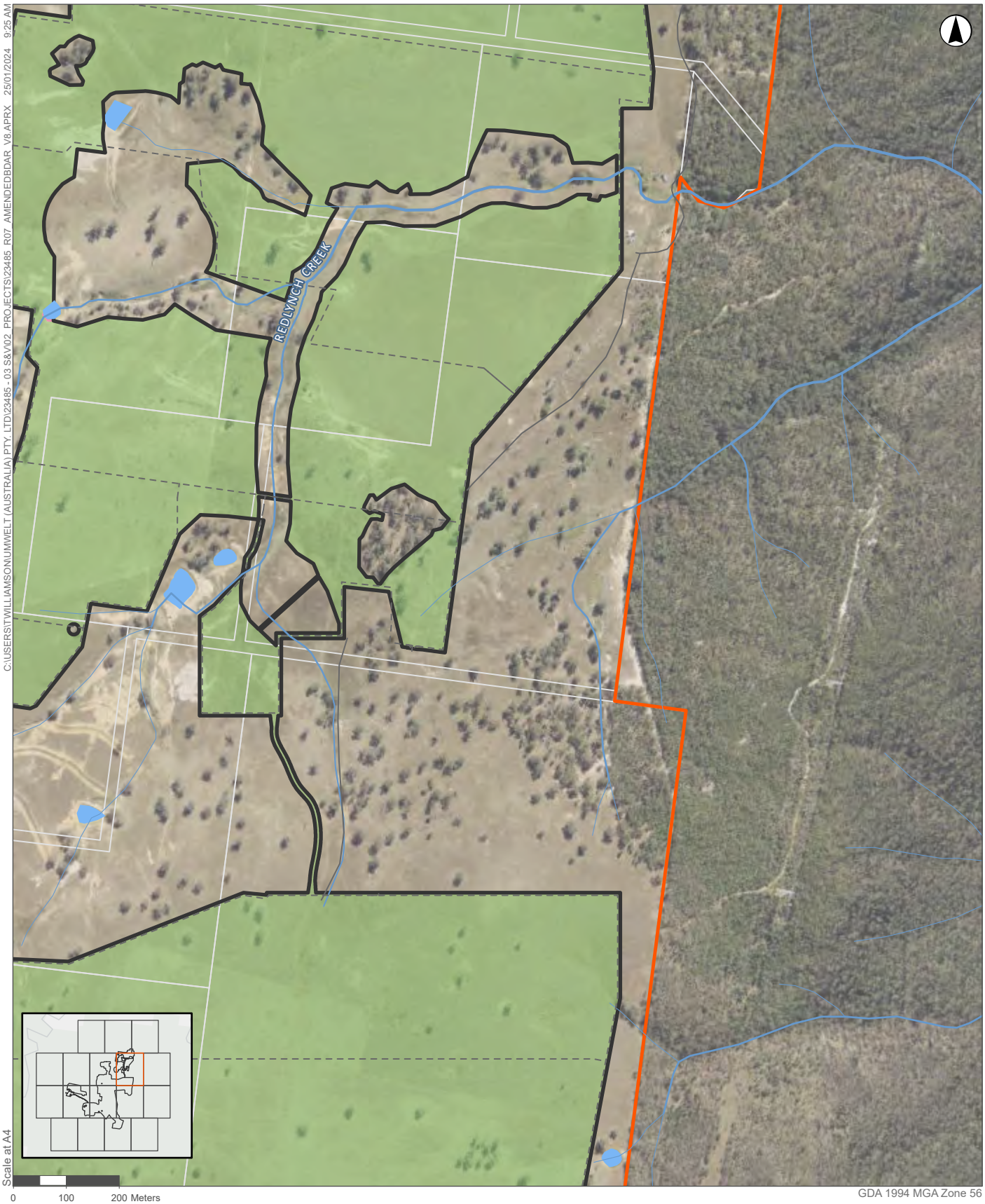
Native Vegetation

- Native Vegetation Extent (Total Area = 4570.6 ha)
- Non-Native Vegetation Extent (Total Area = 18.7 ha)

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 6 of 17)

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



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 7 of 17)

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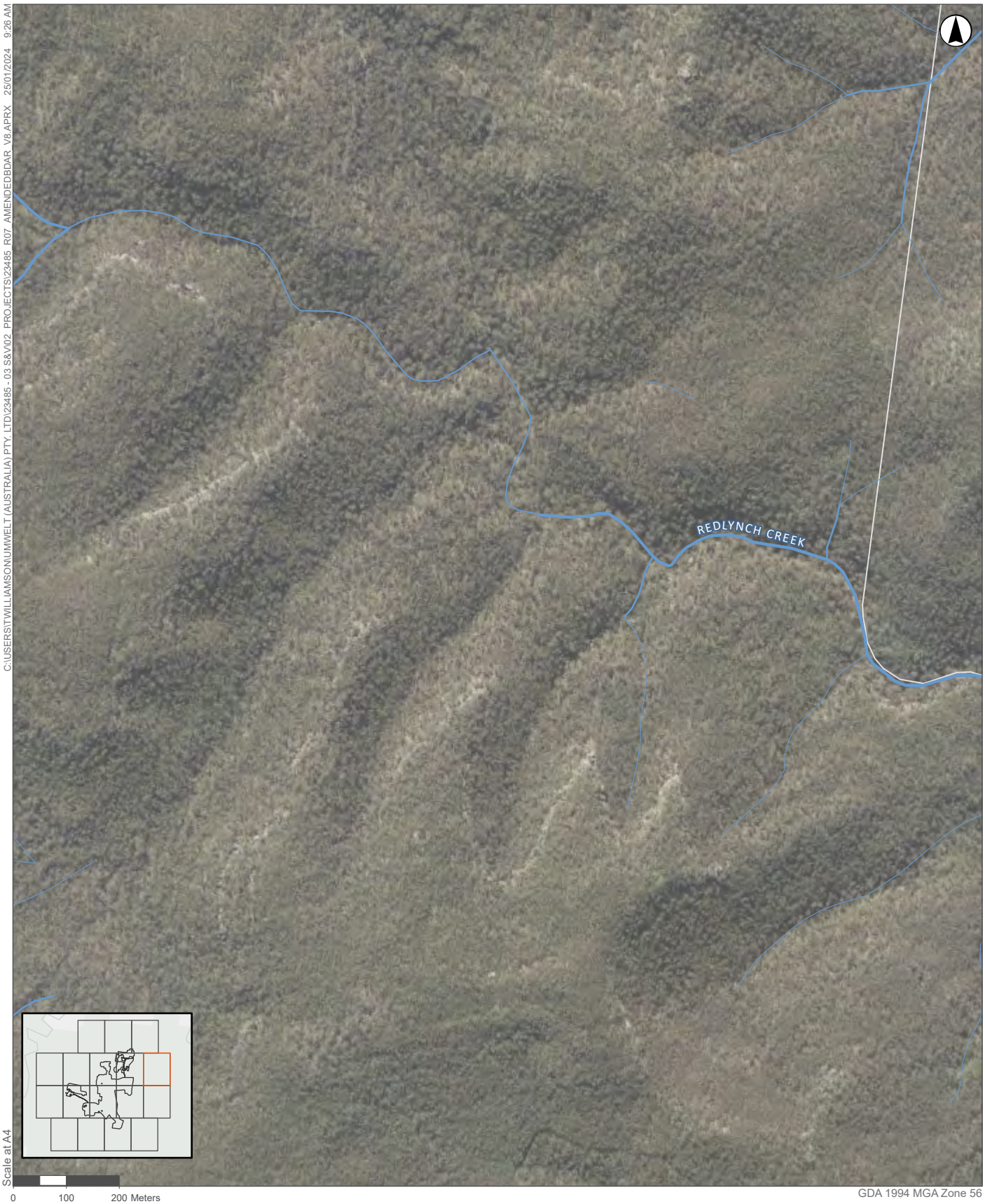

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GDA 1994 MGA Zone 56

Legend

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Native Vegetation

- Native Vegetation Extent (Total Area = 4570.6 ha)
- Non-Native Vegetation Extent (Total Area = 18.7 ha)

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 8 of 17)

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

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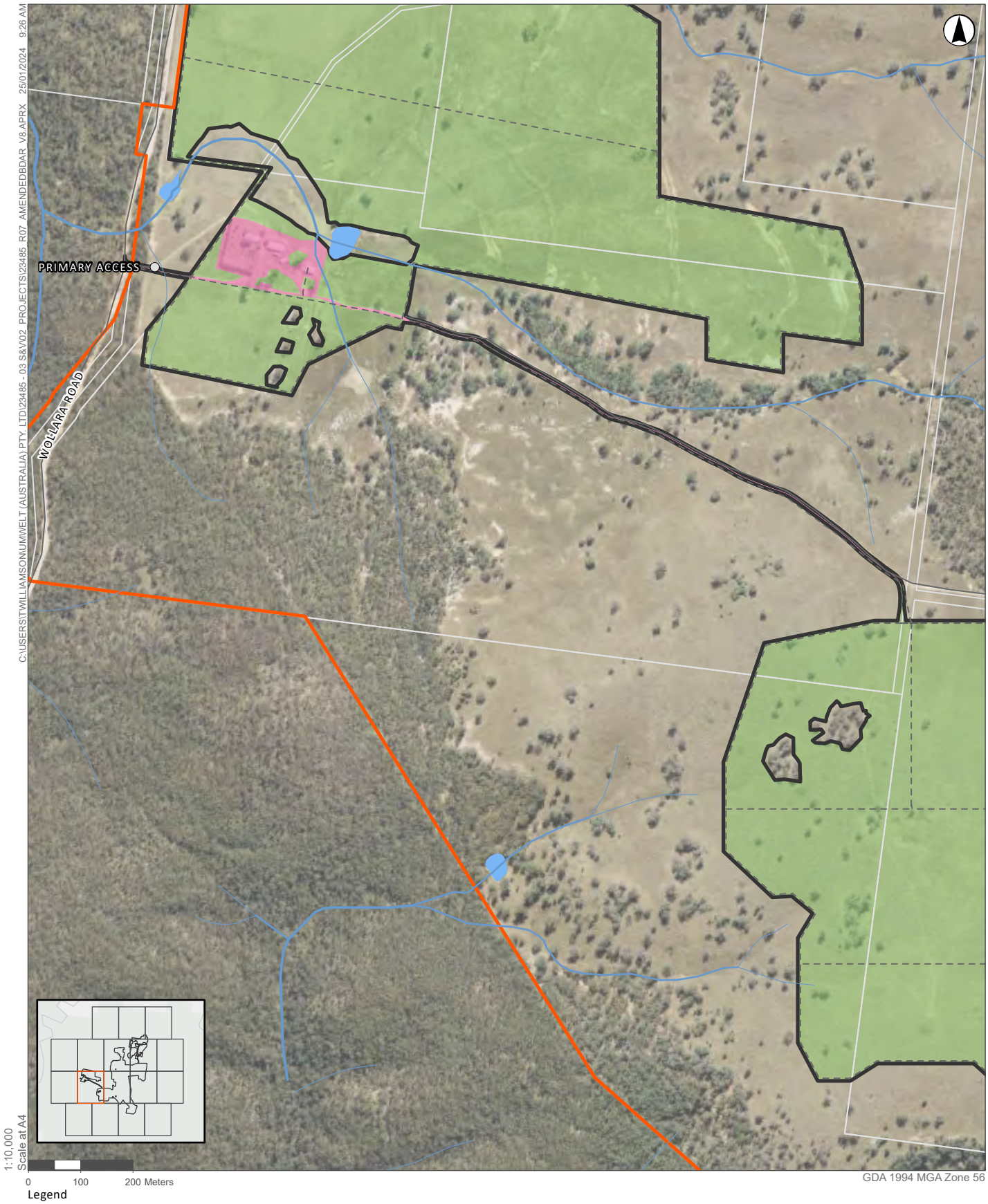
APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 9 of 17)

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



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 10 of 17)

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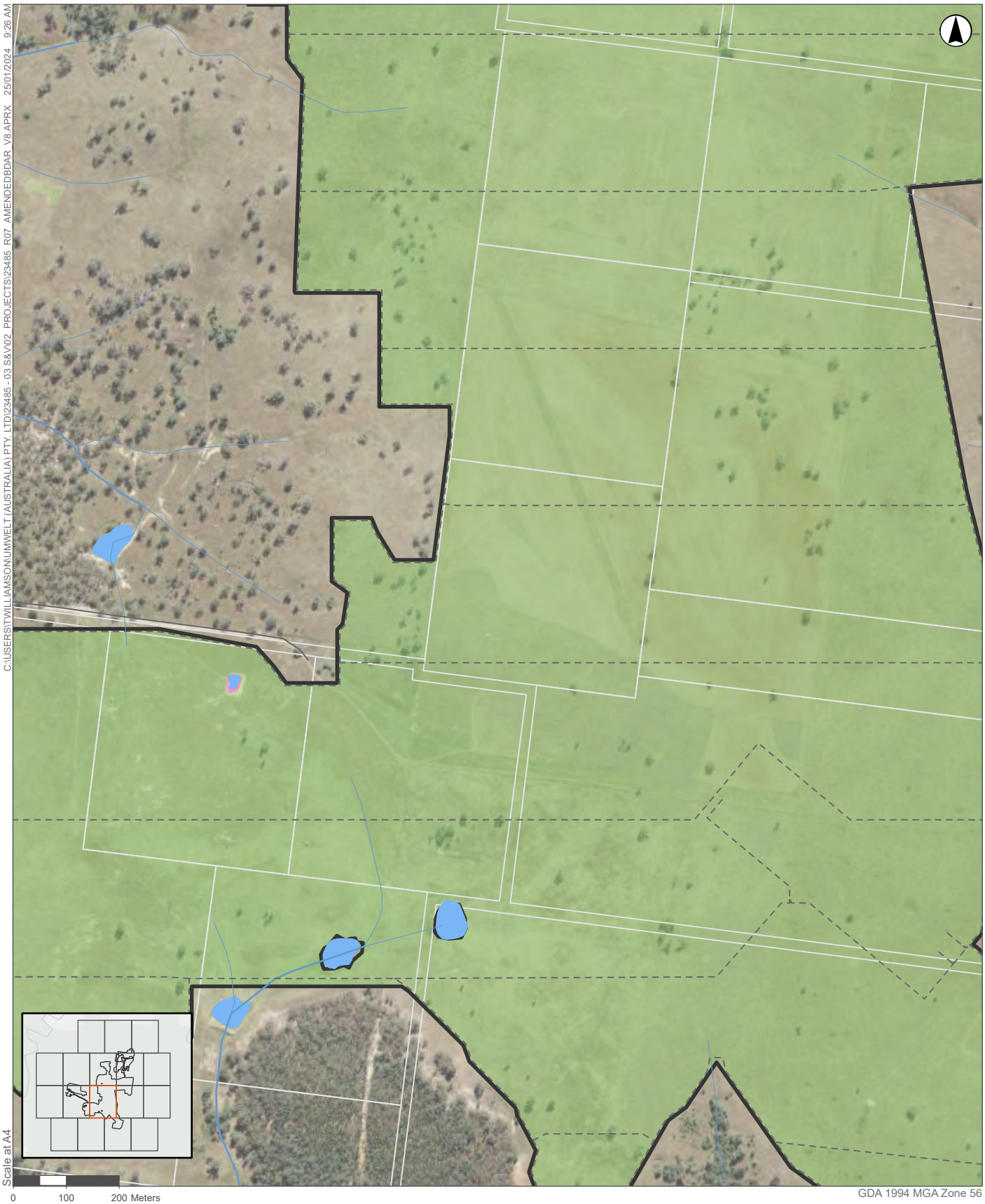
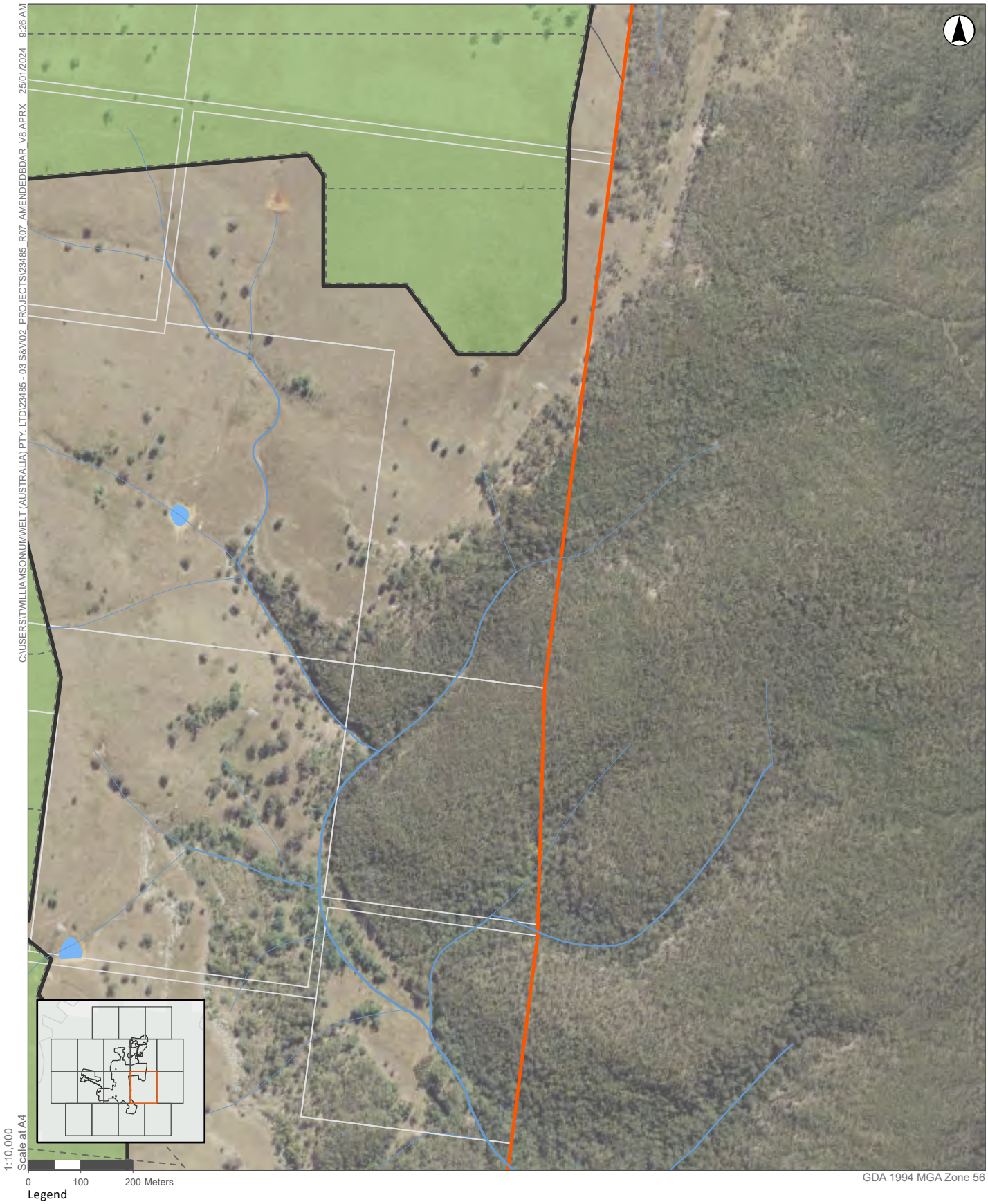


APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 11 of 17)

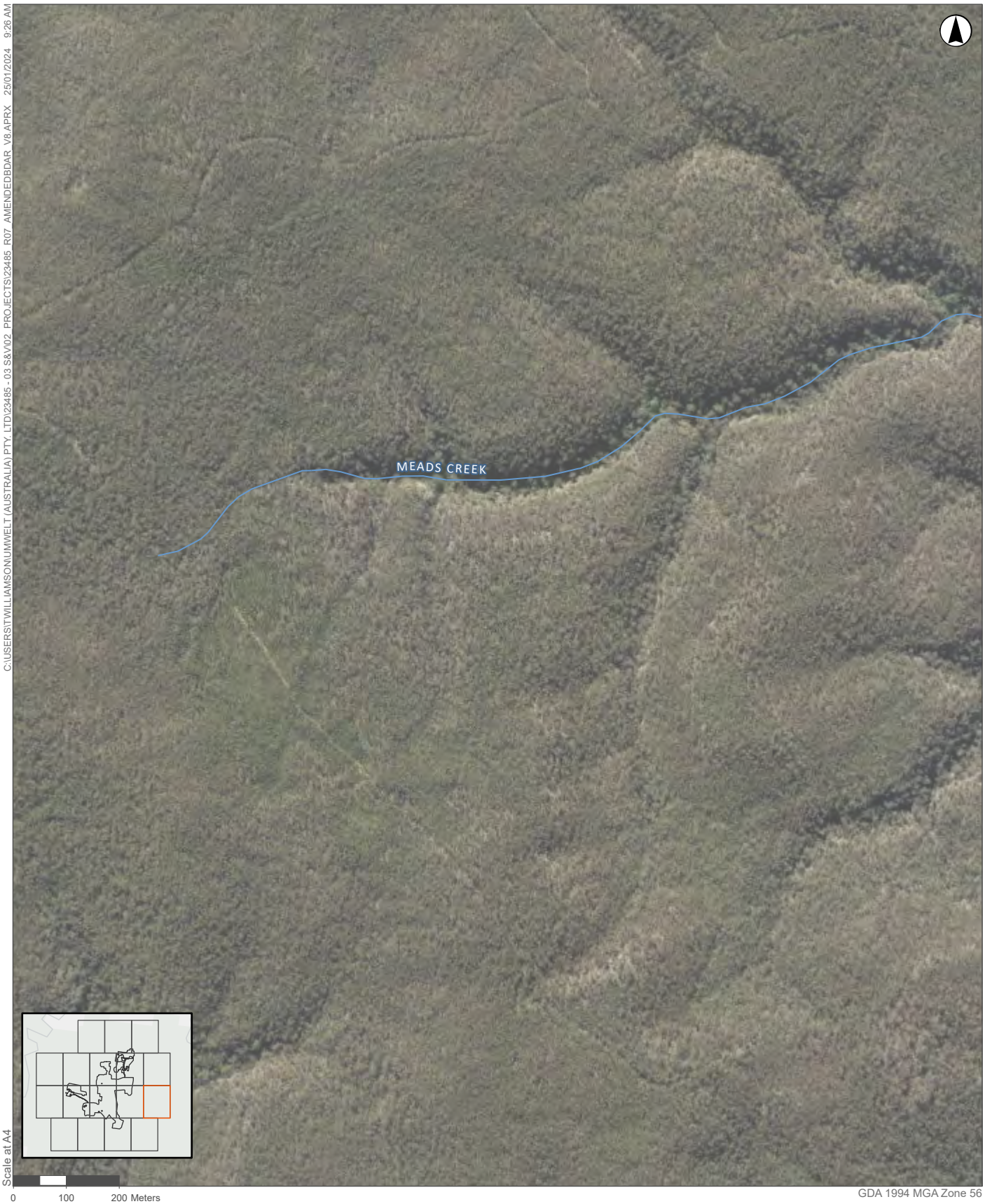
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 12 of 17)

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



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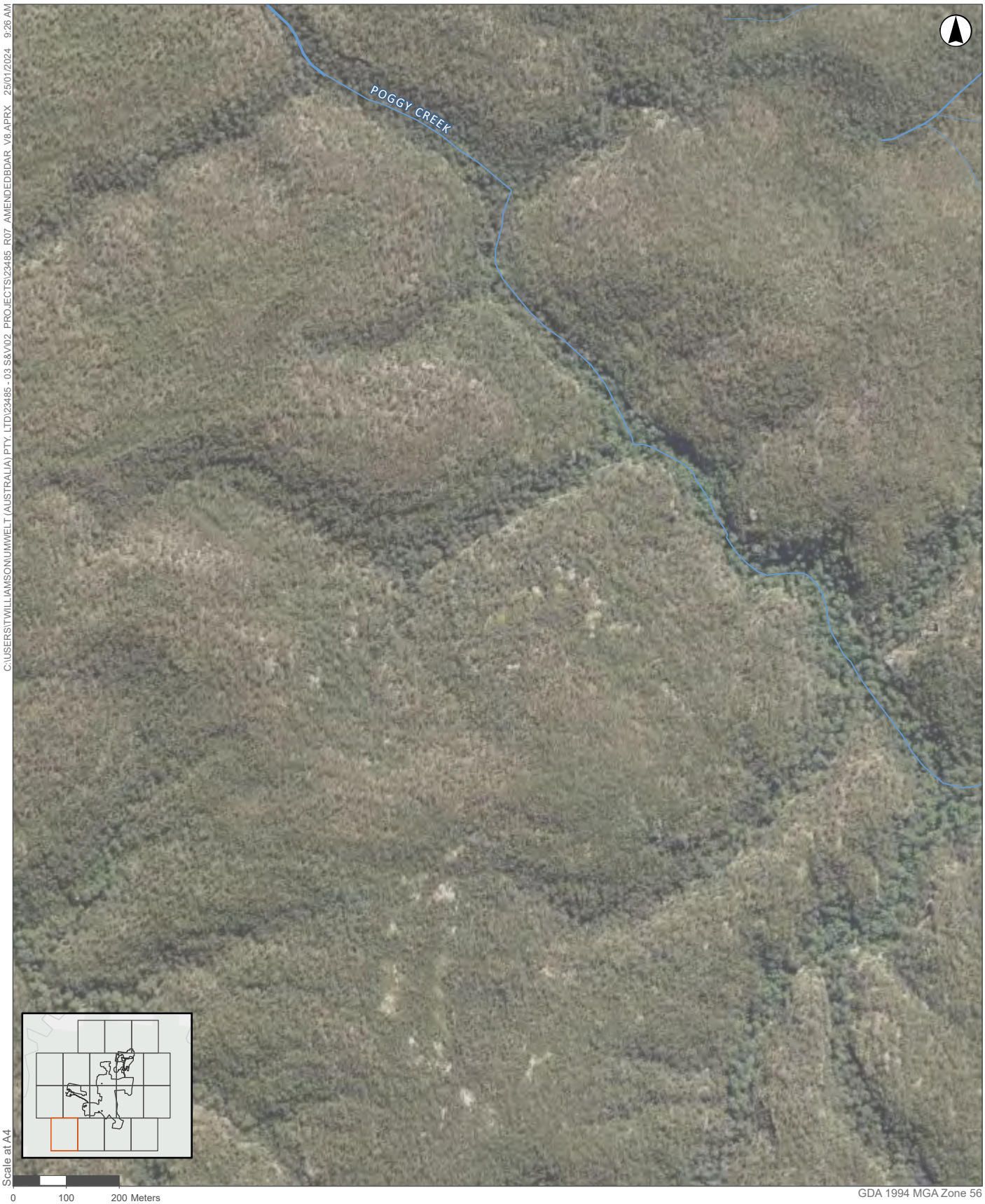
1:10,000 Scale at A4

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 13 of 17)

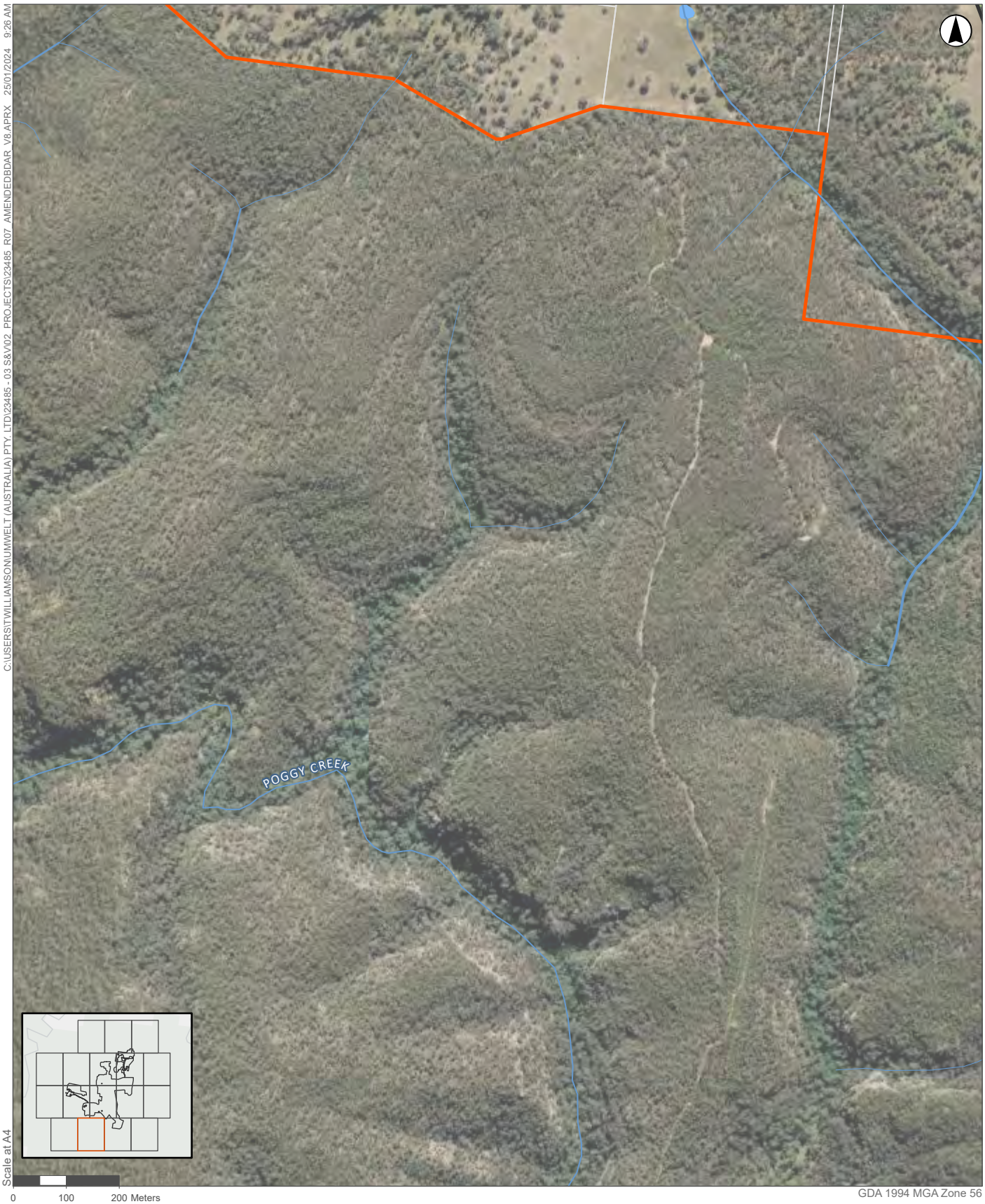
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 14 of 17)

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



Legend

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

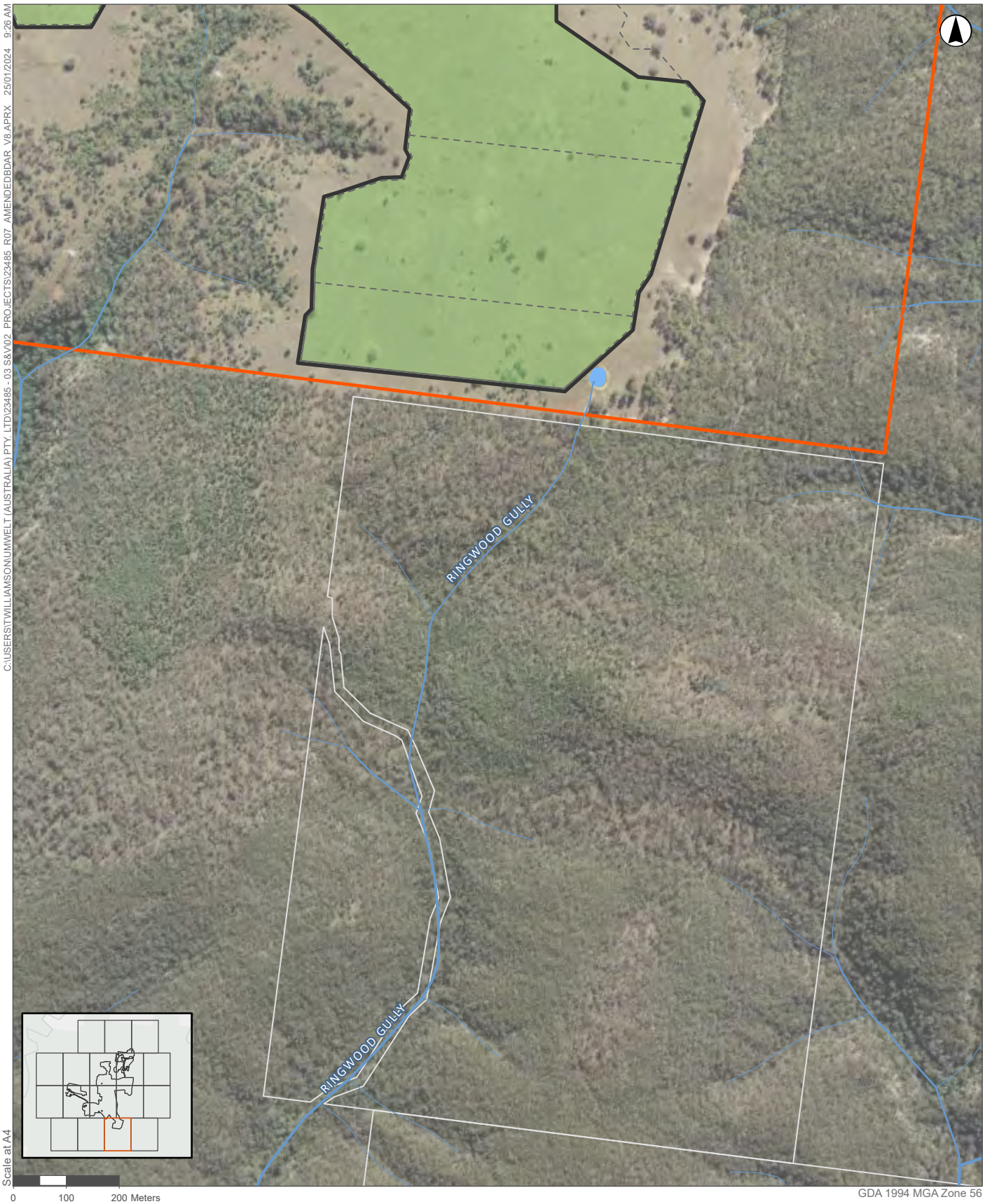
Native Vegetation

- Native Vegetation Extent (Total Area = 4570.6 ha)
- Non-Native Vegetation Extent (Total Area = 18.7 ha)

APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 15 of 17)

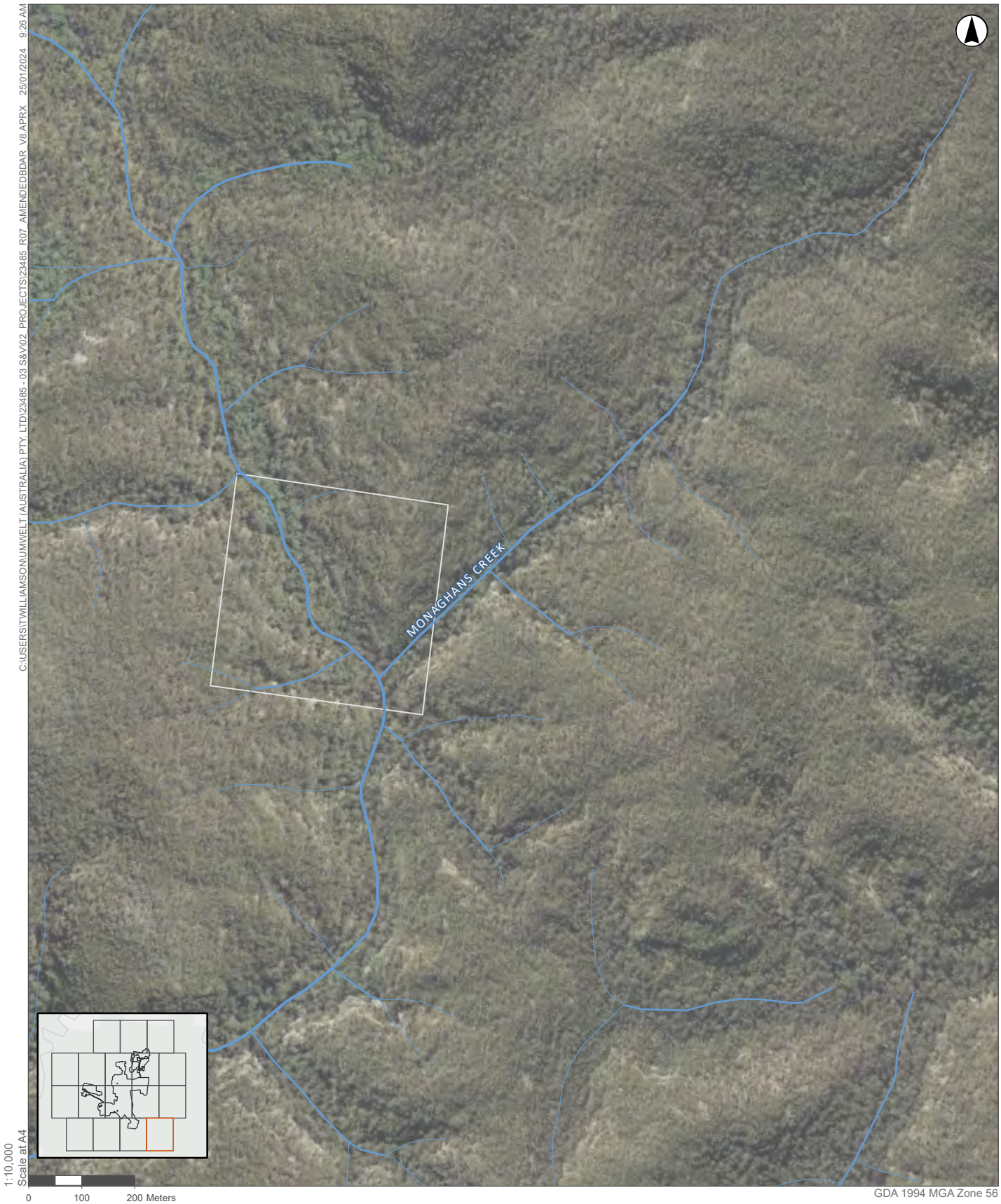
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 16 of 17)

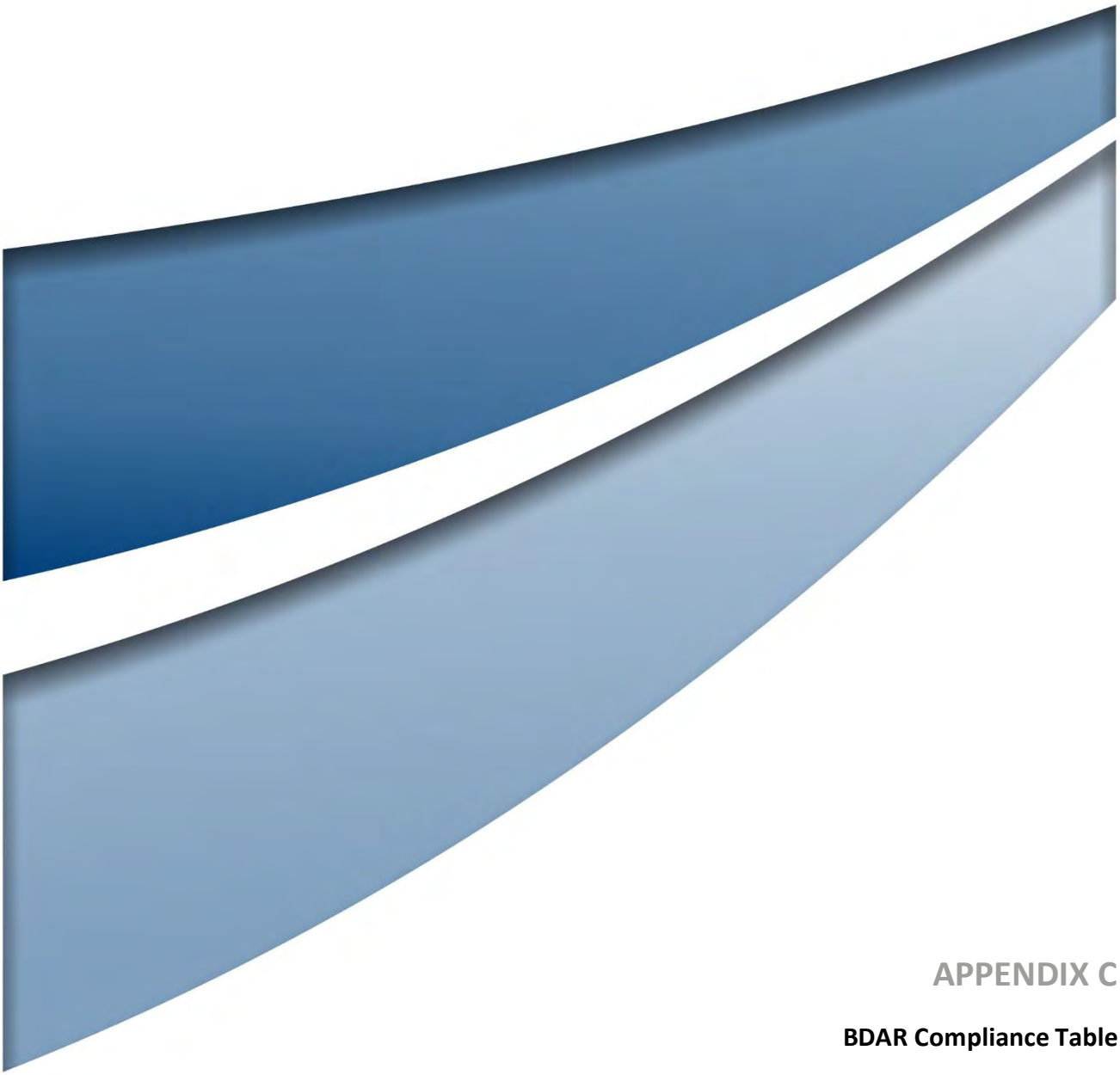
Image Source: ESRI Basemap (2021) **Data source:** NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019); Lightsource BP (2022)



APPENDIX B FIGURE 4.1

Development Footprint Native Vegetation Extents (page 17 of 17)

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



APPENDIX C

BDAR Compliance Table

C.1 BDAR Requirement Compliance

C1.1 BDAR Requirements Compliance Details

Compliance with the BDAR minimum information requirements of the BAM is documented in **Table C.1**.

Table C.1 Assessment of Compliance with BDAR Minimum Information Requirements

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	**Section 1.2.1**
		☒ identification of subject land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	**Section 1.2.2 and Figure 1.1 and Figure 1.2**
		☒ general description of the subject land	**Section 1.2.2**
		☒ sources of information used in the assessment, including reports and spatial data	**Section 1.9. Also referenced in text and listed in the References Section.**
		☒ identification and justification for entering the BOS	**Section 1.6**
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	**Figure 1.1**
Landscape	Section 3.1 and Section 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	**Section 1.2.2**
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	**Section 3.3 and Figure 1.2**
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	**Section 3.2.1 and Figure 1.1 and Figure 1.2**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	**Section 3.2.2 and Figure 1.1 and Figure 1.2**
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	**Section 3.2.2 and Figure 3.1**
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	**Section 3.2.3**
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	**Section 3.2.4**
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	**Section 3.2.5**
		☒ any additional landscape features identified in any SEARs for the proposal	**Section 3.2.7**
		☒ NSW (Mitchell) landscape on which the subject land occurs	**Section 3.2.6**
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	**Section 3.3**
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3.	**Figure 1.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	**Figure 1.2**
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat ☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☒ areas of outstanding biodiversity value occurring on the subject land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	**Figure 1.1 and Figure 1.2**
		Data	
		☒ All report maps as separate jpeg files	–
		Individual digital shape files of:	–
		☒ subject land boundary	–
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ cadastral boundary of subject land	–
		☒ areas of native vegetation cover	–
		☒ landscape features	–
Native vegetation	Chapter 4, Appendix A and Appendix H	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	**Section 4.1 and Figure 4.1**
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	**Section 4.1.2**
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	**Section 2.2.1**
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	**Section** Error! Reference source not found.
		☒ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	**Not applicable**
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	**Section 4.2.1, Table 4.1**
		☒ vegetation class	**Section 4.2.1, Table 4.1**
		☒ extent (ha) within subject land	**Section 4.2.1, Table 4.1**
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	**Section 4.2.2**
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	**Section 4.2.2**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	**Section 4.2.2, Section 4.3 and Appendix C**
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	**Table 4.1**
		Describe the vegetation integrity assessment of the subject land, including:	**–**
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	**Method provided in Section 2.2, Results provided in Table 4.1, Figure 4.2 and Section 4.2.2**
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	**Section 4.2.2**
		☒ area (ha) of each vegetation zone	**Table 4.1**
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	**Table 4.1**
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	**Table 2.1 and Table 4.9**
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	**Section 4.5.3**
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	**–**
		☐ identify the PCT or vegetation class for which local benchmark data will be applied ☐ identify published sources of local benchmark data (if benchmarks obtained from published sources) ☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	**Not applicable**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	**Not applicable**
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	**Not applicable**
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	**Figure 4.1**
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	**Figure 4.2**
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	**Figure 4.2**
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	**Figure 2.1**
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	**Figure 4.3 and Table 4.4**
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	**Patch size not mapped and exceeds 100ha for all vegetation condition zones, as listed in Table 4.5**
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	**–**
		☒ composition condition score ☒ structure condition score ☒ function condition score ☒ presence of hollow bearing trees	**Table 4.6**
		Data	

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ All report maps as separate jpeg files	–
		☒ Plot field data (MS Excel format)	
		☒ Plot field datasheets	**Appendix F**
		Digital shape files of:	–
		☒ PCT boundaries within subject land	–
		☒ TEC boundaries within subject land	–
		☒ vegetation zone boundaries within subject land	–
		☒ floristic vegetation survey and vegetation integrity plot locations	–
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	**Table 5.1**
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	**Table 5.1**
		☒ justification for addition of any ecosystem credit species to the list	**Table 5.1 / Justification for inclusion of additional BioNet Atlas species documented in Section 2.4.2**
		Identify species credit species likely to occur on the subject land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	**Table 5.2 and Table 5.3**
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	**Table 5.2 and Table 5.3**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	**Table 5.2 and Table 5.3**
		☒ justification for addition of any species credit species to the list	**Table 5.2 and Table 5.3 / Justification for inclusion of additional Bionet Atlas species documented in Section 2.4.2**
		From the list of candidate species credit species, identify:	**–**
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) ☒ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) ☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.)) ☒ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	**Table 5.4 and Table 5.5**
		Present the outcomes of species credit species assessments from:	**–**
		☒ threatened species survey (as described in BAM Section 5.2.4)	**Section 5.2 and Section 5.3**
		☐ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	**Not applicable**
		Where survey has been undertaken include detailed information on:	**–**
		☒ survey method and effort (as described in BAM Section 5.3)	**Section 5.3**
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	**Section 5.3**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	**Section 5.3**
		☒ survey personnel and relevant experience	**Section 1.5. CVs for key staff have been provided in Appendix D.**
		☒ describe any limitations to surveys and how these were addressed/overcome	**Section 2.7**
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	–
		☒ justification of the use of an expert report ☒ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☒ all requirements of Box 3 have been addressed in the expert report	**Section 5.3.3**
		Where use of local data is proposed (BAM Subsection 1.4.2):	–
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g. published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	**Not applicable**
		☐ provide written confirmation from the decision-maker that they support the use of local data	**Not applicable**
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		☒ the unit of measure for each species is documented	**Section 5.3.4**
		for species assessed by area:	–
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	**Section 5.3.4**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	**Section 5.3.4**
		for species assessed by counts of individuals:	–
		☐ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	**Not applicable**
		☐ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	**Not applicable**
		☐ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	**Not applicable**
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	**Table 10.3**
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	**Table 5.1**
		☒ the ecosystem credit species removed from the list	**Table 5.1**
		☒ the sensitivity to gain class of each species	**Table 5.1**
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	**Table 5.2 and Table 5.3**
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	**Table 5.2 and Table 5.3**
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	**Table 5.4 and Table 5.5**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	**Table 10.3**
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	**Figure 5.1 to Figure 5.4**
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	–
		☒ Survey locations including GPS coordinates of any plots, transects, grids	
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	–
		☒ Species polygon map in jpeg format	–
		☒ Expert reports and any supporting data used to support conclusions of the expert report	**Appendix H**
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	**Field data captured digitally**
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	**Table 6.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	**Not applicable**
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	**Table 6.1**
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	**Table 6.1**
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	**Table 6.1**
		Where the proposed development is for a wind farm:	**–**
		☐ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	**Not applicable**
		☐ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	**Not applicable**
		☐ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	**Not applicable**
		Where the proposal may result in vehicle strike:	**–**
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	**Table 6.1**
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	**Figure 6.1**
		☒ Map showing location of potential vehicle strike locations	**Figure 6.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	**Not applicable**
		Data	
		☒ Digital shape files of prescribed impact feature locations	–
		☒ Prescribed impact features map in jpeg format	–
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	**Section 7.1.2.7**
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	**Section 7.1.1.6**
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	**Section 7.1.1**
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	**Section 7.1.1.7**
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	**Section 7.1**
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	**Section 7.1**
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	**Section 7.3**
		Maps and tables	

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	**Table 7.1**
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	**Figure 7.1**
		☒ Maps demonstrating indirect impact zones where applicable	**Not applicable**
		Data	
		Digital shape files of:	–
		☒ alternative and final proposal footprint	–
		☒ direct and indirect impact zones	–
		☒ Maps in jpeg format	–
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	**Section 8.1**
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	–
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	**Section 8.2, Table 8.3**
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	**Section 8.2, Table 8.3**
		☒ reporting any limitations or assumptions, etc. made during the assessment	**Section 8.2, Table 8.3**
		☒ identification of the threatened entities and their habitat likely to be affected	**Section 8.2, Table 8.3**
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–

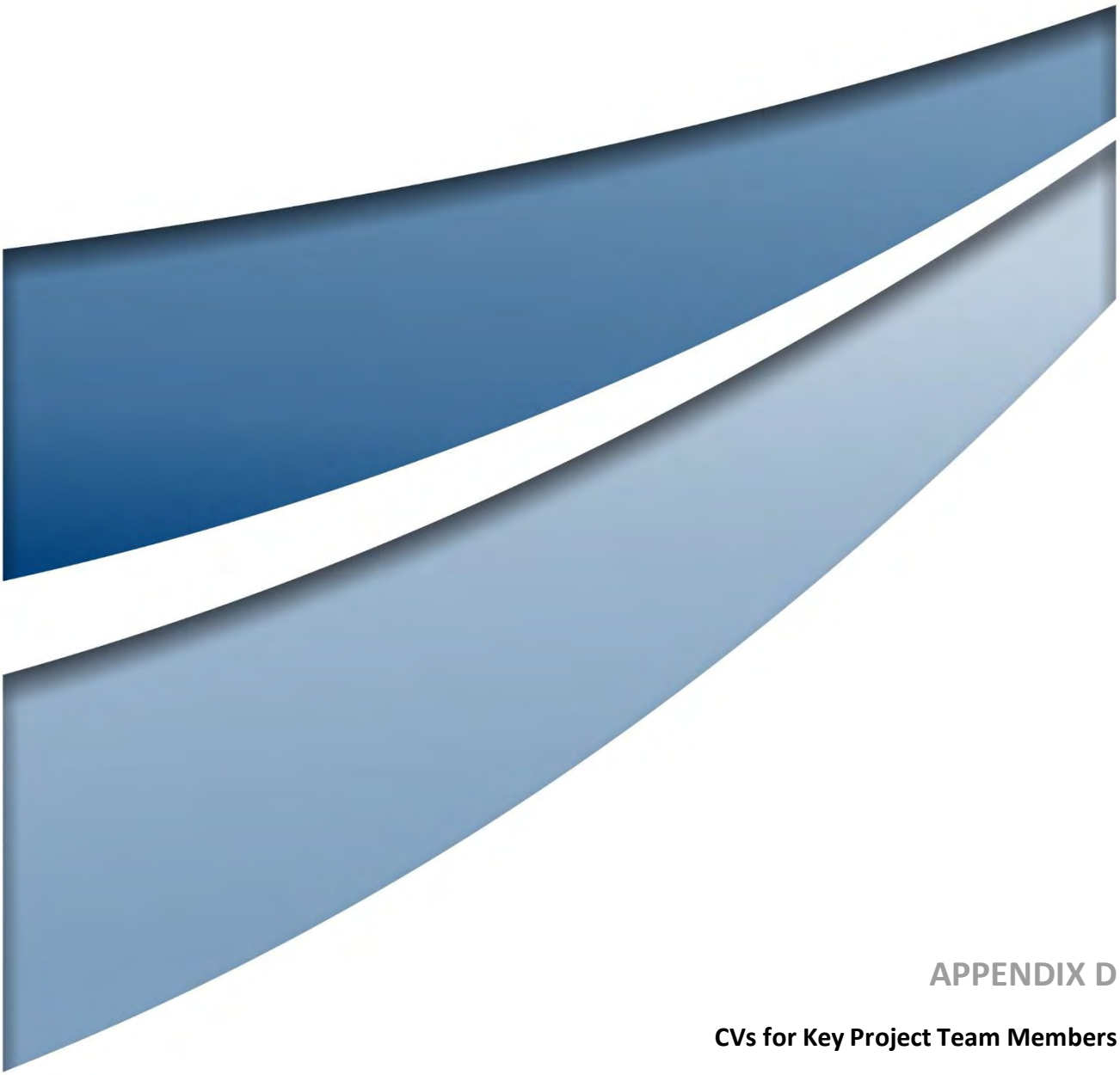
BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–
		☒ karst, caves, crevices, cliffs, rocks and other features of geological significance	**Section 8.3**
		☒ human-made structures	**Section 8.3**
		☒ non-native vegetation	**Section 8.3**
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	**Section 8.3**
		☒ movement of threatened species that maintains their life cycle	**Section 8.3**
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	**Section 8.3**
		☐ assessment of the impacts of wind turbine strikes on protected animals	**Not applicable**
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	**Section 8.3**
		☒ evaluate the consequences of prescribed impacts	**Section 8.3**
		☒ describe impacts that are uncertain	**Section 8.5**
		☒ document limitations to data, assumptions and predictions	**Section 8.3**
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	**Table 10.2**
		Data	
		N/A	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility ☒ identify measures for which there is risk of failure ☒ evaluate the risk and consequence of any residual impacts	**Table 8.4, Table 8.5**
		☒ document any adaptive management strategy proposed	**Table 8.5**
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) ☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) ☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	**Section 8.4**
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	**Table 8.5**
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	**Table 8.4**
		Data	
		N/A	–
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–
		☒ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	**Section 9.2**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ for each TEC, report the extent of the TEC in NSW	**Section 9.2**
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	**Section 9.3**
		☒ for each threatened species, report the population size in NSW	**Section 9.3**
		☒ documenting assumptions made and/or limitations to information ☒ documenting all sources of data, information, references used or consulted ☒ clearly justifying why any criteria could not be addressed	**Section 9**
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	**Section 10.1 and Table 10.2, Section 10.3**
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	**Section 10.2**
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	**Section 10.2**
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	**Figure 9.1**
		☒ Map showing location of threatened species at risk of an SAII within the subject land	**Figure 9.1**
		Map showing location of:	**–**
		☒ impacts requiring offset	**Figure 8.1**
		☒ impacts not requiring offset	**Table 10.1**
		☒ areas not requiring assessment	**Section 10.2**
		Data	
		Digital shape files of:	**–**
		☒ extent of TECs at risk of an SAII within the subject land	**-**
		☒ location of threatened species at risk of an SAII within the subject land	**-**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ boundary of impacts requiring offset	–
		☒ boundary of impacts not requiring offset	-
		☒ boundary of areas not requiring assessment	-
		☒ Maps in jpeg format	–
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	**Table 10.2**
		☒ biodiversity risk weighting for each	**Table 10.2, Table 10.3**
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	**Table 10.3**
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	**Table 10.2**
		☒ Table of threatened species requiring offset and the number of species credits required	**Table 10.3**
		Data	
		☒ Submitted proposal in the BAM Calculator	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
Biodiversity credit report	Chapter 10	**Information**	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	**Table 11.1, Table 11.2**
		☒ BAM credit report in pdf format	**Appendix G**
		Maps and tables	
		☒ Table of credit class and matching credit profile	**Table 11.1**
		Data	
		☒ BAM credit report in pdf format	**Appendix G**



APPENDIX D

CVs for Key Project Team Members

umwelt Environmental & Social Consultants

Allison Riley

Ecology Manager, South East Australia

Allison is a Principal Ecologist and Umwelt's Ecology Manager for the South East Australia operations (Newcastle, Sydney and Canberra) and has a strong background in preparing biodiversity assessments, offset strategies, EPBC Referrals and monitoring reports for projects assessed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and NSW *Environmental Planning and Assessment Act 1974* (EP&A Act) and at a Commonwealth level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). She has a thorough understanding of ecological values, impacts and assessment processes allows her to provide a streamlined approach that delivers quality outcomes for clients that meet government authority and community expectations.

Allison has reviewed and provided director overview for a range of large-scale renewable energy projects across NSW in the last 5 years, including impact assessments under the Biodiversity Assessment Method (BAM), regulator consultation, preparation of post approval management plans and ecological assessments of potential Stewardship (offset) sites required under the NSW Biodiversity Offsets Scheme.

Allison has substantial knowledge on directing regional-scale projects. She was the project manager for the Central Coast Biodiversity Certification Project scoping report and the project director for the subsequent winter, spring and summer surveys and reporting works. She has an in-depth knowledge of the potential development areas gained through the desktop assessments completed as part of the scoping report and field surveys.

Qualifications/Affiliations:	Bachelor of Science, University of Newcastle Accredited BAM Assessor (BAAS17042) under the NSW *Biodiversity Conservation Act 2016* Accredited BioBanking Assessor under the NSW *Threatened Species Conservation Act 1995*
Years of Industry Experience:	20+
Specialisation:	Strategic impact assessment and biodiversity conservation planning/offset strategy delivery, State Significant Development (SSD) and State Significant Infrastructure (SSI) ecological impact assessment, Commonwealth EPBC Referrals and EPBC Offset Calculator assessments, Threatened species and communities assessment, management and monitoring.

Relevant Project Experience

Central Coast Biodiversity Certification Project | DPIE | 2018–Current | Project Director | Allison is the project director for the Central Coast Biodiversity Certification Project. Allison oversaw the preparation of the scoping document for the Project which provided an analysis of the existing biodiversity data and planning information available to support a strategic assessment of future biodiversity impacts, identification of data collection needs to meet state and Commonwealth requirements, including timeframes and projected costs, strategic context and issues to inform the Biodiversity Certification, identification of opportunities to mitigate and offset residual impacts and avoid unacceptable impacts on biodiversity. This study was integral for defining the survey and assessment needs of the project. Al also provided advice on Matters of National Environmental Significance (MNES) under the EPBC Act to inform the terms of reference of the Strategic Assessment with the Commonwealth Department. A key component of this project has been identifying potential offset areas within the Central Coast LGA to offset the impacts associated with the project. This involved ranking land available for offsetting based on biodiversity values and providing DPE target areas for establishing conservation areas.

Spicers Creek Wind Farm | Squadron Energy | Current | NSW | Project Director | Allison is project directing a desktop based preliminary category 1 land mapping exercise. This GIS based package of work is being completed across the wider desktop boundary being considered in the early stages for the Project. It covers an extensive area of land within the locality. The project will consider all required publicly available mapping material and digital aerial photography, with a preliminary allocation of category 1 land mapping confidence levels comprising high, medium and low. Once complete, this mapping product will assist CWPR with preliminary project design so as to reduce impacts to biodiversity values and in turn reduce survey and offset requirements.

Preliminary Biodiversity Assessment for Confidential Solar Farm | RES | Current | NSW | NSW Team Lead/Project Director | Allison has overseen the delivery of a preliminary ecological assessment of this proposed solar project. This included an initial desktop assessment, with review of existing ecological databases, regional vegetation mapping products and mapping of Category 1 – Exempt Land. The last component involved a GIS mapping exercise where land historically cleared of native vegetation (through intensive agricultural land use) was identified and will subsequently be excluded from application of BAM and therefore any biodiversity offset liability should the project progress. Following this, Umwelt completed a preliminary ecological field survey of the Project site (excluding the Category 1 – Exempt Land) to assess the likely ecological constraints for the Project. This included rapid vegetation assessments, preliminary vegetation community identification, preliminary Threatened Ecological Community analysis and fauna habitat assessment.

Liverpool Range Wind Farm | Tilt Renewables | 2020–Current | NSW | NSW Team Lead/Project Director | Allison is project directing an extensive ecological impact assessment for this wind farm project in NSW. Initially, an extensive review of the modified project compared to the previously approved Project was completed, including detailed desktop review and subsequent GAP analysis of survey effort. As part of the project modification, Allison is overseeing the impact assessment being completed in accordance with the BAM.

Hunter Valley Operations (HVO) BAM Assessment | HVO | Hunter Valley, NSW |2019–Ongoing | Project Director | Al is the project director in the preparation of the BDAR for the HVO North and South Projects, near Lemington, NSW. This has required the coordination and management of multiple years of biodiversity survey and assessment for a project that spans over 1,000 hectares in the Central Hunter Valley. This has involved key considerations including Category 1 – Exempt Land mapping, mapping of *Warkworth Sands Woodland CEEC* and *Central Hunter Valley Eucalypt Forest and Woodland CEEC*.

Glendell Continued Operations Project | Ravensworth NSW | Glencore | 2018–Current | Project Director | This is a major project comprising a coal mine expansion. Allison is the project director for the ecological assessment which includes an ecological impact assessment, biodiversity conservation planning and an EPBC referral. The assessment pathway is the Biodiversity Assessment Method (BAM) and Allison is the accredited assessor who has reviewed and authorised the Biodiversity Development Assessment Report (BDAR). The impacts of the project in excess of 600 hectares of vegetation.

Mangoola Coal Continued Operations Project FBA Assessment | Mangoola NSW | Glencore | 2016–Current | Project Director | This is a major project comprising a coal mine expansion. Allison is the project director for the ecological assessment which includes an ecological impact assessment, biodiversity offsetting and an EPBC referral. The assessment pathway is a blend of FBA and the Biodiversity Assessment Method (BAM). The impacts of the project in excess of 500 ha of vegetation with conservation of approximately 2500 ha of land-based conservation measures that were designed to meet NSW and Commonwealth requirements. The development of the strategy included close liaison and consultation with the Mangoola project team, subject matter experts and state and Commonwealth government agencies and this iterative and collaborative approach to the design and execution of the strategy was key to its successful completion in July 2019.

Melbourne to Brisbane Inland Railway (IR) Biodiversity Assessment Report | Western NSW | ARTC | 2016–Current | Ecology – Project Director | Allison is the Ecology Project Director for the state significant infrastructure biodiversity assessment of the Parkes to Narromine and Narrabri to North Star sections of the Inland Rail Project. The project includes preparation and delivery of the Biodiversity Assessment Report (BAR), Aquatic Assessment and Referral under the Commonwealth EPBC Act for the two sections of Inland Rail. The Project includes targeted threatened flora and fauna surveys across approximately 300 kilometres of railway corridor. The project includes the development of a range of impact mitigations strategies to minimise the impact of the project on biodiversity values, including threatened ecological communities, threatened flora species and threatened fauna species, including the koala and provides detailed analysis to inform conservation planning priorities for the development.

Aquatic Impact Assessment – Inland Rail | Western NSW | ARTC | 2016 | Project Director | Allison is the Project Director for the preparation of two state significant infrastructure aquatic impact assessments that describe the impacts of rail upgrades on freshwater aquatic environments. This project involved key fish habitat mapping and assessment against the Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013) and a detailed assessment of impacts on listed state and Commonwealth aquatic species. The project includes consideration of impact mitigation measures design to reduce the impact of the project on state and Commonwealth listed threatened species and ecological communities.

Invincible Coal Mine Southern Extension Project | Cullen Bullen NSW | 2015–2018 | Project Director | The project included an Ecological Assessment, Biodiversity Offset Strategy and strategic agency consultation using the Framework for Biodiversity Assessment (FBA). The Project had been rejected previously by the NSW Department of Planning for biodiversity impacts (among others). Allison directed the preparation of the BAR and Offset Strategy with project approval received February 2018.

Terminal Four (T4) Project | Port Waratah Coal Services | Kooragang Island, NSW | 2011–2013 | Project Manager | Allison was the project manager and primary author for the comprehensive Ecological Assessment and Biodiversity Offset Strategy for this high profile major infrastructure project. The Project involved analysis of complex ecological interactions and threatened species issues and included the development of a range of impact mitigation and offsetting measures. The project required approval under the EPBC Act, including for likely impacts on EPBC listed migratory bird populations within the Hunter Estuary Wetlands Ramsar site and for the construction of a major 120 ha system of intertidal migratory shorebird habitat. The T4 project would further develop Port of Newcastle in response to demand for increased coal export capacity in region, and Allison was integral in negotiating and securing a positive ecological outcome for the Project in terms of mitigating and offsetting the impacts of the Project.

Rachel Musgrave

Sydney Ecology Lead – Principal Ecologist – Botanist

Rachel is an experienced ecologist/botanist and accredited assessor with over 12 years' experience delivering biodiversity assessments for a range of development types, biodiversity monitoring programs, and biodiversity management plans. Rachel has been involved in numerous ecological impact assessments of threatened species and endangered ecological communities in accordance with NSW and Commonwealth threatened species legislation. She has had experience in a broad range of environmental impact assessment projects, including REFs, EISs and biodiversity technical reports for large infrastructure, road, rail, renewable energy, and residential developments.

Prior to joining Umwelt, Rachel lead a team of 12 ecologists across NSW and the ACT within a multidisciplinary engineering company. The responsibilities carried out as part of this team lead role included delivering projects within project timeframes and set budgets, team financial management and forecasting, team performance management and resource forecasting, business development and preparing tender responses, and technical reviews.

Rachel has extensive experience in carrying out and leading teams on field assessments. Her skills include vegetation mapping, Plant Community Type and Threatened Ecological Community identification, BAM plots, targeted threatened flora and fauna species surveys, and habitat condition assessment. Furthermore, Rachel has also participated in expeditions to poorly botanised mountains in Borneo, the Philippines, Venezuela, and Madagascar for the purposes of research and species-specific population monitoring.

Rachel is an accredited person under the NSW Biodiversity Offset Scheme and was an accredited assessor under s142B(1)(c) of the *Threatened Species Conservation Act 1995.* As a result, Rachel has a strong working knowledge of the principles for biodiversity offsetting in NSW and provides accurate and concise advice on major projects.

Rachel is an adaptable, resourceful, and consultative team member who delivers high quality work for our clients.

Qualifications/Affiliations:	Bachelor of Science (Hons) Ecology
Years of Industry Experience:	12
Specialisation:	BAM accreditation (BAAS18032), BAM assessments, BAM VI assessments, Plant identification, PCT and TEC identification, Fauna surveys, BAM-C, Survey design, Data management, Technical Reviews, Environmental Management Plans, Vegetation & Bushland Management Plans, GIS.

Relevant Project Experience

Boorolong Wind Farm | CWP Renewables | Armidale | 2021–Present | Project Director and Accredited Biodiversity Assessor for a 6,500 ha wind farm development on the Northern Tablelands. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, vegetation mapping, targeted threatened species surveys flora, assessment of impacts in accordance with BAM, and consultation with NSW and Commonwealth agencies. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process.

Narrabri to North Star – Inland Rail | ARTC | Narrabri – North Star | 2021 | Project Manager & Accredited Assessor | Project manager and accredited assessor for an FBA Major Project Assessment of impacts associated with N2NS. Assessment of impacts in accordance with FBA, including preparation of an addendum Biodiversity Assessment Report and consultation with NSW and Commonwealth agencies

Warragamba Dam Raising | WNSW | Warragamba | 2017–2020 | Accredited Assessor | Ecology lead on an FBA Major Project Assessment of impacts associated with the raising of Warragamba Dam wall. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, vegetation mapping, targeted threatened species surveys flora, assessment of impacts in accordance with FBA, preparation of three standalone Biodiversity Assessment Reports and MNES assessment report, consultation with NSW and Commonwealth agencies.

Bathurst Second Circuit | Apex | Bathurst | 2018–2020 | Accredited Assessor | Ecology lead on a BAM Major Project Assessment of impacts associated with the construction of a car racing circuit. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, vegetation mapping targeted threatened species surveys, assessment of impacts in accordance with BAM, reporting and consultation with NSW and Commonwealth agencies.

Elysian Wind Farm | Willy Willy/Alinta | Tuross | 2019–2020 | Accredited Assessor | Ecology lead on a BAM Major Project Assessment of impacts associated with the construction of a wind farm. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, vegetation mapping targeted threatened species surveys, assessment of impacts in accordance with BAM, reporting and consultation with NSW and Commonwealth agencies.

Roaches Water Storage | Murrumbidgee Irrigation | Leeton | 2018–2020 | Accredited Assessor | Ecology lead on a BAM Assessment for a Part 4 designated and integrated development of a water storage in Leeton. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, vegetation mapping, assessment of impacts in accordance with BAM, reporting and consultation with NSW and Commonwealth agencies.

Eurobodalla Southern Storage | Eurobodalla Shire Council | Eurobodalla | 2016–2019 | Accredited Assessor | Ecology lead on a FBA Major Project Assessment of impacts associated with the construction of a water storage facility in Eurobodalla Shire Council. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, flora and fauna surveying, assessment in accordance with FBA, reporting and mapping.

Granite Hills Wind Farm | Akuo Energy | Glenbog | 2018–2020 | Accredited Assessor | Ecology lead on a FBA Major Project Assessment of impacts associated with the construction of a wind farm near Nimmitabel. Responsibilities include all aspects of impact assessment including, but not limited to, management of ecology team undertaking flora and fauna surveys, logistical management, flora and fauna surveying, assessment in accordance with FBA, reporting and mapping.

Snowy 2.0 | Snowy Hydro | Kosciuszko National Park | 2017 | Biodiversity specialist | Preparation of REF's for Snowy Hydro 2.0 geotechnical investigations. Responsible for vegetation assessment and preparation of REFs pertaining to geotechnical works for the Snowy 2.0 Feasibility Study. Potential impacts on numerous EECs and threatened species were considered as part of the assessment process.

Milton Ulladulla Bypass | TfNSW | Milton-Ulladulla | 2020–2021 | Project Manager & Accredited Assessor | Project manager and ecology lead for biodiversity surveys to inform the concept design of Milton Ulladulla Bypass. Biodiversity surveys carried out in accordance with the BAM within a 300-metre boundary of proposed upgrade footprint. Work included vegetation mapping and BAM plot surveys, targeted threatened species surveys, preparation of technical memo updates, and a Biodiversity Survey Report. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process. Also responsible for contract execution, program delivery, and financial reporting for the project.

Moruya Bypass | TfNSW | Moruya | 2020–2021 | Biodiversity specialist | Biodiversity specialist responsible for technical reviews for biodiversity surveys to inform the options selection and concept design of Moruya Bypass. Biodiversity surveys carried out in accordance with the BAM within a 300-metre boundary of proposed upgrade options footprint. Work included vegetation mapping and BAM plot surveys, targeted threatened species surveys, preparation of technical memo updates, and a Biodiversity Survey Report. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process. Also provided support and assistance with contract execution, program delivery, and financial reporting for the project.

Olympic Highway Intersections Upgrade | TfNSW | Wagga Wagga | 2021–2021 | Biodiversity specialist | Biodiversity specialist responsible for technical reviews for a Biodiversity Assessment Report prepared to inform an REF for an upgrade of intersections on Olympic Highway in Wagga Wagga. Work included vegetation mapping and BAM plot surveys, targeted threatened species surveys, preparation of a Biodiversity Survey Report. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process.

Garfield Road Upgrade DD | TfNSW | Riverstone | 2019–2020 | Ecology Lead | Preparation and technical review of a Biodiversity Assessment Report for inclusion to the REF for Garfield Road upgrade. Vegetation assessment, targeted threatened species surveys, and preparation of a Biodiversity Assessment Report pertaining to the upgrade of one section of Garfield Road in Riverstone. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process.

RP2J DD | TfNSW | Rankin Park-Jesmond | 2019–2020 | Ecology Lead | Preparation of a Biodiversity Assessment Report, Fauna Crossing Structure Report, Vegetation Clearing Report, and Bat Management Plan for the detailed design phase of RP2J DD, and inclusion into addendum REF as required. Vegetation assessments, targeted threatened species surveys, and the preparation of Biodiversity Assessment Report, Fauna Crossing Structure Report, Bat Management Plan, and Vegetation Clearing Report pertaining to the RP2J DD. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process.

Heathcote Road Upgrade DD | TfNSW | Holsworthy | 2018–2019 | Ecology Lead | Preparation of a Biodiversity Assessment Report, Fauna Crossing Structure Report, and Vegetation Clearing Report for the detailed design phase of Heathcote Road Upgrade, and inclusion into addendum REF as required. Vegetation assessments, targeted threatened species surveys, and the preparation of Biodiversity Assessment Report, Fauna Crossing Structure Report, and Vegetation Clearing Report pertaining to the upgrade of

Heathcote Road in Hammondville. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process.

Golden Highway Upgrade| TfNSW | Singleton | 2016–2020 | Ecology Lead | Preparation of a Biodiversity Assessment Reports for inclusion to the REFs for three segments of Golden Highway upgrade, preparation of technical memos to inform MREFs for Geotechnical works and UXO pre-clearance. Potential impacts on numerous TECs and threatened species were considered as part of the assessment process. Offsetting requirements calculated in accordance with FBA.

Northern Beaches Hospital Road Upgrade | TfNSW | Belrose | 2017–2020 | Ecology Lead | Preparation of a Biodiversity Offset Package for works associated with Northern Beaches Hospital and Mona Vale Road East road upgrades. Works included identification of potential offset sites, vegetation assessments, targeted threatened species surveys, and preparation of a Biodiversity Offset Package for approval by relevant agencies. Biodiversity credit calculations carried out in accordance with FBA and BAM.

Pacific Highway Upgrade N2L | TfNSW | Narara-Lisarow | 2016–2017 | Ecology Lead | Preparation of a Species Impact Statement for inclusion to the REF for N2L road upgrade. Vegetation assessment and preparation of SIS in accordance with Secretary's Environmental Assessment Requirements pertaining to the upgrade of the Pacific Highway from Narara to Lisarow. Potential impacts on numerous EECs and threatened species were considered as part of the assessment process. Offsetting requirements calculated in accordance with FBA.

Mona Vale Road West Upgrade | TfNSW | Terry Hills | 2016–2017 | Ecology Lead | Preparation of a Species Impact Statement for inclusion to the REF for Mona Vale Road upgrade. Vegetation assessment and preparation of SIS in accordance with Secretary's Environmental Assessment Requirements pertaining to the upgrade of Mona Vale Road. Potential impacts on numerous EECs and threatened species were considered as part of the assessment process. Offsetting requirements calculated in accordance with FBA.

Bells Line of Road Strategic Environmental Assessment | TfNSW | Castlereagh | 2016 | Biodiversity specialist | Preparation of Biodiversity Technical Specialist Assessment Report for inclusion into a Strategic Environmental Assessment for a corridor study to investigate options for the preservation of a future transport corridor in north western Sydney.

Taralga Wind Farm | Downer | Taralga | 2013–2016 | Biodiversity specialist | Implementation of Project Ecologist tasks outlined in State and Federally Approved Management Plans for the construction of a 60-turbine wind farm and 132 kV transmission line near Taralga NSW. Responsibilities include undertaking pre-clearance surveys for threatened microbat species and other native fauna present on site, relocation and monitoring of relocated individuals, habitat assessment, consistency reviews, fauna surveys and management, provision of expert advice.

Boco Rock Wind Farm | Downer | Nimmitabel | 2013–2014 | Biodiversity specialist | Implementation of Project Ecologist tasks outlined in State and Federally Approved Management Plans for the construction of a 70-turbine wind farm and 132 kV transmission line in Cooma Monaro LGA. Responsibilities include undertaking pre-clearance surveys for threatened reptile species and other native fauna present on site, relocation and monitoring of relocated individuals, habitat assessment, consistency reviews, fauna surveys and management, provision of expert advice.

Jacob Manners

Senior Ecologist

Jacob is a Senior Ecologist with 15 years' experience in the planning and implementation of terrestrial biodiversity surveys and impact assessments in support of Local, State and Commonwealth approvals for a diverse range of projects. He has extensive experience across a range of industries including renewable energy development, resource extraction, transport, linear infrastructure and urban development. Jacob enjoys engaging with clients to deliver challenging projects which achieve high quality impact assessment, mitigation and offsetting outcomes.

Jacob is an accredited BAM Assessor under the BC Act and has certified over 15 Biodiversity Development Assessment Reports. Jacob has led numerous large-scale and technically complex ecological projects across NSW and has appeared as an **expert** witness in Class 1 Development Appeals in the NSW Land and Environment Court and has an in-depth working knowledge of the Environmental Planning and Assessment Act, Biodiversity Conservation Act and the Environment Protection and Biodiversity Conservation Act.

Qualifications/ Affiliations:	Bachelor of Science (Sustainable Resource Management & Marine Science) – University of Newcastle, Master of Wildlife Management – Macquarie University Arboriculture Graduate Certificate – University of Melbourne Certificate 3 in Commercial Photography – Ultimo TAFE Accredited BAM Assessor under the *Biodiversity Conservation Act 2016*
Years of Industry Experience:	>15
Specialisation:	Biodiversity impact assessment including under the Biodiversity Assessment Method (BAM), rehabilitation planning, project management, flora and fauna field surveys, GIS Mapping, arboriculture.

Relevant Project Experience

Goulburn River Solar Farm Biodiversity Assessment| Merriwa LGA| 2021–Ongoing |Author and accredited BAM Assessor | Jacob is the Project Manager and lead BAM Accredited Assessor for the preparation of the BDAR for the Goulburn River Solar Farm, an approximately 800 ha Solar Farm in the Merriwa LGA. This has involved the coordination and completion of several years of biodiversity surveys and assessment for the project that covers an area of 800ha. This has involved the consideration of plant community type mapping, Category 1 – Exempt Land Mapping, and assessment of impacts to the vulnerable Barking Owl and critically endangered Regent Honeyeater and 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 ecological community.

Stone Ridge Quarry Biodiversity Assessment | 2022–Ongoing |Author and accredited assessor | Jacob is the Project Manager and lead BAM Accredited Assessor for the preparation of the BDAR for the proposed Stone Ridge hard rock quarry, an approximately 80 ha quarry development in the Port Stephens LGA. This has involved the coordination and synthesis of several years of biodiversity surveys including vegetation mapping, BAM Plot surveys and management of field teams completing targeted threatened species surveys.

Martins Creek Quarry Biodiversity Assessment and Offsets Strategy| Dungog LGA | 2014–2022 |Author and accredited assessor | Jacob was the Project Manager and lead biodiversity assessor for the preparation of the BAR for the proposed Martins Creek hard rock quarry, in the Dungog LGA. This has involved the coordination and completion of several years of biodiversity surveys including vegetation mapping, BAM Plot surveys and targeted threatened species surveys.

Confidential Windfarm Project in the NSW Southern Highlands | 2021–Ongoing | Project Manager | Jacob is the Project Manager responsible for coordinating the completion of biodiversity surveys and assessments for a large windfarm project in the NSW Southern Highlands which is currently in the scoping phase. Considerations have included Category 1 – Exempt Land Mapping, plant community type mapping, threatened flora and fauna surveys and bird and bat utilisation surveys.

Kurri Kurri Lateral Gas Pipeline Project| 2023 | Jacob was responsible for undertaking a revised assessment of the project under the BAM, in response to design changes to recalculate project impacts and associated biodiversity offset liability.

Transgrid Major Infrastructure Transmission Line Project | Tamworth to Winton NSW | 2021 | Jacob was the Project manager and lead biodiversity assessor for the preparation of updated advice on the Transgrid Tamworth to Winton biodiversity constraints assessment. Jacob completed a detailed analysis of the constraints for the project and provided advice on the cost of offsetting the biodiversity impacts associated with the Project.

Taylors Beach NSW Biodiversity Assessments and Management Plans Mixed Use Industrial Development | Port Stephens LGA | 2019–2020 | Jacob was the Project Manager and lead BAM Accredited Assessor for the preparation of the BDAR for the project. Jacob completed the biodiversity surveys for the project and considered impacts to the Swamp Sclerophyll Forest endangered ecological community, Koala, Squirrel Glider and Southern Myotis. Jacob was also responsible for the preparation of vegetation koala management plans for the project.

Hadden Ridge Rural Residential Subdivision Biodiversity Impact Assessment and Farm Management Planning | 2021–2022 |Author and Project Manager | Jacob was responsible for undertaking a monitoring and a critical review of the existing Farm Management Plan which had been prepared for a large rural property at Hadden Ridge in the Hawkesbury LGA. Jacob prepared a Revised Farm Management Plan in consultation with the landowner and authored a flora and fauna assessment in support of a rural residential subdivison for the property.

Grants Road Sand Quarry Biodiversity Assessment and Post Approvals Biodiversity Planning and Monitoring | 2008–2021 |Author and Project Manager | Jacob was the Project Manager and lead biodiversity assessor for the preparation of the BAR for the Grants Road Sand Quarry, in the Gosford LGA. This involved the coordination and completion of several years of biodiversity surveys including vegetation mapping, plot surveys and targeted threatened species surveys. Jacob was also responsible for the completion of groundwater dependent ecosystem, landscape rehabilitation and threatened species monitoring plans for the project.

Project Management and Land and Environment Court Expert Witness for Landscape Supply and Agricultural Use Project | South-west Sydney NSW | 2022 | Jacob was the Project Management responsible for undertaking site investigations and preparing the BDAR and Arboricultural Impact Assessment documentation for the project. Jacob participated in the Joint Expert Conferencing and attended the Land and Environment Court as an Expert Witness.

Bells Wellness Centre and Hotel Expansion | Killcare NSW | 2021 | Jacob was the Project Manager and lead BAM Accredited Assessor for the preparation of the BDAR for a $5.5M upgrade to an existing resort facility. Jacob completed the biodiversity surveys for the project and authored the BDAR which was completed using a Streamlined BDAR assessment module.

Central Coast Airport Obstacle Limitation Surface Vegetation Management | Warnervale NSW | 2020 | Jacob was the Accredited Assessor for the preparation of two Biodiversity Development Assessment Reports for the northern and southern obstacle limitation surfaces at the Central Coast Airport. Jacob worked with Central Coast Council to determine the extent of the OLS and vegetation management works required and provided an assessment of the partial clearing works under the BAM.

Flora and Fauna Assessment and Vegetation Management Plan for Residential Dwelling for Peter Stutchbury and Associates | Macmasters Beach NSW | 2018 | Jacob was the Project Manager and lead author for the preparation of a Flora and Fauna Assessment and Vegetation Management Plan for the project designed by the renowned architect Peter Stuchbury. Jacob provided detailed advice and mitigation measures in relation to the Yellow-bellied Glider.

Thompson Healthcare $27.8M Aged Care Facility | Gosford | 2019–2020 | Jacob was the author of a Flora and Fauna Assessment for the project and completed detailed assessments on the Umina Coastal Sandplain endangered ecological community. Jacob appeared for the applicant at the Joint Regional Planning Panel Meeting for the Project, which was approved with conditions.

State Significant Development Residential Flat Building | Gosford | 2019–2020 | Jacob was the Project Manager responsible for the completion of site investigations and the completion of the BDAR, Arboricultural Impact Assessment and Vegetation Management Plan for a $110 million Apartment precinct development in the Gosford LGA.

Pacific Highway Turramurra Biodiversity Assessment and Expert Witness for Residential Flat Building | Ku-ring-gai LGA | 2019–2020 | Jacob prepared a biodiversity assessment and vegetation management plan for the project, attended a S34 conference and appeared as an Expert Witness in the Land and Environment Court.

Killeaton St, St Ives Seniors Living Development Biodiversity Assessment and Planning and Expert Witness | Ku-ring-gai LGA | 2018 | Jacob prepared a biodiversity assessment, vegetation management plan and ecological site management plan and appeared as an expert witness at a S34 Conference.

Annangrove Road Rouse Hill Biodiversity Assessment for Mixed Use Development | 2019–2020 | Jacob prepared completed site surveys and was the lead accredited assessor for the preparation of a BDAR which addressed serious and irreversible impacts to Cumberland Plain Woodland CEEC. Jacob also attended meetings with local Council to negotiate a development outcome for the client and prepared the Vegetation Management Plan for the Project.

Warnervale Road, Warnervale Rural Residential Subdivision | Wyong LGA | 2019 | Jacob was the Project Manager and lead BAM Accredited Assessor for the preparation of the BDAR for the project. Jacob completed the biodiversity surveys for the project and considered impacts to the Squirrel Glider.

Environmental Impact Assessments for Local Infrastructure Works Projects | Jacob has completed numerous environmental impact assessments for Part 5 Projects which have included field investigations and preparing reports to assess environmental impacts under the *Environmental Planning and Assessment Act 1979* (NSW), *Biodiversity Conservation Act 2016* (NSW), *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *National Parks and Wildlife Act 1974* (NSW).

Selected local infrastructure projects which I have delivered environmental impact assessments for include:

- Perina Road Sewage Main Upgrade Gosford.
- Wagstaff Sewer Pump Station Upgrade.
- Summerland Point Sewer Pump Station Upgrade.
- Ettalong Beach Sewer Pump Station Upgrade.
- Koolewong Sewer Pump Station Upgrade.
- Green Point Sewer Pump Station Upgrade.
- Bridge replacement at Palmdale NSW.
- Private access road upgrade – Dharug National Park.
- Stormwater Infrastructure Upgrade – Davies Street Kincumber.

Thornton Sewer Main Arboricultural Impact Assessment | Maitland LGA | 2020 | Completion of GPS site survey, GIS mapping and assessment of 231 trees, including provision of management recommendations for trees to be retained.

SIMS Metal Recycling Facility West Gosford Biodiversity Assessment and Post Approval Monitoring | Central Coast LGA | 2019 | Jacob was the lead accredited biodiversity assessor and report author for the project and coordinated the field surveys and GIS mapping. Post approval works completed included Arborist Reporting, nest box installation and civil contractor induction.

Lady Carrington Estate Expert Witness and Biodiversity Offset Assessment Report | Helensburgh NSW | 2014 | Jacob worked with a specialist flora survey consultant to prepare a Biodiversity Offset Assessment for the project using the Biobanking Assessment Methodology. Jacob also appeared as an expert witness on threatened fauna at a Section 34 Conference for the Project.

Biodiversity Assessment Report for an approved Resource Recovery Facility at Kemlba Grange NSW | 2014 | Jacob coordinated the biodiversity surveys, including vegetation mapping and threatened flora and fauna surveys and authored the Biodiversity Assessment Report for the project.

Monitoring of *Rutidosis heterogama* | Charmhaven, Wyong LGA | Jacob authored the management plan, oversaw the fencing and establishment of the conservation area and completed monitoring surveys over several years to identify the extent and trends for a population of *Rutidosis heterogama*. He provided practical protection and management measures and devised a strategy to ensure accurate counting of individuals between monitoring events.

Preparation of Species Impact Statements | Various Dates | Jacob has prepared the following Species Impact Statements under the now repealed Threatened Species Conservation Act:

- Residential Subdivision Kellyville NSW – focussing on Cumberland Plain Woodland ecological community.
- Residential Subdivision Warnervale NSW – focussing on the Squirrel Glider.
- Rural-residential Subdivisions Bensville NSW – focussing on the Yellow-bellied Glider and Bush Stone Curlew.
- Residential Dwelling Davistown NSW – focussing on the Green and Golden Bell Frog.

umwelt Environmental & Social Consultants

Sarah Hart

Senior Ecologist

Sarah is an ecologist with nine years professional experience in Natural Resource Management and she has experience delivering consulting projects ranging from small impact assessments and developments to larger collaborations and long-term monitoring and compliance projects in the mining sector. Sarah graduated from James Cook University with a Master of Science majoring in Ecology and Zoology, additionally completing a Graduate Diploma in Environmental Management from the University of Queensland.

Sarah has a strong background in the assessment of the impacts on species, populations and ecological communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), NSW *Biodiversity Conservation Act 2016* (BC Act) and ACT *Nature Conservation Act 2014* (NC Act). She has also undertaken project management and reporting associated with ACT impact assessment and the NSW Biodiversity Offset Scheme including, Biodiversity Development Assessment Reports (BDAR) and her field-based experience includes vegetation survey, plant species identification, regional and localised vegetation mapping, BAM/BBAM plots and targeted threatened flora and fauna surveys. She has created and managed large-scale long-term monitoring projects for compliance within the Southern Coalfields for ongoing monitoring of sensitive ecological systems and threatened species management.

Qualifications/Affiliations:	Master of Science (Ecology and Zoology), Bachelor of Science (Zoology), James Cook University, Graduate Diploma of Environmental Management, University of Queensland, Accredited BAM Assessor.
Years of Industry Experience:	9
Specialisation:	Environmental monitoring, Environmental impact assessments, Native vegetation classification mapping, Habitat condition assessments.

Relevant Project Experience

Linear Infrastructure

Environmental approvals for the relocation of the Tumut Powerline | Neoen | Canberra, ACT & border of NSW | 2022–2023 | Senior Ecologist| Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing impact assessment reports for each state; both NSW and ACT as separate reports; and Commonwealth and scoped fieldwork for the broader ACT ecology team. Mapping all vegetation zones and completing floristic plots to determine PCTs across the site. Targeted flora surveys and providing technical advice to the Client.

Transmission Line 6X (Upper Tumut 330 kV Substation to Ravine 330 kV Substation) Ecological Assessment | Transgrid | Kosciuszko National Park, NSW | 2022–2023 | Senior Ecologist | Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing reporting. Mapping all vegetation zones and completing rapid data plots to determine PCTs across the various locations within the site. Habitat assessments for Booroolong Frog, Smoky mouse and many threatened flora species and providing technical advice to the Client.

Transmission Line U3 and Line 2 Ecological Assessment | Transgrid | Kosciuszko National Park, NSW | June 2022 | Senior Ecologist | Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing reporting for two separate Transmission lines. Mapping all vegetation zones and completing rapid data plots to determine PCTs across the various locations within the site. Habitat assessments for Booroolong Frog, Smoky mouse and many threatened flora species and providing technical advice to the Client.

Great Western Highway Upgrades | TfNSW | Blue Mountains, NSW | 2020–2021 | Ecologist | Sarah assisted in the fieldwork and report preparation for a large-scale BDAR. The fieldwork consistent of using the NSW Biodiversity Assessment Methods (BAM) plots in various threatened and non-threatened ecological communities, habitat assessments for a variety of threatened fauna species, placement of camera traps, targeted flora surveys using transects and nocturnal surveys across the study area.

Picton Road Upgrades | TfNSW | Wollongong, NSW | 2020 | Ecologist | Sarah assisted in the fieldwork and report preparation for an impact assessment along Picton Road, NSW. The fieldwork consistent of using the NSW Biodiversity Assessment Methods (BAM) plots in various threatened and non-threatened ecological communities, habitat assessments for a variety of threatened fauna species, targeted flora surveys using transects and nocturnal surveys across the study area.

Various NBN upgrades | Telstra | Greater Sydney, NSW | 2019–2020 | Ecologist, Project Manager | Sarah was project manager and lead ecologist in the fieldwork and report preparation for impact assessments using the Telecommunications Act in conjunction with the standard impact assessment framework. The fieldwork consistent of an ecologist and an Archaeology consultant to assess the sites.

As an ecologist Sarah used rapid data plots to confirm and inform regional vegetation mapping in various threatened and non-threatened ecological communities, habitat assessments for a variety of threatened fauna species across the study area.

Urban Development

Holsworthy Sewerage Treatment Plant Flora and Fauna Management Plan | Holsworthy, NSW | 2022–2023 | Senior Ecologist and Project Manager | Sarah was the lead ecologist for fieldwork; to update vegetation mapping across the site and include any areas of potential habitat for microbats. Providing technical advice to the Client and reporting of Flora and Fauna Management Plan, specifically for microbat management.

Ginninderra West Ecological Assessment | Canberra, ACT | 2023 | Senior Ecologist and Project Manager | Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing preliminary constraints reporting and scoping fieldwork for the MNES report and EIS. Mapping all vegetation zones and completing floristic plots to determine PCTs across the site. Targeted flora surveys and providing technical advice to the Client.

Gundary Solar Farm Biodiversity Development Assessment Report | Goulburn, NSW | 2022–2023 | Senior Ecologist and Project Manager | Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing preliminary constraints reporting and scoping fieldwork for DBAR to inform the EIS. Mapping all vegetation zones and completing BAM plots to determine PCTs across the site. Including targeted flora and fauna surveys under the relevant guidelines.

Surf Beach Flora and Fauna Report | Public Works Authority | Batemans Bay, NSW | 2022 | Senior Ecologist and Project Manager | Sarah was the Project manager and lead ecologist of vegetation and habitat impact assessment to compliment the REF for the Client. Mapping all vegetation zones and completing BAM plots to determine PCTs across the site. Undertaking spotlighting for nocturnal fauna and habitat assessments for all fauna species.

Goulburn River Solar Farm Biodiversity Development Assessment Report | Merriwa, NSW | 2022 | Senior Ecologist | Sarah completed BAM plots and ecology surveys across the site. Sarah also assisted in reporting for the BDAR, collating data and integrating into the biodiversity development assessment report.

Wattle Creek Wind Farm | Marulan, NSW | 2022 | Senior Ecologist | Sarah completed rapid vegetation plots and ecology fauna habitat surveys across the site. Sarah also completed the constraints reporting for the scoping report, collating data and integrating into the future biodiversity development assessment report.

Booroolong Wind Farm | NSW | 2022 | Senior Ecologist and field coordinator | Sarah completed logistics for a large field team over several seasons, to get safe access and discussions with landowners about access requirements and survey effort. Sarah also completed BAM plots and vegetation boundary mapping across the site to determine PCTs and survey for threatened flora.

Boronia Grove Biodiversity Assessment Report | Bokor Pty Ltd | Sydney | 2020 | Ecologist and Project manager | Sarah was the project manager and completed the report preparation for a small-scale BDAR. The project involved application of the Biodiversity Assessment Method (BAM) and Biodiversity Offset Scheme (BOS) under the Biodiversity Conservation Act 2016 (BC Act), including use of the BAM Calculator to determine offsetting requirements.

Flora and Fauna Assessment Reports | EPM Projects Pty Ltd | Sydney | 2019–2020 | Ecologist and Project manager | Sarah was the Project manager and lead ecologist of vegetation and habitat impact assessment to compliment the REF for the Client under a variety of legislations including SEPP44: Koala habitat protection and the State Environmental Planning Policy (Educational Establishment and Child Care Facilities). Managing internal multi-disciplinary teams (Aboriginal heritage, Aquatic ecology and European heritage).

Conservation and Biodiversity Stewardship Site Assessments (NSW)

The Molonglo Catchment Rehydration Initiative (BDAR) | Queanbeyan, NSW | 2022–2023 | Senior Ecologist and Project Manager | Sarah was the lead ecologist for fieldwork and reporting to complete vegetation mapping across the site and completing preliminary constraints reporting and scoping fieldwork for the BSSAR. Mapping all vegetation zones and completing BAM plots to determine PCTs across the site.

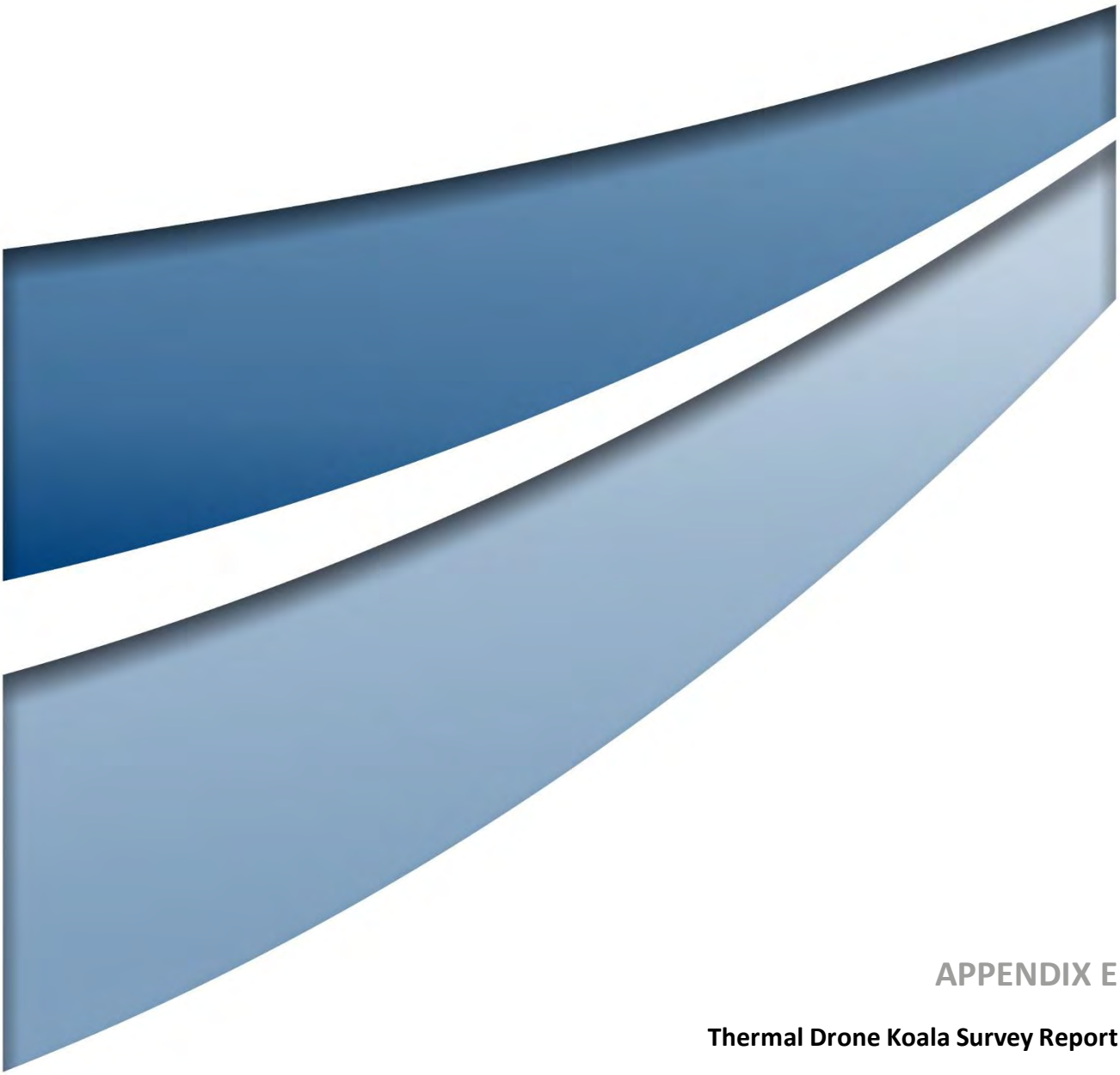
Mining Sector

Dendrobium Terrestrial Monitoring Program | South32 Illawarra Metallurgical Coal | Wollongong | 2020–2021 | Ecologist, Project Manager | Sarah was the lead ecologist for field assessments and monitoring (before, after, control and impact monitoring (BACI)) across the Dendrobium mining domain in the Southern Coalfields. Including replication of previous data collection (defined transects and quadrats, photo points and threatened frogs breeding pools), interpreting potential impacts to swamps and streams, threatened frog populations and any threatened flora in the area. Sarah was also the project manager tasks involving the logistics of equipment, scheduling multiple staff members, causal consultants and subcontractors, assisting the spatial data team with LiDAR and modelling deadlines for Upland Swamp monitoring targets. Sarah also completed the reporting and conducted meetings with the Client and internally.

Tahmoor Terrestrial Monitoring Program/ Tahmoor South Baselines Monitoring | SIMEC Mining | Tahmoor | 2018–2021 | Ecologist | Sarah was the lead ecologist for the terrestrial team and conducted baseline monitoring of vegetation and amphibian populations across several creeks within the three mining domains (Tahmoor Coal Western Domain, Redbank Creek and Tahmoor South). Using the NSW Biodiversity Assessment Methods (BAM) plots to maintain a standard methodology for ongoing monitoring of vegetative changes and standard transects to replicate amphibian surveys. The project involved biannual monitoring of control and impact sites, data analysis, as well as the preparation of spring and autumn monitoring reports, comparing before, after, control and impact sites (BACI), pre and post mining. Including replication of previous data collection and interpreting potential impacts to streams, threatened frog populations and any threatened flora in the area.

Ecological Rehabilitation Plans | South32 Illawarra Metallurgical Coal | Wollongong | 2019–2021 | Project Manager, Ecologist | Sarah was the project manager and lead ecologist to generate rehabilitation plans for each Coal Mining Exploration Program adhering to the WaterNSW approvals compliance conditions across various small-scale areas (>1ha per site) that created a mosaic within the Subject Area. Conducted field assessments of previously drilled exploration borehole locations across various programs within Water NSW water Catchment, using the NSW Biodiversity Assessment Methods (BAM) plots to maintain a standard methodology for ongoing monitoring of vegetative changes and local benchmark data collected for comparison and to allow patterns and trends at a Catchment level to be detected.

Annual Biodiversity Monitoring Program, Ventshaft No.6 Offset monitoring, WestCliff (Appin North) Emplacement Rehabilitation Area Monitoring | South32 Illawarra Metallurgical Coal | Appin | 2019–2021 | Botanist, Project Manager | Sarah was the project manager and lead Botanist in field assessments for biodiversity monitoring across a number of sites operated by South32 Illawarra Metallurgical Coal, including the Appin No. 6 Ventilation Shaft Offset Area, West Cliff (Appin North) Emplacement Rehabilitation Area and monitoring of *Persoonia hirsuta* population at West Cliff (Appin North) Colliery. Undertaking BioBanking plots, targeted threatened species searches for *Persoonia hirsuta*. Collating data and report writing with recommendations to better improve the system and reduce the impact to the surrounding areas.



APPENDIX E

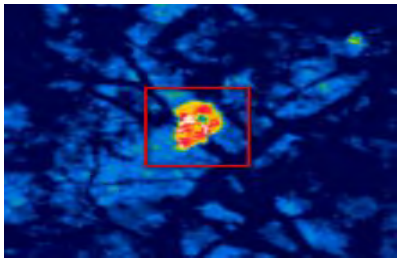
Thermal Drone Koala Survey Report

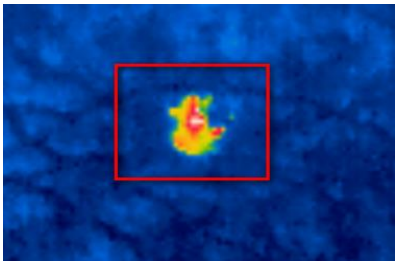
Thermal Drone Fauna Detection & Identification Log

Species/features	Time	Confirmed/unconfirmed	Image file #
11/7/2023	N1		
Bird	9:43:15 PM	Drone Confirmed	DJI_20231107214148_0001_S
Bird	9:44:53 PM	Drone Confirmed	DJI_20231107214446_0004_S
Bird	9:47:53 PM	Drone Confirmed	DJI_20231107214715_0007_S
Hollow	9:56:19 PM	Drone Confirmed	DJI_20231107215556_0010_S
Common Brushtail Possum	10:04:53 PM	Drone Confirmed	DJI_20231107220546_0016_Z
Hollow	10:07:52 PM	Drone Confirmed	DJI_20231107222706_0018_S
Common Brushtail Possum	10:28:07 PM	Drone Confirmed	DJI_20231107222706_0018_S
Hollow	10:29:35 PM	Drone Confirmed	DJI_20231107222923_0020_S
Common Brushtail Possum	10:53:16 PM	Drone Confirmed	DJI_20231107225240_0001_S
Common Brushtail Possum	10:54:21 PM	Drone Confirmed	DJI_20231107225401_0005_S
Bird	11:01:05 PM	Drone Confirmed	DJI_20231107230047_0008_Z
Bird	11:24:35 PM	Drone Confirmed	DJI_20231107232446_0005_S
Common Brushtail Possum	11:26:17 PM	Drone Confirmed	DJI_20231107232555_0008_S
Bird	11:37:11 PM	Drone Confirmed	DJI_20231107233704_0011_Z
Bird	11:40:12 PM	Drone Confirmed	DJI_20231107233950_0014_S
Hollow	11:42:22 PM	Drone Confirmed	DJI_20231107234209_0018_Z
Hollow	11:47:48 PM	Drone Confirmed	DJI_20231107234734_0019_Z
Common Brushtail Possum	12:16:14 AM	Drone Confirmed	DJI_20231108001631_0020_Z
Hollow	12:18:37 AM	Drone Confirmed	DJI_20231108001836_0022_Z
Hollow	12:19:27 AM	Drone Confirmed	DJI_20231108001920_0023_Z
Bird	12:20:39 AM	Drone Confirmed	DJI_20231108002030_0026_Z
Hollow	12:23:00 AM	Drone Confirmed	DJI_20231108002247_0027_Z
Hollow	12:40:28 AM	Drone Confirmed	DJI_20231108004008_0028_Z
Red-necked Wallaby	12:46:14 AM	Drone Confirmed	DJI_20231108004557_0031_Z
Bird	12:57:19 AM	Drone Confirmed	DJI_20231108005700_0033_Z
Bird	1:24:15 AM	Drone Confirmed	DJI_20231108012420_0002_Z
bird	1:40:19 AM	Drone Confirmed	DJI_20231108013959_0004_S
Bare-nosed Wombat	1:51:06 AM	Drone Confirmed	DJI_20231108015040_0009_S
Hollow	1:58:50 AM	Drone Confirmed	DJI_20231108015838_0013_Z
Hollow	2:00:48 AM	Drone Confirmed	DJI_20231108020037_0015_Z
Bird	2:04:14 AM	Drone Confirmed	DJI_20231108020341_0016_S
Bird	2:07:49 AM	Drone Confirmed	DJI_20231108020741_0018_Z
Bird	2:21:42 AM	Drone Confirmed	DJI_20231108022107_0021_Z
Bird	2:24:05 AM	Drone Confirmed	DJI_20231108022351_0023_Z
Bare-nosed Wombat	3:07:50 AM	Drone Confirmed	DJI_20231108030711_0001_S
Common Brushtail Possum	3:08:58 AM	Drone Confirmed	DJI_20231108030837_0002_Z
Bird	3:17:46 AM	Drone Confirmed	DJI_20231108031726_0006_Z
Bird	3:20:40 AM	Drone Confirmed	DJI_20231108032026_0009_Z
Macropod	3:22:58 AM	Drone Confirmed	NA

Common Brushtail Possum	3:23:35 AM	Drone Confirmed	DJI_20231108032321_0012_Z
Bird	3:27:27 AM	Drone Confirmed	DJI_20231108032717_0014_Z
Hollow	3:44:45 AM	Drone Confirmed	DJI_20231108034413_0001_Z
Bird	3:53:14 AM	Drone Confirmed	DJI_20231108035332_0002_S
Bird	4:48:35 AM	Drone Confirmed	DJI_20231108044816_0001_Z
bird	4:50:53 AM	Drone Confirmed	DJI_20231108035509_0006_Z
Common Brushtail Possum	4:54:00 AM	Drone Confirmed	DJI_20231108045342_0005_Z
bird	4:56:05 AM	Drone Confirmed	DJI_20231108045552_0008_Z
bird	4:58:14 AM	Drone Confirmed	DJI_20231108045800_0010_Z
Bird	5:00:42 AM	Drone Confirmed	DJI_20231108050037_0011_Z
Bird	5:01:37 AM	Drone Confirmed	DJI_20231108050121_0012_Z
Bird	5:03:43 AM	Drone Confirmed	DJI_20231108050339_0015_Z
Bird	5:09:50 AM	Drone Confirmed	DJI_20231108050928_0016_Z
Hollow	5:11:03 AM	Drone Confirmed	DJI_20231108051042_0020_Z
Bird	5:12:07 AM	Drone Confirmed	DJI_20231108051153_0021_Z
Bird	5:25:05 AM	Drone Confirmed	DJI_20231108052440_0022_Z
Bird	5:30:47 AM	Drone Confirmed	DJI_20231108053039_0026_Z
bird	5:37:44 AM	Drone Confirmed	DJI_20231108053807_0032_Z
Bird	5:45:29 AM	Drone Confirmed	DJI_20231108054519_0033_Z
Bird	5:47:26 AM	Drone Confirmed	DJI_20231108054722_0034_S
Bird	6:07:16 AM	Drone Confirmed	DJI_20231108060652_0037_Z
11/8/2023	**N2**		
Bird	9:02:11 PM	Drone Confirmed	DJI_20231108210227_0002_Z
Emu	9:03:58 PM	Drone Confirmed	DJI_20231108210350_0003_S
Common Brushtail Possum	9:09:42 PM	Drone Confirmed	DJI_20231108210935_0006_Z
Common Brushtail Possum	9:11:28 PM	Drone Confirmed	DJI_20231108211113_0008_Z
Hollow	9:12:10 PM	Drone Confirmed	DJI_20231108211156_0010_Z
Australian Owlet Nightjar	9:14:57 PM	Drone Confirmed	DJI_20231108211451_0013_Z
Bird	9:16:40 PM	Drone Confirmed	DJI_20231108211635_0018_Z
Bare-nosed Wombat	9:23:11 PM	Drone Confirmed	DJI_20231108212306_0019_Z
Red-necked Wallaby	9:25:27 PM	Drone Confirmed	DJI_20231108212522_0021_Z
Common Brushtail Possum	9:26:43 PM	Drone Confirmed	DJI_20231108212556_0022_S
Bird	9:31:44 PM	Drone Confirmed	DJI_20231108213114_0025_S
Hollow	9:34:27 PM	Drone Confirmed	DJI_20231108213353_0033_S
Bird	9:39:46 PM	Drone Confirmed	DJI_20231108213933_0035_S
Common Brushtail Possum	9:50:36 PM	Drone Confirmed	DJI_20231108215041_0049_Z
Hollow	9:55:43 PM	Drone Confirmed	DJI_20231108215545_0050_Z
Common Brushtail Possum	9:58:39 PM	Drone Confirmed	DJI_20231108215828_0052_Z
Bird	10:03:17 PM	Drone Confirmed	DJI_20231108220311_0054_S
Bird	10:23:39 PM	Drone Confirmed	DJI_20231108222251_0057_S
bird	10:24:31 PM	Drone Confirmed	DJI_20231108222427_0060_Z
Bird	10:26:55 PM	Drone Confirmed	DJI_20231108222652_0061_Z
Bird	10:27:40 PM	Drone Confirmed	DJI_20231108222738_0067_S
Common Brushtail Possum	10:30:55 PM	Drone Confirmed	DJI_20231108223046_0069_Z
Common Brushtail Possum	10:41:45 PM	Drone Confirmed	DJI_20231108224129_0073_S
Bird	10:45:25 PM	Drone Confirmed	DJI_20231108224519_0075_Z
Common Brushtail Possum	10:48:15 PM	Drone Confirmed	DJI_20231108224904_0077_Z
Common Brushtail Possum	10:49:13 PM	Drone Confirmed	NA

Bird	10:50:32 PM	Drone Confirmed	DJI_20231108225022_0078_S
Hollow	11:05:44 PM	Drone Confirmed	DJI_20231108230540_0081_Z
Hollow	11:09:37 PM	Drone Confirmed	DJI_20231108231000_0083_Z
Bird	11:18:11 PM	Drone Confirmed	DJI_20231108231702_0084_S
Bird	12:11:16 AM	Drone Confirmed	DJI_20231109001113_0001_Z
Hollow	12:15:47 AM	Drone Confirmed	DJI_20231109001533_0002_Z
Bird	12:22:13 AM	Drone Confirmed	DJI_20231109002209_0003_Z
Bird	12:29:31 AM	Drone Confirmed	DJI_20231109002923_0005_Z
Hollow	12:31:45 AM	Drone Confirmed	DJI_20231109003139_0006_Z
Bird	12:32:11 AM	Drone Confirmed	DJI_20231109003205_0008_S
Common Brushtail Possum	12:40:25 AM	Drone Confirmed	DJI_20231109004020_0011_Z
Bird	12:44:08 AM	Drone Confirmed	DJI_20231109004358_0014_Z
Bird	12:49:39 AM	Drone Confirmed	DJI_20231109004936_0016_Z
Bird	12:51:35 AM	Drone Confirmed	DJI_20231109005138_0018_S
Bird	1:21:03 AM	Drone Confirmed	DJI_20231109012126_0002_Z
Bare-nosed Wombat	1:35:24 AM	Drone Confirmed	DJI_20231109013516_0003_Z
Hollow	2:05:09 AM	Drone Confirmed	DJI_20231109020505_0005_Z
Hollow	2:14:46 AM	Drone Confirmed	DJI_20231109021443_0006_Z
Bird	2:16:06 AM	Drone Confirmed	DJI_20231109021602_0007_Z
Bird	2:26:28 AM	Drone Confirmed	DJI_20231109022631_0008_Z
Bird	2:40:20 AM	Drone Confirmed	DJI_20231109024010_0010_Z
Bird	2:46:06 AM	Drone Confirmed	DJI_20231109024538_0012_Z
Bird	2:47:01 AM	Drone Confirmed	NA
Bare-nosed Wombat	2:52:31 AM	Drone Confirmed	DJI_20231109025224_0014_S
Common Brushtail Possum	2:53:39 AM	Drone Confirmed	DJI_20231109025407_0017_Z
Common Brushtail Possum	2:54:14 AM	Drone Confirmed	NA
Red-necked Wallaby	2:55:39 AM	Drone Confirmed	DJI_20231109025517_0019_S
Common Brushtail Possum	3:03:19 AM	Drone Confirmed	DJI_20231109030303_0022_Z
Bird	3:05:59 AM	Drone Confirmed	DJI_20231109030553_0023_Z
Bird	3:07:32 AM	Drone Confirmed	DJI_20231109030745_0026_Z
Bird	3:10:12 AM	Drone Confirmed	DJI_20231109030943_0028_S
Bird	3:10:52 AM	Drone Confirmed	DJI_20231109031047_0030_Z
Bird	3:11:21 AM	Drone Confirmed	DJI_20231109031116_0031_Z
Hollow	3:12:45 AM	Drone Confirmed	DJI_20231109031239_0032_Z
Hollow	3:13:31 AM	Drone Confirmed	DJI_20231109031327_0034_Z
Bird	3:14:49 AM	Drone Confirmed	DJI_20231109031447_0036_Z
Bird	3:15:15 AM	Drone Confirmed	DJI_20231109031511_0038_Z
Bird	3:18:17 AM	Drone Confirmed	DJI_20231109031804_0039_Z
Bird	3:18:43 AM	Drone Confirmed	DJI_20231109031843_0040_Z
Hollow	3:35:44 AM	Drone Confirmed	NA
Pig	3:52:15 AM	Drone Confirmed	DJI_20231109035120_0042_S
Bird	5:05:05 AM	Drone Confirmed	DJI_20231109050500_0001_Z
Bird	5:06:54 AM	Drone Confirmed	NA
bird	5:14:33 AM	Drone Confirmed	DJI_20231109051418_0005_S
Bird	5:15:49 AM	Drone Confirmed	DJI_20231109051542_0009_Z





Goulburn River Solar Farm – Thermal Drone Koala Surveys

Prepared for Umwelt, 16 November 2023, Revised 12 January 2024

Wildlife Drones

Ripper Corp.

Table of Contents

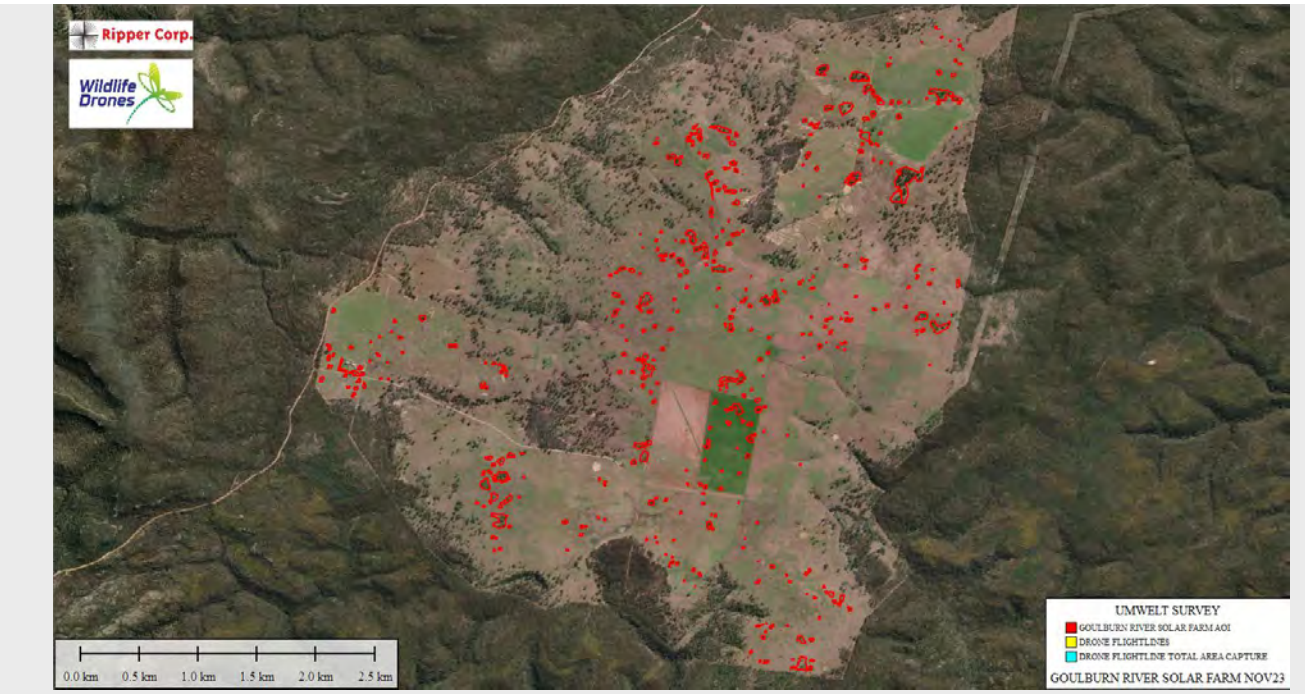
1. Introduction

Wildlife Drones were tasked with surveying for Koalas (*Phascolarctos cinereus*) and any species of Gliders detected, using professional grade drones and sensors including DJI XH20T, H20N or XT2 sensors.

1.1. Study site

Umwelt provided existing site information, our team attained additional survey information including; vegetation mapping, acoustic and nocturnal surveys to inform the priority habitat for koalas and gliders.

Map 1: Goulburn River Solar Farm AOI @ approximately 40ha



Topography	Cattle & Vegetated Land Areas
Land access by client	Granted
Land access by landholder	Granted
Site manager/contractor	Umwelt
Species to be detected	*Phascolarctos cinereus* (Koala) Various glider species

2. Methodology

A detailed site assessment was conducted across the project area to identify suitability for *Phascolarctos cinereus* (Koala) and various glider species thermal sensor surveys. Items considered included airspace, landfall and vegetation mass. Additional elements of influence regarding safe and successful flight also included risk management factors, CASA air law generally and RPA (Remotely Piloted Aircraft) standard operating procedures that may influence outcomes.

Thermal drone surveys were undertaken from 7th November to 9th November 2023 in accordance with Section 4.5 of the Koala Biodiversity Assessment Methodology Survey Guide (DPE 2022) as a minimum standard.

2.1. Desktop research

A desktop review was conducted based upon evidence from Umwelt regarding land usage and possible rehabilitation of regions within the survey area. Tree taxon considerations such as food, shelter or other resources were identified regarding abundance not only in the survey area but also in the surrounding region.

2.2. Drone survey methodology

Flight line direction	N-NW/S-SE (adjusted to corridor angle & site specific heliotropic angle corrections). Whilst generally these lines were observed, due to terrain differences, safety considerations and site configuration, flight direction was variable. Fence, creek and easement areas were surveyed with specific orientation to best optimise coverage.
Flight line overlap (side)	30-40%
Survey altitude (AGL)	60-70m AGL (adjusted to flight waterline areas, required adjustments due to slope changes and altitude difference between take off and mission areas)
Inspection altitude (AGL)	30m AGL above object
Detection method (a)	Hot spot alert
Detection method (b)	Shape detection
Detection method (c)	Characteristic trait
Detection method (d)	Drone infra-red thermal and colour zoom imagery with spotlight
Total flight area (ha)	552.63 ha
Total Koalas detected	No koalas detected
Flight speed	<6m/s to enable higher resolution image collection
Survey times	20:00 - 06:00 each night/morning at suitable temperatures
Survey nights	2 standard survey nights undertaken

Optimised flight line directions

Section 4.5 of the NSW government Biodiversity Assessment Methodology (BAM) (NSW DPE 2022) for surveying koalas using drones includes the use of grid flight patterns, which were used as the base format of these surveys. Although the direction of grid flights is not generally given much consideration industry wide, our extensive experience specialising in this form of targeted detection work highlights the benefits of very specific, directional flight lines for optimising fauna detection in natural variable habitats compared to standard methods. That is, our flight line direction takes into consideration both the heliotropic characteristics of native flora in which allows a much higher confidence spotting outcome, as well as following the terrain rise and fall and the relative look/sensor angle.

Large side overlap (30-40%) to ensure no data gaps

Peer reviewed research (e.g. Hamilton et al. 2020; Witt et al. 2020) have accepted a 10% side overlap, and the BAM method includes >30% side overlap based upon a 60-75m above ground flight altitude. However, in order to guarantee the most robust survey results where there are no possible gaps in the data, we always fly with 30-40% overlap taking into account frame width, lens length, height and other factors, including vegetation and terrain variability (rise and fall height of trees and other vegetation).

Superior thermal data – flight altitude, ground sampling distance & inspection altitudes

We use 19mm focal length thermal sensors which allow greater separation between the tree canopy and drone, making it not only safer in terms of drone flights, but also in terms of detecting and not disturbing wildlife. BAM and other similar methods discuss predominately using 13mm sensors flown at the same altitude, which would result in only 4-6 pixels per koala compared to 14-16 pixels per mature koala from our 19mm sensor at the same height (survey grid height). Therefore, our methods produce a higher likelihood of precise target animal detection and a larger, clearer resultant hotspots for each animal.

Ethical considerations

Inspections carried out upon hotspot detection are performed at no closer than 30m from the fauna for detection. Our team has found disturbance is observed within 25m of both captive and wild koalas during surveys in Queensland, Victoria and New South Wales and so we conduct our surveys further away than this.

In our operations, any disturbance observed other than expected during operations triggers the pilot to move away immediately from the koala, note information regarding the encounter and report back to our team ecologists for discussion. The fauna reaction to the drone is then considered, evaluated and improvements are integrated into our methods particularly around closer inspection for identification whereby we consider fauna wellbeing as a matter of priority, and our team remains vigilant in this regard throughout all survey efforts.

Temperature for flight operations

BAM methodology discusses a minimum overnight temperature of 18 deg, however, if the drone sensor has isothermal capability, the pilot can isolate temperature ranges. This limitation on surveys has been adjusted with isotherm capable drones to a minimum overnight temperature of 25 deg.

Testing regarding temperature ranges and Koalas is continually occurring based upon new sensors, detection methods etc. Our pilots regularly test temperature isolation and other methodology-based aspects, and have compared to simultaneous ground based surveys, with results indicating that the drone detections outperforms ground-based surveys with 50-100% increased detection rate of koalas (pers. comm., Jamie Holyoak 2023).

2.3. Equipment

Enterprise grade drone equipment and sensors

Drones	DJI Matrice 300
Thermal & RGB sensors	DJI XH20T, DJI H20N, DJI XT2 Thermal sensitivity: ≤50 mK • Spectral range: LWIR or 8–14 µm • Thermal resolution: ≥640 x 512 px • Focal length: 19 mm • Frame capture rate: ≥30 Hz
• The H20T sensor was used for all specific fauna inspection occurrences. Sensor automatic calibrations occurred every minute of operation with additional calibrations manually performed as needed.	
• 22 inch, high contrast screens were used to project controller imagery/video to a larger screen allowing higher detail and quicker confirmation of species for detection.	

2.4. Detection evidence

Hotspot detection

Hotspot detection is the primary detection metric whilst at survey altitude, with a hot spot alert in place, this also detects fauna of a temperature higher than the surrounding environment. Isothermic methods are also used within the detection process at survey altitude which allows isolation of specific temperature ranges in which one may reasonably expect to detect koalas. Considerations are made regarding ambient temperature, thermal drop off/radiation loss through the night, previous day temperature, humidity and object reflectance mitigation.

Our thermal sensors allow certain false positives to be mostly removed through heat reflectance masking on specific object types, such as certain eucalypt trunk verities, termite mounds and other miscellaneous objects. Existing peer review academic methods generally do no utilise isothermic methods, as the smaller drones used do not have this feature available.

Our team use Enterprise grade drones and sensors for all of our fauna detection operations. Where available, a passive spotlight detection is used to rapidly confirm in RGB/colour what species has been detected by the initial thermal sensor. This recent innovation, has allowed much shorter time periods of loiter regarding the drone around fauna for inspection thus reducing any possible impacts that prolonged drone inspection may produce. Our team generally does not loiter on a fauna inspection target for any more than two minutes in any single inspection effort per animal.

Combined hot spot, characteristic traits (shape, ears, arms, legs, movement), allow the pilot to gather suitable evidence in an effort to determine fauna type with the use of a spotlight to confirm.

Detection validations & species confirmation:

Our team utilises spotlighting from the drone to confirm species detected whilst airborne. This has generally removed the requirement for follow-up post-survey validation from on the ground. Where there is any uncertainty ground-validations can be undertaken where access to the site is possible, or repeat surveys of the location may be undertaken. A colour image of the species detected is captured upon detection as documented validation of the animals observed. Generally, the team will only capture the target species for detection (koala in this case), however, a base capture of other fauna is catalogued during operations to demonstrate the diversity of fauna that are present at the site. Our team generally collects sample imagery and video of non-target fauna, which articulates what was visible during the survey effort. Not all non target species are collected during the surveys, instead collected at intervals or noted in our fauna ID list.

Calibration and field testing:

Our team utilise several established test ranges with known koala populations to confirm both the sensor quality, settings and other considerations. These ranges also allow our pilots the capability to be trained in a controlled and known environment which senior pilots may grade and determine their suitability for commercial operations. All pilots generally perform testing at least once a month where not field spotting koalas for our commercial clients and partners to maintain well-honed skills and observation abilities.

3. Survey Results

Our team surveyed all survey areas across the site over four nights (two nights with two drones) from 07/11/2023-09/11/2023. This included a total of 37 flights and a total of:

- 175.87km travelled by the drone
- 420 individual polygon search areas
- 10 different take-off and landing locations utilised

Weather conditions were stable throughout the survey period. There were no incidents reported during the surveys from an aviation perspective. There was reasonable access to all areas and so all proposed flight areas were surveyed.

3.1. Detection evidence

Koala & glider detections
No koalas or gliders were detected during these comprehensive surveys.

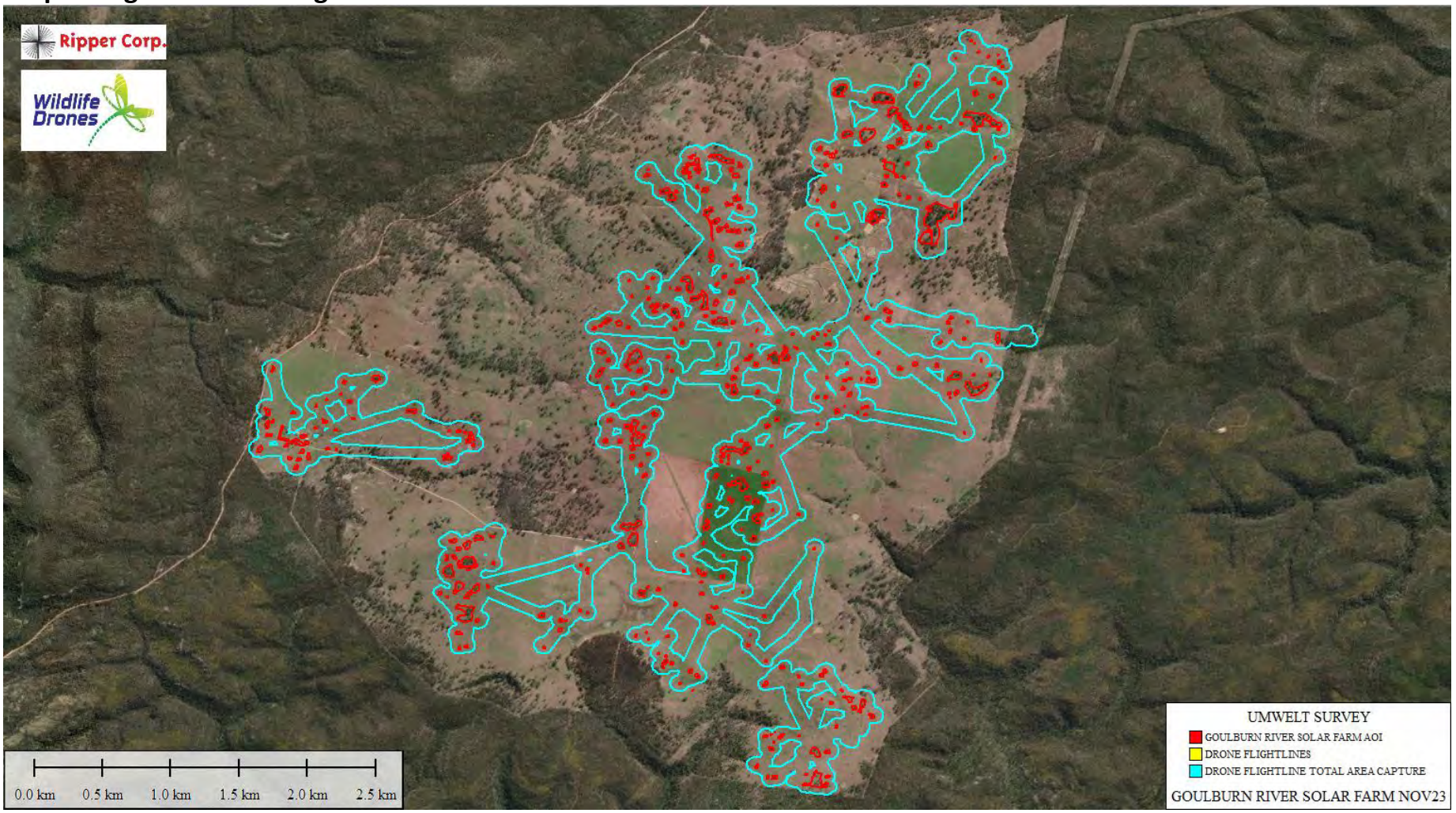
Other wildlife detected
Our pilots use an excel spreadsheet to make wildlife observation notes during all surveys. This document is included with the data collected for these surveys.

The diversity of animals detected and recorded provides evidence of the comprehensive nature of our surveys and illustrates successful detection of an array of wildlife, including a variety of animals with different shapes, sizes and temperature signatures. An example of the data captured on the spreadsheet is provided below:

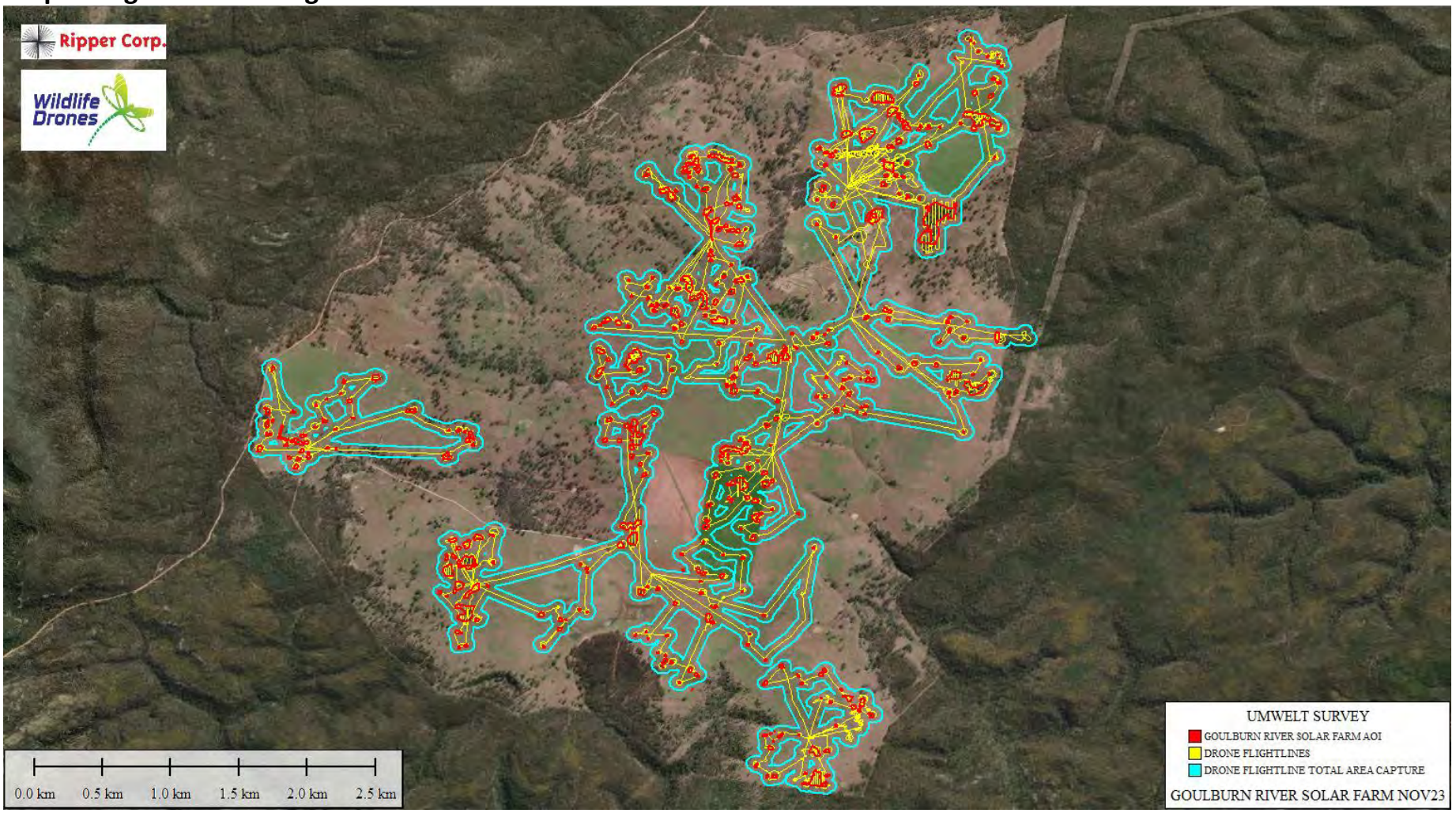
Species	Time	Date/Notes	Confirmed/uncont	Lat/	Pin	Image	File #	Est.	Abnor
		2023-07-12				FALSE			No
Macropod	1:19:07 AM				1	TRUE			No
Macropod	1:30:46 AM				2	TRUE			No
Possum Brushtail	1:35:00 AM				3	TRUE			No
Possum Brushtail	1:39:08 AM				4	TRUE			No
Bird	2:57:55 AM				5	TRUE			No
Bird	3:14:13 AM				6	TRUE			No
Bird	4:42:53 AM				7	TRUE			No

Species images can be found by sorting the file names by time/date and finding the ones that correspond to species on the spreadsheet.

Map 2: Flight area coverage



Map 3: Flight line coverage



3.2. Examples of non-target species detected

Common Brushtail Possums


2023-11-07 23:26:16
32.291804°S 150.085480°E 497.040m


2023-11-08 21:11:20
32.268757°S 150.093900°E 456.954m


2023-11-07 22:29:57
32.284263°S 150.085449°E 442.126m


2023-11-08 21:26:42
32.266792°S 150.100450°E 485.973m

Roosted birds

..


2023-11-08 01:40:20
32.295039°S 150.097099°E 485.925m


2023-11-08 03:27:17
32.305332°S 150.108467°E 517.420m


2023-11-08 04:58:00
32.287928°S 150.103926°E 501.314m


2023-11-08 05:00:37
32.287824°S 150.103140°E 508.120m

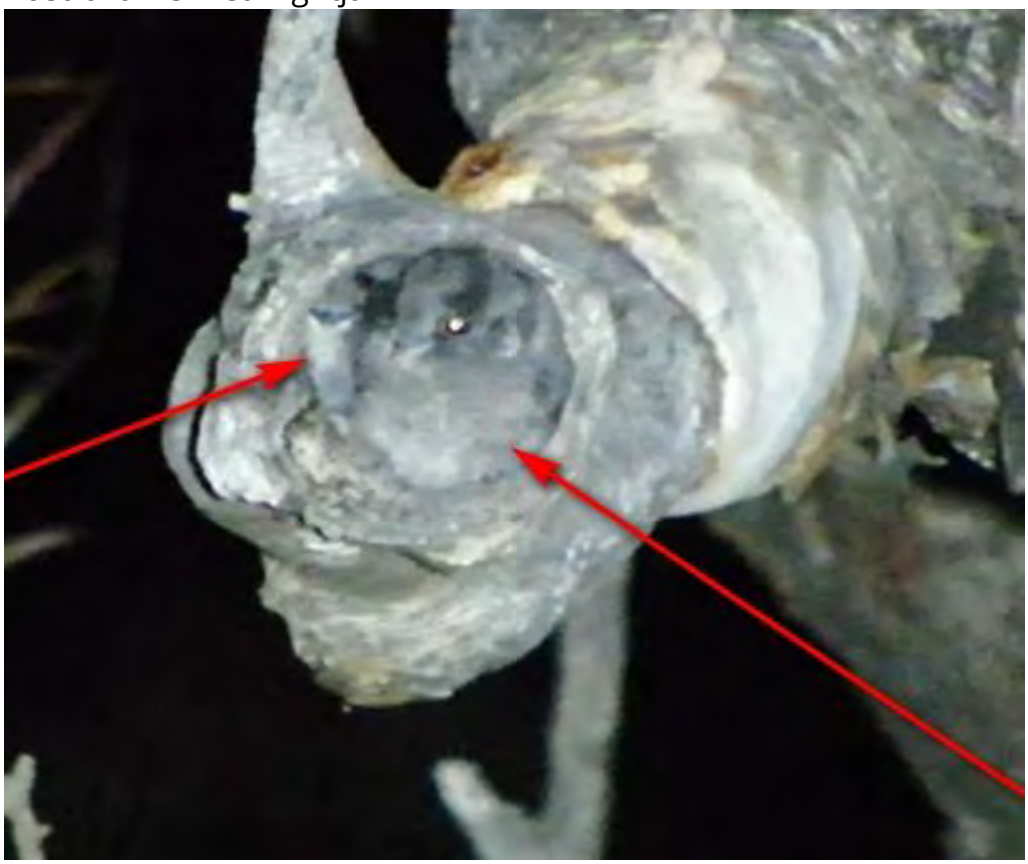

2023-11-08 05:38:07
32.282935°S 150.109729°E 483.562m


2023-11-08 21:31:38
32.265991°S 150.100545°E 465.581m


2023-11-08 22:24:27
32.277161°S 150.102910°E 502.920m


2023-11-09 05:14:24
32.281805°S 150.098593°E 493.017m

Australian Owlet Nightjar



Red-necked Wallaby

Bare-nosed Wombats


2023-11-08 03:07:29
32.307822°S 150.109094°E 490.502m

Feral Pigs


2023-11-09 03:52:00
32.260068°S 150.118732°E 442.556m

Field operations:

4. Conclusion

Although the aerial surveys did not find any koalas or gliders, a range of other native and feral species were detected and identified as a result of the comprehensive survey coverage across the site.

5. References

- Hamilton G, Corcoran E, Denman S, Hennekam ME and Koh LP (2020), When you can't see the koalas for the trees: Using drones and machine learning in complex environments, Biological Conservation, vol.247, p.108598, https://doi.org/10.1016/j.biocon.2020.108598
- NSW DPE (2022) Biodiversity Assessment Methodology https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/koala-phascolarctos-cinereus-biodiversity-assessment-method-survey-guide-220249.pdf)
- Witt RR, Beranek CT, Howell LG, Ryan SA, Clulow J, Jordan NR, Denholm B and Roff A (2020), Real-time drone derived thermal imagery outperforms traditional survey methods for an arboreal forest mammal, PLoS ONE, vol.15, no.11: e0242204, https://doi.org/10.1371/journal.pone.0242204.

Please use the below email addresses to obtain any other relevant files used in this assessment, or if you have any questions.

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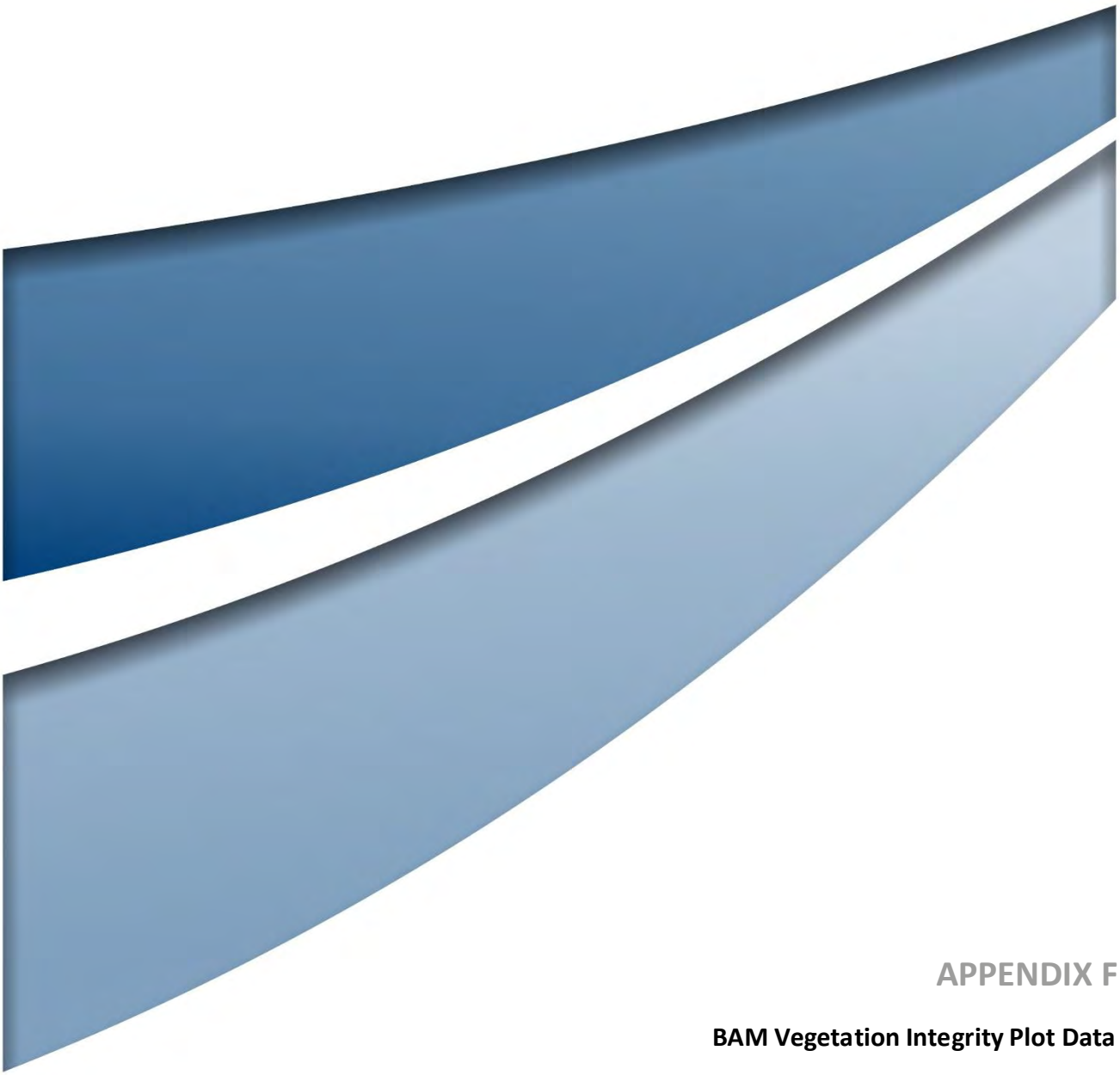


APPENDIX F

BAM Vegetation Integrity Plot Data

Appendix F BAM Plot Data

F.1 Flora Species List

BAM Growth Form Group	Family	Scientific Name	Common Name
Tree (TG)	Casuarinaceae	*Allocasuarina luehmannii*	Bulloak
Tree (TG)	Fabaceae (Mimosoideae)	*Acacia salicina*	Cooba
Tree (TG)	Malvaceae	*Brachychiton populneus*	Kurrajong
Tree (TG)	Myrtaceae	*Eucalyptus albens*	White Box
Tree (TG)	Myrtaceae	*Eucalyptus albens <--> moluccana*	
Tree (TG)	Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark
Tree (TG)	Oleaceae	*Notelaea microcarpa*	Native Olive
Shrub (SG)	Asteraceae	*Cassinia sifton*	
Shrub (SG)	Chenopodiaceae	*Atriplex semibaccata*	Creeping Saltbush
Shrub (SG)	Chenopodiaceae	*Atriplex sp.*	
Shrub (SG)	Chenopodiaceae	*Maireana microphylla*	Small-leaf Bluebush
Shrub (SG)	Chenopodiaceae	*Salsola tragus*	Buckbush,Soft Rolpoly, Saltwort
Shrub (SG)	Ericaceae	*Lissanthe strigosa*	Peach Heath
Shrub (SG)	Fabaceae (Caesalpinioideae)	*Senna artemisioides subsp. zygophylla*	
Shrub (SG)	Fabaceae (Faboideae)	*Bossiaea buxifolia*	
Shrub (SG)	Fabaceae (Faboideae)	*Daviesia genistifolia*	Broom Bitter Pea
Shrub (SG)	Fabaceae (Faboideae)	*Indigofera adesmiifolia*	Tick Indigo
Shrub (SG)	Fabaceae (Faboideae)	*Indigofera australis*	Australian Indigo
Shrub (SG)	Fabaceae (Mimosoideae)	*Acacia paradoxa*	Kangaroo Thorn
Shrub (SG)	Fabaceae (Mimosoideae)	*Acacia parvipinnula*	Silver-stemmed Wattle
Shrub (SG)	Malvaceae	*Abutilon oxycarpum*	Straggly Lantern-bush
Shrub (SG)	Malvaceae	*Commersonia fraseri*	Brush Kurrajong
Shrub (SG)	Sapindaceae	*Dodonaea viscosa subsp. cuneata*	Wedge-leaf Hop-bush

BAM Growth Form Group	Family	Scientific Name	Common Name
Shrub (SG)	Scrophulariaceae	*Eremophila debilis*	Amulla
Shrub (SG)	Solanaceae	*Solanum brownii*	Violet Nightshade
Shrub (SG)	Solanaceae	*Solanum cinereum*	Narrawa Burr
Shrub (SG)	Thymelaeaceae	*Pimelea curviflora*	Rice Flower
Shrub (SG)	Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower
Grass & grasslike (GG)	Cyperaceae	*Carex appressa*	Tall Sedge
Grass & grasslike (GG)	Cyperaceae	*Carex inversa*	Knob Sedge
Grass & grasslike (GG)	Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge
Grass & grasslike (GG)	Cyperaceae	*Cyperus laevis*	
Grass & grasslike (GG)	Cyperaceae	*Cyperus sp.*	
Grass & grasslike (GG)	Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge
Grass & grasslike (GG)	Cyperaceae	*Fimbristylis sp.*	
Grass & grasslike (GG)	Cyperaceae	*Gahnia aspera*	Rough Saw-sedge
Grass & grasslike (GG)	Juncaceae	*Juncus sp.*	
Grass & grasslike (GG)	Juncaceae	*Juncus usitatus*	
Grass & grasslike (GG)	Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush
Grass & grasslike (GG)	Lomandraceae	*Lomandra filiformis subsp. coriacea*	Wattle Matt-rush
Grass & grasslike (GG)	Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Grass & grasslike (GG)	Lomandraceae	*Lomandra sp.*	Mat-rush
Grass & grasslike (GG)	Poaceae	*Anthosachne scabra*	Wheatgrass, Common Wheatgrass
Grass & grasslike (GG)	Poaceae	*Aristida ramosa*	Purple Wiregrass
Grass & grasslike (GG)	Poaceae	*Aristida sp.*	
Grass & grasslike (GG)	Poaceae	*Aristida vagans*	Threeawn Speargrass
Grass & grasslike (GG)	Poaceae	*Austrostipa bigeniculata*	Yanganbil
Grass & grasslike (GG)	Poaceae	*Austrostipa scabra*	Speargrass
Grass & grasslike (GG)	Poaceae	*Austrostipa sp.*	
Grass & grasslike (GG)	Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass
Grass & grasslike (GG)	Poaceae	*Bothriochloa decipiens var. decipiens*	Pitted Bluegrass
Grass & grasslike (GG)	Poaceae	*Bothriochloa macra*	Red Grass
Grass & grasslike (GG)	Poaceae	*Bothriochloa sp.*	Redgrass, Bluegrass

BAM Growth Form Group	Family	Scientific Name	Common Name
Grass & grasslike (GG)	Poaceae	*Bromus sp.*	
Grass & grasslike (GG)	Poaceae	*Chloris truncata*	Windmill Grass
Grass & grasslike (GG)	Poaceae	*Chloris ventricosa*	Tall Chloris
Grass & grasslike (GG)	Poaceae	*Cymbopogon refractus*	Barbed Wire Grass
Grass & grasslike (GG)	Poaceae	*Cynodon dactylon*	Common Couch
Grass & grasslike (GG)	Poaceae	*Dactyloctenium radulans*	Button Grass
Grass & grasslike (GG)	Poaceae	*Dichanthium sericeum*	Queensland Bluegrass
Grass & grasslike (GG)	Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass
Grass & grasslike (GG)	Poaceae	*Dichelachne sp.*	
Grass & grasslike (GG)	Poaceae	*Digitaria brownii*	Cotton Panic Grass
Grass & grasslike (GG)	Poaceae	*Digitaria diffusa*	Open Summer-grass
Grass & grasslike (GG)	Poaceae	*Digitaria divaricatissima*	Umbrella Grass
Grass & grasslike (GG)	Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass
Grass & grasslike (GG)	Poaceae	*Digitaria ramularis*	Finger Panic Grass
Grass & grasslike (GG)	Poaceae	*Digitaria sp.*	
Grass & grasslike (GG)	Poaceae	*Echinochloa colona*	Awnless Barnyard Grass
Grass & grasslike (GG)	Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass
Grass & grasslike (GG)	Poaceae	*Elymus sp.*	
Grass & grasslike (GG)	Poaceae	*Enneapogon gracilis*	Slender Nineawn
Grass & grasslike (GG)	Poaceae	*Enneapogon nigricans*	Nine-awn Grass
Grass & grasslike (GG)	Poaceae	*Entolasia marginata*	Bordered Panic
Grass & grasslike (GG)	Poaceae	*Entolasia stricta*	Wiry Panic
Grass & grasslike (GG)	Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Grass & grasslike (GG)	Poaceae	*Eragrostis elongata*	Clustered Lovegrass
Grass & grasslike (GG)	Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass
Grass & grasslike (GG)	Poaceae	*Eragrostis parviflora*	Weeping Lovegrass
Grass & grasslike (GG)	Poaceae	*Eragrostis sp.*	
Grass & grasslike (GG)	Poaceae	*Eragrostis trachycarpa*	
Grass & grasslike (GG)	Poaceae	*Eriochloa australiensis*	Australian Cupgrass
Grass & grasslike (GG)	Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass
Grass & grasslike (GG)	Poaceae	*Eriochloa sp.*	

BAM Growth Form Group	Family	Scientific Name	Common Name
Grass & grasslike (GG)	Poaceae	*Eulalia aurea*	Silky Browntop
Grass & grasslike (GG)	Poaceae	*Microlaena stipoides*	Weeping Grass
Grass & grasslike (GG)	Poaceae	*Microlaena stipoides var. breviseta*	
Grass & grasslike (GG)	Poaceae	*Microlaena stipoides var. stipoides*	Weeping Grass
Grass & grasslike (GG)	Poaceae	*Panicum effusum*	Hairy Panic
Grass & grasslike (GG)	Poaceae	*Panicum simile*	Two-colour Panic
Grass & grasslike (GG)	Poaceae	*Paspalidium distans*	
Grass & grasslike (GG)	Poaceae	*Paspalidium sp.*	
Grass & grasslike (GG)	Poaceae	*Poa labillardierei var. labillardierei*	Tussock
Grass & grasslike (GG)	Poaceae	*Poa sieberiana*	Snowgrass
Grass & grasslike (GG)	Poaceae	*Poa sp.*	
Grass & grasslike (GG)	Poaceae	*Rytidosperma racemosum*	Wallaby Grass
Grass & grasslike (GG)	Poaceae	*Rytidosperma sp.*	
Grass & grasslike (GG)	Poaceae	*Rytidosperma tenuius*	
Grass & grasslike (GG)	Poaceae	*Setaria sp.*	
Grass & grasslike (GG)	Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Grass & grasslike (GG)	Poaceae	*Sporobolus sp.*	Rat's Tail Couch
Grass & grasslike (GG)	Poaceae	*Themeda triandra*	
Grass & grasslike (GG)	Poaceae	*Tragus australianus*	Small Burrgrass
Grass & grasslike (GG)	Poaceae	*Urochloa piligera*	Hairy Armgrass
Grass & grasslike (GG)	Poaceae	*Urochloa sp.*	
Forb (FG)	Acanthaceae	*Brunoniella pumilio*	Dwarf Blue Trumpet
Forb (FG)	Acanthaceae	*Rostellularia adscendens*	Pink Tongues
Forb (FG)	Amaranthaceae	*Alternanthera sp.*	Joyweed
Forb (FG)	Anthericaceae	*Caesia parviflora*	Pale Grass-lily
Forb (FG)	Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily
Forb (FG)	Apiaceae	*Daucus glochidiatus*	Native Carrot
Forb (FG)	Apiaceae	*Xanthosia pilosa*	Woolly Xanthosia
Forb (FG)	Asparagaceae	*Arthropodium milleflorum*	Pale Vanilla-lily
Forb (FG)	Asparagaceae	*Arthropodium sp.*	
Forb (FG)	Asparagaceae	*Dichopogon fimbriatus*	
Forb (FG)	Asparagaceae	*Dichopogon sp.*	

BAM Growth Form Group	Family	Scientific Name	Common Name
Forb (FG)	Asphodelaceae	*Dianella sp.*	
Forb (FG)	Asteraceae	*Argyrotegium poliochlorum*	
Forb (FG)	Asteraceae	*Calotis anthemoides*	Cut-leaved Burr-daisy
Forb (FG)	Asteraceae	*Calotis cuneifolia*	Purple Burr-Daisy
Forb (FG)	Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy
Forb (FG)	Asteraceae	*Calotis sp.*	
Forb (FG)	Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting
Forb (FG)	Asteraceae	*Cotula australis*	Common Cotula
Forb (FG)	Asteraceae	*Cymbonotus sp.*	
Forb (FG)	Asteraceae	*Euchiton involucratus*	Star Cudweed
Forb (FG)	Asteraceae	*Euchiton sp.*	
Forb (FG)	Asteraceae	*Euchiton sphaericus*	Star Cudweed
Forb (FG)	Asteraceae	*Senecio pinnatifolius*	
Forb (FG)	Asteraceae	*Senecio sp.*	Groundsel, Fireweed
Forb (FG)	Asteraceae	*Sigesbeckia australiensis*	
Forb (FG)	Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Forb (FG)	Asteraceae	*Solenogyne sp.*	
Forb (FG)	Asteraceae	*Sonchus sp.*	Sowthistle
Forb (FG)	Asteraceae	*Triptilodiscus pygmaeus*	Common Sunray
Forb (FG)	Asteraceae	*Vittadinia cuneata*	
Forb (FG)	Asteraceae	*Vittadinia muelleri*	
Forb (FG)	Asteraceae	*Vittadinia sp.*	Fuzzweed
Forb (FG)	Asteraceae	*Xerochrysum sp.*	
Forb (FG)	Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
Forb (FG)	Campanulaceae	*Wahlenbergia gracilis*	Sprawling Bluebell
Forb (FG)	Campanulaceae	*Wahlenbergia luteola*	Bluebell
Forb (FG)	Campanulaceae	*Wahlenbergia sp.*	Bluebell
Forb (FG)	Campanulaceae	*Wahlenbergia stricta*	Tall Bluebell
Forb (FG)	Chenopodiaceae	*Atriplex spinibractea*	Spiny-fruit Saltbush
Forb (FG)	Chenopodiaceae	*Dysphania pumilio*	Small Crumbweed
Forb (FG)	Chenopodiaceae	*Dysphania sp.*	

BAM Growth Form Group	Family	Scientific Name	Common Name
Forb (FG)	Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Forb (FG)	Chenopodiaceae	*Einadia nutans*	Climbing Saltbush
Forb (FG)	Chenopodiaceae	*Einadia polygonoides*	Knotweed Goosefoot
Forb (FG)	Chenopodiaceae	*Einadia sp.*	
Forb (FG)	Clusiaceae	*Hypericum gramineum*	Small St John's Wort
Forb (FG)	Clusiaceae	*Hypericum japonicum*	
Forb (FG)	Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Forb (FG)	Convolvulaceae	*Dichondra repens*	Kidney Weed
Forb (FG)	Convolvulaceae	*Evolvulus alsinoides*	Bindweed
Forb (FG)	Crassulaceae	*Crassula sieberiana*	Australian Stonecrop
Forb (FG)	Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed
Forb (FG)	Fabaceae (Faboideae)	*Bossiaea prostrata*	
Forb (FG)	Fabaceae (Faboideae)	*Hovea linearis*	
Forb (FG)	Fabaceae (Faboideae)	*Zornia dyctiocarpa var. dyctiocarpa*	Zornia
Forb (FG)	Geraniaceae	*Erodium crinitum*	Blue Crowfoot
Forb (FG)	Geraniaceae	*Geranium homeanum*	
Forb (FG)	Geraniaceae	*Geranium solanderi*	Native Geranium
Forb (FG)	Geraniaceae	*Geranium sp.*	
Forb (FG)	Goodeniaceae	*Goodenia pinnatifida*	Scrambles Eggs
Forb (FG)	Haloragaceae	*Haloragis heterophylla*	Variable Raspwort
Forb (FG)	Lamiaceae	*Mentha satureioides*	Native Pennyroyal
Forb (FG)	Linaceae	*Linum marginale*	Native Flax
Forb (FG)	Malvaceae	*Sida cordifolia*	
Forb (FG)	Malvaceae	*Sida corrugata*	Corrugated Sida
Forb (FG)	Malvaceae	*Sida cunninghamii*	Ridge Sida
Forb (FG)	Malvaceae	*Sida sp.*	
Forb (FG)	Nyctaginaceae	*Boerhavia dominii*	Tarvine
Forb (FG)	Onagraceae	*Epilobium billardierianum*	
Forb (FG)	Onagraceae	*Epilobium sp.*	
Forb (FG)	Oxalidaceae	*Oxalis perennans*	

BAM Growth Form Group	Family	Scientific Name	Common Name
Forb (FG)	Oxalidaceae	*Oxalis sp.*	
Forb (FG)	Phyllanthaceae	*Phyllanthus virgatus*	Wiry Spurge
Forb (FG)	Plantaginaceae	*Plantago debilis*	Shade Plantain
Forb (FG)	Plantaginaceae	*Plantago gaudichaudii*	Narrow Plantain
Forb (FG)	Plantaginaceae	*Plantago sp.*	Plantain
Forb (FG)	Plantaginaceae	*Plantago varia*	
Forb (FG)	Plantaginaceae	*Veronica plebeia*	Trailing Speedwell
Forb (FG)	Plantaginaceae	*Veronica sp.*	
Forb (FG)	Polygonaceae	*Rumex brownii*	Swamp Dock
Forb (FG)	Polygonaceae	*Rumex sp.*	Dock
Forb (FG)	Portulacaceae	*Portulaca oleracea*	Pigweed
Forb (FG)	Portulacaceae	*Portulaca sp.*	
Forb (FG)	Rubiaceae	*Asperula conferta*	Common Woodruff
Forb (FG)	Rubiaceae	*Galium sp.*	
Forb (FG)	Rubiaceae	*Pomax umbellata*	Pomax
Forb (FG)	Solanaceae	*Solanum prinophyllum*	Forest Nightshade
Forb (FG)	Solanaceae	*Solanum sp.*	
Forb (FG)	Verbenaceae	*Verbena sp.*	
Fern (EG)	Ophioglossaceae	*Ophioglossum sp.*	
Fern (EG)	Pteridaceae	*Cheilanthes distans*	Bristly Cloak Fern
Fern (EG)	Pteridaceae	*Cheilanthes sieberi*	Rock Fern
Fern (EG)	Pteridaceae	*Cheilanthes sp.*	Cloak Fern, Mulga Fern, Rock Fern
Other (OG)	Apocynaceae	*Marsdenia viridiflora*	Native Pear
Other (OG)	Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*	Native Pear
Other (OG)	Convolvulaceae	*Convolvulus angustissimus*	
Other (OG)	Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Other (OG)	Fabaceae (Faboideae)	*Desmodium sp.*	Tick-trefoil
Other (OG)	Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine
Other (OG)	Fabaceae (Faboideae)	*Glycine clandestina (broad leaf form)*	Scott's Head Broad-Leaved Glycine

BAM Growth Form Group	Family	Scientific Name	Common Name
Other (OG)	Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine
Other (OG)	Fabaceae (Faboideae)	*Grona sp.*	
Other (OG)	Fabaceae (Faboideae)	*Grona varians*	
Other (OG)	Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla
Other (OG)	Fabaceae (Faboideae)	*Oxytes brachypoda*	Large Tick-trefoil
Other (OG)	Loranthaceae	*Amyema sp.*	Mistletoe
Exotic (HTE)	Amaranthaceae	*Alternanthera pungens*	Khaki Weed
Exotic (HTE)	Asteraceae	*Bidens pilosa*	Cobbler's Pegs
Exotic (HTE)	Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks
Exotic (HTE)	Asteraceae	*Carthamus lanatus*	Saffron Thistle
Exotic (HTE)	Asteraceae	*Senecio madagascariensis*	Fireweed
Exotic (HTE)	Asteraceae	*Xanthium spinosum*	Bathurst Burr
Exotic (HTE)	Clusiaceae	*Hypericum perforatum*	St. Johns Wort
Exotic (HTE)	Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge
Exotic (HTE)	Iridaceae	*Romulea rosea var. australis*	Onion Grass
Exotic (HTE)	Poaceae	*Cenchrus clandestinus*	Kikuyu Grass
Exotic (HTE)	Poaceae	*Chloris gayana*	Rhodes Grass
Exotic (HTE)	Poaceae	*Paspalum dilatatum*	Paspalum
Exotic (HTE)	Polygonaceae	*Acetosella vulgaris*	Sheep Sorrel
Exotic (non HTE)	Amaranthaceae	*Amaranthus powellii*	Powell's Amaranth
Exotic (non HTE)	Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed
Exotic (non HTE)	Apiaceae	*Cyclospermum leptophyllum*	Slender Celery
Exotic (non HTE)	Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush
Exotic (non HTE)	Asteraceae	*Arctotheca calendula*	Capeweed
Exotic (non HTE)	Asteraceae	*Aster sp.*	
Exotic (non HTE)	Asteraceae	*Carduus pycnocephalus*	Slender Thistle
Exotic (non HTE)	Asteraceae	*Carduus tenuiflorus*	Winged Slender Thistle
Exotic (non HTE)	Asteraceae	*Carthamus dentatus*	Toothed Thistle

BAM Growth Form Group	Family	Scientific Name	Common Name
Exotic (non HTE)	Asteraceae	*Chondrilla juncea*	Skeleton Weed
Exotic (non HTE)	Asteraceae	*Cirsium vulgare*	Spear Thistle
Exotic (non HTE)	Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane
Exotic (non HTE)	Asteraceae	*Conyza sp.*	
Exotic (non HTE)	Asteraceae	*Crepis capillaris*	Smooth Hawksbeard
Exotic (non HTE)	Asteraceae	*Gamochaeta calviceps*	Cudweed
Exotic (non HTE)	Asteraceae	*Gamochaeta purpurea*	Purple Cudweed
Exotic (non HTE)	Asteraceae	*Gamochaeta sp.*	
Exotic (non HTE)	Asteraceae	*Hypochaeris radicata*	Catsear
Exotic (non HTE)	Asteraceae	*Hypochaeris sp.*	
Exotic (non HTE)	Asteraceae	*Lactuca saligna*	Willow-leaved Lettuce
Exotic (non HTE)	Asteraceae	*Lactuca serriola*	Prickly Lettuce
Exotic (non HTE)	Asteraceae	*Schkuhria pinnata*	Dwarf Marigold
Exotic (non HTE)	Asteraceae	*Schkuhria pinnata var. abrotanoides*	Dwarf Marigold
Exotic (non HTE)	Asteraceae	*Senecio vulgaris*	
Exotic (non HTE)	Asteraceae	*Silybum marianum*	Variegated Thistle
Exotic (non HTE)	Asteraceae	*Sonchus oleraceus*	Common Sowthistle
Exotic (non HTE)	Asteraceae	*Tagetes minuta*	Stinking Roger
Exotic (non HTE)	Asteraceae	*Taraxacum officinale*	Dandelion
Exotic (non HTE)	Boraginaceae	*Echium plantagineum*	Patterson's Curse
Exotic (non HTE)	Brassicaceae	*Capsella bursa-pastoris*	Shepherd's Purse
Exotic (non HTE)	Brassicaceae	*Lepidium africanum*	Common Peppercress
Exotic (non HTE)	Cactaceae	*Opuntia stricta*	Common Prickly Pear
Exotic (non HTE)	Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow
Exotic (non HTE)	Caryophyllaceae	*Petrorhagia dubia*	
Exotic (non HTE)	Caryophyllaceae	*Petrorhagia nanteuilii*	Proliferous Pink
Exotic (non HTE)	Caryophyllaceae	*Petrorhagia sp.*	
Exotic (non HTE)	Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed
Exotic (non HTE)	Caryophyllaceae	*Stellaria media*	Common Chickweed
Exotic (non HTE)	Chenopodiaceae	*Chenopodium album*	Fat Hen

BAM Growth Form Group	Family	Scientific Name	Common Name
Exotic (non HTE)	Cyperaceae	*Cyperus aggregatus*	
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago laciniata*	Cut-leaved Medic
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago minima*	Woolly Burr Medic
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago sp.*	
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago truncatula*	Barrel Medic
Exotic (non HTE)	Fabaceae (Faboideae)	*Trifolium arvense*	Haresfoot Clover
Exotic (non HTE)	Fabaceae (Faboideae)	*Trifolium campestre*	Hop Clover
Exotic (non HTE)	Fabaceae (Faboideae)	*Trifolium sp.*	
Exotic (non HTE)	Fabaceae (Faboideae)	*Trifolium subterraneum*	Subterranean Clover
Exotic (non HTE)	Gentianaceae	*Centaurium erythraea*	Common Centaury
Exotic (non HTE)	Geraniaceae	*Geranium molle subsp. molle*	Cranesbill Geranium
Exotic (non HTE)	Lamiaceae	*Marrubium vulgare*	White Horehound
Exotic (non HTE)	Lamiaceae	*Salvia reflexa*	Mintweed
Exotic (non HTE)	Lamiaceae	*Salvia verbenaca*	Vervain
Exotic (non HTE)	Malvaceae	*Malva neglecta*	Dwarf Mallow
Exotic (non HTE)	Malvaceae	*Malva parviflora*	Small-flowered Mallow
Exotic (non HTE)	Malvaceae	*Modiola caroliniana*	Red-flowered Mallow
Exotic (non HTE)	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne
Exotic (non HTE)	Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis
Exotic (non HTE)	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues
Exotic (non HTE)	Poaceae	*Aira sp.*	
Exotic (non HTE)	Poaceae	*Anthoxanthum odoratum*	Sweet Vernal Grass
Exotic (non HTE)	Poaceae	*Avena sativa*	Oats
Exotic (non HTE)	Poaceae	*Avena sp.*	Oats
Exotic (non HTE)	Poaceae	*Bromus catharticus*	Praire Grass

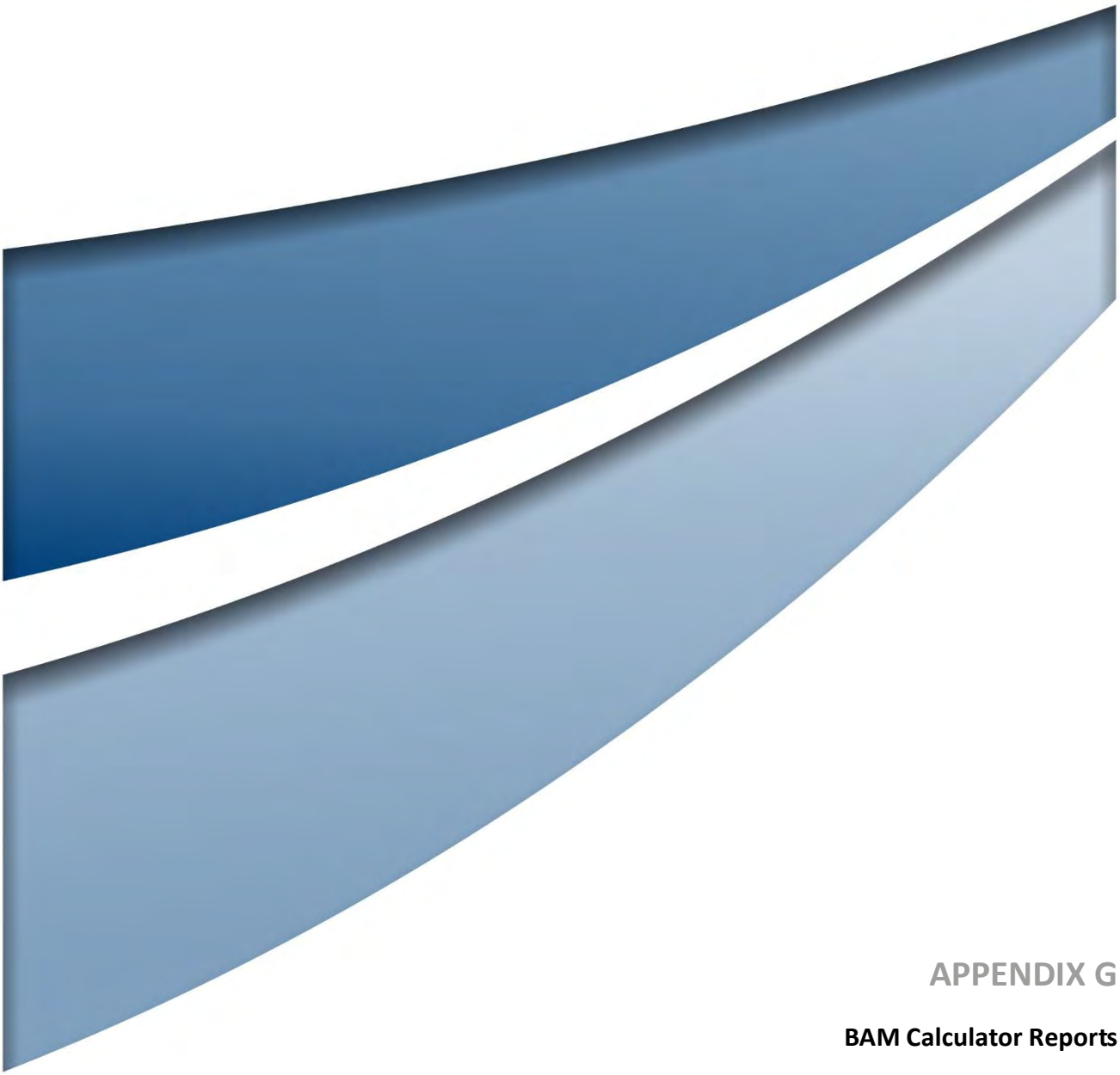
BAM Growth Form Group	Family	Scientific Name	Common Name
Exotic (non HTE)	Poaceae	*Bromus hordeaceus*	Soft Brome
Exotic (non HTE)	Poaceae	*Chloris virgata*	Feathertop Rhodes Grass
Exotic (non HTE)	Poaceae	*Digitaria sanguinalis*	Crab Grass
Exotic (non HTE)	Poaceae	*Echinochloa crus-galli*	Barnyard Grass
Exotic (non HTE)	Poaceae	*Eleusine indica*	Crowsfoot Grass
Exotic (non HTE)	Poaceae	*Eleusine tristachya*	Goose Grass
Exotic (non HTE)	Poaceae	*Eragrostis cilianensis*	Stinkgrass
Exotic (non HTE)	Poaceae	*Holcus lanatus*	Yorkshire Fog
Exotic (non HTE)	Poaceae	*Hordeum hystrix*	Mediterranean Barley Grass
Exotic (non HTE)	Poaceae	*Hordeum leporinum*	Barley Grass
Exotic (non HTE)	Poaceae	*Lolium perenne*	Perennial Ryegrass
Exotic (non HTE)	Poaceae	*Setaria parviflora*	
Exotic (non HTE)	Poaceae	*Urochloa panicoides*	Urochloa Grass
Exotic (non HTE)	Poaceae	*Vulpia bromoides*	Squirrel Tail Fesque
Exotic (non HTE)	Polygonaceae	*Polygonum arenastrum*	Wireweed
Exotic (non HTE)	Polygonaceae	*Polygonum aviculare*	Wireweed
Exotic (non HTE)	Polygonaceae	*Rumex crispus*	Curled Dock
Exotic (non HTE)	Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel
Exotic (non HTE)	Rubiaceae	*Richardia stellaris*	
Exotic (non HTE)	Scrophulariaceae	*Verbascum sp.*	
Exotic (non HTE)	Scrophulariaceae	*Verbascum virgatum*	Twiggy Mullein
Exotic (non HTE)	Solanaceae	*Datura ferox*	Fierce Thornapple
Exotic (non HTE)	Solanaceae	*Solanum chenopodioides*	Whitetip Nightshade
Exotic (non HTE)	Solanaceae	*Solanum nigrum*	Black-berry Nightshade
Exotic (non HTE)	Urticaceae	*Urtica urens*	Small Nettle
Exotic (non HTE)	Verbenaceae	*Verbena bonariensis*	Purpletop
Exotic (non HTE)	Verbenaceae	*Verbena quadrangularis*	

F.2 Vegetation Integrity Plot Data

Plot	PCT	Patch Size	Condition Class	Zone	Easting	Northing	Bearing	Composition (Species Richness)						Structure (Percentage Cover)						Function									
								Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow Trees	Litter Cover (%)	Length Fallen Logs (m)	Tree Stems (cm)					Tree Regen	High Threat Exotics
																								5 to 9	10 to 19	20 to 29	30 to 49	50 to 79		
P2	1661	100	1_Scattered	56	228426.5	6426009	185	4	3	9	11	1	5	3.9	0.5	81.8	5.5	0.1	2.3	4	0	3	43.5	0	1	1	1	1	1	1.1
P23	1661	100	1_Scattered	56	228383.5	6425874	188	1	2	11	12	1	1	45	1.1	18.5	7.9	0.1	0.3	3	1	73	1	0	0	0	0	1	0	0.6
P26	1661	100	1_Scattered	56	227892.2	6426407	262	3	6	21	17	1	3	8.1	1.2	65.5	2.1	0.1	0.3	1	1	48.4	73	0	1	1	1	1	1	0.6
P43	1661	100	1_Scattered	56	225287.1	6424393	37	2	7	22	16	1	3	15.3	5	85.5	27.6	0.1	0.5	2	1	38	7	0	0	0	1	1	1	0.3
P1	1661	100	2_Mod_Low_DNG	56	228642	6427140	278	0	1	13	8	1	1	0	0.1	94.7	3.7	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.8
P4	1661	100	2_Mod_Low_DNG	56	228450.9	6425834	164	0	0	22	14	1	1	0	0	82.8	2	0.1	0.1	0	0	6.2	0	0	0	0	0	0	0	0.9
P5	1661	100	2_Mod_Low_DNG	56	228867.2	6427118	72	0	1	14	9	1	0	0	0.1	91.7	0.9	0.1	0	0	0	95	0	0	0	0	0	0	0	0.1
P27	1661	100	2_Mod_Low_DNG	56	225258.7	6424301	88	0	0	7	7	0	2	0	0	91.6	0.8	0	0.2	0	0	19	0	0	0	0	0	0	0	1.2
P30	1661	100	2_Mod_Low_DNG	56	227863.1	6426467	222	0	0	17	8	1	1	0	0	82.3	0.8	0.1	0.1	0	0	5	0	0	0	0	0	0	0	0.6
P50	483	100	2_Mod_Low_DNG	56	228495	6427128	15	0	1	10	8	1	1	0	0.1	35.8	6.1	0.2	0.1	0	0	0.4	0	0	0	0	0	0	0	5
P59	483	100	1661_2_Mod_Low_DNG	56	228270.7	6426023	340	0	0	9	2	0	1	0	0	79	0.3	0	0.1	0	0	41	0	0	0	0	0	0	0	15.6
P60	483	100	2_Mod_Low_DNG	56	228024.4	6426495	0	0	0	7	3	0	1	0	0	26.8	0.3	0	0.2	0	0	13	0	0	0	0	0	0	0	4
P76	483	100	2_Mod_Low_DNG	56	225409.6	6424192	40	0	0	10	7	1	0	0	0	65	0.7	0.1	0	0	0	11	0	0	0	0	0	0	0	31.5
P77	483	100	2_Mod_Low_DNG	56	225184.5	6424191	240	0	0	11	5	1	0	0	0	18.5	3.8	0.1	0	0	0	11	0	0	0	0	0	0	0	31.1
P78	483	100	2_Mod_Low_DNG	56	224775.8	6424258	330	0	0	12	15	1	3	0	0	96.3	10.4	0.1	2.3	0	0	10	0	0	0	0	0	0	0	1.5
P3	1661	100	3_Low_DNG	56	224548.7	6424016	314	0	0	16	11	1	2	0	0	94.2	1.9	0.1	0.3	0	0	0	0	0	0	0	0	0	0	0.2
P28	483	100	3_Low_DNG	56	226033.6	6423362	123	0	0	3	2	0	0	0	0	78	0.8	0	0	0	0	9	0	0	0	0	0	0	0	2
P29	483	100	3_Low_DNG	56	226329.7	6423228	355	0	0	6	1	0	0	0	0	29.4	0.1	0	0	0	0	0.2	0	0	0	0	0	0	0	0.6
P71	483	100	3_Low_DNG	56	226119.8	6423120	0	0	0	3	0	0	0	0	0	90.1	0	0	0	0	0	8	0	0	0	0	0	0	0	0.6
P72	483	100	3_Low_DNG	56	225932.5	6422877	80	0	0	15	10	1	2	0	0	82.6	6.8	0.1	0.2	0	0	2.6	0	0	0	0	0	0	0	13.2
P18	483	100	1_Scattered	56	225588.1	6424282	57	1	0	13	9	0	2	20	0	43.5	2.3	0	0.3	1	0	10.4	0	0	0	0	0	1	1	1
P20	483	100	1_Scattered	56	228024	6422427	167	2	4	18	16	2	2	37	1.3	107.4	3.8	0.2	3.2	3	0	67	11	0	1	0	0	1	1	0.2
P21	483	100	1_Scattered	56	226464.9	6425744	277	2	0	8	12	1	1	12	0	47.4	2.3	0.1	3	3	1	4	5	0	0	0	0	1	0	2.5
P22	483	100	1_Scattered	56	228239	6427124	185	2	6	22	12	1	5	5.3	1.1	35.1	1.5	0.1	0.5	0	0	17.8	5	1	1	0	1	0	1	0.2
P45	483	100	1_Scattered	56	225310.9	6424567	350	3	1	5	5	0	1	21	0.1	85.1	1	0	0.1	5	4	17	38	0	1	1	1	1	0	1.2
P6	483	100	2_Mod_DNG	56	228314.3	6427010	103	0	0	11	6	1	1	0	0	95.8	1.4	0.1	0.1	0	0	2.4	0	0	0	0	0	0	0	0.3
P8	483	100	2_Mod_DNG	56	226708.4	6425077	237	0	0	13	10	0	2	0	0	68.5	20.9	0	0.2	0	0	0	0	0	0	0	0	0	0	0.4
P44	483	100	2_Mod_DNG	56	225015.2	6424457	270	0	0	9	6	0	0	0	0	36.4	7.8	0	0	0	0	39	0	0	0	0	0	0	0	8
P51	483	100	2_Mod_DNG	56	228469	6427025	40	0	0	7	8	0	1	0	0	37.2	1.2	0	0.1	0	0	15.2	0	0	0	0	0	0	0	5.1
P52	483	100	2_Mod_DNG	56	228624.7	6426942	20	0	0	11	11	0	2	0	0	62.8	4.4	0	0.2	0	0	15	0	0	0	0	0	0	0	1.7
P61	483	100	2_Mod_DNG	56	227518	6425121	0	0	0	6	4	0	1	0	0	56.4	5.7	0	0.1	0	0	15	0	0	0	0	0	0	0	2.1
P62	483	100	2_Mod_DNG	56	228278.1	6425185	35	0	0	8	9	0	0	0	0	92.1	2.9	0	0	0	0	25	0	0	0	0	0	0	0	0.7
P63	483	100	2_Mod_DNG	56	228526.3	6424994	70	0	0	10	9	0	2	0	0	90.6	2.7	0	0.2	0	0	22	0	0	0	0	0	0	0	1.1

Plot	PCT	Patch Size	Condition Class	Zone	Easting	Northing	Bearing	Composition (Species Richness)						Structure (Percentage Cover)						Function									
								Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow Trees	Litter Cover (%)	Length Fallen Logs (m)	Tree Stems (cm)					Tree Regen	High Threat Exotics
																								5 to 9	10 to 19	20 to 29	30 to 49	50 to 79		
P64	483	100	2_Mod_DNG	56	228679.1	6425212	35	0	0	12	8	1	3	0	0	99.1	3.1	0.1	0.3	0	0	29	0	0	0	0	0	0	0	0.6
P65	483	100	2_Mod_DNG	56	227007.8	6426219	50	0	0	5	3	0	0	0	0	10.8	10.2	0	0	0	0	27	0	0	0	0	0	0	0	0.4
P66	483	100	2_Mod_DNG	56	227057.4	6425677	60	0	2	8	6	0	3	0	1.1	90.6	4.5	0	0.4	0	0	34	0	0	0	0	0	0	0	2.6
P67	483	100	2_Mod_DNG	56	226510	6424496	100	0	0	9	9	0	3	0	0	91.2	2.5	0	0.3	0	0	17	0	0	0	0	0	0	0	1.4
P68	483	100	2_Mod_DNG	56	226460	6423727	225	0	1	9	7	1	2	0	0.1	101	2.2	0.1	0.2	0	0	16	0	0	0	0	0	0	0	5.3
P69	483	100	2_Mod_DNG	56	226377.7	6425289	290	0	0	9	13	0	3	0	0	55.8	5.8	0	0.6	0	0	13	0	0	0	0	0	0	0	0.5
P79	483	100	2_Mod_DNG	56	224768	6424761	195	0	1	14	9	1	1	0	0.1	77.8	22.5	0.1	0.1	0	0	8	3	0	0	0	0	0	0	0.3
P80	483	100	2_Mod_DNG	56	225100.3	6424583	80	0	0	7	4	0	0	0	0	71.1	8.3	0	0	0	0	17	0	0	0	0	0	0	0	0.4
P81	483	100	2_Mod_DNG	56	224908.5	6424511	90	0	0	9	7	1	0	0	0	28.1	5.6	0.5	0	0	0	14	0	0	0	0	0	0	0	1.8
P82	483	100	2_Mod_DNG	56	224680.3	6424430	250	0	1	17	14	1	1	0	0.1	123.2	22.8	0.1	0.1	0	0	16	0	0	0	0	0	0	0	0.1
P7	483	100	3_Mod_Low_DNG	56	227864.6	6425887	239	0	1	18	8	1	3	0	0.7	89.8	0.8	0.1	0.3	0	0	3.4	0	0	0	0	0	0	0	0.6
P9	483	100	3_Mod_Low_DNG	56	228601.6	6424339	290	0	0	15	8	0	1	0	0	121.1	3.3	0	0.1	0	0	4.4	0	0	0	0	0	0	0	0.6
P10	483	100	3_Mod_Low_DNG	56	227672.3	6422533	14	0	0	13	10	0	2	0	0	61.1	3.8	0	1.5	0	0	4.8	0	0	0	0	0	0	0	1.4
P11	483	100	3_Mod_Low_DNG	56	225740.8	6422886	144	0	1	12	10	0	2	0	0.1	89	5.9	0	0.2	0	0	0	0	0	0	0	0	0	0	0.6
P16	483	100	3_Mod_Low_DNG	56	227437.7	6423409	0	0	0	9	8	0	2	0	0	89.1	0.8	0	4.1	0	0	7.4	0	0	0	0	0	0	0	0.2
P17	483	100	3_Mod_Low_DNG	56	227502.4	6423918	10	0	0	9	10	1	2	0	0	92	1	0.1	0.2	0	0	5	0	0	0	0	0	0	0	0.1
P34	483	100	3_Mod_Low_DNG	56	227973.6	6421934	9	0	0	22	9	2	3	0	0	97.8	1.8	0.2	0.3	0	0	1.2	0	0	0	0	0	0	0	0.3
P36	483	100	3_Mod_Low_DNG	56	227783.1	6424666	353	0	0	7	11	0	1	0	0	100.7	1.1	0	0.2	0	0	2.4	0	0	0	0	0	0	0	0.2
P37	483	100	3_Mod_Low_DNG	56	227319.4	6424742	342	0	0	6	8	0	2	0	0	77.6	2.6	0	0.2	0	0	0	0	0	0	0	0	0	0	0.2
P41	483	100	3_Mod_Low_DNG	56	228193.9	6426749	116	0	1	11	7	0	1	0	0.1	33.4	25.6	0	0.1	0	0	0	0	0	0	0	0	0	0	0.5
P53	483	100	3_Mod_Low_DNG	56	228603.7	6426787	145	0	1	6	6	0	0	0	0.1	26.2	2.6	0	0	0	0	7	0	0	0	0	0	0	0	5.1
P55	483	100	3_Mod_Low_DNG	56	228060.7	6426930	215	0	0	11	1	1	0	0	0	39.7	0.1	0.1	0	0	0	8	0	0	0	0	0	0	0	10.5
P56	483	100	3_Mod_Low_DNG	56	227814.9	6426644	350	0	1	12	5	0	0	0	0.3	78.9	1.7	0	0	0	0	6.2	0	0	0	0	0	0	0	1.6
P57	483	100	3_Mod_Low_DNG	56	228393.8	6426547	260	0	0	11	6	0	2	0	0	64.9	1.5	0	0.2	0	0	6.2	0	0	0	0	0	0	0	21.3
P58	483	100	3_Mod_Low_DNG	56	228036.2	6426101	5	0	0	5	3	1	1	0	0	89	0.4	0.1	0.1	0	0	11	0	0	0	0	0	0	0	10.2
P70	483	100	3_Mod_Low_DNG	56	227444.7	6422931	100	0	1	12	12	1	3	0	0.2	113	10.4	0.1	0.3	0	0	1.8	0	0	0	0	0	0	0	0.2
P73	483	100	3_Mod_Low_DNG	56	225635.6	6423431	90	0	0	10	17	1	3	0	0	105.5	15.6	0.1	1.2	0	0	2.4	0	0	0	0	0	0	0	0.3
P74	483	100	483_3_Mod_Low_DNG	56	225702.4	6423110	170	0	0	6	7	0	2	0	0	83	2.8	0	0.2	0	0	9	0	0	0	0	0	0	0	27.4
P75	483	100	3_Mod_Low_DNG	56	225668.4	6422753	80	0	2	13	9	1	2	0	1.1	95.1	7.1	0.1	0.2	0	0	7.4	0	0	0	0	0	0	0	0.1
P15	483	100	4_Low_DNG	56	227011.5	6422634	355	0	1	11	13	1	2	0	0.1	65.4	4.5	0.1	2	0	0	2	0	0	0	0	0	0	0	2.2
P38	483	100	4_Low_DNG	56	227324.4	6424382	346	0	0	7	7	0	1	0	0	9.4	70.7	0	0.1	0	0	0.8	0	0	0	0	0	0	0	0.2
P39	483	100	4_Low_DNG	56	227203.7	6423654	264	0	0	4	6	0	0	0	0	15.5	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0.3
P40	483	100	4_Low_DNG	56	226953.4	6423192	170	0	0	4	6	0	0	0	0	0.5	0.6	0	0	0	0	1.2	0	0	0	0	0	0	0	75.2
P42	483	100	4_Low_DNG	56	228361.4	6426378	100	0	0	2	8	0	0	0	0	0.2	10.6	0	0	0	0	0.4	0	0	0	0	0	0	0	2.2

Plot	PCT	Patch Size	Condition Class	Zone	Easting	Northing	Bearing	Composition (Species Richness)						Structure (Percentage Cover)						Function								
								Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow Trees	Litter Cover (%)	Length Fallen Logs (m)	Tree Stems (cm)					Tree Regen	High Threat Exotics
																								5 to 9	10 to 19	20 to 29	30 to 49	50 to 79		
P46	483	100	4_Low_DNG	56	224581.2	6424648	260	0	0	3	4	0	0	0	0	2.4	1.2	0	0	0	0	7	0	0	0	0	0	0	0	0.2
P54	483	100	4_Low_DNG	56	228369.5	6426177	330	0	0	2	2	0	0	0	0	2.1	0.3	0	0	0	0	32	0	0	0	0	0	0	0	20
P83	483	100	4_Low_DNG	56	224427	6424801	80	0	1	9	11	0	0	0	0.1	21.1	11.8	0	0	0	0	4.2	0	0	0	0	0	0	0	0.4
P84	483	100	4_Low_DNG	56	224381.3	6424534	350	0	0	7	8	0	0	0	0	61.2	2	0	0	0	0	1.4	0	0	0	0	0	0	0	5.1
P85	483	100	4_Low_DNG	56	227940.2	6426136	270	0	1	6	2	0	0	0	0.1	8.6	0.2	0	0	0	0	6.2	0	0	0	0	0	0	0	5



APPENDIX G

BAM Calculator Reports

BAM Credit Summary Report

Proposal Details

Assessment Id
00032861/BAAS17099/22/00032862

Proposal Name
Goulburn River Solar Farm

BAM data last updated *
22/06/2023

Assessor Name
Jacob Manners

Report Created
24/01/2024

BAM Data version *
61

Assessor Number
BAAS17099

BAM Case Status
Finalised

Date Finalised
24/01/2024

Assessment Revision
13

Assessment Type
Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
4	483_3_Mod_Low_DNG	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 Highla	12.6	12.6	310	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

5	483_2_Mod_DNG	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 Highla	34	34.0	165.4	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3509

6	483_4_Low_DNG	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 Highla	10.3	10.3	196	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

7	483_1_Scattered	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 Highla	78.9	78.9	22.5	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	1109
											Subtotal	**4618**
Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin												
1	1661_2_Mod_Low_DNG	Not a TEC	13.3	13.3	37.6	PCT Cleared - 50%	High Sensitivity to Gain			1.75		0
2	1661_1_Scattered	Not a TEC	51.1	51.1	2.7	PCT Cleared - 50%	High Sensitivity to Gain			1.75		59

3	1661_3_Low_DNG	Not a TEC	3.4	3.4	55	PCT Cleared - 50%	High Sensitivity to Gain			1.75		0
											Subtotal	**59**
											Total	**4677**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Anthochaera phrygia / Regent Honeyeater (Fauna)									
483_1_Scattered	78.9	78.9	16.2			Critically Endangered	Critically Endangered	True	959
1661_2_Mod_Low_DNG	13.3	13.3	4.3			Critically Endangered	Critically Endangered	True	43
1661_1_Scattered	51.1	51.1	1.4			Critically Endangered	Critically Endangered	True	52
1661_3_Low_DNG	3.4	3.4	0.46			Critically Endangered	Critically Endangered	True	1
483_3_Mod_Low_DNG	12.6	12.6	5.9			Critically Endangered	Critically Endangered	True	56
483_2_Mod_DNG	34.0	34.0	11.6			Critically Endangered	Critically Endangered	True	294
483_4_Low_DNG	10.3	10.3	2.5			Critically Endangered	Critically Endangered	True	19

								Subtotal	**1424**
Ninox connivens / Barking Owl (Fauna)									
483_4_Low_DNG	10.3	10.3	1.2			Vulnerable	Not Listed	False	6
								Subtotal	**6**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00032861/BAAS17099/22/00032862

Proposal Name
Goulburn River Solar Farm

BAM data last updated *
22/06/2023

Assessor Name
Jacob Manners

Assessor Number
BAAS17099

BAM Data version *
61

Proponent Names

Report Created
24/01/2024

BAM Case Status
Finalised

Assessment Revision
13

Assessment Type
Major Projects

Date Finalised
24/01/2024

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
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 Highla	Critically Endangered Ecological Community	483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Species
Anthochaera phrygia / Regent Honeyeater

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

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

Predicted Threatened Species Not On Site

Name
No Changes

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1661-Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Not a TEC	95.3	59	0	59
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	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 Highla	693.9	1109	3509	4618

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

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
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 Highla This includes PCT's: 74, 75, 83, 250, 266, 267,	-	483_3_Mod_Low_DNG	No	0	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum	-	483_2_Mod_DNG	No	3509	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and

	Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 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,					Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	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 Highla This includes PCT's: 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,	-	483_4_Low_DNG	No	0	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	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,	-	483_1_Scattered	Yes	1109	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	South Eastern Highla This includes PCT's: 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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415,					

	3533, 4147, 4149, 4150					
1661-Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_2_Mod_Low_DNG	No	0	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_1_Scattered	Yes	59	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_3_Low_DNG	No	0	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Anthochaera phrygia / Regent Honeyeater	**483_1_Scattered, 1661_2_Mod_Low_DNG, 1661_1_Scattered, 1661_3_Low_DNG, 483_3_Mod_Low_DNG, 483_2_Mod_DNG, 483_4_Low_DNG**	42.3	1424.00
Ninox connivens / Barking Owl	**483_4_Low_DNG**	1.2	6.00

Credit Retirement Options

Like-for-like credit retirement options

Anthochaera phrygia / Regent Honeyeater	Spp	IBRA subregion
	Anthochaera phrygia / Regent Honeyeater	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00032861/BAAS17099/22/00032862

Proposal Name
Goulburn River Solar Farm

BAM data last updated *
22/06/2023

Assessor Name
Jacob Manners

Assessor Number
BAAS17099

BAM Data version *
61

Proponent Name(s)

Report Created
24/01/2024

BAM Case Status
Finalised

Assessment Revision
13

Assessment Type
Major Projects

Date Finalised
24/01/2024

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
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 Highla	Critically Endangered Ecological Community	483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Species
Anthochaera phrygia / Regent Honeyeater

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

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

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1661-Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Not a TEC	95.3	59	0	59.00
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	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 Highla	693.9	1109	3509	4618.00

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

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the	-	483_3_Mod_Low_DNG	No	0	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100

	NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533,					kilometers of the outer edge of the impacted site.

	4147, 4149, 4150					
	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 Highla This includes PCT's: 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,	-	483_2_Mod_DNG	No	3509	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	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 Highla This includes PCT's: 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,	-	483_4_Low_DNG	No	0	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	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 Highla This includes PCT's: 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,	-	483_1_Scattered	Yes	1109	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	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, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
1661-Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_2_Mod_Low_DNG	No	0	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_1_Scattered	Yes	59	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Western Slopes Dry Sclerophyll Forests This includes PCT's: 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, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	1661_3_Low_DNG	No	0	Kerrabee,Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1661_2_Mod_Low_DNG	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1661_1_Scattered	Yes (including artificial)	59	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1661_3_Low_DNG	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Anthochaera phrygia / Regent Honeyeater	**483_1_Scattered, 1661_2_Mod_Low_DNG, 1661_1_Scattered, 1661_3_Low_DNG, 483_3_Mod_Low_DNG, 483_2_Mod_DNG, 483_4_Low_DNG**	42.3	1424.00
Ninox connivens / Barking Owl	**483_4_Low_DNG**	1.2	6.00

Credit Retirement Options

Like-for-like options

Anthochaera phrygia/ Regent Honeyeater	Spp		IBRA region
	Anthochaera phrygia/Regent Honeyeater *Note: Variation rules do not apply for Critically Endangered species and impacts on Commonwealth listed entities that are a controlled action.*		Any in NSW
Ninox connivens/ Barking Owl	Spp		IBRA region
	Ninox connivens/Barking Owl		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	**1661** - Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	50	Not a TEC			ADD VEG ZONE Default benchmarks modified	✖

Select type:	Tree (5)	Shrub (17)	Grass & grass like (9)	Forb (9)	Fern (2)	Other (3)
Composition	5	18	8	9	2	3

Select type:	Tree (69)	Shrub (70)	Grass & grass like (22)	Forb (6)	Fern (1)	Other (1)
Structure	59	73	25	6	1	1

Select type:	Number of large trees (1)	Stem size class (4)	Length of fallen logs (55)	Regeneration stems (Present)	Litter cover (63)
Function	1	4	58	Present	64

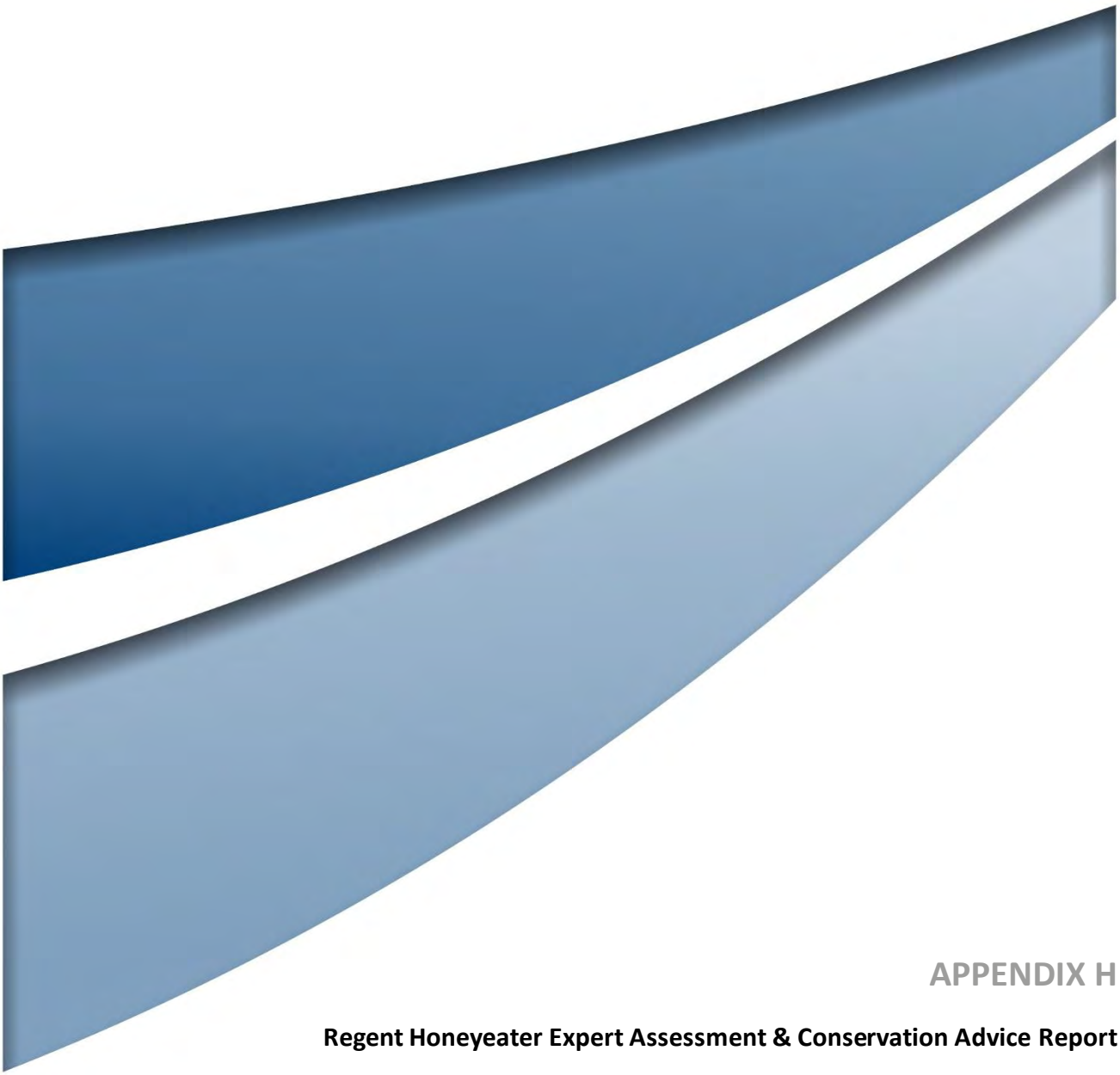
Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Grassy Woodlands	Western Slopes Grassy Woodlands	**483** - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	90	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 Highla	Critically Endangered Ecological Community	Not Listed	ADD VEG ZONE Default benchmarks modified	✖

Select type:	Tree (4)	Shrub (6)	Grass & grass like (10)	Forb (13)	Fern (1)	Other (3)
Composition	4	7	11	13	1	3

Select type:	Tree (21)	Shrub (5)	Grass & grass like (45)	Forb (8)	Fern (0)	Other (1)
Structure	19	5	44	8	0	1

Select type:	Number of large trees (2)	Stem size class (4)	Length of fallen logs (34)	Regeneration stems (Present)	Litter cover (35)
Function	2	4	34	Present	35



APPENDIX H

Regent Honeyeater Expert Assessment & Conservation Advice Report

Goulburn River Solar Farm

Expert assessment and conservation advice for the regent honeyeater *Anthochaera phrygia*

Dr Ross Crates

Executive summary

- Dr Ross Crates was engaged by Umwelt (Australia) Pty. Ltd. (Umwelt) on behalf of Lightsource Development Services Australia Pty Ltd (Lightsource bp). to provide expert comment on the potential impact of the proposed Goulburn River Solar Farm on the regent honeyeater *Anthochaera phrygia*, and to suggest additional mitigation measures to offset any potential impact of the development on the species.
- The entire Project Area of the proposed Goulburn River Solar Farm contains 895.71 ha of mapped regent honeyeater important area habitat following the New South Wales Department of Planning and Environment methodology.
- The area surrounding the Goulburn River in the Upper Hunter Valley is a known important breeding area for the regent honeyeater, forming part of the greater Blue Mountains metapopulation- the largest remaining wild subpopulation of regent honeyeaters.
- The proposed development footprint will impact 42.30 ha of native vegetation mapped as regent honeyeater important habitat, of which 16.20 ha is mapped as a scattered tree condition zone of PCT 483- Grey Box × White Box grassy open woodland. Derived native grassland comprises 24.73 ha of the mapped regent honeyeater important habitat areas within the development footprint.
- The current development footprint avoids impact to 95.26 % of the regent honeyeater important areas within the Project Area.
- Mapped important regent honeyeater habitats within the development footprint are considered by the author to be very unlikely to represent potential breeding habitat for regent honeyeaters, due to: (i) a lack of suitable permanent water sources within the development footprint (ii) the relatively high elevation of the development footprint; and (iii) the sparse canopy cover within the development footprint.
- Mapped important regent honeyeater habitats within the development footprint are considered of low importance to regent honeyeaters as potential foraging habitat, due to: (i) the factors mentioned above and (ii) the abundance of much higher quality foraging habitats within the wider area, including the proposed Biodiversity Stewardship Site (BSS).
- The proposed BSS contains the highest quality regent honeyeater habitats within the Project Area, with the Project Area containing 853.29 ha of habitats mapped as regent honeyeater important areas which will not be impacted by the proposed Solar Farm. Habitats within the BSS are considered of low to moderate quality regent honeyeater breeding habitat and moderate quality foraging habitat.
- Suggested additional mitigation measures include noisy miner management, habitat restoration in key breeding areas, contributions to wild bird nest protection measures and/or the zoo-breeding and reintroduction program.
- Given the low likelihood of occurrence of regent honeyeaters within the biodiversity stewardship site, it is recommended that any additional mitigation measures that may be required, are targeted off-site in areas where regent honeyeaters are either known or considered much more likely to breed, such as the riparian corridor of Goulburn River National Park.
- A NSW Biodiversity Conservation Act Serious and Irreversible Impact statement is provided.

Contents

(Cover image credit: Nathan Sherwood)

1. Background

1.1. Goulburn River Solar Farm

The proposed Lightsource bp Goulburn River Solar Farm (GRSF) is a 550-Megawatt peak renewable energy project located in the Upper Hunter (hereafter the 'Project Area'), approximately 30km south-west of Merriwa in the upper Hunter River Valley, New South Wales. The Project Area is currently a grazing property located on a basalt cap, and is surrounded by Goulburn River National Park. The proposed development footprint will impact 693.86 ha of plant community type (PCT) 483- Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley. 671.37 ha of this PCT is derived native grassland. The proposed development footprint will also impact 95.28 ha of PCT 1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin, of which 92.63 ha is derived native grassland.

The Project Area is located within a known important area for the regent honeyeater *Anthochaera phrygia.* As such the proposed development footprint would lead to the loss of 42.3 ha of native vegetation mapped as regent honeyeater important areas (RHIA) using the NSW government's methodology. This methodology includes all suitable breeding and foraging habitat within a known important area for the species. These areas include: Bundarra-Barraba, Mudgee-Wollar, Capertee Valley, Hunter Valley and the Pilliga Woodlands. Within these areas, buffers are placed around native vegetation within 5 km of a confirmed regent honeyeater breeding location. A 1 km buffer is placed around confirmed regent honeyeaters nests occurring outside of the core breeding areas (NSW DPE 2022).

Following the review of the Biodiversity Development Assessment Report (BDAR) as part of the Environmental Impact Statement (EIS) for the GRSF submitted by Umwelt, the NSW Biodiversity Conservation Division (BCD) requested an assessment by a species' expert of the potential impact of the proposed GRSF on habitat of the regent honeyeater.

1.2. Regent honeyeater ecology and conservation

The regent honeyeater is a medium-sized nectarivorous songbird of the family Meliphagidae. The species' former range extended from Adelaide to south-eastern Queensland, within which birds made nomadic movements to track nectar resources in large flocks (Franklin et al., 1989). Severe habitat loss since European colonisation of Australia has disproportionately impacted the regent honeyeater's feed tree species

(Bradshaw, 2012), which primarily occur on fertile soils and therefore provide abundant nectar resources when in blossom (Commonwealth of Australia 2016).

Key feed tree and mistletoe species from with regent honeyeaters forage nectar and /or lerp (*Psyllid* spp.) include the following (Commonwealth of Australia 2016):

- Yellow box *Eucalyptus melliodora*
- Mugga ironbark *E. sideroxylon*
- White box *E. albens*
- Grey box *E.molluccana/macrocarpa*
- Blakely's red gum *E. blakelyi*
- Broad-leaved ironbark *E. fibrosa*
- Grey ironbark *E. siderophloia*
- Spotted gum *Corymbia maculate*
- Swamp mahogany *E. robusta*
- Rough-barked apple *Angophora floribunda*
- Grey gum *E.punctata*
- Stringybark spp.
- River she-oak *Casuarina cunninghamiana*
- Needle-leaf mistletoe *Amyema cambagei*
- Long-flowered mistletoe *Dendropthoe vitellina*

The impact of habitat loss on regent honeyeaters has been compounded by increased competition with larger nectarivorous species for access to remaining habitats (Ford, 1979; Ford et al., 2001; Oliver, 1998). This competition has contributed to a further reduction in the size of regent honeyeater foraging flocks and nesting aggregations, likely creating a positive feedback towards extinction, known as an Allee effect (Crates, Rayner, et al., 2017). Additional threats to the regent honeyeater include droughts, which reduce eucalypt flowering phenology and lead to dieback of eucalypts (Losso et al., 2022) and mistletoes (Crates et al., 2022).

The regent honeyeater population has suffered rapid and severe decline, to the extent that there may be fewer than 250 individuals remaining in the wild (Crates et al. 2021). The species' is therefore listed as Critically Endangered under Federal and NSW legislation (Threatened Species Scientific Committee 2015).

There are three known remaining core regent honeyeater breeding areas: the Chiltern-Lurg-Killawarra region of northern Victoria, the NSW Northern Tablelands including the Bundarra-Barraba-Severn River areas, and the greater Blue Mountains. Breeding records in northern Victoria and the NSW Northern Tablelands are now very rare (less than annual). The vast majority of the wild regent honeyeater population now occurs within the greater Blue Mountains. Whilst genetic data suggest the wild population represents a single genetic management unit (Crates, Olah, et al., 2019; Kvistad et al., 2015), colour-mark-resightings and bioacoustic data suggest the majority of birds occur within a single subpopulation, at least during the breeding period (Crates et al., 2021; Geering & French, 1998; Powys, 2010).

The greater Blue Mountains subpopulation includes breeding areas in the Burragorang, Capertee, Wolgan, Widden, Goulburn River, Merriwa and Hunter River Valleys (Figure 1a). Birds are known to move between these areas and breed in different areas in different years, contingent on the local environmental conditions which are primarily determined by rainfall in the preceding six months (Stojanovic et al., 2022).

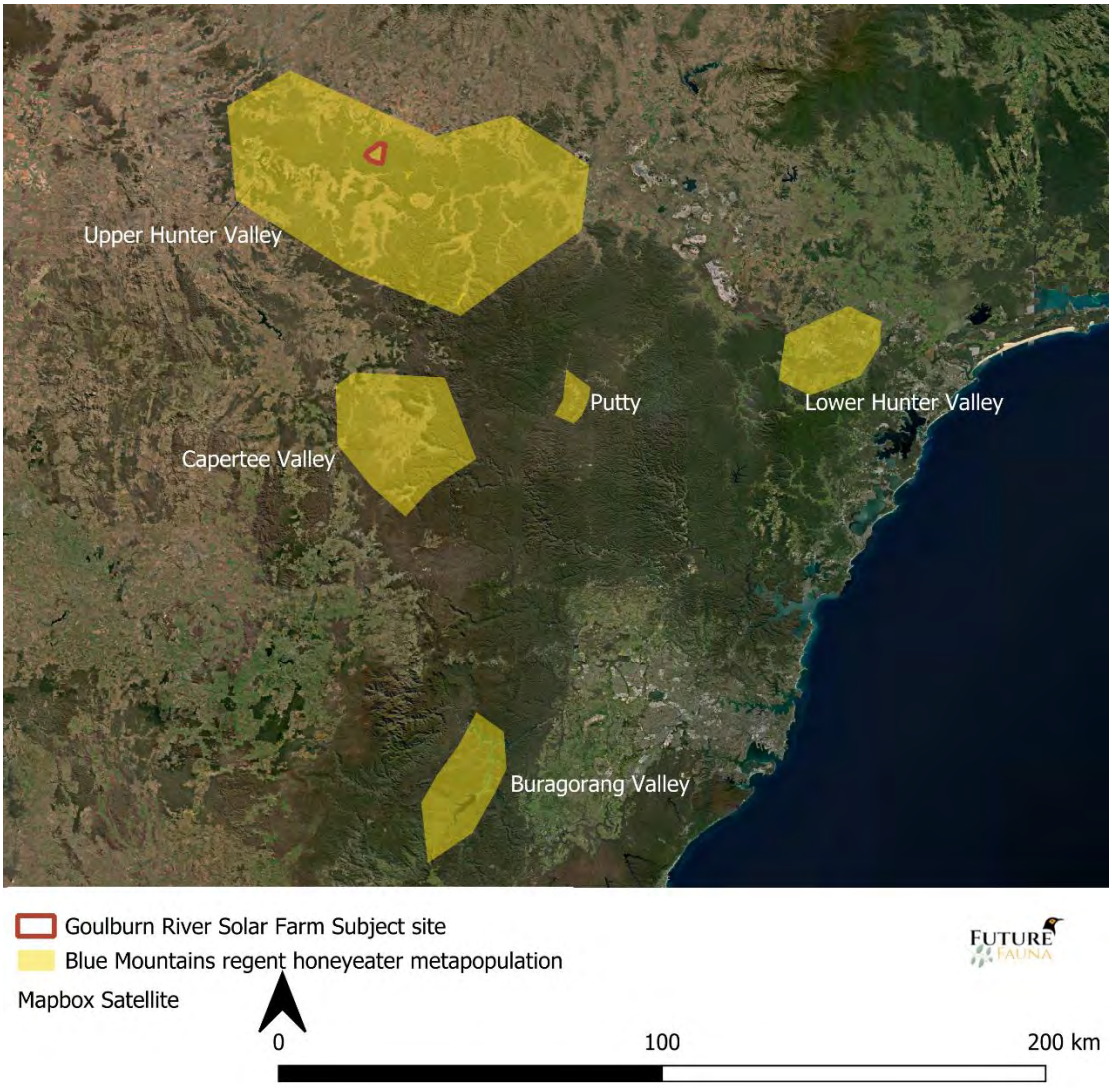


Figure 1a: Distribution of known regent honeyeater breeding areas within the greater Blue Mountains with respect to the Goulburn River Solar Farm Development Footprint.

Population models based on all available monitoring data predict the regent honeyeater could be extinct in the wild within two decades without enhanced conservation action (Heinsohn et al., 2022), with the northern Victorian and Northern Tablelands breeding subpopulations potentially becoming locally extinct within five years. Primary conservation actions required to facilitate population recovery include:

- Nest protection efforts to boost low breeding productivity of wild birds, which suffer high rates of nest predation by a range of mammalian and avian nest predators (Crates, Rayner, et al., 2019; Taylor et al., 2018).
- Biannual release of at least 100 zoo-bred birds with improved fitness into the greater Blue Mountains (Heinsohn et al., 2022; Tripovich et al., 2021).
- Restoration of key breeding habitats in remaining and previous breeding areas.

1.3. Importance of the Goulburn River to regent honeyeaters

The area surrounding the Goulburn River and its tributaries in the Upper Hunter Valley is an important breeding area for regent honeyeaters within the greater Blue Mountains (Figure 1b). Since 2015, nests have been located on the Goulburn River near Thompson's Flat (8 km from the GRSF site) and Morrison's Flat (8.5 km), on Hulks Road (3 km), Murrumbo Station (15 km), the Merriwa River (20 km) and Widden brook (48 km).

Significant stretches of potential regent honeyeater breeding habitat along the Goulburn River are difficult to access and have therefore received minimal monitoring effort. It is likely that additional undetected regent honeyeater nesting attempts have been made along other sections of the Goulburn River and its tributaries in recent times.

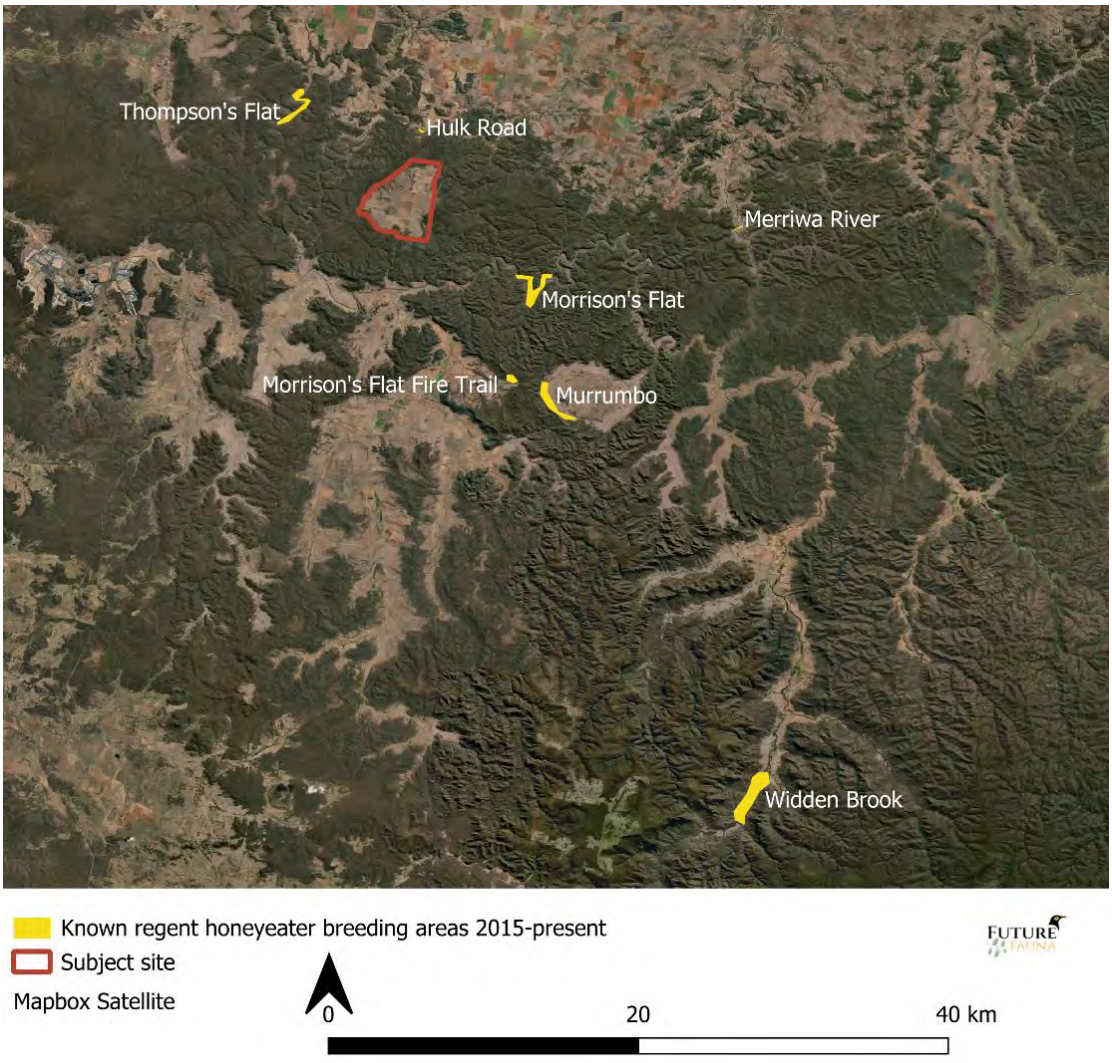


Figure 1b: Location of Goulburn River Solar Farm with respect to known contemporary regent honeyeater breeding areas in the upper Hunter Valley, NSW.

The largest non-breeding flock of regent honeyeaters observed within a 50 km radius of the GRSF since 2015 was of seven adult birds feeding in a flowering mugga ironbark *E.sideroxylon* on Mogo Road, 6 km west of the GRSF site.

2. Methodology

2.1. Background information and site visit

Background information on the GRSF proposal was obtained from the draft amended BDAR (to support the Project Amendment Report) produced by Umwelt on behalf of Lightsource bp and from an initial meeting with the relevant ecologists and project managers from both companies on 9th November 2023.

A visit was made to the property on Tuesday 31st October, during which three hours were spent driving the development footprint and the proposed Biodiversity Stewardship Site. The track taken to assess habitats within both areas is shown in Figure 2.

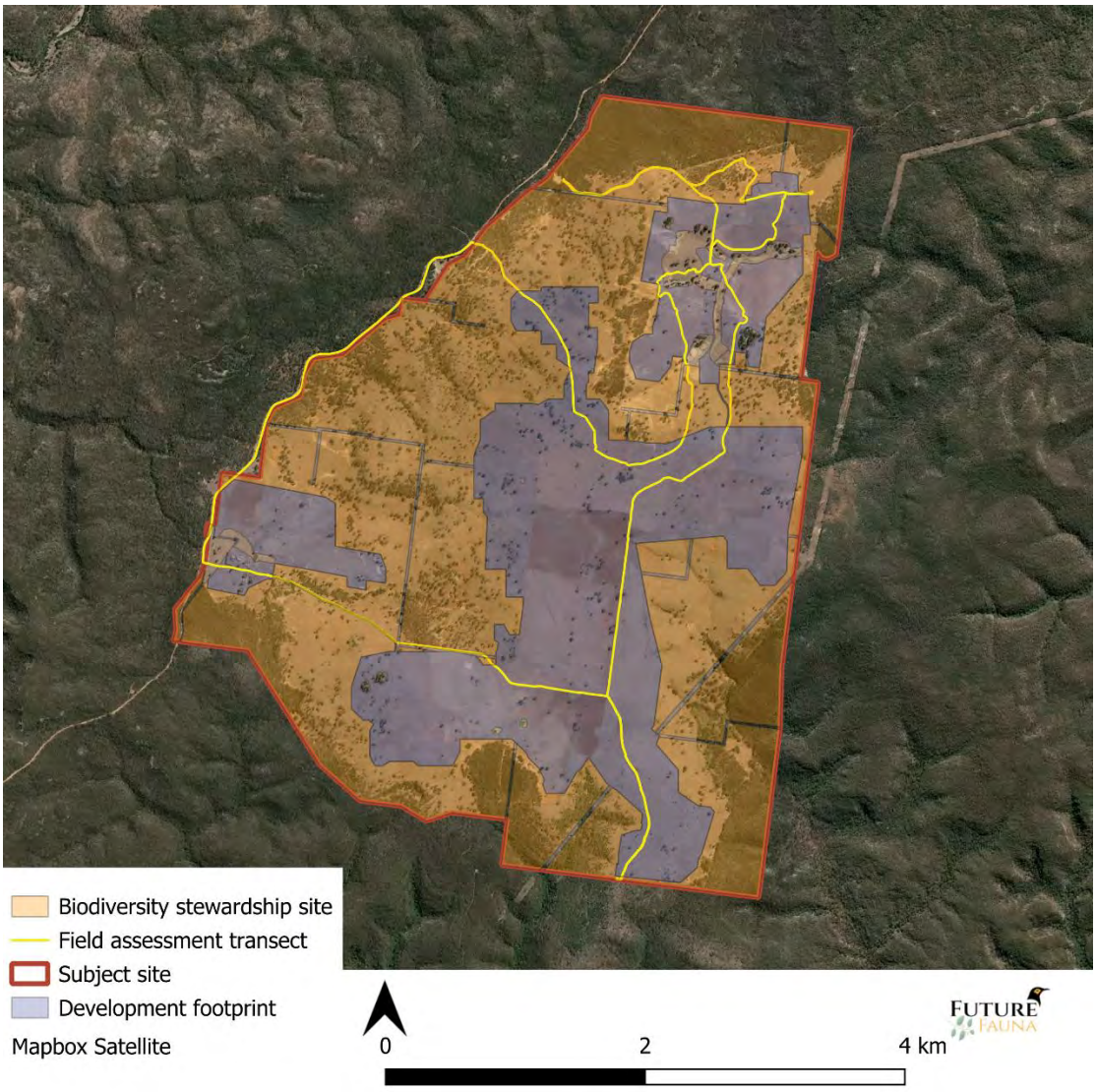


Figure 2: Track taken through the Goulburn River Solar Farm Project Area during the habitat assessment site visit.

2.2 Spatial analysis

Umwelt provided all relevant spatial data including the following:

- Property boundary
- Development footprint
- Biodiversity Stewardship Site (BSS) boundary
- Regent honeyeater important area mapping, buffered around the Project Area
- Plant Community Types within the development footprint and the BSS
- BioNet regent honeyeater records

3. Results

3.1 Development footprint

The proposed development footprint contains 42.3 ha of native vegetation mapped as regent honeyeater important area habitat (Figures 3 – 5). 24.73 ha, or 58.5 % of the RHIA is derived native grassland and does not currently contain regent honeyeater feed trees. Habitats within the development footprint have been subject to high grazing pressure to the extent that there is currently no natural regeneration of any regent honeyeater feed trees within the derived native grasslands (Figure 5). The development footprint is located on a basalt cap in an area of relatively high elevation.

The most valuable mapped important regent honeyeater habitats within the development footprint consists of 16.20 ha of Grey Box × White Box scattered trees (Table 1). These trees are generally mature or old growth trees and are sparsely distributed within the development footprint. Although Grey Box and White Box hybridise in the region, field assessments indicated the majority of the scattered trees within the RHIA more closely resembled Grey Box than White Box, with very small bud and fruit and small glossy leaves. The flowering phenology of box trees within the Project Area is unknown, as white box typically flower in winter to early spring whereas grey box typically flower in summer. Some regent honeyeater feed trees within the development footprint are senescing and/or suffering impacts of drought.

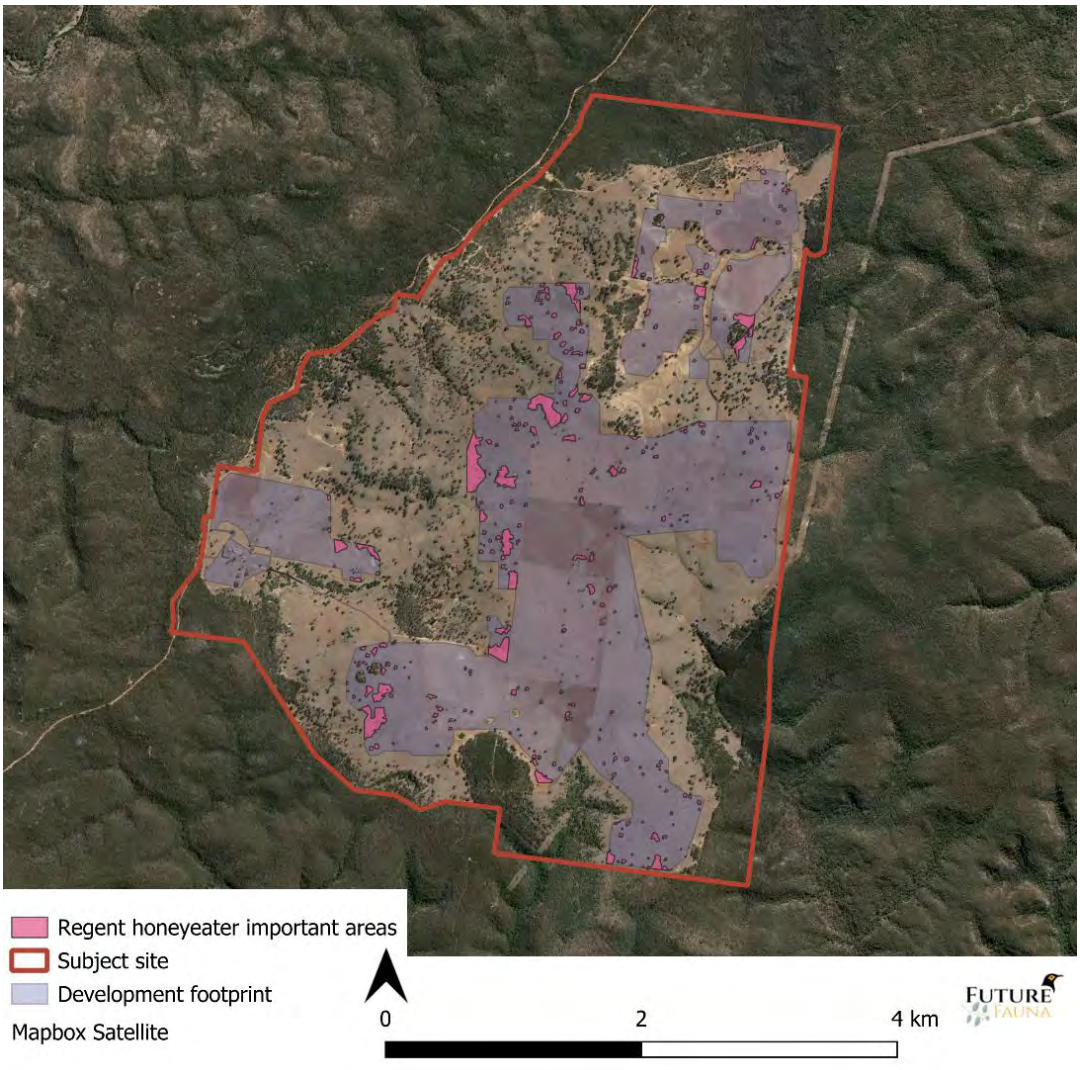


Figure 3: Extent and distribution of regent honeyeater important are mapping within the proposed Goulburn River Solar Farm development footprint.

Water is a critical habitat feature for regent honeyeaters, particularly during the nesting period (Crates, Terauds, et al., 2017; Geering & French, 1998). Drainage lines intersecting or in close proximity to the development footprint are ephemeral, as are the majority of farm dams within the development footprint. It is therefore unlikely that regent honeyeaters would use the farm dams or ephemeral watercourses within the development footprint as a drinking or bathing point due to both their ephemeral nature and a lack of native vegetation cover surrounding them.

No other threatened woodland bird species that may be indicative of high-quality habitats that may at times be utilised by regent honeyeaters were detected within the development footprint during the site visit. Analysis of bird data presented within the BDAR shows only small numbers of diamond firetails were detected within the development footprint during surveys. The following threatened woodland bird indicator species were not detected within the development footprint:

- Brown treecreeper *Climacteris picumnus*
- South-eastern hooded robin *Melanodryas cucullata cucullata*
- Turquoise parrot *Neophema pulchella*
- Black-chinned honeyeater *Melithreptus gularis*
- Dusky woodswallow *Artamus cyanopterus*
- Varied sittella *Daphoenositta chrysoptera*

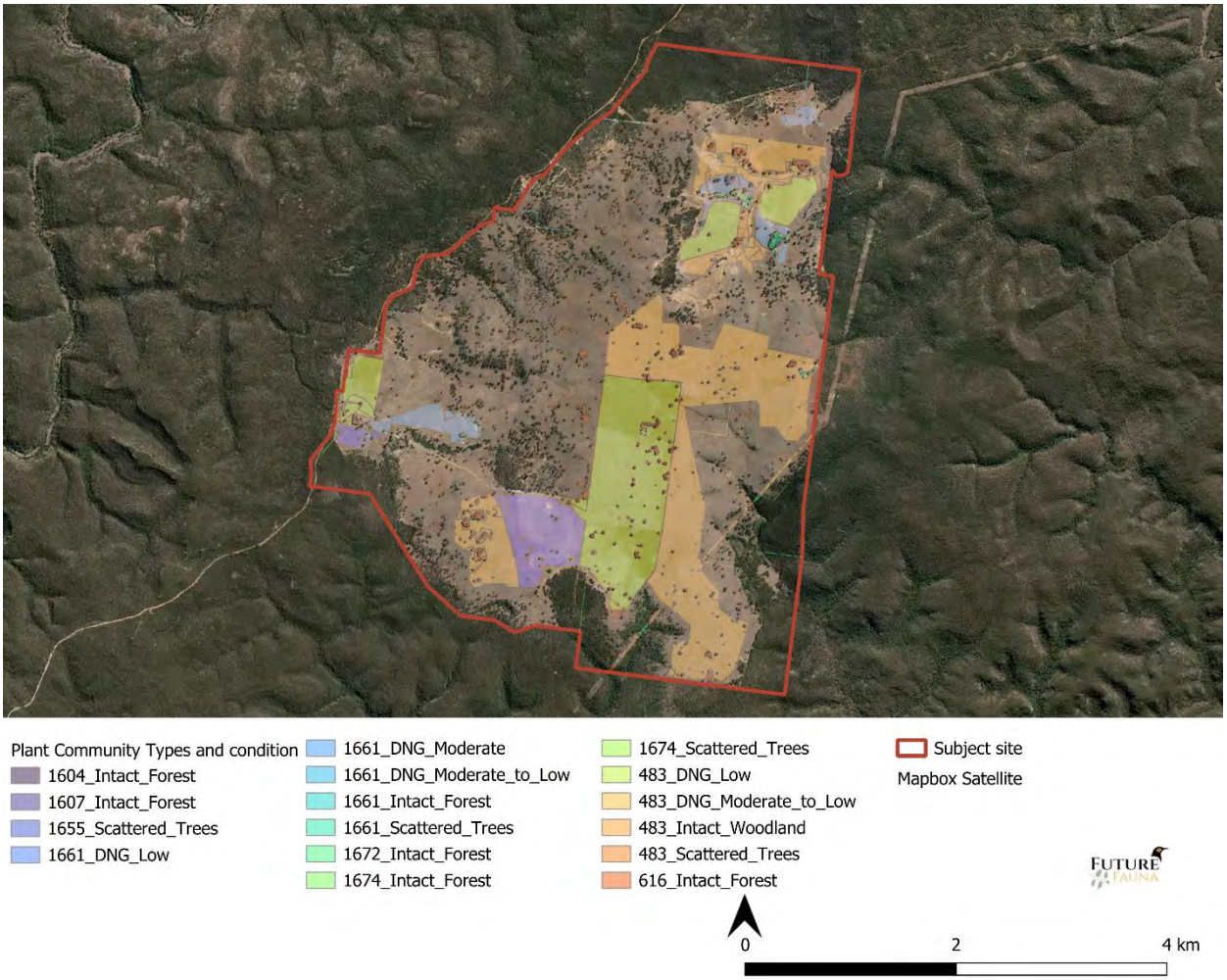


Figure 4: Plant Community Types and condition within the Goulburn River Solar Farm development footprint. GND signifies derived native grassland.

Figure 5: Indicative imagery of PCT 483- Grey Box × White Box grassy open woodland and derived native grasslands within the proposed Goulburn River Solar Farm development footprint.

Table 1: Extent of regent honeyeater important area mapping within the Goulburn River Solar Farm development footprint by Plant Community Type and condition.

Plant Community Type	Condition	Area (ha)
483- Grey Box × White Box grassy open woodland	Zone 1- scattered trees	16.20
483- Grey Box × White Box grassy open woodland	Zone 2- moderate condition derived native grassland	11.54
483- Grey Box × White Box grassy open woodland	Zone 3- moderate to low condition derived native grassland	5.91
1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest	Zone 4- scattered trees	1.37
1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest	Zone 5- low to moderate condition derived native grassland	4.34
1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest	Zone 6- low condition derived native grassland	2.47
Non-PCT areas		0.13

3.2 Biodiversity Stewardship Site

The preliminary boundary of the proposed BSS contains 1,195.76 ha of native vegetation, excluding water bodies, of which 824.73 ha is included within the regent honeyeater important area mapping (Figures 6-8). The BSS encompasses approximately 92 % of the regent honeyeater important areas contained within the Project Area (Figures 3, 6 & 7).

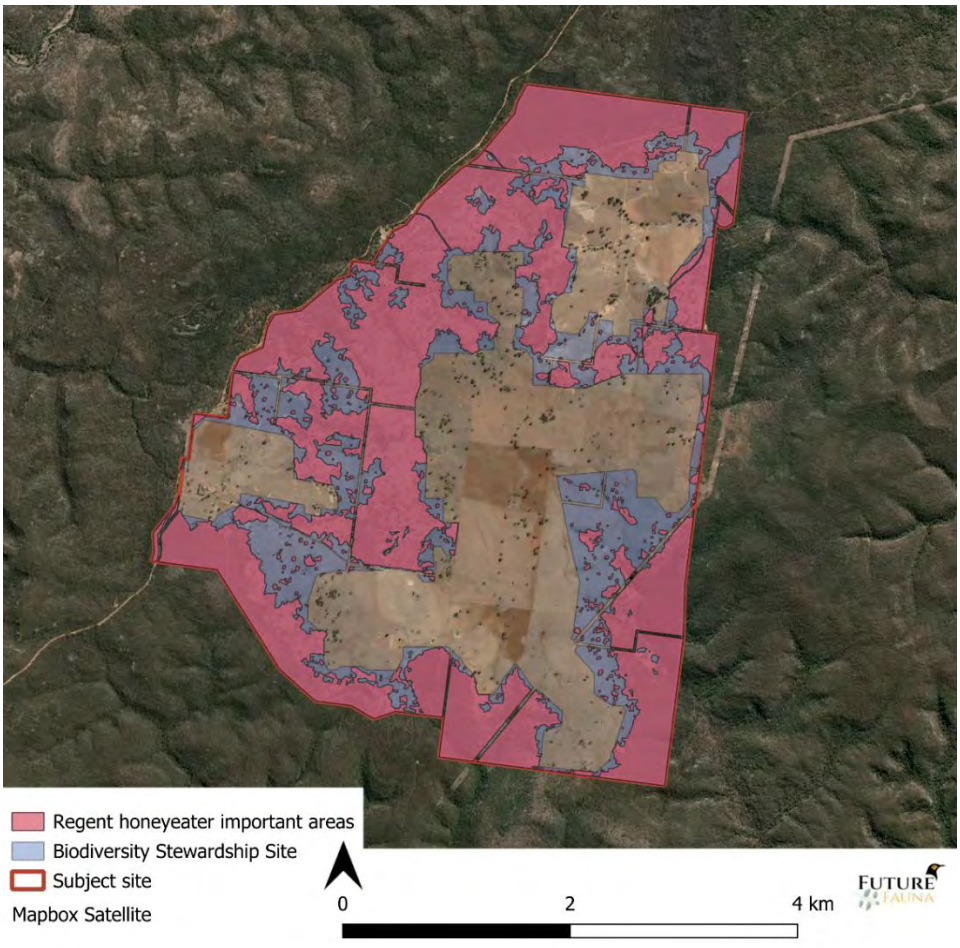


Figure 6: Distribution of regent honeyeater important area mapping within the proposed Goulburn River Solar Farm Biodiversity Stewardship Site. Regent honeyeater important areas are overlaid the proposed Biodiversity Stewardship Site.

The RHIA mapping within the proposed BSS is comprised primarily of PCTs 483- Grey Box × White Box grassy open woodland (386.83 ha), 1672- Red Ironbark – Grey Gum – Black Pine heathy woodland (225.35 ha),1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest (142.34 ha, Table 2), PCT 1604 Narrow-leaved Ironbark – Grey Box – Spotted Gum – grass woodland (49.95 ha) and PCT 1607 Blakely's Red Gum – Narrow-leaved ironbark – Rough-barked Apple Shrubby Woodland (11.10 ha). Canopy cover within the BSS is primarily immature box-ironbark regrowth with a grassy-shrubby understorey, although there are a number of mature trees present these are primarily Narrow-leaved Ironbark. Spotted Gum occurs in the south-eastern part of the BSS. Trees are generally in good health and box mistletoe *Amyema miquelii* is patchily-distributed throughout the BSS (Figure 8).

The majority of the BSS occurs at a lower elevation than the development footprint, and is directly connected to neighbouring vegetation within Goulburn River National Park. Both of these factors make the habitats within the BSS significantly more important to regent honeyeaters than those within the development footprint.

There are also a number of small to medium-sized dams within the BSS which would be suitable for regent honeyeaters to utilise for drinking or bathing. The dams are similar to those that supported two breeding regent honeyeater pairs on Hulk Road in 2016, approximately 4km from the BSS.

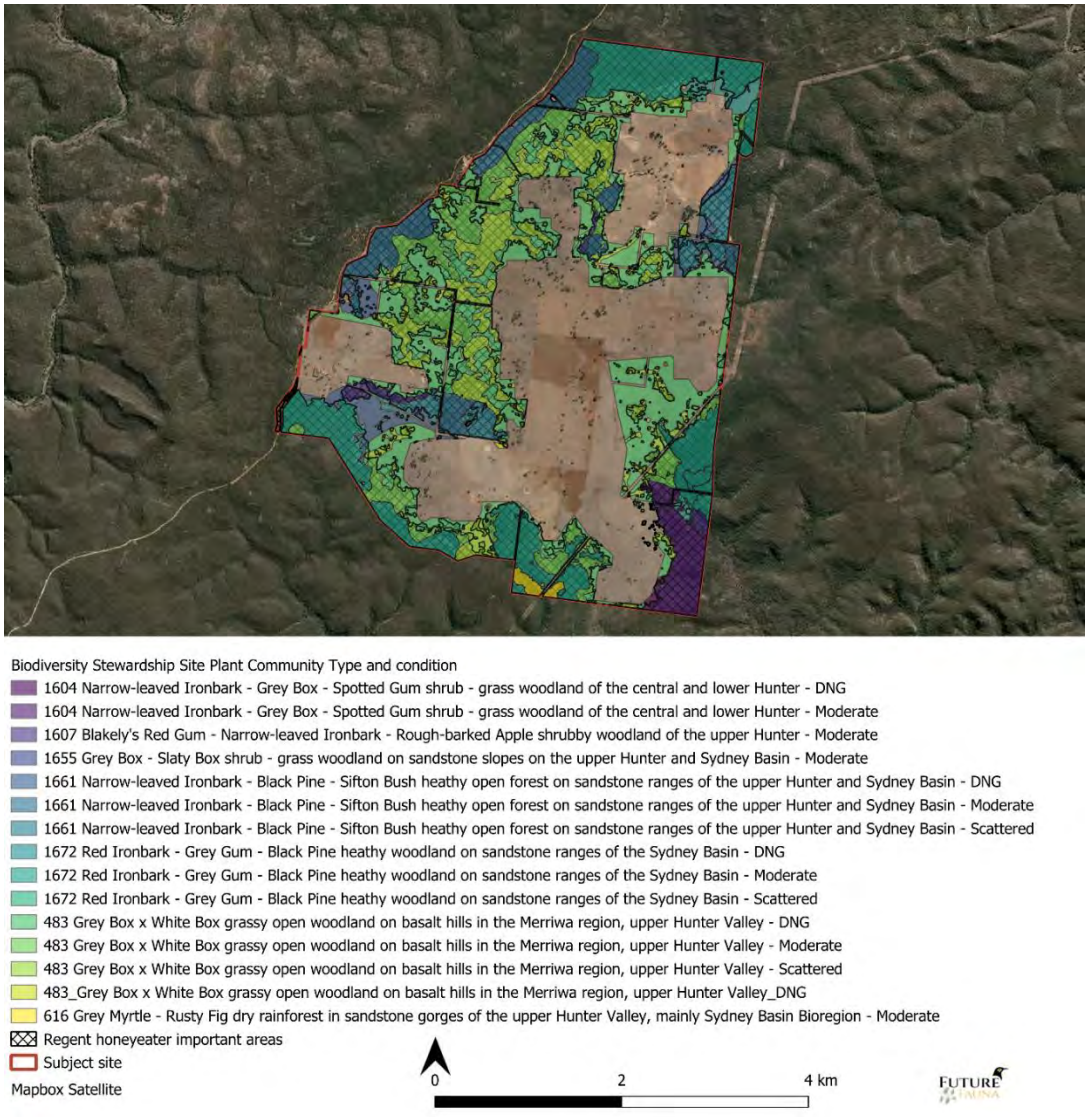


Figure 7: Distribution of Plant Community Types and condition within the Goulburn River Solar Farm Biodiversity Stewardship Site within respect to regent honeyeater important area mapping. DNG refers to derived native grassland.

Figure 8: Indicative imagery of box-ironbark woodlands and water sources present within the proposed Goulburn River Solar Farm Biodiversity Stewardship Site.

Table 2: Extent of Plant Community Types and regent honeyeater important areas contained within the Goulburn River Solar Farm Biodiversity Stewardship Site.

Plant Community Type	Total area in Biodiversity Stewardship Site (Ha)	Mapped regent honeyeater important area (Ha)
483- Grey Box x White Box grassy open woodland	692.71	386.83
616- Grey Myrtle – Rusty Fig dry rainforest	7.14	7.14
1604- Narrow-leaved Ironbark – Spotted Gum shrub grass woodland	51.98	49.95
1607- Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland	12.72	11.09
1655- Grey Box – Slaty Box shrub grass woodland	2.07	2.03
1661- Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest	187.72	142.34
1672- Red Ironbark – Grey Gum – Black Pine heathy woodland	241.44	225.35

Although small numbers of noisy miners occur within the BSS, brown treecreeper, dusky woodswallow, varied sittella and black-chinned honeyeater were also all detected occupying the BSS during the site visit in October. In addition, glossy-black cockatoo and scarlet robin were detected occupying the BSS during fauna surveys conducted by Umwelt.

4. Serious and Irreversible Impact assessment

1. The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.

Response: Umwelt and Lightsource BP provided the following statement in response to SAII point 1 in with regards to avoidance and minimisation of potential impacts of the Goulburn River Solar Farm on the regent honeyeater. All other responses have been prepared by the author with review and comment from Umwelt's BAM accredited assessor.

- 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 BSS, excluding water bodies, of which 824.72 ha is included within the regent honeyeater important area mapping (Figures 6-8). The BSS 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 (792.22 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.

Table 1: Goulburn River Solar Farm impact avoidance

Regent Honeyeater Important Habitat Development Footprint Impacts			
Design Revision A (Scoping Report)	**Design Revision B**	**Design Revision C**	**Design Revision D**
109.51	79.02	45.09	42.43

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.

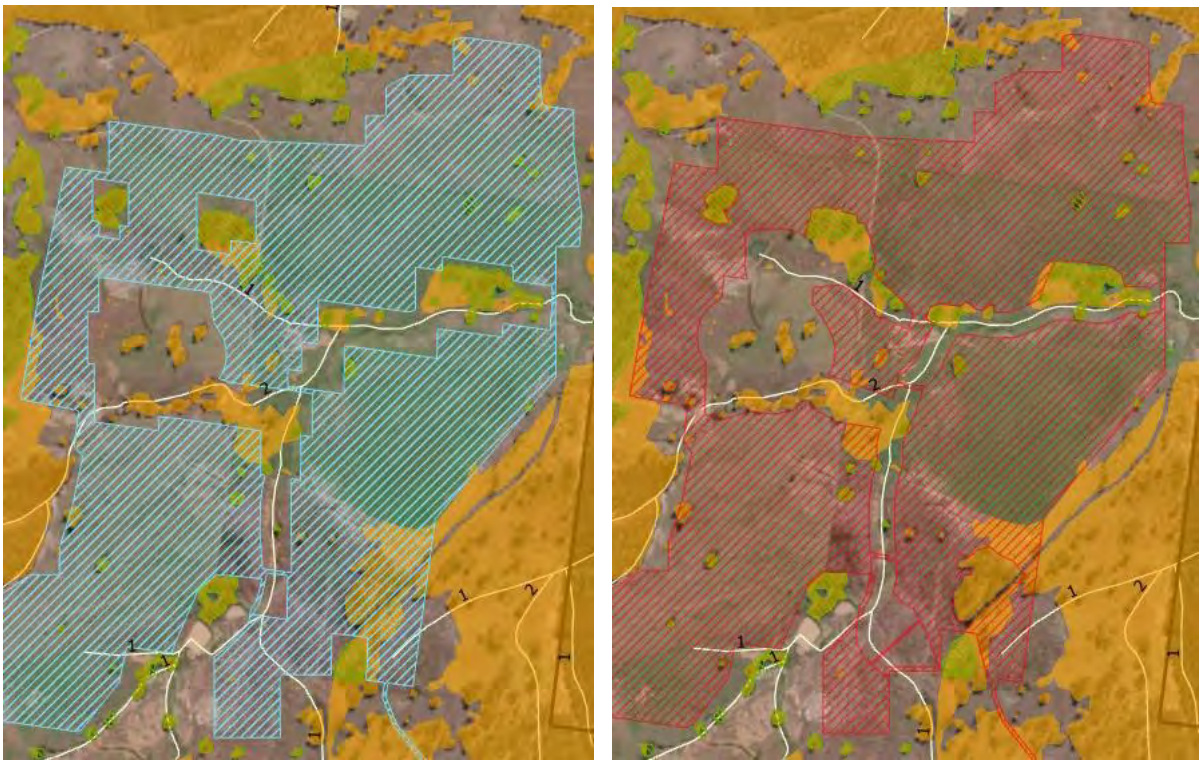


Figure 9 Detail of the most recent changes to the Development Footprint (EIS = blue, Amendment Report = red; Regent Honeyeater important habitat is shown as orange, with box gum woodland scattered trees in green).

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 Footslopes 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)

Response: 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 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).

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.

Response: In addition to the information provided in response to 2a (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.

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

Response: 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.

ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer)

Response: 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.

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.

Response: 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, Burragorang 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. 2021).

c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:

i. extent of occurrence

Response: 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 SAII assessments.

ii. area of occupancy

Response: 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 SAII assessments.

iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences).

Response: 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 Burragorang 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. 2021).

iv. whether the species' population is likely to undergo extreme fluctuations.

Response: 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.

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.

Response: 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 site establishment are considered measures more complementary to targeted actions to help save regent honeyeaters from extinction in the coming decades.

ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site.

Response: 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.

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).

Response: 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.

Response: regent honeyeaters are not listed as data unknown or data deficient.

As per Section 9.1.2.4 of the BAM 2020, the following information, where available, is provided to determine SAII:

(a) The impact on the species' population (Principles 1 and 2) presented by:

(ii) An estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population.

Response: 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 and the species' current population size, very unlikely that more than five (5) regent honeyeaters could on very rare occasions forage within the GRSF development footprint, which would represent between 1.7 – 5 % of the New South Wales population.

(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.

Response: 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 a 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.

(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.

Response: 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 59 % of the 42.43 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.

(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.

Response: The GRSF development footprint will lead to the loss of 42.43 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 SAII assessments.

(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.

Response: 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.

(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: 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 42.43 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 42.43 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.

(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 of the BDAR or BCAR.

Response: 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.

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.

5. Conclusions

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 Project Area 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 areas within the development footprint that are considered critical regent honeyeater habitat.

The habitats of most value to the regent honeyeater within the Project Area 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 200m 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.

6. Management recommendations

If additional offset requirements are considered necessary, Lightsource bp may choose to implement additional mitigation measures to benefit regent honeyeaters, including:

- Noisy miner management. Noisy miner culling has been successful in reducing the number of noisy miners in known regent honeyeater breeding areas on the Goulburn River (Crates et al., 2020, 2023). Whilst noisy miners are present within some parts of the GRSF Biodiversity Stewardship Site, noisy miner management would be more beneficial if it were to occur in areas where regent honeyeaters are known to breed or may breed in future if noisy miner populations were reduced. Potential areas for implementing noisy miner management include the section of the Goulburn River between ‘Coggan’ and Drummer’s flat. Noisy miner management has already taken place within this section at Morrison’s flat, and could be expanded or sustained to suppress noisy miner numbers in areas with high potential for regent honeyeater nesting to occur. Noisy miner management would require a sustained commitment of at least 5-10 years to benefit regent honeyeaters and prevent noisy miner recolonisation within management areas.
- Habitat restoration. Regent honeyeaters are most restricted by the availability of breeding habitat. Restoration of cleared riparian box-gum woodland on fertile river flats within close proximity to known regent honeyeater breeding areas on the Goulburn River and surrounds would most assist long-term

recovery of the species. Planting of yellow box *E. melliodora* would be highest priority, with secondary species including Blakely's red gum *E. blakelyi,* Manna gum *E.viminalis* and rough-barked apple *A. floribunda.* Habitat restoration in any noisy miner management areas could complement noisy miner management to help prevent noisy miner recolonisation in the longer term.

- Nest protection funding. Protecting regent honeyeater nests from predation will be a critical way of increasing breeding productivity of the wild population. Population models indicate breeding females will need to produce on average one extra juvenile per female per year to facilitate recovery of the population (Heinsohn et al., 2022), and recent efforts in the Capertee Valley suggest targeted nest predator management in regent honeyeater breeding areas can double nest success rates (R. Crates, unpublished data). A financial contribution could be made to fund the location and protection of wild regent honeyeater nests in coming years.
- Zoo-breeding and release. Zoo-bred regent honeyeaters are now being reintroduced into the greater Blue Mountains. A financial contribution could be made to increase the breeding capacity of Taronga Zoo Sydney & Taronga Western Plains Zoo Dubbo) to reach the target cohort size of 100 birds released into the wild biannually (Heinsohn et al., 2022).

Mistletoe seeding has been discussed as an additional measure, however the host plants of needle-leaf mistletoe *Amyema cambagei* (with which mistletoe species regent honeyeater nesting is most often associated) are not present within the proposed BSS. Additionally, in recent years significant natural regeneration of needle-leaf mistletoe has been observed in key breeding areas (R. Crates, Pers. Obs). Coupled with low rates of experimental germination of seeded needle-leaf mistletoe (BirdLife Australia, unpublished data), attempts to restore or supplement mistletoe populations within the GRSF Biodiversity Stewardship Site or elsewhere are unlikely to benefit regent honeyeaters in the longer term.

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8. Author Curriculum Vitae

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Selected employment history:

- October '21 – present: **Owner, FutureFauna**- Ecological consulting, research and conservation.
- September '18 – present: **Postdoctoral Fellow, Australian National University**- Designing, implementing and managing national monitoring programs for the regent honeyeater and swift parrot. Publication of peer-reviewed articles pertaining to woodland bird conservation. Student supervision, teaching.
- December '14 – Jan '15: **Freelance ecologist.** Thames estuary wind farm environmental impact surveys.
- September '10 – November '13: **Edward Grey Institute, University of Oxford- Graduate research assistant.** RA to professor Ben Sheldon, on a major ERC grant to study the social ecology and dispersal of wild birds.

Academic history:

- 2015-2018 - Australian National University, Australia. PhD, conservation biology.
- 2006-2010 - University of East Anglia. BSc (1st class Hons) Ecology with a year in Australasia.
- 1999-2006 - Barton Court Grammar School, Canterbury. 4 A-levels grade A and 8 GCSEs grade A*- A.

Academic awards:

- Michael Graham prizes for best performance in Ecology & best conservation project, University of East Anglia.
- Australian National University, Australian Postgraduate Award Research Scholarship.

Industry awards:

- NSW Minerals council environment award 2022- managing noisy miners for regent honeyeater conservation. In collaboration with Yancoal and Australian Vertebrate Pest Management.

Selected publications:

- Crates, R. et al. (2022). Towards effective management of an overabundant native bird: the noisy miner. *Conservation Science and Practice* e12875.
- Crates, R. et al. (2022). The phenotypic costs of captivity. *Biological Reviews* doi:10.1111/brv.12913.
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Selected Grants:

- NSW Local Land Services: Regent honeyeater population monitoring program. $300,000.
- CWP renewables: Sapphire Wind Farm swift parrot and regent honeyeater biodiversity offset. $250,000.
- Commonwealth of Australia Department of Agriculture, Water & Environment: Noisy miner management assessment. $70,000.
- Commonwealth of Australia Department of Agriculture, Water & Environment: King Island scrubtit and brown thornbill population genetics $70,000.
- BirdLife Australia: Regent honeyeater monitoring, nest protection and noisy miner management. $60,000.
- Bin Zayed Species Conservation Fund: Ecology and conservation of the regent honeyeater. $28,000.

Professional accreditations

- Swift Parrot and Regent Honeyeater listed species' expert (2021-present), NSW Biodiversity Conservation Division.

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