BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

TOCUMWAL EXPLOSIVE MAGAZINE STORAGE UPGRADE

BERRIGAN SHIRE LOCAL GOVERNMENT AREA, NSW

SEPTEMBER 2025

Report prepared by

OzArk Environment & Heritage

for GHD on behalf of Orica Australia Pty Ltd

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CERTIFICATION

I certify that I have prepared this BDAR and, to the best of my knowledge, it is in accordance with the NSW *Biodiversity Conservation Act* 2016 and the Biodiversity Assessment Method 2020 (BAM 2020). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity.

BDAR prepared by	**Dr David Orchard**
Signed	
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Executive summary

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica Australia Pty Ltd (the proponent) to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed upgrade of the existing Explosives Reserve Magazine Compound at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire Local Government Area (LGA). The Project will be assessed as a State Significant Development (SSD-64923965).

The proposal would occupy up to 7.05 ha, of which 4.53 ha possesses remnant native vegetation. The remaining extent of the subject land has been cleared for existing infrastructure or contains non-native vegetation. The proposal triggers entry into the NSW Biodiversity Offsets Scheme (BOS) by virtue of its status as a State Significant Development (SSD); consequently, the proponent is required to prepare a Biodiversity Development Assessment Report (BDAR) and to offset impacts to biodiversity. This report documents the assessment, which has been completed in accordance with the Biodiversity Assessment Method 2020 (BAM 2020) and details the proponent's biodiversity offset requirement (measured by the number of ecosystem and species credits).

The native vegetation present in the disturbance footprint consists of three Plant Community Types (PCTs):

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

Each PCT was recorded in a single condition state and assigned to a single vegetation zone: 9_Remnant, 45_Moderate, and 74_Remnant.

PCT 74 was found to belong to the Threatened Ecological Community (TEC) *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*, listed as a Critically Endangered Ecological Community (CEEC) under the NSW *Biodiversity Conservation Act* 2016 (BC Act). Up to 0.22 ha of this community would be impacted by the proposal.

PCT 45 was found to belong to the CEEC *Natural Grasslands of the Murray Valley Plains*, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). Up to 3.01 ha of this community would be impacted by the proposal.

In total, 36 ecosystem credit species were generated by the Biodiversity Assessment Method Calculator (BAM-C). The habitat suitability of the subject land for these species was assessed. Three species was removed from the list due to habitat constraints; consequently, 33 species were assumed present as ecosystem credit species, generating a total of 167 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 16 species were eliminated by targeted survey. Two species – the Southern Myotis (*Myotis macropus*) and the Brush-tailed Phascogale (*Phascogale tapoatafa*) – could not be ruled out by constraints or surveys and have been assumed present, generating a total of 52 species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within this BDAR. Therefore, a referral of the proposal to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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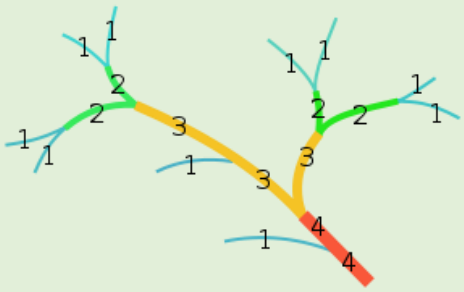
Abbreviations

Term	Description
^{0}C	Degrees Celsius
AOBV	Areas of Outstanding Biodiversity Value
APZ	Asset Protection Zone
ASL	Above Sea Level
BAM	Biodiversity Assessment Method 2020
BAR	Biodiversity Assessment Report
BCR	NSW *Biodiversity Conservation Regulation* 2017
BDAR	Biodiversity Development Assessment Report
BC Act	NSW *Biodiversity Conservation Act* 2016
BOS	NSW Biodiversity Offsets Scheme
CAMBA	China-Australia Migratory Bird Agreement
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW, Cth	Commonwealth Department of Climate Change, Energy the Environment and Water
DoE	Department of Environment
DNVRM	Draft Native Vegetation Regulatory Map
DPE	Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
ESCP	Erosion and Sediment Control Plan
FM Act	NSW *Fisheries Management Act 1994*
GDEs	Groundwater dependent ecosystems
GPS	Global Positioning System
ha	Hectare
HTE	High Threat Exotic

Term	Description
IBRA	Interim Biogeographic Regionalisation of Australia.
JAMBA	Japan-Australia Migratory Bird Agreement
KFH	Key Fish Habitat
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
mm/cm/m/m^2/km	Millimetre/centimetre/metre/square metre/kilometre
MNES	Matters of National Environmental Significance
NPW Act	NSW *National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
NSW DCCEEW	NSW Department of Climate Change, Energy the Environment and Water
PCT	Plant Community Type
PMST	Protected Matters Search Tool
PRL	Protected Riparian Land
PW	Priority Weed
RAMSAR	Convention on Wetlands of International Importance
REF	Review of Environmental Factors
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened Ecological Communities
TSPD	Threatened Species Profile Database
VIS	Vegetation Information System
VRZ	Vegetated Riparian Zone
WoNS	Weed of National Significance

Glossary of terms

Term	Description
Areas of outstanding biodiversity	An area of outstanding biodiversity value is: ❖ an area important at a State, national or global scale, and ❖ an area that makes a significant contribution to the persistence of at least one of the following: o multiple species or at least one threatened species or ecological community o irreplaceable biological distinctiveness o ecological processes or ecological integrity o outstanding ecological value for education or scientific research. The declaration of an area may relate, but is not limited, to protecting threatened species or ecological communities, connectivity, climate refuges and migratory species (BC Act).
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impacts	Are those that directly affect the habitat of species and ecological communities and of individuals using the study area. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (OEH 2018).
Habitat	The area occupied or used, including areas periodically or occasionally occupied or used, by any threatened species or ecological community and includes all the different aspects (both biotic and abiotic) used by species during the different stages of their life cycle (OEH 2018).
Important population	Is a population that is necessary for a species' long-term survival and recovery; this may include populations identified as such in recovery plans, and/or that are: ❖ 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 (DE 2013).
Indirect impact	Occur when project-related activities affect species or ecological communities in a manner other than direct loss within the subject land. Indirect impacts may sterilise or reduce the habitability of adjacent or connected habitats. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, reduction in viability of adjacent habitat due to edge effects, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, noise, light spill, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (OEH 2018).
Invasive species	Is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources, or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.
Local occurrence (EEC)	The ecological community present within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of the ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
Local population **(in regard to a threatened or migratory species)**	A local population of a threatened plant species comprises those individuals occurring in a defined area or a cluster of individuals extends into habitat adjoining and contiguous with the study area where the individuals could reasonably be expected to cross-pollinate. A local population of fauna species comprises those individuals known or likely to occur in a defined area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

Term	Description
	The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the study area from time to time (DECC 2007).
Low condition (vegetation)	Either: a) woody native vegetation with native over-storey percent foliage cover less than 50% of the lower value of the over-story percent foliage cover benchmark for that vegetation type, and where either: ❖ less than 50% of ground cover vegetation is indigenous species, or ❖ greater than 90% of ground cover vegetation is cleared or b) native grassland, wetland or herb field where either: ❖ less than 50% of ground cover vegetation is indigenous species, or ❖ more than 90% of ground cover vegetation is cleared. Note: The percentages for the ground cover calculations must be made in a season when the proportion of native ground cover vegetated compared to non-native ground cover vegetation is likely to be at its maximum.
Moderate to good condition (vegetation)	If native vegetation is not in low condition (above), it is in moderate to good condition.
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that prevents, reduce or controls adverse environmental effects of a project.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH 2018).
Proposal	Is considered to include 'all activities likely to be undertaken within the subject land to achieve the objective of the proposed development' (DECC 2007).
Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
Search area	Is considered to 'include the lands that surround the subject land for a distance of 10 km' (DECC 2007). The search area has been used to search information sources to establish the landscape context of the subject land.
Significant impact	A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
Strahler stream order	Strahler stream orders are used to define stream size based on a hierarchy of tributaries, based on the diagram below. 
Study area	Means the subject land and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (OEH 2018). In this instance, the study area extends 1,500 m from the site.
Subject land	Means the area directly affected by the proposal. The subject land includes the footprint of the proposal and any ancillary works, facilities, accesses or hazard reduction zones that support

Term	Description
	the construction or operation of the development or activity (OEH 2018).
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.

1 Introduction

1.1 Background

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica (the proponent) to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed upgrade of the existing Explosives Reserve Magazine Compound (ERMC) at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire Local Government Area (LGA). The Project will be assessed as a State Significant Development (SSD). The Planning Secretary's Environmental Assessment Requirements (SEARs) were issued for the Project on 18 December 2023 (SSD-64923965).

This BDAR documents the biodiversity assessment, which has been completed in accordance with the Biodiversity Assessment Method 2020 (BAM 2020) and details the proponent's biodiversity offset requirement (measured by the number of ecosystem and species credits).This BDAR will form part of an Environmental Impact Statement (EIS) being prepared by GHD to accompany an application for development consent under Division 5.2 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

1.2 Project Overview

The proponent operates an ERMC which is fenced, has an office and some basic machinery/storage sheds. The current facilities were originally constructed in 1956 and has been modified several times during its lifetime.

ERMC's primary function is to store cast boosters and cord locally produced and imported from overseas. It is a staging point to supply the full range of explosive product for NSW, Victoria, South Australia, and Tasmania.

However, the buildings are not compliant to Australian Standard (AS) 2187 Explosives – Storage, Transport and Use. Whilst current exemptions allow the plant to operate, Orica wishes to upgrade facilities to all Australian standards and code of practice and remove the need for the exemption.

Consequently, Orica intends to build four new 250 tonne HE magazines and a new detonator magazine in new locations (**Figure 1-1**). These new locations will be cleared, hardstands created, concrete slabs laid, and new sealed roads will be built to service the new magazines. Existing buildings will be either repurposed or demolished at the completion of the new build.

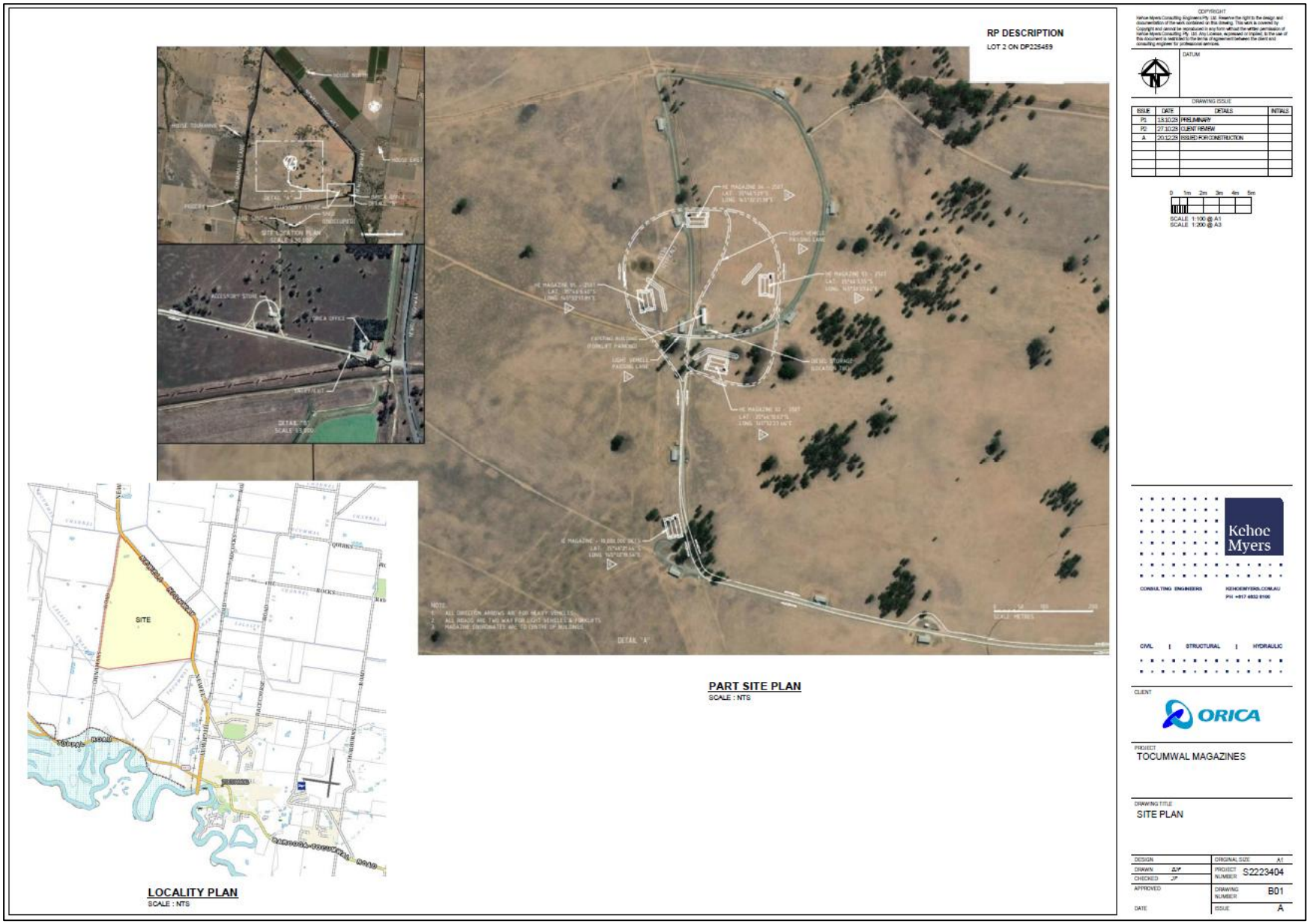


Figure 1-1. Proposed site layout for the Project.

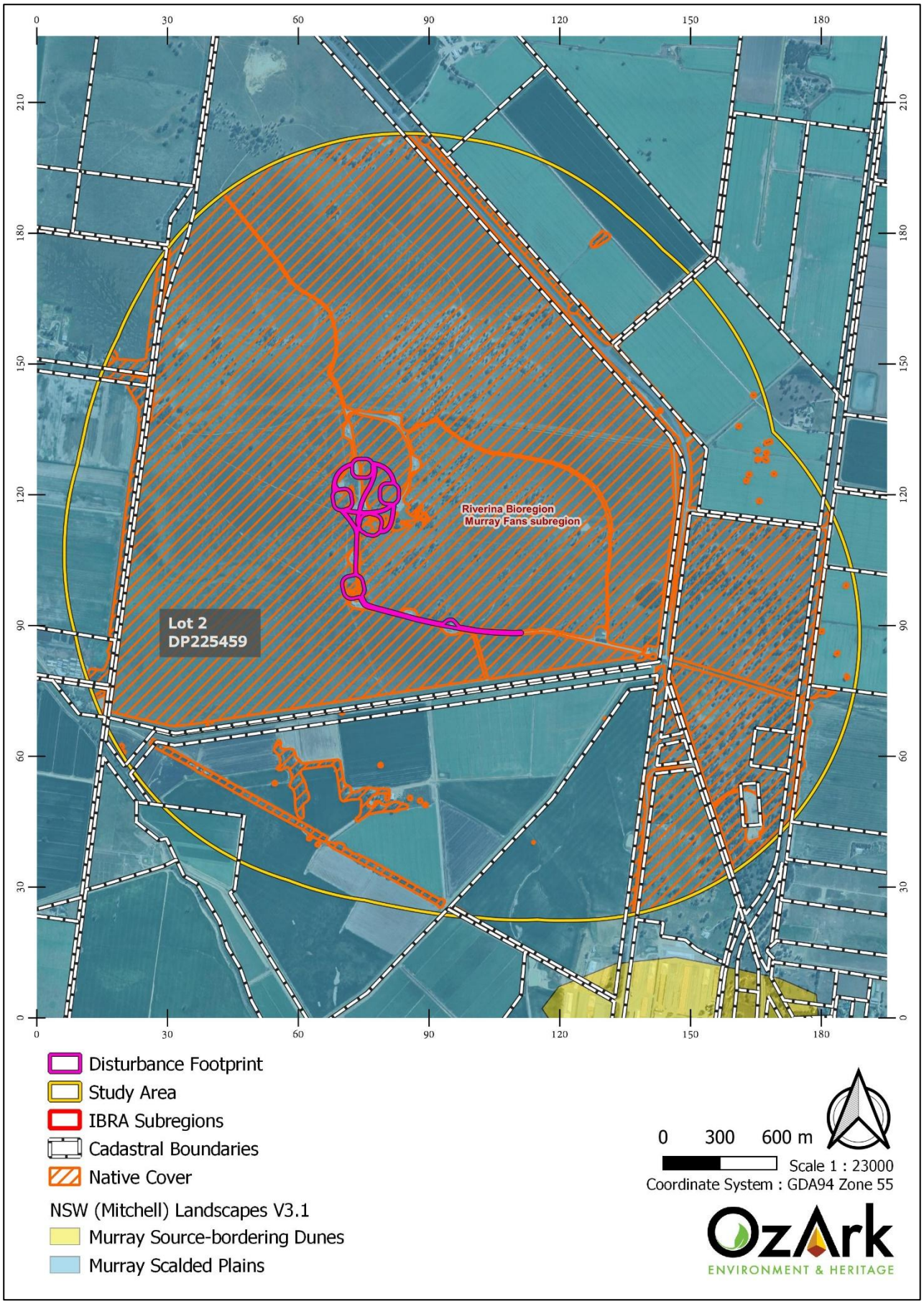


Figure 1-2. Location map showing the disturbance footprint, subject land, study area and key features required by the BAM (2020).

1.3 Relevant Terms

The following terms and definitions are used to describe the land assessed in this study.

Subject land – In a development assessment, the land proposed for development and related activities.

Disturbance footprint – The area of land that is directly impacted by the proposed development (including construction compound/stockpile/laydown areas and Asset Protection Zones [APZs]).

Study area – Land within a 1,500 m buffer from the outside edge of the subject land. The study area is assessed for the purpose of establishing landscape context including native vegetation cover and associated threatened species.

10 km search area – The area within a 10 km radius of the subject land. This 10 km buffer has been used to search information sources, including the Protected Matters Search Tool (PMST) (Department of Climate Change, Energy, the Environment and Water, 2024) and BioNet Atlas (DPE, 2024) threatened species sightings.

1.4 Site Identification

The site is identified under the *Berrigan Local Environment Plan* 2013 and on the NSW Planning Portal as follows.

- **Lot/Section/Plan No:** 2/-/DP225459.
- **Land Zoning:** RU1 Primary Production.
- **Minimum Lot Size:** 120 ha
- **Terrestrial Biodiversity:** The disturbance footprint falls largely within an area mapped as containing terrestrial biodiversity in the Berrigan LEP (see figure in **Appendix A**).

The location of the proposal is shown on the location map (**Figure 1-2**).

1.5 Regulatory Context

The proposal constitutes an SSD. In the case of SSD, entry into the BOS is automatic. Consequently, it has been determined that the BOS applies to this proposal irrespective of the extent of clearing necessitated by the works.

1.6 Report Purpose

The purpose of the BDAR is to determine the biodiversity assets, including flora, fauna, threatened species, threatened communities and habitat values, of the subject land.

The BDAR also identifies any constraints on the proposal according to relevant Federal and NSW environmental legislations and includes the calculation of ecosystem and/or species credits requiring offset.

1.7 Legislation

1.7.1 International legislation

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Ramsar Convention on Wetlands (Ramsar).

1.7.2 Commonwealth legislation

***Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act)**

To assist with nationally listed matters assessments, the Matters of National Environmental Significance, the Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999 (Fairfull [2013]) are followed.

Matters which fall under this legislation are addressed in **Section 6.8** and **Appendix D**.

1.7.3 NSW legislation

***Environmental Planning and Assessment Act* 1979 (EP&A Act)**

The EP&A Act provides the legal framework for the assessment and approval of the proposed activities. Part 4 of the EP&A Act requires the proponent to examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

***Biodiversity Conservation Act* 2016 (BC Act)**

Under the BC Act, the proponent has an obligation to consider impacts to all threatened species, populations and ecological communities listed in NSW, as well as ensuring the proposal does not exacerbate a Key Threatening Process (KTP). Entry to the BOS is triggered automatically for SSDs, as in the present case.

***Biodiversity Conservation Regulation* 2017 (BCR)**

The BCR defines the triggers and entry thresholds for the BOS. It also provides the rules for meeting offset obligations, triggers for authorities to refuse development applications and compliance provisions.

Biosecurity Act 2015

Schedule 1 of the *Biosecurity Act* 2015 contains the special provisions relating to weeds and duty to control weeds which pose a biosecurity risk. The Department of Primary Industries (DPI) maintains a list of 'Priority Weeds' (previously referred to as noxious weeds) in NSW for the State and each region which impose an obligation on landholders to prevent, eliminate or minimise, so far as is reasonably practicable, any biosecurity risk they may pose. In addition, Local Government Areas may include their own priority weeds.

Fisheries Management Act 1994 (FM Act)

The objects of the FM Act are to:

- Conserve fish stocks and key fish habitats.
- Conserve threatened species, populations and ecological communities of fish and marine vegetation.
- Promote ecologically sustainable development, including the conservation of biological diversity.

Section 201 of the FM Act states that a person other than a government authority must seek a permit from NSW DPI – Fisheries for dredging or reclamation in a waterway. Dredging work means any work that involves excavating water land. Reclamation work means any work that involves depositing any material on water land. However, this legislation does not apply for an SSD as per Section 4.4.1(1)(b) of the EP&A Act.

Matters relating to watercourses are discussed in detail in **Section 3.9** of this report.

Local Land Services Act 2013 (LLS Act)

The objects of the Act include '*to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistently with the principles of ecologically sustainable development*'. Briefly, the LLS Act applies to rural land, it does not apply to wilderness areas, National Parks, State Forests, flora reserves, areas of outstanding biodiversity value (under the BC Act), critical habitat under the FM Act, or land dedicated or reserved under the *Crown Lands Act 1989*.

Under the LLS Act, native vegetation means any of the following types of plants (including dead plants) native to NSW:

- trees (including any sapling or shrub or any scrub),
- understorey plants,
- groundcover (being any type of herbaceous vegetation),
- plants occurring in a wetland.

A plant is native to NSW if it was established prior to European settlement.

Clearing native vegetation means cutting down, felling, uprooting, killing, destroying, poisoning, ringbarking or burning or otherwise removing native vegetation.

Land defined as Category 1 – Exempt Land (within the meaning of Part 5A of the LLS Act) is to be excluded from assessment under the BAM (according to section 6.8(3) of the BC Act). Category 1 exemption applies to rural land (zoned RU1, RU2, or RU3) that was cleared of native vegetation as of 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The *SEPP (Biodiversity and Conservation)* 2021 (SEPPBC 2021) is the collation of biodiversity and conservation related SEPPs. Chapters 3 and 4 aim to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'.

Chapter 3 of the SEPPBC 2021 applies to the subject land as the Berrigan LGA is listed in Schedule 2 of the SEPPBC 2021 and the land is zoned RU1.

Assessment of the subject land according to the provisions of Chapter 3 of the SEPPBC 2021 determined that areas of PCT 9 (1.30 ha) within the site (see **Section 4.2**) constitute potential koala habitat for the Koala as a feed tree listed under Schedule 1 of the SEPP, River Red Gum (*Eucalyptus camaldulensis*), is the sole canopy tree in these areas. The site does not constitute core koala habitat, however, as there are no historical records of a resident population within the site and targeted surveys conducted as part of the present assessment did not identify any evidence of ongoing or recent occupancy. No further consideration is required for this area.

The proposal's potential impacts to Koalas have been further considered in this BDAR under the EPBC Act (**Appendix D**).

1.7.4 Berrigan Local Environmental Plan (2013)

A Local Environmental Plan (LEP) is a legal document prepared by Council and approved by the State Government to regulate land use and development. LEPs guide planning decisions for local governments. The plan allows Council to regulate the ways in which all land both private and public may be used and protected through zoning and development controls.

The key aims of the Berrigan LEP (2013) are as follows:

> *(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,*
>
> *(a) to encourage development that complements and enhances the unique character and scenic values of Berrigan, offering a diverse economy, significant natural resources and an attractive rural lifestyle,*

(b) to provide for a range of development opportunities that contribute to the social, economic and environmental resources of Berrigan in a way that allows the needs of present and future generations to be met by implementing the principles of ecologically sustainable development,

(c) to recognise and manage valued environmental and cultural heritage, landscape and scenic features of Berrigan,

(d) to promote the efficient and equitable provision of public services, infrastructure and amenities.

Sections of the subject land have been mapped as possessing terrestrial biodiversity values under the Berrigan LEP (see figure in **Appendix A**).

2 Methods

The ecological assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the BC Act, FM Act or the EPBC Act that have the potential to occur in the study area.
2. Field survey of the subject land to conduct BAM plots, identify vegetation communities and habitat features present and target predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence.
3. Preparation of a BDAR that describes the impacts of the proposed activity on native vegetation and threatened species, populations and ecological communities, and provides recommendations to avoid, minimise and mitigate these impacts. The BDAR also includes a biodiversity credit summary that identifies the number of ecosystem credits and species credits required to offset the development.

2.1 Personnel

OzArk operates under NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Scientific License 101908, NSW Department of Primary Industries and Regional Development (DPIRD) Accreditation as an Animal Research Establishment (accreditation number 53103), and the Secretary's Animal Care and Ethics Committee Animal Research Authority RVF21/954. The role and key details of personnel involved in the project are provided in **Table 2-1**.

Table 2-1. Summary of OzArk personnel qualifications and roles in the assessment.

Name	Position	Role	CV Details
Dr David Orchard	Senior Ecologist	Initial survey, BAM plots, vegetation mapping, BAM calculations, October targeted surveys, reporting	• Accredited BAM assessor – Accreditation # BAAS21028 • Doctor of Philosophy – Charles Sturt University • Graduate Diploma in Science (Botany) – University of New England • Bachelor of Arts – Australian National University • 4WD Training • First aid training • WH&S Induction Training for Construction Work
Dr Crystal Graham	Senior Ecologist	Reporting, quality control, technical review	• Accredited BAM assessor – Accreditation # BAAS22024 • Doctor of Philosophy – Biology – University of Sydney • Honours 1 – Biology – University of Sydney • Bachelor of Advanced Science – University of Sydney • 4WD Training • WH&S Induction Training for Construction Work
Lucca Brozler	Ecologist	Reporting	• Masters in Conservation Biology – The University of Queensland • Bachelor of Biological Science – The University of Queensland • WH&S Induction Training for Construction Work

Name	Position	Role	CV Details
Paris Hughes	Ecologist	Initial survey, January targeted surveys	• Honours (Animal Behaviour) – Flinders University • Bachelor of Science (Biodiversity and Conservation) – Flinders University • First Aid Training • WH&S Induction Training for Construction Work

2.2 Desktop Review

Existing information sources were reviewed to contextualise the study area, identify entities for targeted surveys, predict possible constraints, refine field survey methodology and assist with assessing the impacts of the proposal. Information sources consulted included:

- NSW Government Web Map Service (WMS) layers for NSW Imagery (compiled imagery, NSW Property, NSW Base Map and NSW Topographic Map) (https://www.spatial.nsw.gov.au/).
- EPBC Protected Matters Search Tool (https://www.environment.gov.au/epbc/protected-matters-search-tool)
- NSW State Vegetation Type Map C1.1.M1.1 (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map)
- NSW DPI threatened fish indicative distribution maps (www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps)
- NSW BioNet Wildlife Atlas Vegetation classification (https://www.environment.nsw.gov.au/research/Visclassification.htm)
- NSW BioNet Threatened Biodiversity Data Collection (www.bionet.nsw.gov.au/)
- NSW BioNet Atlas (www.bionet.nsw.gov.au/)
- Register of Declared Areas of Outstanding Biodiversity Value (www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/critical-habitats)
- PlantNET, NSW Flora Online (www.plantnet.rbgsyd.nsw.gov.au/)
- NSW Department of Planning and Environment *Biodiversity Values Map* (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap)
- Vulnerable Lands – Steep or Highly Erodible, Protected Riparian and Special Category land Mapping (https://datasets.seed.nsw.gov.au/dataset/vulnerable-land-protected-riparian73a9e)
- Acid Sulphate Soils Risk mapping (https://datasets.seed.nsw.gov.au/dataset/acid-sulfate-soils-risk0196c)

- Directory of Important Wetlands of Australia (DIWA) (https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands)
- NSW wetlands mapping (https://datasets.seed.nsw.gov.au/dataset/nsw-wetlands047c7)
- Important area mapping for the Regent Honeyeater and Swift Parrot available from the Biodiversity Offsets and Agreement Management System (BOAMs).

All databases were searched in July 2023, prior to conducting the initial fieldwork, and reviewed (and updated where applicable) in March and May 2024 prior to completing the draft BDAR. Results of the database searches are provided in **Appendix A**.

2.3 Field Survey

2.3.1 BAM Survey Methodology

Vegetation communities are identified in accordance with the online NSW Plant Community Type Classification (DPE, 2023d), which is the current state-wide vegetation classification system for Plant Community Types (PCTs). This classification system is used for vegetation mapping, development assessment and site planning purposes. It describes over 1,500 PCTs across the state, and groups the vegetation communities into vegetation Class and Formation / Sub-formation as per Keith (2004).

In this study, PCTs were identified on the basis of the following inputs:

- NSW State Vegetation Map C1.1.M1.1 (DPE 2022), which provides predictive mapping of PCTs in and around the subject land. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type on the subject land and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database, this being used to identify the candidate vegetation communities likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type) and the relevant published PCT descriptions.

If any of the PCTs were identified as having potential to be part of a Threatened Ecological Community (TEC), the relevant identification guidelines (NSW Scientific Committee listing criteria and Commonwealth identification guides) were consulted to determine the status of the vegetation

community present. These guidelines provide the identification criteria used to positively identify the community as being part of the TEC. The criteria include location, species present, overstory species, weed cover, number and type of native species including whether certain 'important' native species are present.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNET online database (Royal Botanic Gardens and Domain Trust, 2023).

In total, eight BAM plots were completed on the 19th of July 2023. The plot locations were randomly selected whilst ensuring adequate survey effort within each vegetation zone (**Table 2-2**; **Figure 4-3**). According to the BAM (2020), a minimum of four BAM plots would be required for this site, which contains three vegetation zones of 0.22, 1.30, and 3.01 ha in size (see **Section 4.3.1** for a description of these zones). The location of BAM plots is shown in **Figure 4-3.** Plot data and site photographs are included in **Appendix B**.

Note that the initial survey covered a much wider area than the final footprint; consequently, most BAM plots fell outside of the final impact area. BAM plots which were considered to be unrepresentative of the vegetation within the final footprint (TO02, TO04, TO05) were omitted from the assessment. One additional plot, designated NN01, was conducted with a view to supporting the mapping of certain sections of the site as non-native. NN01 was not conducted as a full BAM plot but as an approximately 15 m × 15 m floristics-only plot.

Table 2-2. Minimum number of plots and transects required per zone area (DPIE, 2020b).

Vegetation zone area (ha)	Minimum number of plots/transects
<2	**1 plot/transect**
>2 – 5	**2 plots/transects**
>5 – 20	3 plots/transects
>20 – 50	4 plots/transects
>50 – 100	5 plots/transects
>100 – 250	6 plots/transects
>250 – 1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

Plots were surveyed according to the BAM (2020) as follows:

- The native survey plot consisted of nested 20 metres (m) × 50 m and 20 m × 20 m plots.

- Species composition and structure (species and percent cover) data are collected from within the 20 m × 20 plot.
- Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within the 20 m × 50 m plot.
- Percent of litter cover data collected within five 1 m x 1 m squares positioned at 5 m, 15 m, 25 m, 35 m and 45 m points of the 50 m plot.
- The plots were positioned within the subject land and their GPS locations were recorded (GDA 94 / MGA Zone 55).

The remainder of the subject land was traversed by foot to confirm the nature of vegetation (i.e. native or non-native) and search for habitat features such as hollow bearing trees, rock outcrops, and nests.

2.3.2 Incidental Surveys

Incidental flora and fauna sightings were recorded while undertaking the BAM plots and searching the subject land for hollow-bearing trees and other potential habitat features. Potential habitat such as rock, loose bark and coarse woody debris was recorded and examined for signs of cryptic species. Tracks and other areas of suitable substrate were searched for animal tracks. Other evidence of fauna presence on the subject land, such as scats, feathers and sloughed skins were also recorded.

2.3.3 Targeted Surveys

Vegetation mapping for PCTs was conducted on the 19th of July 2023. Some fauna species were targeted while undertaking this initial fieldwork (**Table 2-3**). One Song Meter SM4 Acoustic Recorder was installed at the site (**Figure 2-1**) on the 19th of July 2023 at 08:30 and left in place until 18:30 on the 26th of July 2023 (eight days, eight dusks and seven nights of recording). Audio files were analysed by Kristy Peters at Wingbeat Ecology.

Targeted flora surveys were undertaken on the 10th of October 2023 and the 10-11 January 2024. These surveys involved walking parallel transects across the subject land at 10 m spacings as per the guidelines for surveying flora species under the BAM (DPIE, 2020a; **Figure 2-3**). October is the appropriate survey period for the species credit flora species *Austrostipa wakoolica, Brachyscome muelleroides, Lepidium monoplocoides, Pilularia novae-hollandiae, Swainsona sericea*. January is the appropriate survey period for the species credit flora species *Cullen parvum*. The flora survey effort is depicted in **Figure 2-3** and all detected flora species are listed in **Appendix B**.

The reported sensitivity of Austral Pillwort (*P. novae-hollandiae*) to climatic conditions warrants additional consideration. According to the Threatened Biodiversity Data Collection (TBDC), the species is typically recorded “in drying mud after inundation.” The subject land received heavy

rainfall (between 58.0 and 83.0 mm) six days prior to the survey, resulting in inundation of depressions, drains, and similar landscape features within the site. These were drying at the time of the survey. Comparison of the weather conditions at the time of the survey with prior records of the species at its two remaining known locations (Moulamein and Lake Cowal) suggests that conditions should have been suitable for detection. For example, records from Lake Cowal in November 2022 were made one, four, and eight days after heavy rainfall (22.0 mm) and sightings at Moulamein in September and October 2022 were made two and five days after the end of a series of rainfall events totalling 31.2 mm. It should be noted, however, that there is no clear association between rainfall and detection of the species: sightings were made at Lake Cowal in December 2022 and January 2023 after approximately a month without rain and other sightings at both locations were made during periods of infrequent, light rain. Weather data during the survey period and during known detection periods at Lake Cowal and Moulamein are given in **Appendix F**.

Targeted fauna surveys were conducted on the 19th of July 2023, 10th of October 2023, 10-12th of January 2024, and 29th of August-3rd of September 2024. The targeted fauna methodology followed the Biodiversity Assessment Method Survey Guide where available (i.e., for Koalas; DPE, 2022a) and where not available the Australian Government Guidelines were followed (DEWHA 2010, DSEWPC, 2011). Camera traps were baited with a mixture of honey, peanut butter and oats or sardines and confined within a gauze bait cannister and sprayed with honey water as an attractant. The targeted survey effort is summarized in **Figure 2-1**, **Figure 2-2**, **Figure 2-3**, and **Table 2-3** and all detected fauna species are listed in **Appendix C**. Survey effort was considered insufficient for the Brush-tailed Phascogale (*Phascogale tapoatafa*). This species has therefore been assumed present.

Potential habitat for Sloane's Froglet (*Crinia sloanei*) was observed in the wider landscape, meeting the constraints identified for this species in the BAM-C:

- Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area.
- Swamps within 500 m of swamps.
- Waterbodies within 500 m of waterbody.
- Semi-permanent/ephemeral wet areas.

Despite this, the species polygon for the species identified in the relevant survey guide (DPIE 2020c) is instead defined as comprising associated PCTs within 100 metres of the top of the bank of a suitable waterbody. No habitat meeting this description occurs within the disturbance footprint and it has not been possible to define a species polygon within this footprint. To reflect this, habitat for this species has been identified as degraded within the BAM-C and the species excluded from the final credit obligation.

Further detail concerning targeted survey effort is given in **Section 5.3.**

Table 2-3. Summary of Targeted Fauna Survey Effort (July 2023-September 2024).

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Ardeotis australis Australian Bustard	• 3 person hours of birding (3 days)	-	-	-	-	-	• 2 person hours of birding (1 day) • 8 days & 7 nights of audio recording	• 9.5 hours of birding (4 days)	• 14.25 person hours of birding (3 days)	• 2 person hours of birding (1 day) • 15.4 km diurnal transects	-	-	• 30.75 hours of birding (12 days) • 15.4 km transects • 8 days audio recording • 7 nights audio recording
Burhinus grallarius Bush Stone-curlew	• 3 person hours of birding (3 days) • 2 nights of call playback • 7 person hours spotlighting (2 nights)	-	-	-	-	-	• 2 person hours of birding (1 day) • 8 days & 7 nights of audio recording	• 9.5 hours of birding (4 days) • 5.75 hours of spotlighting (4 nights)	• 14.25 person hours of birding (3 days) • 2.5 hours of spotlighting (2 nights)	• 2 person hours of birding (1 day) • 15.4 km diurnal transects	-	-	• 30.75 hours of birding (12 days) • 2 nights call playback • 15.4 km transects • 8 days audio recording • 7 nights audio recording • 15.25 hours of spotlighting (8 nights)
Crinia sloanei Sloane's Froglet							• 7 nights of audio recording	-					• 7 nights of audio recording
Hieraaetus morphnoides Little Eagle								• 9.5 hours of birding (4 days)	• 14.25 person hours of birding (3 days)	• 2 person hours of birding (1 day)			• 25.75 hours of birding (8 days)

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Lophochroa leadbeateri Major Mitchell's Cockatoo									• 2 hollow watches (2 days) • 14.25 person hours of birding (3 days)	• 2 person hours of birding (1 day)	-	-	• 2 hollow watch days • 16.25 hours of birding (4 days)
Lophoictinia isura Square-tailed Kite	• 3 person hours of birding (1 day)								• 14.25 person hours of birding (3 days)	• 2 person hours of birding (1 day)	-	-	• 19.25 person hours of birding (5 days)
Myotis macropus Southern Myotis	-	-	-							-	-	-	• None
Ninox connivens Barking Owl	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights)	-	-	-	-	-	• 7 nights of audio recording	• 2 hollow watch (2 nights) • 4 nights of call playback • 5.75 hours of spotlighting (4 nights)	• 1 hollow watch (1 night) • 2 nights of call playback • 2.5 hours of spotlighting (2 nights)				• 5 hollow watch nights • 15.25 hours spotlighting (8 nights) • 7 nights of audio recording • 6 nights call playback
Petaurus norfolcensis Squirrel Glider	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights) • 10 camera trap nights (5 cameras)	-	-	-	-	-	• 7 nights of audio recording	• 4 hollow watches (4 nights) • 5.75 hours of spotlighting (4 nights)	• 2 hollow watches (2 nights) • 2.5 hours of spotlighting (2 nights)	-	-	-	• 8 hollow watch nights • 7 nights of audio recording • 15.25 hours spotlighting (8 nights) • 10 baited camera trap nights

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Phascogale tapoatafa Brush-tailed Phascogale	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights) • 10 camera trap nights (5 cameras)	-	-	-	-	-	• 1 day of diurnal searches for deceased males after male die off					-	• 2 hollow watch nights • 7 hours spotlighting (2 nights) • 10 baited camera trap nights
Phascolarctos cinereus Koala	• 3 hours diurnal searches (3 days) • 4 koala SAT surveys • 7 hours spotlighting transects (2 nights)	-	-	-	-	-	• 2 hours of diurnal searches (1 day) • 8 days & 7 nights of audio recording	• 9.5 hours of diurnal searches (4 days) • 5.75 hours of spotlighting (4 nights)	• 14.25 hours of diurnal searches (3 days) • 2.5 hours of spotlighting (2 nights)	• 2 hours of diurnal searches (1 day)	-	-	• 30.75 hours diurnal searches (12 days) • 4 koala SAT surveys • 15.25 hours spotlighting (8 nights) • 8 days & 7 nights of audio recording
Polytelis swainsonii Superb Parrot									• 2 hollow watches (2 days) • 14.25 hours of birding (3 days)	• 2 hours of birding (1 day)	-		• 2 hollow watch days • 16.25 person hours of birding (4 days)

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Tyto novaehollandiae Masked Owl	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights)	-	-	-	-	-	• 7 nights of audio recording	• 2 hollow watches (2 nights) • 4 nights of call playback • 5.75 hours of spotlighting (4 nights)	• 1 hollow watch (1 night) • 2 nights of call playback • 2.5 hours of spotlighting (2 nights)				• 5 hollow watch nights • 7 nights of audio recording • 15.25 hours spotlighting (8 nights) • 6 nights call playback

Green shading = approved survey month.

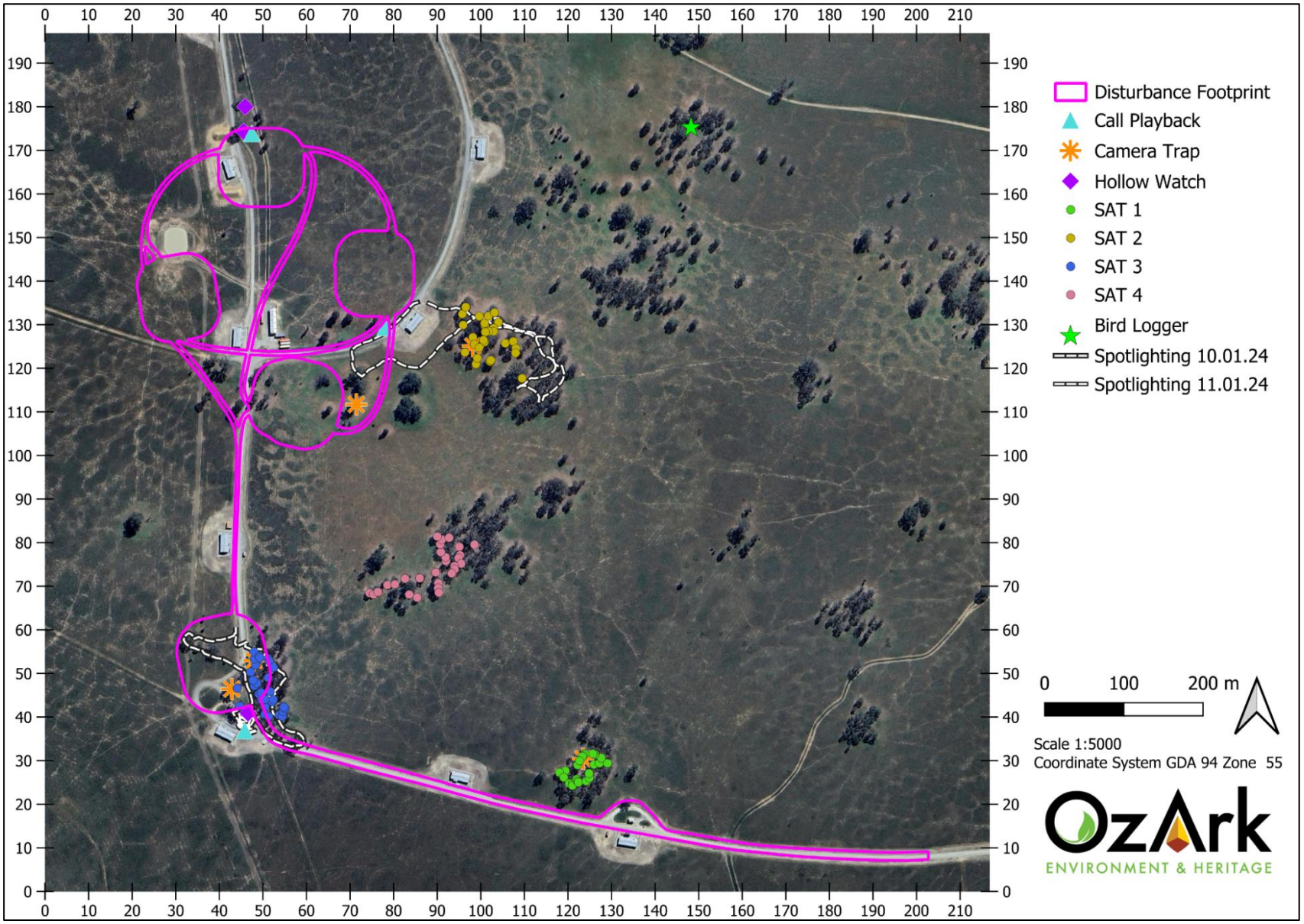


Figure 2-1. Summary of targeted fauna survey effort (July 2023, October 2023, January 2024).

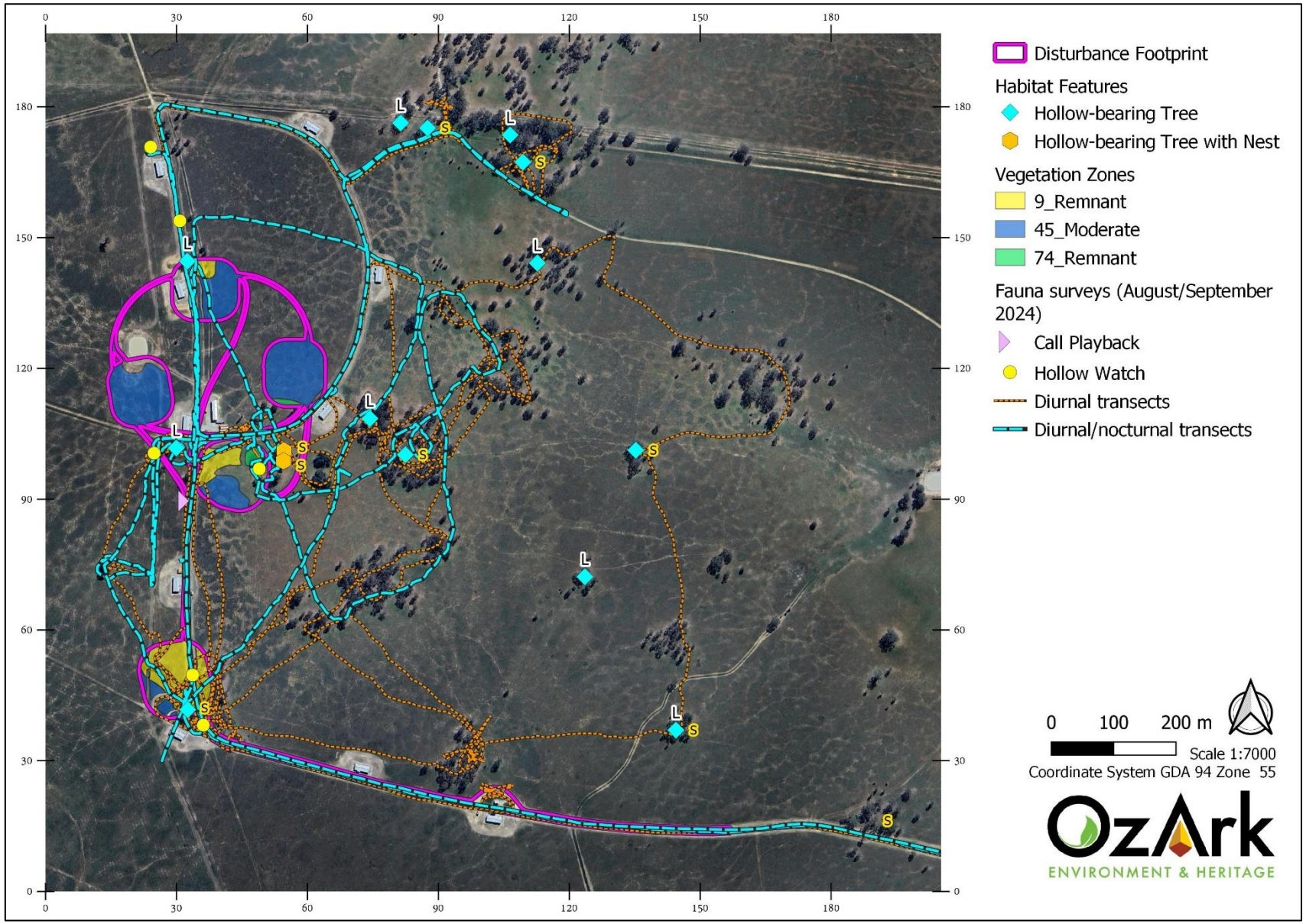


Figure 2-2. Summary of targeted fauna survey effort (August/September 2024).

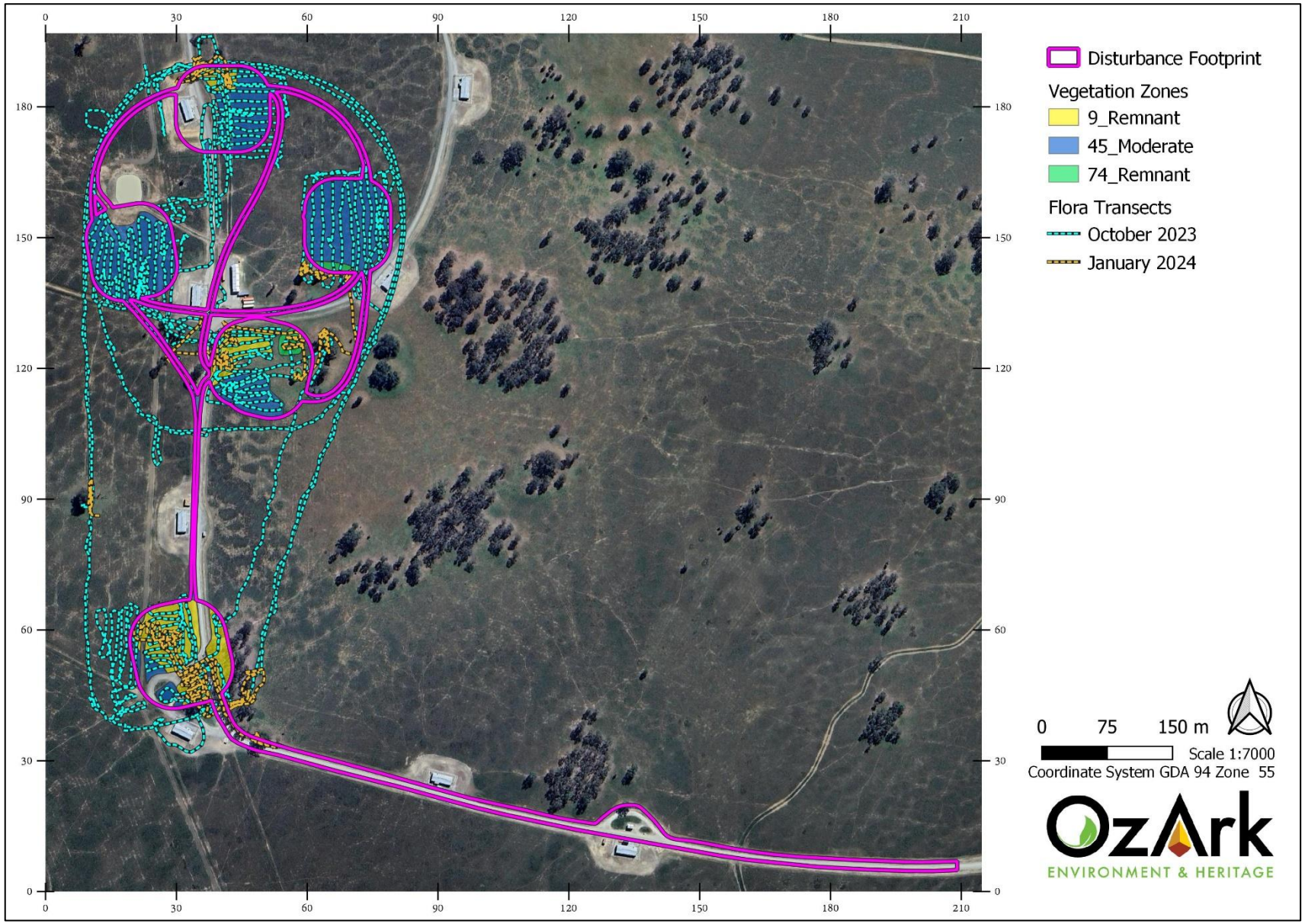


Figure 2-3. Summary of targeted flora survey effort.

2.4 Habitat Suitability

The suitability of the subject land as habitat for all species credit species generated by the BAM-C was assessed (**Section 5.2** and **5.3**).

The presence / absence of threatened species was categorised as follows:

- 'Assumed present' – the species was predicted to occur by the BAM-C, suitable habitat features occur on the subject land for that species and no targeted survey or expert report was commissioned.
- 'Absent' constraint – None of the habitat constraints or geographic limitations are present, the habitat is degraded or the species is a vagrant.
- 'Absent' surveyed – Targeted surveys undertaken during the time period specified for the species in the TBDC and following DPIE threatened species survey guidelines (DEWHA, 2010b). Where no relevant published guidelines exist, the survey must be undertaken using best practice methods.

EPBC Act-listed fauna that were predicted to occur within 10 km of the subject land were also assessed for their presence or absence on site (**Appendix D**).

2.5 Limitations

This study is based upon the species data available at the time of the study, and the environmental conditions, season, and time constraints imposed by the project for the field survey. Specific limitations on this study include the following:

- BAM plots were conducted in the winter, therefore flora species diversity may have been lower than if plots were conducted in the spring.
- Flora fieldwork was conducted on five days from July 2023-January 2024. While appropriate survey windows were adopted for the identification of threatened species, it is unlikely that the flora list contained in this report is comprehensive.
- Specific targeted survey methods for bats were not employed; consequently, the species list is likely to underrepresent mammals.

To overcome some of these limitations, a 'precautionary approach' for species presence has been adopted where required.

The above-mentioned limitations were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

3 Landscape Features

3.1 Overview

A series of background searches were performed to comply with legal standards (**Table 3-1**).

Table 3-1. Environmental protection areas within the study area.

Environmental Protection Areas	Presence in the Study Area
Land identified on the Biodiversity Values Map under the NSW *BC Act* 2016	No (**Appendix A**).
Area of Outstanding Biodiversity Value (AOBV) under the NSW *BC Act* 2016	No.
A World Heritage Area.	No.
An area reserved or dedicated under the *National Parks and Wildlife Act 1974* or *Wilderness Act 1987*.	No.
Land subject to a conservation agreement under the *National Parks and Wildlife Act 1974.*	No.
Land identified as State Forest under the *Forestry Act 1916.*	No.
Is the proposal located within land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for preservation of other environmental protection purposes?	No.
Lands protected under NSW *State Environmental Planning Policy (Biodiversity and Conservation) 2021*	Yes. (See **Section 1.7.3**).
Environmental Protection Zones in environmental planning instruments.	No.
Wetland areas dedicated under the Ramsar Wetlands Convention.	No.
Aquatic reserves dedicated under the *Fisheries Management Act 1994.*	No.
Watercourse mapped as Key Fish Habitat (KFH) and/or within the extent of an aquatic Endangered Ecological Community, listed under the *Fisheries Management Act* 1994.	No.
Acid sulphate area.	No.

3.2 Bioregion

The subject land falls within the Murray Fans Subregion of the Riverina Bioregion (**Figure 1-2**) as per the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The subregion is characterised by geology, landforms, soil types and vegetation as described in **Table 3-2**.

Table 3-2. Description of the Murray Fans subregion (NSW NPWS 2003).

Bioregion	Riverina
Subregion	Murray Fans
Geology	Quaternary alluvial sediments. Clay and sand with source bordering dunes, lakes and swamps.
Landforms	Relatively confined alluvial fan constrained by sediments from northern Victorian rivers, the Murrumbidgee fan and the Cadell fault. Meandering channels, floodplains, source-bordering dunes, overflow lakes and swamps.
Soils	Red brown earths, grey clays and deep sands.
Vegetation	Extensive river red gum forests with river cooba on channels and low floodplains. Yellow Box and black box with saltbush on high floodplains and terraces. White cypress pines on dunes, sandy levees and lunettes. Common reed, Cumbungi and grasses in swamps.

3.3 NSW (Mitchell) Landscapes

Landscapes with relatively homogenous geomorphology, soils and broad vegetation types in NSW have been classified and mapped at a 1:250,000 scale. These landscapes are referred to as NSW (Mitchell) Landscapes (Mitchell, 2002).

The subject land falls within the Murray Scalded Plains landscape (**Figure 3-1**). The characteristics of these landscapes are described below.

Murray Scalded Plains

Murray Scalded Plains Quaternary alluvial plains with extensive scalding interpreted as relic floodplains, terraces or part of the Cadell tilt block. Red brown texture-contrast soils with extensive scalds. Prior stream channels of deep coarse sands with sandy levees and grey, brown and red cracking clays in depressions, relief 5 to 15m. Murray Lakes, Swamps and Lunettes ecosystem includes parts of two land systems: Leaghur and Victoria.

Over-clearing status: Over-cleared. In total, 92% of this landscape is estimated to have been cleared.

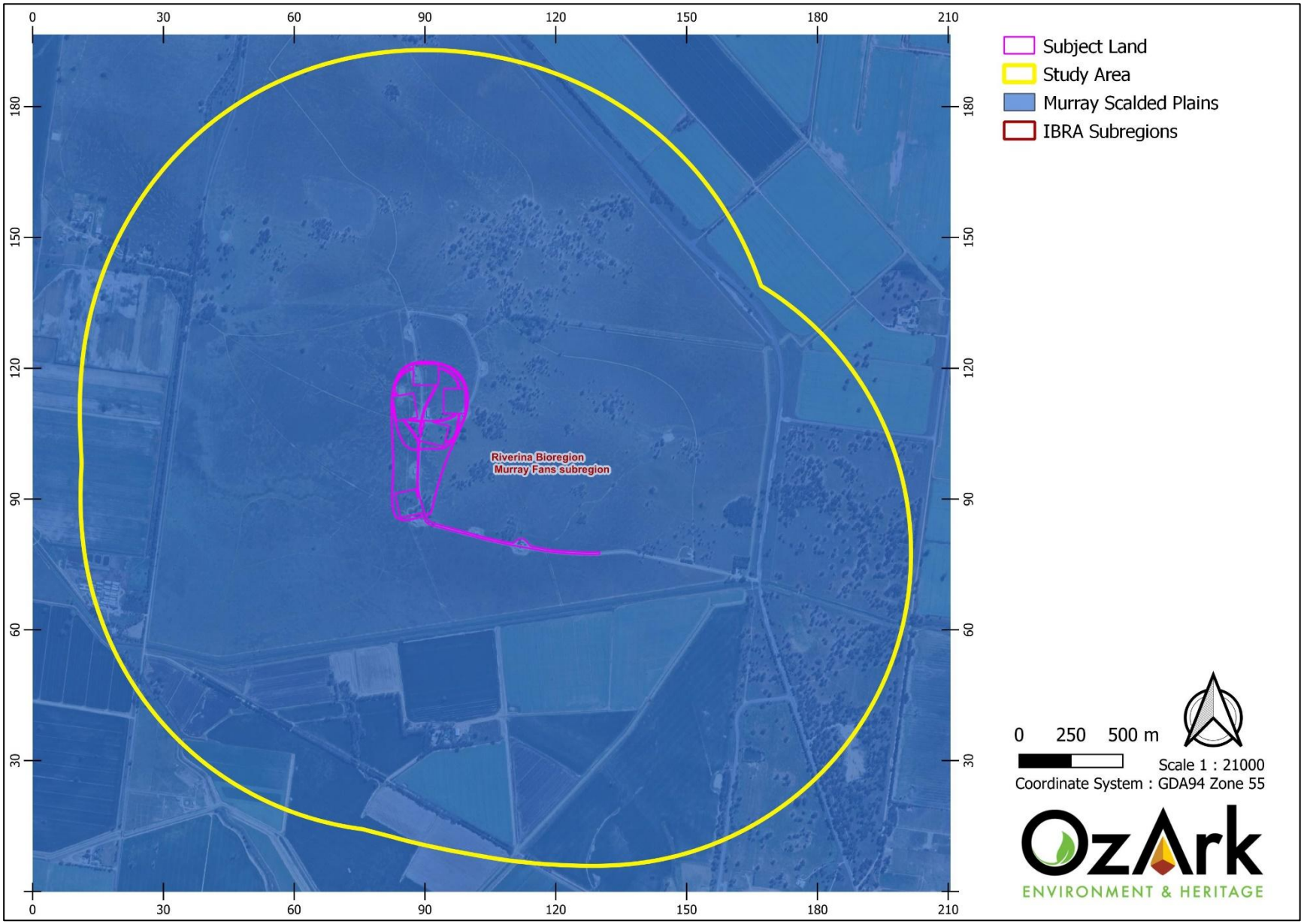


Figure 3-1. NSW (Mitchell) Landscapes within the study area.

3.4 Geology, Cave, Karst and Soil Features

The underlying geology and soil typical of the subject land and wider study area has been described in **Table 3-2** and above. No outcropping rock, surface rock, caves or karst formations were detected on the subject land.

3.5 Climate and Weather Data

The nearest weather station is located at the Tocumwal Airport (station 074106), which is approximately 6.8 km from the subject land. Rainfall records commenced at this station in 1897, while temperature records commenced in 1970. The latest available data from this weather station is from the 12th of May 2022.

The area experiences hot summers, with the highest average maximum temperature of 32.0°C experienced in January (**Figure 3-2**). Temperatures in winter are cool to mild with the coldest temperatures being recorded in July, having an average minimum of 3.4°C and an average maximum of 13.9°C.

The average annual rainfall at this station is 449.0 mm. Rainfall occurs year-round, peaking during the winter months. June records the highest average rainfall of 44.0 mm, followed by August (42.7 mm) and October (42.4 mm). The lowest monthly rainfall occurs in February (28.9 mm), followed by April (32.2 mm) and January (33.4 mm).

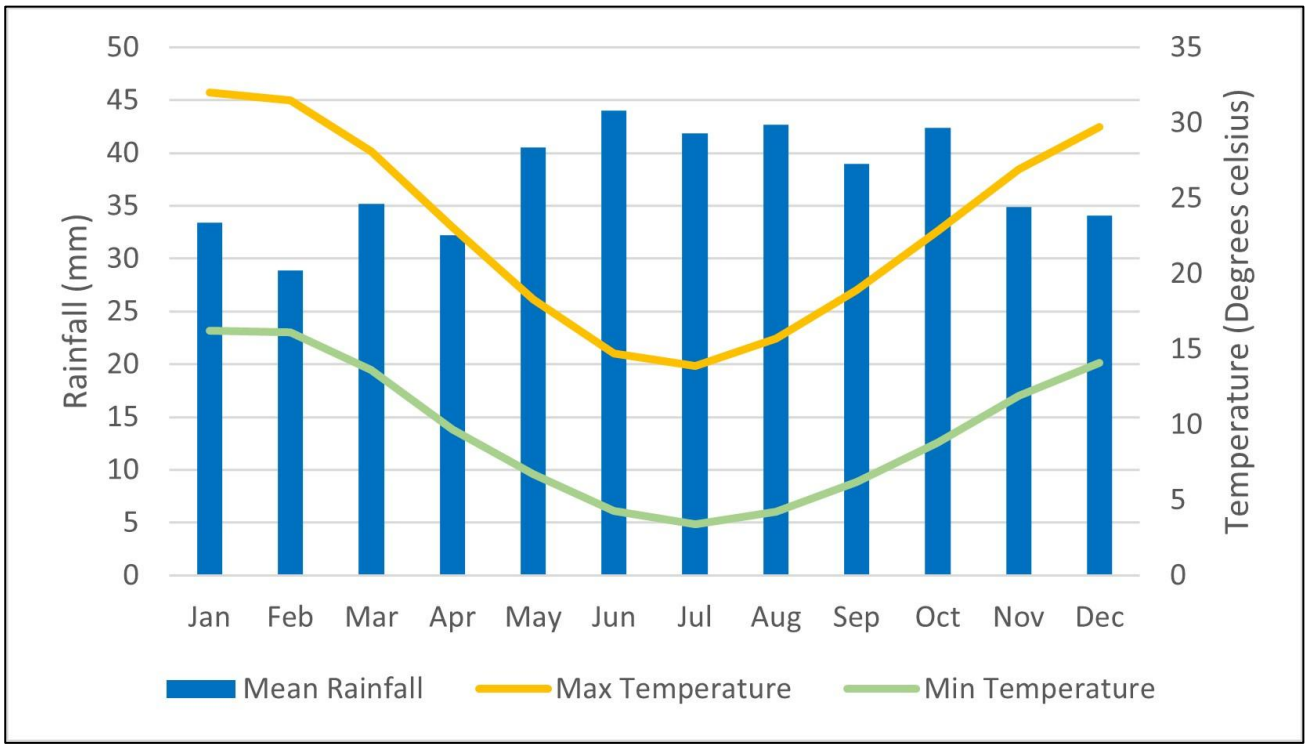


Figure 3-2. Climate statistics for Tocumwal Airport Weather Station (ID 074106) showing mean minimum and maximum temperatures, and mean rainfall (Bureau of Meteorology, 2022).

3.6 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the *Biodiversity Conservation Regulation* 2017. The subject land does not contain land identified on the BV Map (**Appendix A**).

3.7 Areas of Outstanding Biodiversity Value

The site does not contain any currently listed Areas of Outstanding Biodiversity Value (AOBV).

3.8 Native vegetation cover

Native vegetation cover, assessed as the proportion of the study area retaining native vegetation, was assessed by consulting aerial imagery of the surrounding landscape and ground-truthing this where possible to determine whether native vegetation persists. Native vegetation is defined to include woody vegetation and non-woody vegetation, including regrowth and plantations, comprised of plants native to New South Wales. Native cover is mapped in **Figure 1-2**. Areas excluded from the estimate of cover include built infrastructure (chiefly roads and residences) and cropped land. A summary of the vegetation cover estimate is provided in **Table 3-3**. For the purposes of the BAM, the native vegetation cover class has been determined as 30-70%.

Table 3-3. Native vegetation cover estimates in the study area.

Vegetation Cover Type	Description	Cover Within Study Area (ha)	Total Area of Study Area (ha)	Native Cover within Study Area (%)
Native vegetation	Remnant woodland and associated derived grassland, planted native vegetation, remnant natural grassland	844.5	1352.2	62

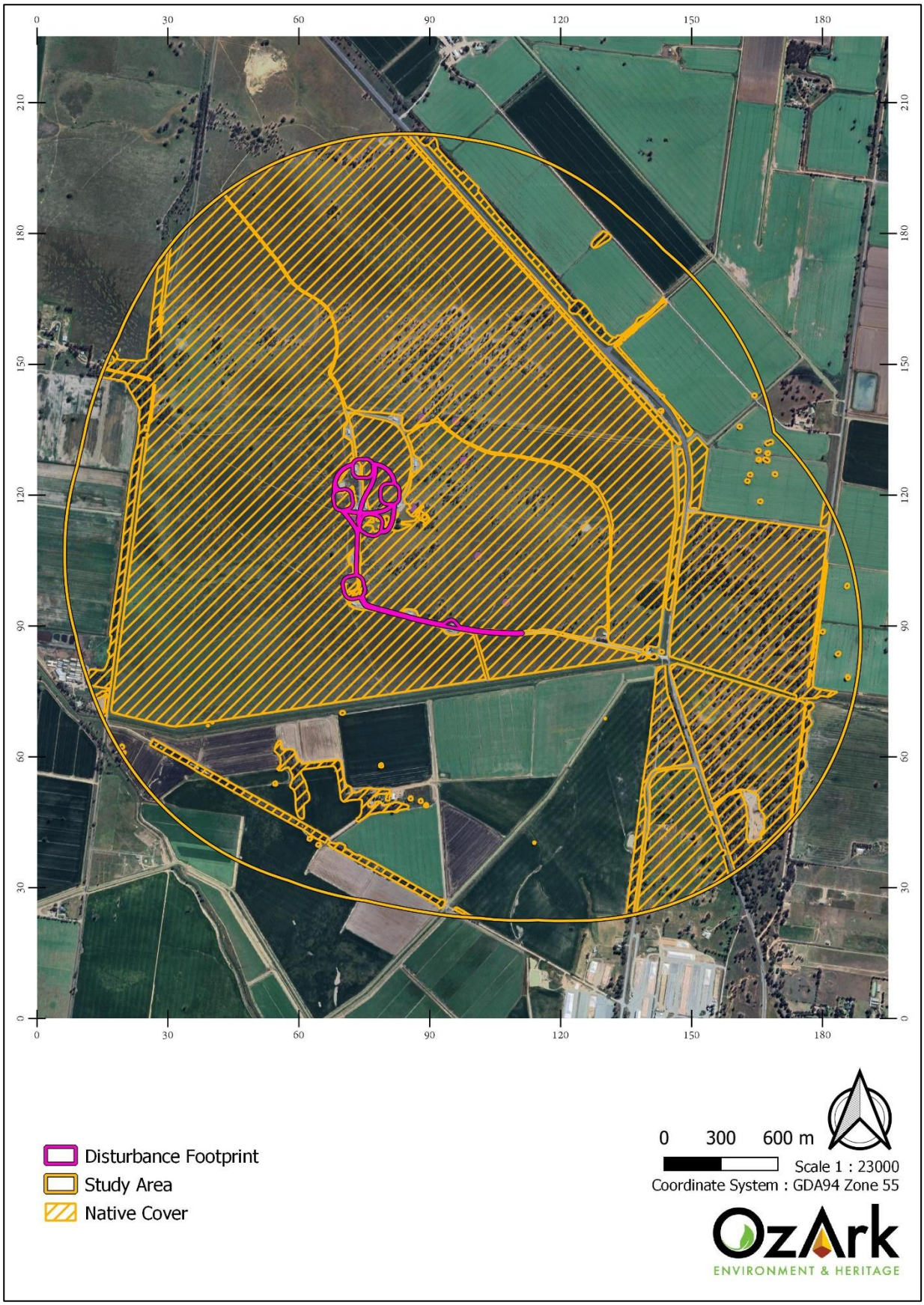


Figure 3-3. Native vegetation cover within the study area.

3.9 Rivers, Streams, Wetlands and Key Fish Habitat

An artificial dam occurs partially within the subject land. However, this was not observed to possess native flanking vegetation and is likely to offer only limited habitat for wetland flora and fauna.

One natural watercourse occurs within the study area (**Figure 3-4**). This watercourse is an unnamed Strahler 1st order minor, non-perennial stream. A further three manmade irrigation channels also occur within the study area. No watercourses mapped as Key Fish Habitat by DPI – Fisheries occur within the study area. Similarly, no areas of Protected Riparian Land (PRL), as recognised by the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), occur within the study area.

No watercourses within the study area are mapped as containing distributions of threatened fish species or populations listed under the FM Act.

3.10 Groundwater Dependent Ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment.

The degree of groundwater dependence of ecosystems can be categorised into three broad categories:

- Non-dependent ecosystems that occur mostly in recharge areas and have no connection with groundwater.
- Facultative GDEs that require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function. Minor changes to the groundwater regime in facultative GDEs with proportional or opportunistic groundwater dependence may not have any adverse impacts but these ecosystems can be damaged or destroyed if a lack of access to groundwater is prolonged.
- Obligate GDEs that are restricted to locations of groundwater discharge and ecosystems located within aquifers (e.g. subterranean cave and stygofauna communities). Aquifer ecosystems are inherently groundwater dependent.

Groundwater dependent ecosystems have been classified into seven types under two broad categories as follows (Serov *et al*. 2012):

- Subsurface ecosystems – Underground ecosystems
    - Karst systems and caves (limestone geology)
    - Subsurface aquifer (phreatic) ecosystems

    - Baseflow streams (hyporheic or subsurface component)
- Surface ecosystems – Above ground ecosystems
    - Groundwater dependent wetlands
    - Baseflow surface streams (surface/free-water component)
    - Estuarine and near shore marine ecosystems
    - Groundwater dependent terrestrial ecosystems; dependent on subsurface groundwater (phreatophytic).

The Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems identifies areas of low-potential terrestrial GDEs within the subject land (**Figure 3-4**; BOM, 2017). Further areas of high potential terrestrial GDEs and low potential aquatic GDEs occur within the wider study area. However, no moderate- or high-potential GDEs are predicted to occur within the subject land.

The proposal does not include the extraction of groundwater; however, contamination from construction operations could impact on the quality of groundwater if adequate mitigation measures are not taken. Mitigation measures to reduce the impacts of erosion and runoff, which may adversely affect groundwater, have been provided in **Section 6.7.**

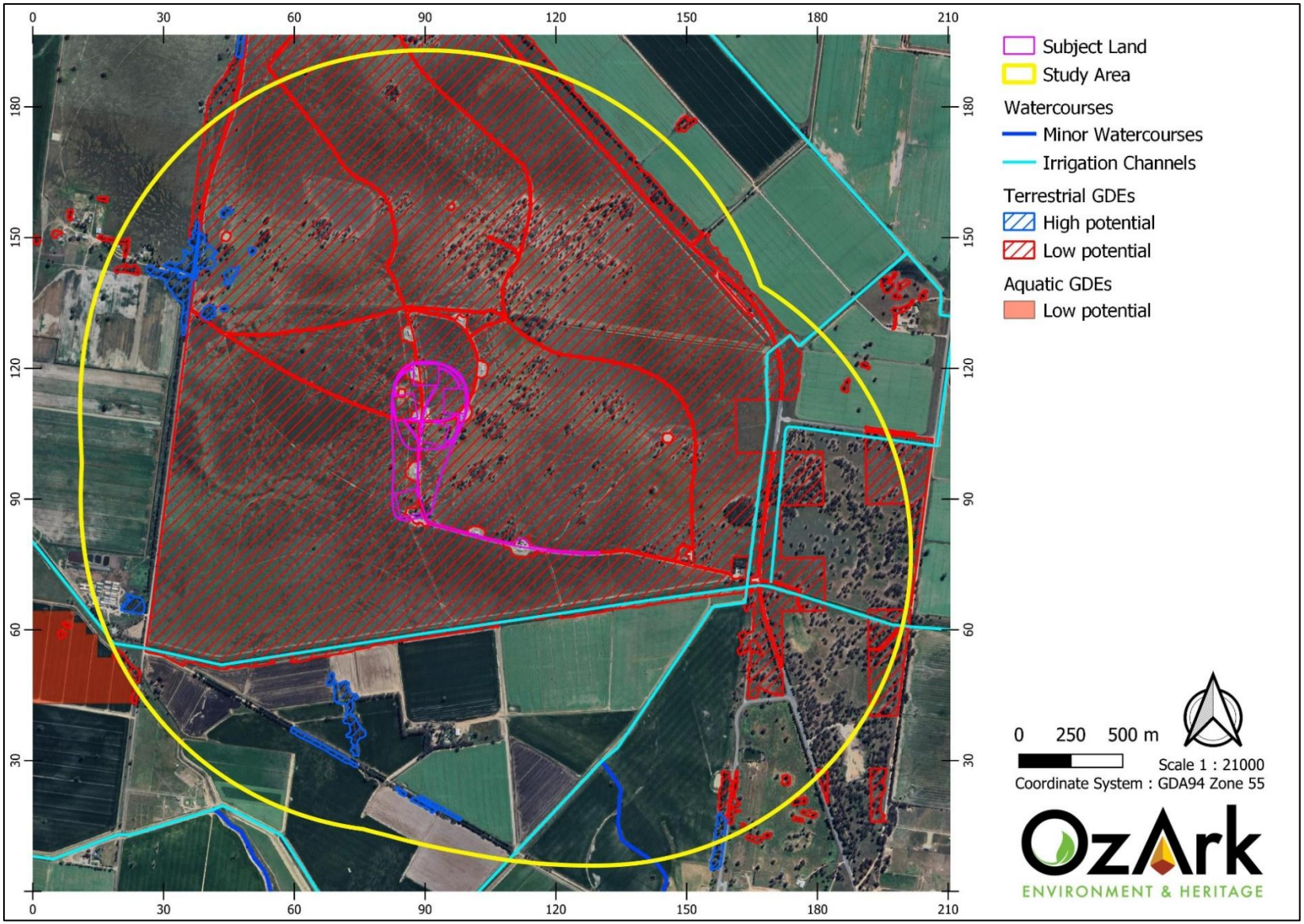


Figure 3-4. Watercourses and groundwater-dependent ecosystems within the study area.

3.11 Connectivity Features

The development footprint contains a mixture of grasslands presumed to be natural and small, scattered woodland remnants. The only remnant wildlife corridors for woodland-dependent species within the study area are:

1) Vegetation along Chinamans Road to the west of the site
2) A remnant patch east of the Newell Highway which is narrowly connected to the eastern edge of the subject land; however, the Newell Highway severs this connectivity.

As the development footprint overlaps the edge of this latter wildlife corridor, it will be slightly narrowed by the project. Considering the Newell Highway already severs connectivity in the study area, any additional impacts on wildlife connectivity associated with the project are considered negligible.

The natural grasslands may provide connectivity for species adapted to grassland habitats. The disturbance footprint is situated within a patch of natural grassland that may exceed 700 ha and may provide some connectivity to grasslands in adjacent paddocks to the northwest. Outside of this area, connectivity is likely to be significantly disrupted by cropping, and grassland species are unlikely to be able to move significantly beyond this patch.

4 Native Vegetation

4.1 Land Category Assessment

According to section 6.8(3) of the BC Act, land defined as Category 1 – Exempt Land (within the meaning of Part 5A of the LLS Act) is to be excluded from assessment under the BAM. Category 1 exemption applies to rural land (zoned RU1, RU2, or RU3) that was cleared of native vegetation as of 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017. The Draft Native Vegetation Regulatory Map (DVNRM) provides preliminary mapping of land categories for the subject land and identifies much of the site as Category 1 land, excluding areas of remnant woodland (**Figure 4-1**). However, this mapping is not binding and does not supersede the results of an *in situ* assessment.

The likely categorisation of land can be determined by consulting the following sources of information:

- Land zoning maps in the applicable Local Environment Plan.
- Public land use mapping (DPIE, 2017).
- NSW woody vegetation extent mapping (NSW DCCEEW, 2015).
- The Transitional Native Vegetation Regulatory Map (NSW DCCEEW, 2024h).
- Historical aerial photographs accessed via the NSW Government Spatial Services platform (NSW DCCEEW, 2024i).
- Vegetation surveys conducted during the field assessment.
- Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme (DPE, 2023).

4.1.1 Land Zoning

The whole of the subject land is zoned RU1 – Primary Production, which is compatible with Category 1 classification.

4.1.2 Land Use

The whole of the subject land is mapped to 5.5.4 Defence facilities - urban. This land use is compatible with Category 1 listing.

4.1.3 Draft Native Vegetation Regulatory Map (DNVRM)

The DNVRM identifies areas of regulated land within the site, aligning with remnant woody vegetation (see **Figure 4-1**). The remainder of the site has been provisionally mapped in the DNVRM as Category 1 land, but this is subject to ground truthing in the field.

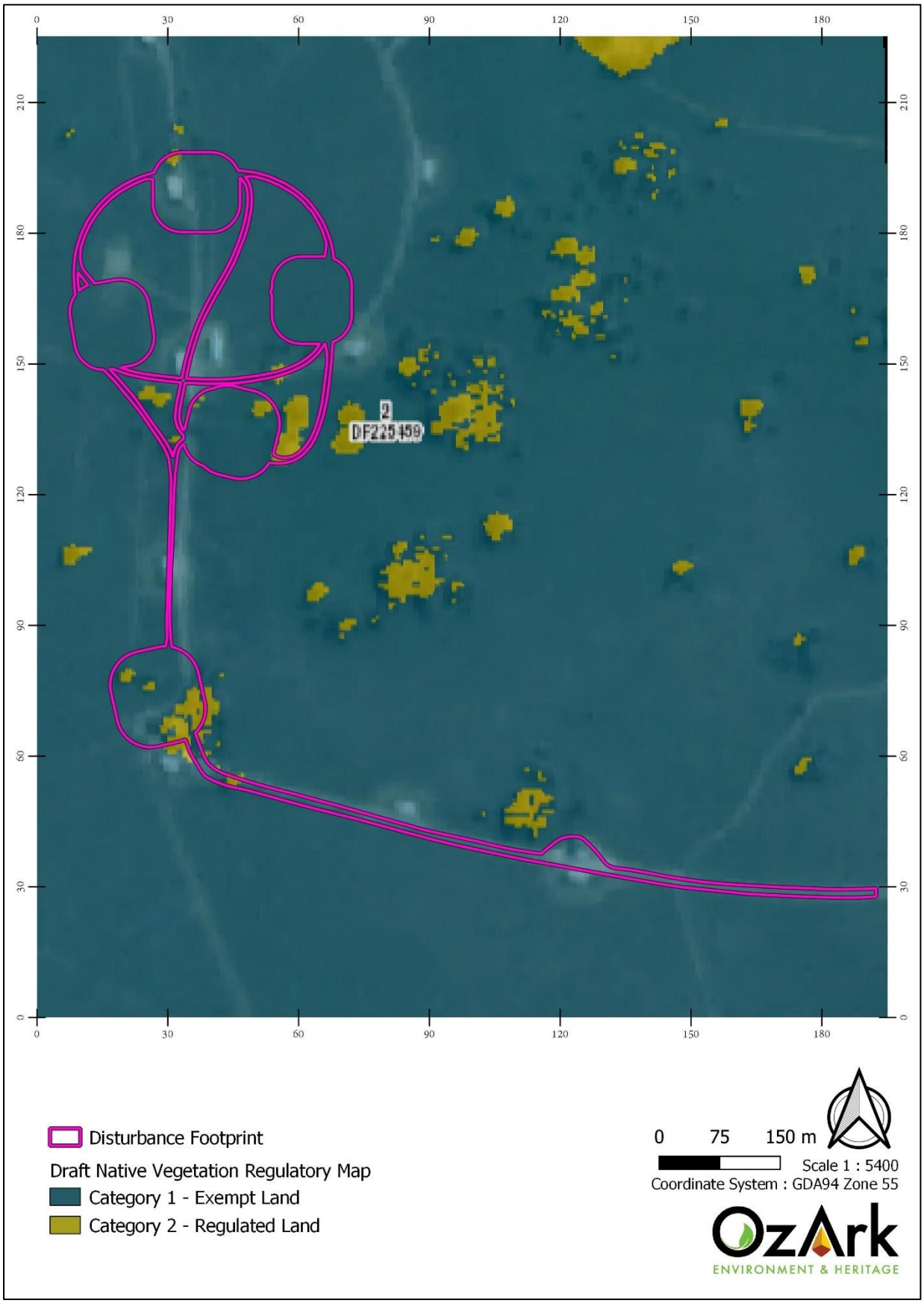


Figure 4-1. View of the subject land as dispayed on the Draft Native Vegetation Regulatory Map.

4.1.4 Historical Aerial Photography

Historical aerial imagery suggests that there has been significant regrowth of woody vegetation within the site since 1976 (**Figure 4-2**). Certain areas that now support woodland communities are likely to have been grasslands at the time of the 1990 cutoff.

4.1.5 Vegetation Surveys

Most of the treeless land within the site now supports native grasslands (see **Section 4.2**). Only minor areas were noted in which native vegetation made up less than 50% of total vegetative cover. These areas, which were dominated by exotic grasses, may constitute Category 1 land as they comprise low conservation value grassland. These areas correspond to areas mapped as non-native vegetation in this assessment (see **Section 4.2**).

4.1.6 Conclusion

As most of the site supports woodlands or moderate to high conservation value grasslands, the majority of the site is likely to constitute Category 2 – Regulated Land. The only exception to this may be minor areas of low conservation value grassland, which are treated in this assessment as non-native.

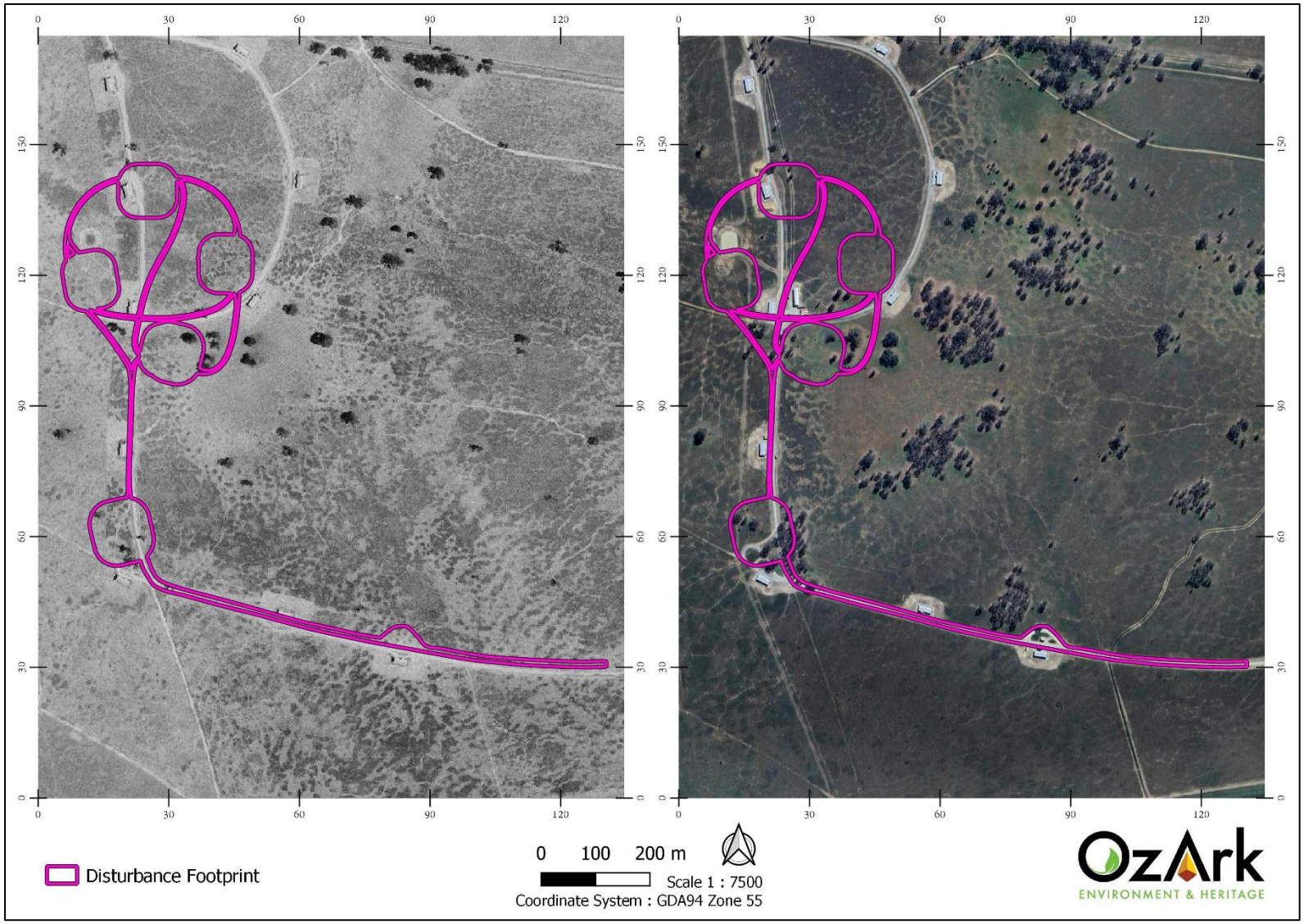


Figure 4-2. View of the subject land in 1976 (left) and in the most recent available aerial photographs (right), suggesting that extensive regrowth – particularly of River Red Gum (*Eucalyptus camaldulensis*) – has occurred within the landscape.

4.2 Plant Community Types (PCTs)

The subject land is dominated by native grasslands in which speargrasses (*Austrostipa aristiglumis*, *A. scabra*, and *A. nodosa*), wallaby grasses (*Rytidosperma caespitosum* and *R. duttonianum*), windmill grasses (*Enteropogon ramosus* and *E. acicularis*), and panic grasses (*Walwhalleya proluta* and *Panicum effusum*) are variously dominant. Remnant "islands" of woodland occur within these grasslands, dominated either by River Red Gum (*Eucalyptus camaldulensis*) or by Yellow Box (*E. melliodora*).

Three PCTs were recorded within the development footprint:

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

These three PCTs each occurred in a single condition state. Consequently, three vegetation zones were mapped within the site (**Figure 4-3**). PCT determination and zone descriptions are provided in **Table 4-1**. Plot data and site photographs are included in **Appendix B**. A list of all plant species observed during the field surveys is provided in **Appendix C**.

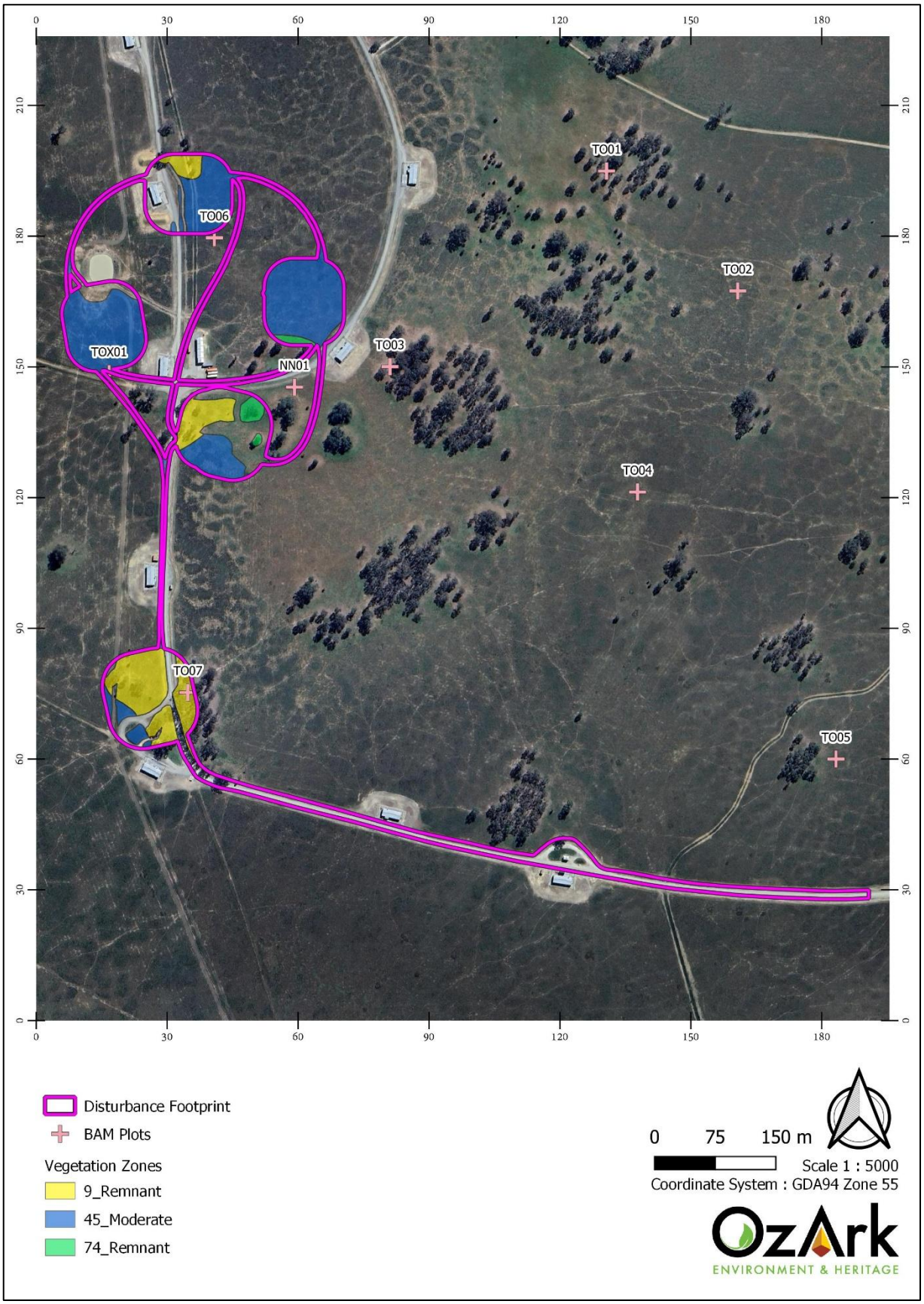


Figure 4-3. Vegetation zones and BAM Vegetation Integrity plots.

Table 4-1. PCT justification and vegetation zones present within the disturbance footprint.

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
9	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.	Inland Riverine Forests	No TEC	No TEC	**"Remnant" condition:** • Woodland in which River Red Gum (*Eucalyptus camaldulensis*) is the sole canopy species. Many local stands of this community appear to consist of a single mature tree or a small number of mature trees surrounded by regeneration. Patches have been mapped to include all trees and all intervening grassland within 100 m. Consequently, there is a significant influence from the grassland community (PCT 45) on this community. • No shrub layer was recorded in any local occurrence of this community. • Understorey is predominantly grassy. While the dominant grasses are often non-native (chiefly *Hordeum* and *Lolium* species), the wallaby grasses *Rytidosperma caespitosum* and *R. duttonianum* are also common. Rough Speargrass (*Austrostipa scabra*) is also common in places. The community grades into the background grassland, in which Rigid Panic (*Walwhalleya proluta*), Plains Grass (*Austrostipa aristiglumis*), wallaby grasses (*Rytidosperma* spp.), Windmill Grass (*Chloris truncata*), and Curly Windmill Grass (*Enteropogon acicularis*) are most abundant. • Native forbs are generally scarce in this community but do include native dock (*Rumex*) species and Grassland Wood-sorrel (*Oxalis perennans*). • The SVTM maps these areas to Grey Box (*Eucalyptus microcarpa*) communities – PCTs 76 and 237 – or to the grassland community PCT 44. These options could be discounted as they do not align with the recorded vegetation. • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the dominant canopy and groundcover	12,000 ha 66.00% ±50%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					species returns strong (4/4) matches to eight PCTs. Discounting PCTs in which River Red Gum is not typically dominant (13, 26, 237) leaves five candidate PCT: 5, 7, 9, 10, and 74. PCT 10 was also discounted as it is considered ecotonal between River Red Gum and Black Box (*Eucalyptus largiflorens*) communities and no evidence of Black Box was recorded within or near the site. The use of PCT 74, while broadly appropriate, was reserved for patches in which River Red Gum was found to co-occur with Yellow Box (*Eucalyptus melliodora*). Areas in which River Red Gum was found by itself were assigned to a separate PCT. • Of the three remaining PCTs (5, 7, and 9), PCT 7 is least likely as it primarily occurs west of Deniliquin, which does not describe the site. By contrast, PCT 5 occurs primarily east of Deniliquin and PCT 9 is found within the Riverina IBRA bioregion more broadly. • Soil type preferences differ subtly between PCTs, with PCT 5 favouring "silty-sandy loam-clay soils," PCT 7 favouring "alluvial brown or grey cracking clay soils or clay loams," and PCT 9 "grey and brown clay and loam soils," according to the BioNet VCD. No site-specific soil surveys were conducted to confirm soil type. Soil landscape mapping (DECCW, 2010) suggests that the surrounding landscape consists primarily of red-brown soils derived from clays, silts, and sands, which is broadly compatible with all three PCTs. • Ultimately, PCT 5 was discounted as it typically occurs on levees or other raised landform elements adjacent to watercourses, which does not describe the subject land. PCT 7 was discounted due to its typical position on inner floodplains and the absence of Warrego Grass (*Paspalidium jubiflorum*) from the subject land. The dominance of wallaby grasses within the patch aligns the observed community more closely with PCT 9, which occurs on the outer edge of the River Red	

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					Gum zone, consistent with the subject land, which is transitional between River Red Gum and other woodland types.	
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.	Riverine Plain Grasslands	Not a TEC	Critically Endangered: Natural Grasslands of the Murray Valley Plain	**"Remnant" condition:** • Grassland forming part of a mosaic of grassland communities spanning much of the surrounding landscape. The wider grassland is variable in composition and includes elements dominated by Plains Grass (*Austrostipa aristiglumis*), Rigid Panic (*Walwhalleya proluta*), curly windmill grasses (*Enteropogon acicularis* and *E. ramosus*), wallaby grasses (*Rytidosperma caespitosum* and *R. duttonianum*), and sometimes Rough Speargrass (*Austrostipa scabra*). The occurrence of the grassland community within the subject land is dominated by Rigid Panic and wallaby grasses with Plains Grass occurring throughout. • The small chenopod shrubs Black Rolypoly (*Sclerolaena muricata*) and Ruby Saltbush (*Enchylaena tomentosa*) occur in some areas but the community generally lacks a well-defined shrub layer. • The SVTM maps these areas to the grassland community PCT 44. This option is further considered below. • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the grassland vegetation formation and excluding PCTs considered to be wholly or largely derived returns five potential matches: 44, 45, 46, 50, and 242. Each community is defined by one or more key species: o 44: *Austrostipa nodosa*, *Chloris truncata*, and *Rytidosperma caespitosum*. o 45: *Austrostipa aristiglumis*, often with *Walwhalleya proluta*, *Rytidosperma duttonianum*, *Enteropogon ramosus*, *Sporobolus caroli* and *Chloris truncata*. o 46: *Enteropogon ramosus*, *Austrostipa nodosa* and/or	100,000 ha 60.00% ±80%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					Austrostipa scabra, and *Rytidosperma* spp. ○ 50: *Cynodon dactylon*, often with rushes, sedges and other minor grasses. ○ 242: *Sporobolus mitchellii*, with other minor grasses. Of the five candidate grasslands, two (50 and 242) could be excluded as the key species were not found to be dominant or did not occur at all within the site. • PCT 46 is less likely as it is considered to occur primarily on the Hay Plain and northeast of Deniliquin, whereas the subject land is located to the southeast of Deniliquin. • PCTs 44, 45, and 46 all favour alluvial, generally clay, soils, and cannot be readily delineated on that basis, particularly given the absence of site-specific soil data. • It is likely that elements of PCT 44 and PCT 45 (and potentially PCT 46) all occur within the wider grassland patch; however, as the dominant species within the disturbance footprint were found to be *Walwhalleya proluta* and *Rytidosperma duttonianum*, with *Austrostipa aristiglumis* occurring in patches throughout, it was considered that PCT 45 best described the observed vegetation. The site is subject to ongoing disturbance by grazing, which may complicate the delineation of grassland communities. Comparison of the flora recorded on site with the species lists provided for each of the three communities also suggests a stronger match with PCT 45 (12/28 species = 42.86%) than with PCT 44 (4/17 species = 23.53%) or PCT 46 (6/26 species = 23.08%).	
74	Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes	Floodplain Transition Woodlands	Critically Endangered: White Box -	Not a TEC	**"Remnant" condition:** • Woodland in which Yellow Box (*Eucalyptus melliodora*) dominates, rarely with a minor component of River Red Gum (*Eucalyptus*	8,000 ha 73.00% ±50%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
	Bioregion and Riverina Bioregion		Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland		*camaldulensis*). Occurrences within the disturbance footprint contain Yellow Box by itself. Patches have been mapped to include all trees and all intervening grassland within 100 m. Consequently, there is a significant influence from the grassland community (PCT 45) on this community. • No native shrub layer was recorded in any local occurrence of this community. • Native diversity in the understorey is generally poor, with the dominant species being exotic grasses (chiefly *Hordeum* and *Lolium* species) and a range of introduced forbs. The native grasses Ringed Wallaby Grass (*Rytidosperma caespitosum*), Rough Speargrass (*Austrostipa scabra*), and Rigid Panic (*Walwhalleya proluta*) were recorded within this zone, along with patches of the native forb Australian Stonecrop (*Crassula sieberiana*). • Understorey vegetation is overwhelmingly non-native in the largest patches of this community (11.1% in plot TO03) and declines to 2% within 10 m of the dripline of trees (plot NN). This minor native element is ambiguous between PCT 74 and the grassland community in the wider landscape (PCT 45), containing both *Austrostipa scabra* (PCT 74) and *Walwhalleya proluta* (PCT 45), suggesting that, where native vegetation persists, PCT 45 takes over within only a short distance of each remnant or regrowth tree, • In open areas between larger patches, this understorey appeared wholly non-native at the time of survey, with large areas dominated by Barley Grasses (*Hordeum* spp., particularly *H. glaucum*) and Wild Oat (*Avena fatua*). The community has been mapped to the full extent of any recorded native vegetation, omitting these wholly non-native areas. • Some examples of this community within the site consist of immature regrowth within a grassland matrix that aligns with PCT 45. In these	

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					areas, the understorey and surrounding vegetation is consistent with PCT 45. • The SVTM maps these areas to the Grey Box community PCT 76 or to the grassland community PCT 44. These options could be discounted as they do not align with the recorded vegetation. • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the presence of Yellow Box and Ringed Wallaby Grass returns perfect (3/3) matches to only three PCTs: 26, 74, and 80. Of these, only PCT 74 lists Yellow Box as a dominant species. This community also accounts for the occasional presence of River Red Gum, as was noted on site. Consequently, PCT 74 was preferred for these areas. • Alternative Yellow Box PCTs were considered but could be discounted for the following reasons: o PCT 75: The subject land lacks White Cypress-pine (Callitris glaucophylla) and is not situated on a sandy rise or sandhill. It also does not contain the "light textured, sandy-loam soils" favoured by this PCT. o PCT 276: The subject land does not contain the understorey species most commonly recorded in this community, namely *Bothriochloa macra* and *Austrostipa bigeniculata*. While the subject land could be considered to meet the preference of this community for "red-brown loam or clay soils on flats on floodplains or plains," it is well outside the known distribution of the community, which is generally bounded by Wagga Wagga, Temora, and Wellington, though modelling does suggest it may also occur in the Murray Fans subregion.	

4.3 Vegetation Zones, Patch Size and Vegetation Integrity

4.3.1 Vegetation Zones

In order to be assessed under the BAM (2020), all native vegetation on the subject land must be assigned to a zone, based on its condition state and the patch to which it belongs.

Three PCTs were recorded within the site, each in a single condition state. Consequently, three vegetation zones were mapped within the site. A description of each is provided below:

- **9_Remnant** – Woodland in which River Red Gum (*Eucalyptus camaldulensis*) is the sole canopy species. The understorey is grassy and is dominated by exotic species, with localised patches of native species of the genera *Rytidosperma*, *Austrostipa*, *Walwhalleya*, *Chloris*, and *Enteropogon*. In accordance with recommendations from the Conservation Programs, Heritage and Regulation (CPHR) division within DCEEW, patches have been mapped to include all remnant trees and all intervening grassland where trees are ≤100 m apart. Consequently, this zone also includes areas consistent with 45_Moderate below. Area of impact: 1.30 ha.
- **45_Moderate** – Presumed natural grassland variably dominated by Rigid Panic (*Walwhalleya proluta*) and Brown-backed Wallaby Grass (*Rytidosperma duttonianum*), along with Plains Grass (*Austrostipa aristiglumis*) and other native grass species. A chenopod shrub layer is present in places and native forbs – most commonly Old Man Weed (*Centipeda cunninghamii*) – occur at low densities throughout. Area of impact: 3.01 ha.
- **74_Remnant** – A woodland in which Yellow Box (*Eucalyptus melliodora*) is the dominant and sometimes sole canopy species, occasionally co-occurring with River Red Gum. No shrub layer is present and the understorey is dominated by introduced grass species of the genera *Lolium*, *Hordeum*, and *Avena*. Native grasses and forbs are present but in low densities, with the most common species being Ringed Wallaby Grass (*Rytidosperma caespitosum*), Rough Speargrass (*Austrostipa scabra*), and Rigid Panic (*Walwhalleya proluta*). As with zone 9_Remnant, patches have been mapped to include all remnant trees and all intervening grassland where trees are ≤100 m apart. Consequently, this zone also includes areas consistent with 45_Moderate below. Area of impact: 0.22 ha.
- **Non-native** – Designation of vegetation as non-native was reserved for wholly cleared asset protection zones, human-made infrastructure (e.g. roads and existing magazines), and degraded areas likely to constitute low conservation value grassland. Area of impact: 2.55 ha (includes infrastructure, bare ground, dam surfaces, and c. 0.6 ha non-native vegetation).

Vegetation zones within the assessed area are described in **Table 4-1** and mapped in **Figure 4-3**. Habitat features and the locations of supporting BAM plots are also shown in **Figure 5-1**.

4.3.2 Patch Size and Vegetation Integrity Score

A patch is defined in the BAM operational manual – Stage 1 (2020) as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤30 m for non-woody ecosystems). The patch may extend onto land adjoining the subject land. The patch size should include derived communities (i.e. where one or more of the structural components or strata layers is missing, modified or new) as these are likely to provide suitable habitat for at least some species. The extent of native vegetation was determined from a combination of satellite imagery, ground-truthing and the State Vegetation Type Map (**Figure 4-4**).

The use of a single patch was appropriate for the present assessment. It should be noted that the patch extends well beyond the limits of the study area, and it was not considered necessary to map its full extent. For this reason, references to patch size should be taken to refer to the size of the patch within the study area only. Patch size falls into the >100 ha size class for all vegetation zones. Patch size and vegetation integrity score (VIS) are displayed in **Table 4-2.** Patch size is depicted in **Figure 4-4**.

Table 4-2. Vegetation zones and patch sizes of native vegetation in the disturbance footprint.

BAM-C Zone No.	PCT ID	Condition State	VI Score	HBT[1]	Area Impacted (ha)	Patch Number	Patch Size (ha)	BAM Patch Size Class	Vegetation Zone	BAM Plots	Minimum No. Plots
1	9	Remnant	57.3	Y	1.30	1	843.47	>100 ha	9_Remnant	TO01 TO07	1
2	45	Moderate	67.9	N	3.01	1	843.47	>100 ha	45_Moderate	TO06 TOX01	2
3	74	Remnant	43.5	Y	0.22	1	843.47	>100 ha	74_Remnant	TO03	1

[1]Hollow-bearing trees.

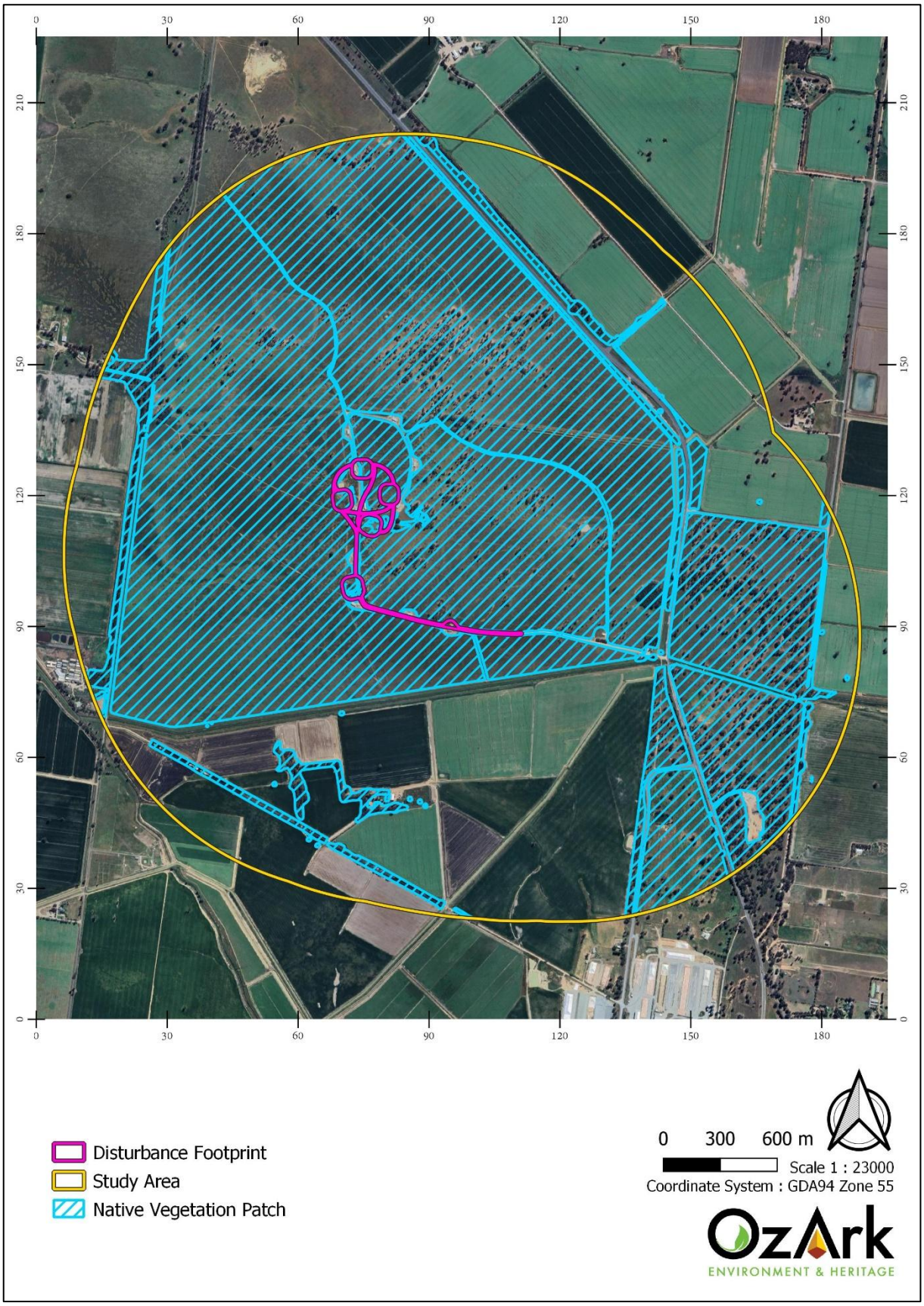


Figure 4-4. Native vegetation patch associated with the vegetation zones.

4.4 Flora Species Observed

In total, 62 plant species were detected during the initial July 2023 field survey and October 2023 targeted surveys. Of this number, 33 (53.23%) are native and 29 (46.77%) are introduced.

Three species are listed as High-threat Exotic species (HTE) under the BAM (**Table 4-3**). Of these, one species – Silver-Leaved Nightshade (*Solanum elaeagnifolium*) – is also listed as a Weed of National Significance (WoNS) and as a Priority Weed (PW) for the Murray LLS region.

No threatened flora species or populations were recorded during the surveys. Plot data, plot photographs and a list of all flora species observed during the field assessment are provided in **Appendices B** and **C**.

Table 4-3. Significant weeds recorded during the field assessment.

Scientific Name	Common Name	HTE	WoNS	PW
Eragrostis curvula	African Lovegrass	Yes	No	No
Solanum elaeagnifolium	Silver-Leaved Nightshade	Yes	Yes	Yes
Xanthium spinosum	Bathurst Burr	Yes	No	No

4.5 Fauna Species Observed

The field surveys identified 37 fauna species within, or adjacent to, the disturbance footprint, comprising 28 birds, one amphibian, and four mammals (**Appendix C**). Of these, 28 (82.35%) were native and six (17.65%) introduced. The introduced species comprised two birds and four mammals. No threatened or migratory fauna species or populations were detected.

4.6 Threatened Ecological Communities

PCT 9 is not associated with any Threatened Ecological Community (TEC).

PCT 74 is associated with the BC Act-listed Critically Endangered Ecological Community (CEEC) *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*. This listing applies to all grassy woodlands in which one or more of White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*), or Blakely's Red Gum (*E. blakelyi*) is dominant or co-dominant; consequently, the local occurrence of this PCT constitutes an example of this CEEC. Up to 0.22 ha of this CEEC would be impacted by the proposal.

PCT 74 is likewise associated with the EPBC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Despite the highly degraded condition of the understorey, perennial native species account for more of the

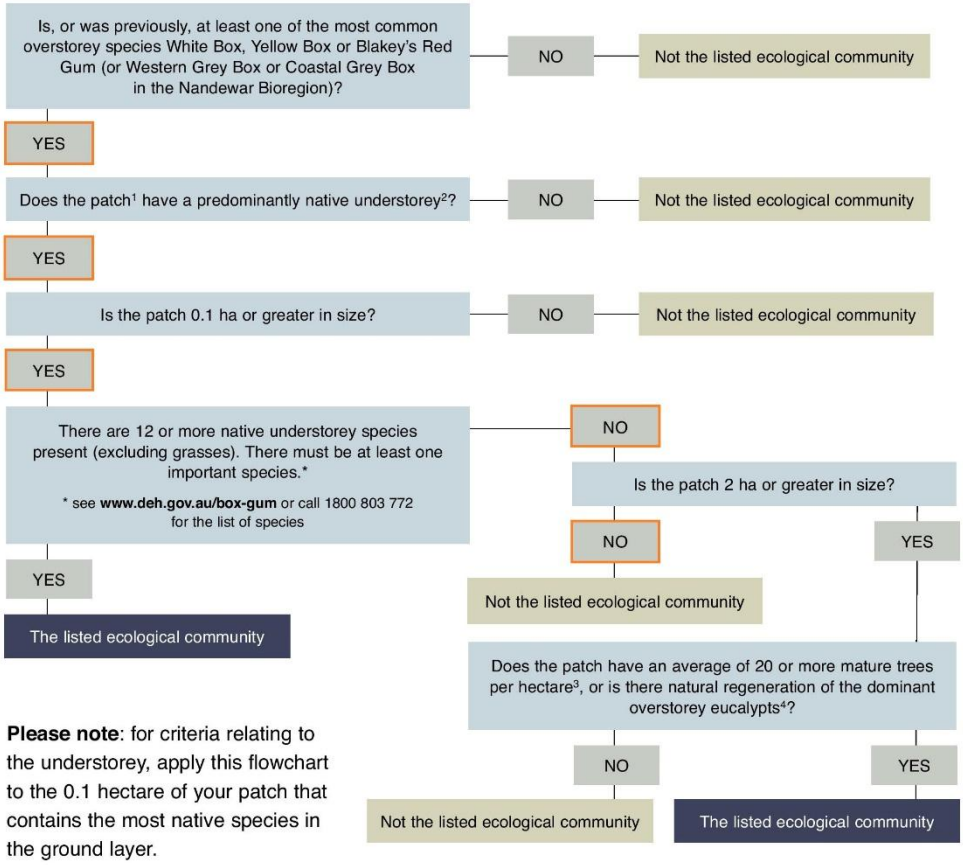
recorded cover than perennial non-native species. The community exceeds the minimum patch size (0.1 ha) for highly biodiverse examples of the community but does not possess the requisite 12 native non-grass understorey species. The near absence of native non-grass understorey species recorded in the initial BAM plot surveys was confirmed during subsequent visits in more favourable seasons. The patch does not meet the minimum patch size (2 ha) for less biodiverse zones: less than 1 ha of vegetation associated with this CEEC and meeting the definition of a continuous patch is present within the site or in surrounding lands. A second nearby area of Yellow Box-dominated woodland has been excluded from this patch as the patches are separated by an area of a distinct ecological community (PCT 45). On this basis, the local example of PCT 74 does not meet the criteria to be considered an example of this CEEC. This assessment is demonstrated in **Figure 4-5**.

PCT 45 is associated with the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains*. Seven indicator species for this community were detected within the grassland (*Rytidosperma duttonianum*, *Austrostipa aristiglumis*, *Austrostipa nodosa*, *Crassula decumbens*, *Leiocarpa panaetioides*, *Triptilodiscus pygmaeus*, and *Wahlenbergia gracilenta*), as were six contraindicative species (*Austrostipa scabra*, *Crassula sieberiana*, *Enchylaena tomentosa*, *Marsilea drummondii*, *Sclerolaena muricata*, and *Sporobolus caroli*). In addition, four species considered to be indicative of a high-quality remnant were noted: *Asperula conferta*, *L. panaetioides*, *T. pygmaeus*, and *W. gracilenta*. This suggests that the grassland, considered as a whole, qualifies for the CEEC listing. In total, 3.01 ha of this community would be impacted by the proposal. Considering that more than 30 ha of this community was recorded during the initial surveys, and the community extends beyond the margins of the directly assessed area, this impact is unlikely to be significant and hence unlikely to warrant EPBC referral. A test of significance is provided for this community in **Appendix D**.

PCT 45 is also associated with the BC Act-listed CEEC *Artesian Springs Ecological Community in the Great Artesian Basin*. This listing does not apply to the present occurrence of this PCT as the subject land falls outside the Great Artesian Basin and no evidence of artesian spring activity was noted.

The flowchart below represents the lowest condition at which patches are included in the listed ecological community. This is not the ideal state of the ecological community. Large patches, those that link remnants in the landscape, those that occur in highly cleared areas, those that contain rare, declining or threatened species, and those that represent the entire range of the ecological community, are important for the long-term future of the ecological community.

Determining if your land has an area of the listed ecological community



Please note: for criteria relating to the understorey, apply this flowchart to the 0.1 hectare of your patch that contains the most native species in the ground layer.

[1] Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:
- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m^2) or greater.

[2] A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

[3] Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

[4] Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

5

Figure 4-5. Assessment of zone 74_Remnant against the condition criteria for the EPBC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*.

5 Threatened Species

For the purpose of credit calculations, threatened species are listed as either ecosystem credit species or species credit species:

- An ecosystem credit species is a species whose likelihood of occurrence can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. A targeted survey is not required for these species (DPIE, 2020b).
- A species credit species is a species whose likelihood of occurrence cannot be predicted by vegetation surrogates and/or landscape features and can be reliably detected by survey. A targeted survey or expert report is required to confirm presence/absence of these species (DPIE, 2020b).

5.1 Habitat Features Present

The subject land was assessed for its potential to provide habitat for threatened flora and fauna known or predicted to occur in the study area. Habitat features including but not limited to rock outcrops, caves, hollow-bearing trees, nests, wetlands (including dams), and watercourses were searched for and recorded, if present.

The subject land was found to be devoid of caves, outcropping rock and loose surface rock. Two hollow-bearing trees fall partly or wholly within the disturbance footprint, and it is assumed that both trees would be removed by the proposal (**Figure 5-1**). One tree possessed large hollows (≥20 cm diameter) and the other only small (<20 cm diameter) hollows. Additional hollow-bearing trees were recorded outside the proposed disturbance footprint. Two of these trees were found also to support stick nests. One dam falls partly within the APZ of a proposed magazine and may be impacted. While this dam lacks any native wetland vegetation, it may still provide habitat for native fauna. All habitat features are mapped in **Figure 5-1**.

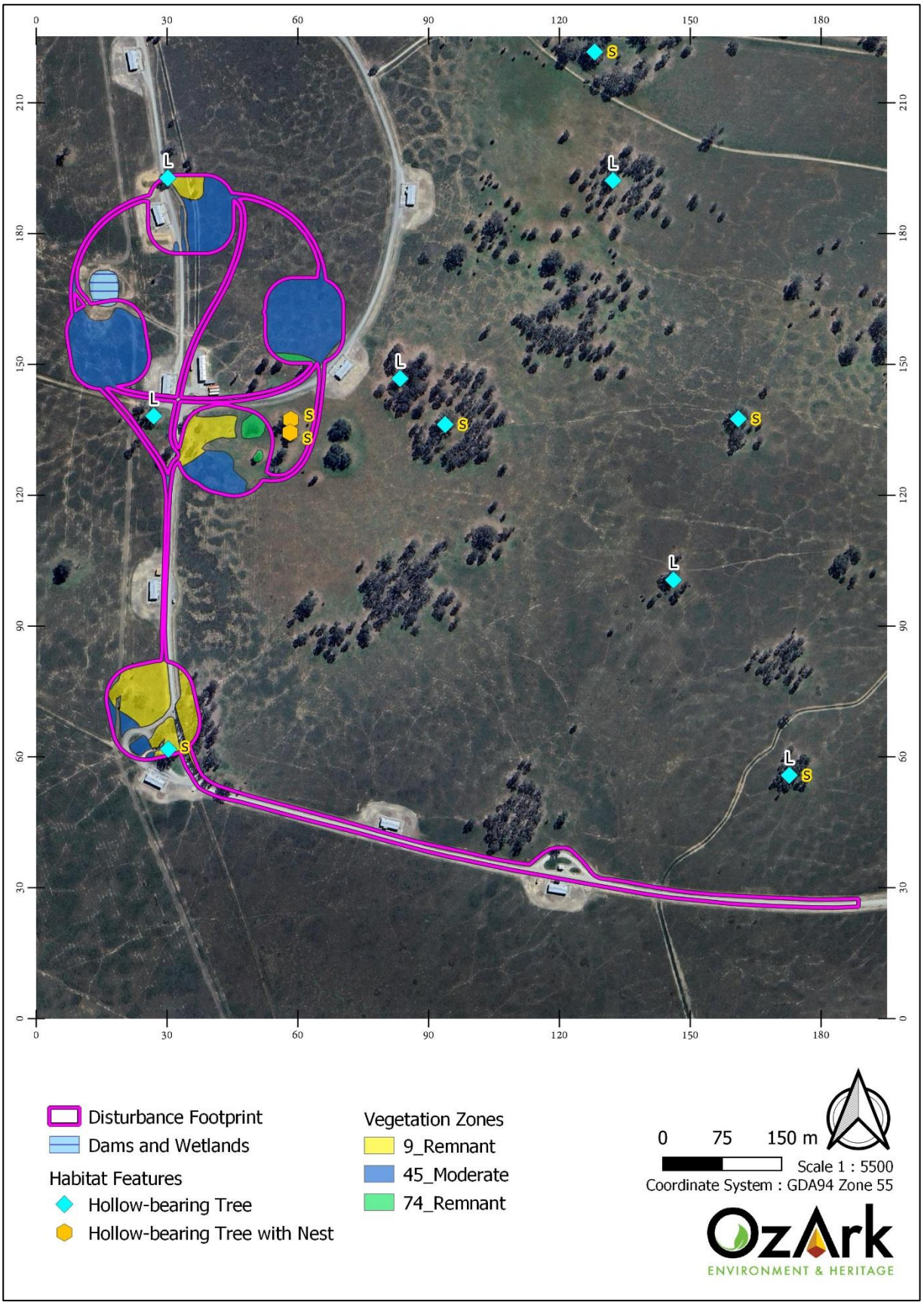


Figure 5-1. Habitat features recorded within the initial assessment area.

Hollow-bearing trees marked with 'L' contain large (≥20 cm diameter) hollows. Tree marked with 'S' contain small (<20 cm diameter) hollows. Mapping of habitat features outside of the disturbance footprint was not comprehensive owing to the limited duration of the survey.

5.2 Ecosystem Credit Species

In total, 34 ecosystem credit species were initially generated by the BAM-C (**Table 5-1**). The habitat suitability of the subject land for these species was assessed. Two species were removed from the list due to habitat constraints and one due to geographical constraints:

1. The Painted Honeyeater (*Grantiella picta*) requires mistletoe at a density of greater than five mistletoes per hectare; these plants were not present within the subject land.
2. The White-bellied Sea-eagle (*Haliaeetus leucogaster*) is confined to habitat within 1 km of "rivers, lakes, large dams or creeks, wetlands and coastlines." These habitat features do not occur within 1 km of the subject land.
3. The Regent Parrot (eastern subspecies; *Polytelis anthopeplus monarchoides*) is considered to be confined to the area along Wakool River west of Kyalite, which excludes the subject land.

After the exclusion of this species, 31 ecosystem credit species were assumed present (see **Table 5-1**).

Two additional ecosystem credit species – the Southern Whiteface (*Aphelocephala leucopsis*) and the Blue-winged Parrot (*Neophema chrysostoma*) – were added to the case during revisions in May and September 2025. These species were assumed present.

Table 5-1. Ecosystem credit species predicted to occur and the nature of their presence within, or absence from, the subject land.

Scientific Name	Common Name	Presence
Anseranas semipalmata	Magpie Goose	Assumed present
Anthochaera phrygia	Regent Honeyeater	Assumed present
Aphelocephala leucopsis	Southern Whiteface	Assumed present
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Assumed present
Chalinolobus picatus	Little Pied Bat	Assumed present
Chthonicola sagittata	Speckled Warbler	Assumed present
Circus assimilis	Spotted Harrier	Assumed present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Assumed present
Daphoenositta chrysoptera	Varied Sittella	Assumed present
Dasyurus maculatus	Spotted-tailed Quoll	Assumed present
Epthianura albifrons	White-fronted Chat	Assumed present
Falco hypoleucos	Grey Falcon	Assumed present
Falco subniger	Black Falcon	Assumed present
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Assumed present
Glossopsitta pusilla	Little Lorikeet	Assumed present
Grantiella picta	Painted Honeyeater	Absent (constraint)
Grus rubicunda	Brolga	Assumed present
Haliaeetus leucogaster	White-bellied Sea-Eagle	Absent (constraint)
Hieraaetus morphnoides	Little Eagle	Assumed present

Scientific Name	Common Name	Presence
Hirundapus caudacutus	White-throated Needletail	Assumed present
Lathamus discolor	Swift Parrot	Assumed present
Lophochroa leadbeateri	Pink Cockatoo	Assumed present
Lophoictinia isura	Square-tailed Kite	Assumed present
Melanodryas cucullata cucullata	South-eastern Hooded Robin	Assumed present
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Assumed present
Neophema chrysostoma	Blue-winged Parrot	Assumed present
Neophema pulchella	Turquoise Parrot	Assumed present
Nyctophilus corbeni	Corben's Long-eared Bat	Assumed present
Petroica boodang	Scarlet Robin	Assumed present
Petroica phoenicea	Flame Robin	Assumed present
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	Absent (constraint)
Polytelis swainsonii	Superb Parrot	Assumed present
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Assumed present
Rostratula australis	Australian Painted Snipe	Assumed present
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Assumed present
Stagonopleura guttata	Diamond Firetail	Assumed present

5.3 Species Credit Species

In total, 25 species credit species were generated by the BAM-C (**Table 5-2**). The habitat suitability of the subject land for these species was assessed. According to the BAM, if suitable habitat for these species occurs on the subject land, they must be the subject of targeted survey according to recommended guidelines, or else assumed present.

5.3.1 Species removed due to geographic or habitat constraints

After consideration of the geographical and habitat constraints identified in the TBDC and BAM-C, six species could be discounted due either to distribution or to the absence of features necessary for breeding:

1. **Regent Honeyeater (*Anthochaera phrygia*).** The subject land does not fall within areas included on the Important Habitat Map for this species.
2. **Swift Parrot (*Lathamus discolor*).** The subject land does not fall within areas included on the Important Habitat Map for this species.
3. **White-bellied Sea-eagle (*Haliaeetus leucogaster*).** This species requires living or dead mature trees within “suitable vegetation” and within 1 km of “rivers, lakes, large dams or creeks, wetlands and coastlines,” according to the TBDC. These habitat features do not occur within 1 km of the subject land.
4. **Regent Parrot (eastern subspecies) (*Polytelis anthopeplus monarchoides*).** This species is considered to be confined to the area along Wakool River west of Kyalite, which excludes the subject land.

5. **Slender Darling Pea (*Swainsona murrayana*)**. This species is considered to be confined to the Hay Plain, a region of inland NSW that is variably defined but which excludes the Tocumwal area – see, for example Porteners (1993), who defines the Hay Plain as excluding the region contained in the Berrigan 1:100,000 topographic map, which contains the subject land.
6. **Red Darling Pea (*Swainsona plagiotropis*).** This species is considered to be confined to the Hay Plain. It has been excluded for the reason given for *S. murrayana* above.

One species could also be removed owing to the absence of suitable habitat:

1. **Sloane's Froglet (*Crinia sloanei*).** The species polygon for this species includes all associated vegetation communities within 100 metres of the top of the bank of any suitable waterbody. While habitat for this species exists in the wider landscape, its polygon, if mapped, would not extend into the disturbance footprint.

5.3.2 Species eliminated via targeted survey

Targeted species surveys were conducted for the below species according to the methodologies outlined in **Section 2.3.3** and detailed further below. For reference, no threatened or migratory species or populations were detected during the targeted surveys. The BioNet species records from within 10 km of the subject land are also displayed in **Table 5-3** for site context.

1. **Australian Bustard (*Ardeotis australis*).** There are no records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with PCT 45; therefore, 3.01 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 39-78 minutes of area searches. As area searches were undertaken for 30.75 hours over 12 days, and considering audio recording was also undertaken (**Figure 2-1**; **Table 2-3**), this species is considered absent surveyed.
2. **A Speargrass (*Austrostipa wakoolica*).** There are four records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**). Surveys were conducted at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). *Austrostipa aristiglumis* and *Austrostipa scabra* were identified, but *A. wakoolica* was not.
3. **Claypan Daisy (*Brachyscome muelleroides*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Brachyscome* were encountered.

4. **Bush Stone-curlew (*Burhinus grallarius*).** There are seven records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with PCT 9 and PCT 74, therefore, 0.6 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 6-12 minutes of area searches. As area searches were undertaken for 30.5 hours over twelve days, and considering audio recording, spotlighting and call playback surveys were also undertaken (**Figure 2-1**; **Table 2-3**), this species is considered absent surveyed.
5. **Small Scurf-pea (*Cullen parvum*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**). Surveys were conducted at the appropriate time of year (January) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Cullen* were encountered.
6. **Little Eagle (*Hieraaetus morphnoides*).** There is one BioNET Atlas record of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with all three PCTs, therefore, 4.5 ha of suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches. This species can be surveyed during the period August-October. Area searches were undertaken for 25.75 hours over eight days during the survey window. No Little Eagles were observed and only two nests were observed, both were Corvid-type nests and would be too small for the Little Eagle. As no Little Eagles were observed and no suitable nests occur, this species is considered absent surveyed.
7. **Winged Peppercress (*Lepidium monoplocoides*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). Only the non-native species *Lepidium africanum* was encountered.
8. **Pink Cockatoo (*Lophochroa leadbeateri*).** This species requires living or dead trees with hollows greater than 10 cm. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with all three PCTs, therefore, 4.5 ha of suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches. As area searches were undertaken for 16.25 hours over 4 days in September-October, two hollow watch evenings were undertaken during the breeding period, and considering this conspicuous species routinely nests in the same hollow year after year (Rowley

and Chapman 1991), it is considered that the current survey is adequate to eliminate this species. In addition, the subject land is outside of the core range of this species and is instead mapped as “species or species habitat *may* occur” as per the Conservation Advice for this species (DCCEEW Cth. 2023). Furthermore, there are no records of this species within 10 km of the subject land and only one record from the LGA (from 1999, at Berrigan, c. 25.8 km north of the subject land).

9. **Square-tailed Kite (*Lophoictinia isura*).** There are no records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with PCT 9, PCT 45 and PCT 74, therefore, 4.5 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches during the period September to January. As area searches were undertaken for 19.25 hours over five days (**Table 2-3**), this species is considered absent surveyed.
10. **Barking Owl (*Ninox connivens*).** There are no records of this species within 10 km of the subject land. Six nights of call playback were conducted on the subject land in late August/early September 2024. In addition, five nights of hollow watching, 15.25 hours of spotlighting, and seven nights of passive audio recording were undertaken. The species was not detected and is considered absent surveyed.
11. **Squirrel Glider (*Petaurus norfolcensis*).** There are two records of this species within 10 km, both within the township of Tocumwal. This species is associated with PCT 9 and PCT 74, therefore, 0.6 ha of potentially suitable habitat occurs. There are no BAM-approved survey guidelines for this species. This species requires tree hollows, *Acacia* spp. and other flowering shrubs (NSW Scientific Committee 2008). Although hollow-bearing trees occur, the only shrubs within the subject land are *Atriplex semibaccata, Enchylaena tomentosa* and *Sclerolaena muricata*. These are small-flowered species producing little potential food for the Squirrel Glider and are not known to be utilised by this species. All records of this species within the Berrigan LGA are exclusively within 600 m of the Murray River (**Figure 5-2**). Therefore, it is considered very unlikely that the species would occur at the site (which is c. 3.1 km from the Murray River). Nonetheless, this species was targeted using baited camera traps (10 camera trap nights), audio recording (7 nights), spotlighting (15.25 hours over 8 nights), and hollow watching (8 nights). The species was not detected and is considered absent surveyed.

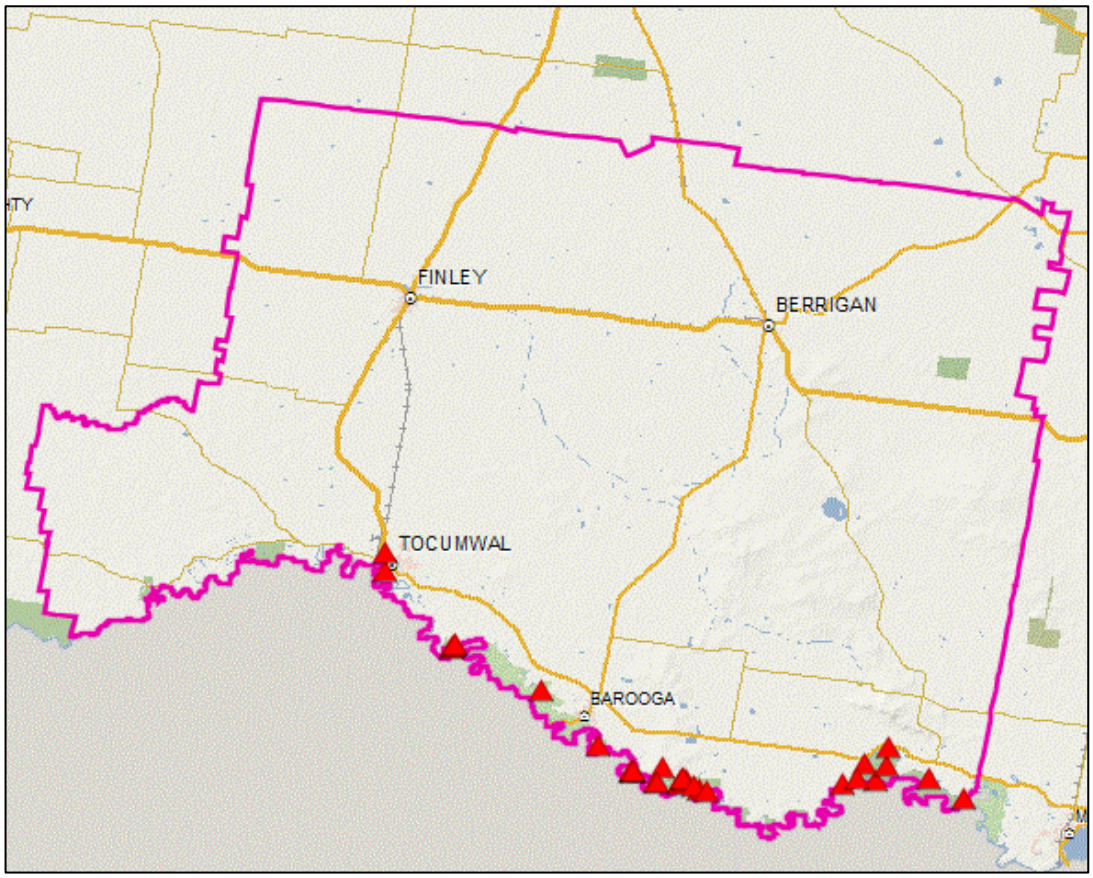


Figure 5-2. BioNET atlas records of the Squirrel Glider within the Berrigan LGA.

12. **Koala (*Phascolarctos cinereus*).** There are 58 records of this species within 10 km, the majority of which are along the Murray River. This species is associated with PCT 9 and PCT 74, therefore 0.6 ha of potentially suitable habitat occurs. According to the *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPE 2022a) areas of suitable habitat ≤5 ha require a minimum of three SAT sites, located in different PCTs, where relevant; four koala SAT sites were completed (**Table 2-3**; **Figure 2-1**) and no signs of koalas were detected. In addition, eight nights of spotlighting were undertaken, 8 days of audio recording, 7 nights of audio recording, and 30.75 hours of diurnal searches; of the time spent conducting diurnal searches, 16.25 hours fell within the koala breeding season (September-December), when males may be heard bellowing. No koalas or koala signs (scats or calls) were detected; therefore this species is considered absent surveyed.
13. **Austral Pillwort (*Pilularia novae-hollandiae*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). Particular attention was given to depressions, table drains, and the margins of dams, channels, and earthworks, which were partly inundated and contained patches of drying mud. No species in the genus *Pilularia* were encountered.
14. **Silky Swainson-pea (*Swainsona sericea*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Swainsona* were encountered.
15. **Superb Parrot (*Polytelis swainsonii*).** There are four records of this species within 10 km of the subject land and suitable breeding habitat occurs on site. In total, 16.25 hours of dawn/dusk bird surveys (over four days) and two dusk hollow watches were conducted during the targeted survey period. The species was not detected and is considered absent surveyed.
16. **Masked Owl (*Tyto novaehollandiae*).** There are no records of this species within 10 km of the subject land. Six nights call playback were conducted on the subject land in late August/early September 2024. In addition, five nights of hollow watching, 15.25 hours of spotlighting, and seven nights of passive audio recording were undertaken. The species was not detected and is considered absent surveyed.

5.3.3 Species assumed present

Due to time constraints or logistical factors, insufficient targeted survey effort was conducted for two species credit species:

1. **Southern Myotis (*Myotis macropus*).** This species can be surveyed October-March using ultrasonic recorders. No ultrasonic recording devices have been placed on the site, therefore this species is assumed present and the species polygon has been drawn to incorporate all associated PCT (PCT 9 and PCT 74) within 200 m of the farm dam (**Figure 5-3**). There are no records of this species within 10 km of the subject land. This species has been assumed present.
2. **Brush-tailed Phascogale (*Phascogale tapoatafa*).** While camera traps were deployed during fauna surveys and these may be used to detect this species, they could not be deployed for the duration specified in the survey guidelines for this species. This species has therefore been assumed present.

Table 5-2. Species credit species predicted to occur and the nature of their presence within or absence from the subject land.

Scientific Name	Common Name	Species presence
Anthochaera phrygia	Regent Honeyeater	Absent (habitat constraint)
Ardeotis australis	Australian Bustard	Absent surveyed
Austrostipa wakoolica	A Spear-grass	Absent surveyed
Brachyscome muelleroides	Claypan Daisy	Absent surveyed
Burhinus grallarius	Bush Stone-curlew	Absent surveyed
Crinia sloanei	Sloane's Froglet	Absent (habitat degraded)
Cullen parvum	Small Scurf-pea	Absent surveyed
Haliaeetus leucogaster	White-bellied Sea-Eagle	Absent (habitat constraint)
Hieraaetus morphnoides	Little Eagle	Absent surveyed
Lathamus discolor	Swift Parrot	Absent (habitat constraint)
Lepidium monoplocoides	Winged Peppercress	Absent surveyed
Lophochroa leadbeateri	Pink Cockatoo	Absent surveyed
Lophoictinia isura	Square-tailed Kite	Absent surveyed
Myotis macropus	Southern Myotis	Assumed present (no targeted survey conducted)
Ninox connivens	Barking Owl	Absent surveyed
Petaurus norfolcensis	Squirrel Glider	Absent surveyed
Phascogale tapoatafa	Brush-tailed Phascogale	Assumed present (insufficient targeted survey effort)
Phascolarctos cinereus	Koala	Absent surveyed
Pilularia novae-hollandiae	Austral Pillwort	Absent surveyed
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	Absent (geographical constraint)
Polytelis swainsonii	Superb Parrot	Absent surveyed
Swainsona murrayana	Slender Darling Pea	Absent (geographical constraint)
Swainsona plagiotropis	Red Darling Pea	Absent (geographical constraint)
Swainsona sericea	Silky Swainson-pea	Absent surveyed

Scientific Name	Common Name	Species presence
Tyto novaehollandiae	Masked Owl	Absent surveyed

Table 5-3. BioNet records of threatened species within 10 km of the subject land.

Scientific Name	Common Name	*NSW Status	+Comm. Status	No. records
Apus pacificus	Fork-tailed Swift	P	C,J,K	2
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		10
Austrostipa wakoolica	A spear-grass	E1	E	4
Burhinus grallarius	Bush Stone-curlew	E1,P		7
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K	1
Circus assimilis	Spotted Harrier	V,P		1
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P	V	20
Daphoenositta chrysoptera	Varied Sittella	V,P		4
Grus rubicunda	Brolga	V,P		1
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		6
Hieraaetus morphnoides	Little Eagle	V,P		1
Neophema chrysostoma	Blue-winged Parrot	V,P	V	2
Petaurus norfolcensis	Squirrel Glider	V,P		2
Petroica phoenicea	Flame Robin	V,P		3
Phascolarctos cinereus	Koala	E1,P	E	58
Polytelis swainsonii	Superb Parrot	V,P,3	V	4
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V,P		13

*V=Vulnerable, E1=Endangered, P=Protected, 3=Category 3 sensitive species

+V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K=ROKAMBA

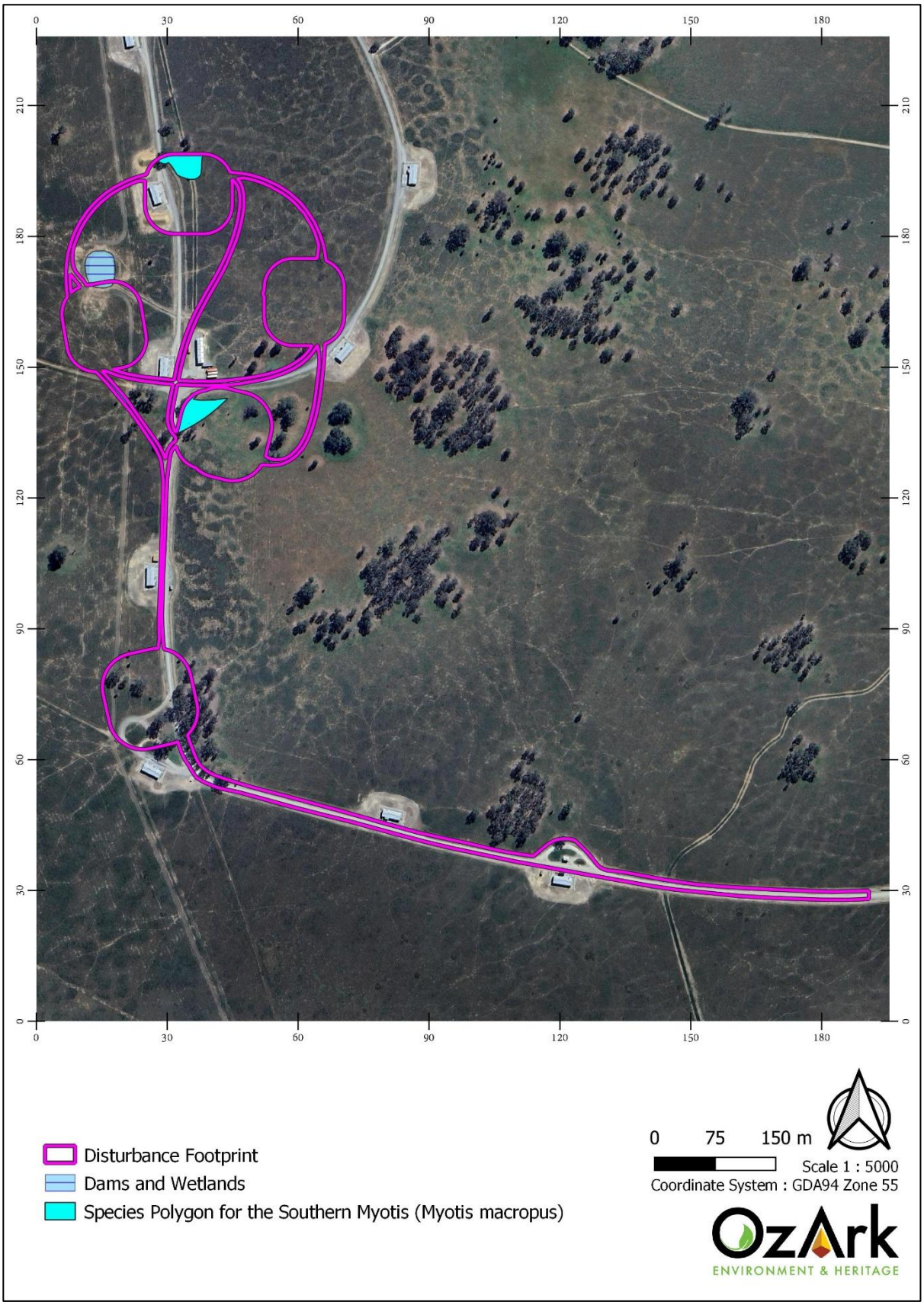


Figure 5-3. Species polygon for the Southern Myotis (*Myotis macropus*).

6 Impact Summary

6.1 Impacts to Native Vegetation

There are three PCTs (PCT 9, PCT 45, and PCT 74) within the disturbance footprint, with up to 4.54 ha of native vegetation to be removed, comprising a small number of mature trees, a small amount of woody regrowth, and an area of native grassland.

Up to 0.22 ha of the BC Act-listed CEEC *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* will be impacted by this proposal.

Up to 3.01 ha of the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains* would be impacted by the proposal. A test of significance conducted under the EPBC Act concluded that this impact is unlikely to be significant or warrant referral (**Appendix D**).

6.2 Serious and Irreversible Impacts

The Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019) and the NSW threatened species data collection have been used to determine which threatened entities require further assessment for Serious and Irreversible Impacts (SAII). An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species (including endangered populations) or ecological community becoming extinct based on following 4 principles (set out in clause 6.7 of BCR and the BAM):

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

One such entity is relevant to the present proposal and is explored below:

6.2.1 White Box - Yellow Box - Blakely's Red Gum Grassy Woodland

Up to 0.22 ha of this SAII entity would be impacted by this proposal, necessitating an assessment under the SAII provisions outlined in section 9.1 of the BAM (2020). This assessment is given here. The assessment follows the numbering given in section 9.1.1 of the BAM:

1. The proposal would result in impacts of up to 0.22 ha to this SAII entity. The proponent has reduced the overall footprint of the proposal during the design phase to concentrate impacts within a relatively restricted area, reducing the extent of clearing associated with access tracks. This is likely to reduce the potential for landscape fragmentation but has not reduced the total impact to this CEEC, which has remained constant at 0.22 ha. Avoidance, minimisation and mitigation measures are discussed in **Section 6.7**.
2. Current status of the CEEC:
    a. Evidence of reduction in geographic distribution. The TBDC states that this SAII entity is undergoing a population reduction of ≥80% in 10 years or three generations. The exact extent of this reduction is not known. However, the NSW Threatened Species Scientific Committee estimates in the Final Determination (2020) that the CEEC has declined by approximately 93% relative to its pre-1750 extent (from 3,717,366 ha to 250,729 ha). Further, there is evidence to suggest that clearing of communities belonging to this CEEC has increased: annual clearing averaged 650 ha for the years 2009-2016, rising to 870 ha in 2016-2017 and to 1,933 ha in 2017-2018. While figures for the extent of clearing after 2018 have not been published, the available evidence suggests that the CEEC is in rapid decline.
    b. Extent of reduction in ecological function for the TEC. This has not been and perhaps cannot be reliably quantified. The Final Determination states that " the extent to which remaining examples continue to support characteristic biota, their interactions and function is unknown," while also noting that the community "is subject to a number of threatening processes that have caused severe declines in biotic processes and interactions throughout its range and are likely to cause continuing decline in the future," including the conversion of most examples of the CEEC to agricultural activity with consequent effects on community composition and structure, soil fertility, weediness, understorey biodiversity, and other key aspects of the community that support ecosystem function. It is also noted that most remaining examples are highly fragmented, again reducing ecosystem function.

c. Evidence of restricted geographic distribution. The CEEC is not considered to have a restricted geographic distribution by the TBDC or Final Determination. The area of occupancy is estimated at 151,100 km^2 and the extent of occurrence at 702,800 km^2 (NSW Threatened Species Scientific Committee, 2020).

d. Evidence that the TEC is unlikely to respond to management. The TBDC and Final Determination do not explicitly respond to this principle. The response to management of any individual remnant is likely to depend on a multitude of factors, including the severity of historical impacts and management practices in surrounding lands.

3. The TBDC does not explicitly identify any of the principles as being data deficient but does not provide an answer to Principle 4.
4. Impacts associated with the proposal:
    a. The impact on the geographic extent of the TEC.
        i. The proposal would reduce the total geographic extent of the CEEC by up to 0.22 ha. Minor indirect impacts (e.g. weed incursions) are likely to result from the proposal but cannot be readily quantified, particularly given the severely degraded nature of the understorey as it currently exists.
        ii. As a percentage of the current geographic extent, an impact of 0.22 ha represents 0.00015% of the current area of occupancy.
    b. Contribution to further environmental degradation or disruption of biotic processes:
        i. Impacts would be to a single patch that is already largely isolated. Only one further example of the CEEC is known from within 500 m of the site. This patch is located approximately 60 m from the patch to be impacted. While the SVTM identifies an area of PCT 75, another Yellow Box (*Eucalyptus melliodora*) community, approximately 620 m from the site, ground-truthing suggests that this is, in reality, a Grey Box (*E. microcarpa*) community. Small areas of PCT 74 are mapped along Lalalty Channel and Tuppal Creek c. 3.6 km to the west of the site and may also belong to this CEEC. The validity of this mapping is uncertain, however, considering the inaccuracy of the predictive mapping across the subject land. The SVTM misidentifies the local occurrence of PCTs 74 as PCT 76 or 237, both Grey Box communities. Similarly, many River Red Gum (*E. camaldulensis*) patches are also misidentified as PCTs 76 or 237. The remaining known patch of the CEEC would be

approximately 0.61 ha in size, though this includes some highly disturbed areas and built infrastructure.

ii. The proposal is unlikely to exacerbate existing fragmentation and the loss of connectivity between remaining examples of the CEEC as only two examples of the CEEC could be located and these will be largely retained. Impacts will be confined to 0.22 of an approximately 1.50 ha patch and the second patch (1.87 ha) will not be directly impacted. The existing fragmentation is such that the recorded examples of the CEEC should already be regarded as isolated, as they do not appear to connect to any other occurrences of the CEEC in the wider landscape.
    - Any connectivity between remaining examples of the CEEC must be via intervening River Red Gum, Grey Box, or grassland communities, and these will also be largely retained.
    - It is unclear whether dispersal of flora between local remnants of the CEEC is possible as no other nearby examples of the CEEC could be located on land accessible during the surveys, with the exception of the two patches described above. Dispersal via other surrounding communities would be possible for certain species, particularly for common understorey grasses such as Rough Speargrass (*Austrostipa scabra*), as there is likely to be some overlap in species composition between these communities; however, gene flow between Yellow Box populations is likely to be limited. Pollen of Yellow Box has been recorded travelling at least 1 km (Broadhurst, 2013), but this may still not be sufficient to connect remnant patches in the landscape. The presence of regrowth within the site – visible in plot photographs for this community (**Appendix B**) – cannot be taken as an indication of successful gene flow between populations, as Yellow Box, while preferentially outcrossing, is also self-compatible (Burrows, 2000).
    - The perimeter of the remaining patch subject to direct impacts would be approximately 727 m and the area to perimeter ratio would be 20.6:1. The perimeter of the unaffected patch would be approximately 651 m and area to perimeter ratio would be 28.7:1.

iii. The community exists within the site as a small number of mature trees with highly degraded understoreys and as immature regrowth encroaching into the surrounding grassland. The VI score for the

community is 43.5, the composition score 26.0, the structure score 40.4, and the function score 78.1.

5. No information challenging the applicability of the principles discussed above to this CEEC has been identified.

6.3 Prescribed Impacts

The BCR lists certain impacts as prescribed impacts that must be avoided, minimised and mitigated. These prescribed impacts and their relevance to the proposal are described in **Table 6-1.**

Table 6-1. Prescribed impacts of the proposal.

Prescribed Impact	Site Assessment	Mitigation Measure
Impacts on the habitat of threatened species or TECs associated with karst, caves, crevices, cliffs and other features of geological significance.	No karsts, caves, crevices, cliffs or other features of geological significance present on the subject land or within the study area.	None required.
Impacts of development on the habitat of threatened species or TECs associated with rocks.	No areas of loose surface rock or outcropping rock occur within the disturbance footprint.	None required.
Impacts of development on the habitat of threatened species or TECs associated with human made structures.	In the longer term, the proposal will entail the removal of the existing magazines. These may provide some limited habitat for fauna species, though the survey did not include these structures and their usefulness to fauna species is therefore unknown.	None required.
Impacts of development on the habitat of threatened species or TECs associated with non-native vegetation.	Of the c. 7.05 ha disturbance footprint, 4.53 ha support native vegetation. The balance largely consists of human-made infrastructure lacking all vegetation (existing magazines and sheds, tracks, wholly cleared APZs) but also contains small areas (c. 0.6 ha) of majority non-native vegetation. Non-native vegetation on the subject land may provide marginal habitat for species or ecosystem credit species, and mitigations associated with fauna interactions still apply. Considering the very small amount of non-native vegetation within the impact footprint, these impacts are considered negligible.	**Table 6-3.**
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	Minor impacts to connectivity would result from the proposal (see **Section 3.11**).	**Table 6-3.**
Impacts of the development on movement of threatened species that maintains their life cycle.	Minor impacts to connectivity would result from the proposal (see **Section 3.11**).	**Table 6-3.**

Prescribed Impact	Site Assessment	Mitigation Measure
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and TECs.	No natural watercourses occur on the subject land. Consequently, negligible impacts to water quality, water bodies and hydrological processes are expected to result from this Project.	None required. **Table 6-3.**
Impacts of wind turbine strikes on protected animals.	None associated with the proposal.	None required.
Impact of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	An increase in overall traffic movement is anticipated due to construction and maintenance works associated with the proposal. Maintaining suitably low speed limits (20km/hr) on site will help to mitigate resultant impacts.	**Table 6-3.**

6.4 Indirect Impacts

Potential indirect impacts associated with the proposal are explored further in **Table 6-2**. The main impacts of the proposal are expected to be contained within the disturbance footprint, provided there is adequate demarcation between operational and non-operational areas. Disturbance from machinery and operational activities will occur, such as noise and dust. However, these impacts will be minimised by following the environmental safeguards proposed in **Table 6-3**.

Table 6-2. Potential indirect impacts of the proposal.

Nature of impact	Timing	Frequency	PCTs, threatened species and/or TECs impacted	Consequence of impact on biodiversity
Inadvertent impacts on adjacent habitat or vegetation	Construction phase	Possible	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Increased edge effects, loss of foraging habitat, potential mortality to neighbouring fauna
Reduced viability of adjacent habitat due to edge effects	Construction phase	High	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Degradation (possibly temporary) of a small area of native vegetation and habitat for threatened flora and fauna.

Nature of impact	Timing	Frequency	PCTs, threatened species and/or TECs impacted	Consequence of impact on biodiversity
Reduce viability of adjacent habitat due to noise, dust or light spill	Construction phase	Medium	• Threatened species assumed present	Minor foraging and breeding habitat for fauna may be altered or removed.
Transport of weeds and pathogens from the site to adjacent vegetation	Construction phase	Possible	• Native vegetation surrounding the disturbance footprint	Degradation (possibly temporary) of native vegetation.
Increased risk of starvation or exposure, and loss of shade or shelter	Construction phase	Low	• Threatened species assumed present	Minor loss of foraging and refuging habitat
Loss of breeding habitat	Construction and Operation phase	Possible	• Threatened species assumed present	Minor potential loss of potential breeding habitat, chiefly for grassland species.
Trampling of threatened flora species	Construction and Operation phase	Low	• Threatened species assumed present	Possible minor loss of threatened flora
Inappropriate Waste Management	Construction and Operation phase	Possible	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Degradation of native vegetation and habitat for threatened species.

6.5 Impacts to Wetlands, Watercourses, and Aquatic Habitat

No natural watercourses occur on the subject land. A farm dam occurs in close proximity to the subject land and provides some habitat for aquatic species such as freshwater turtles and ducks, but the dam lacks typical wetland vegetation. It is also unlikely that impacts to this dam would be required. Consequently, negligible impacts to wetland, watercourse or aquatic habitats are expected to result from this Project.

6.6 Cumulative Impacts

The potential impacts of this proposal must be regarded as a contribution to the wider loss of biodiversity in the local area and across NSW. The incremental effects of multiple impacts – past, present, and future – are referred to as cumulative impacts. This BDAR provides an opportunity to consider the impacts associated with this proposal within a wider context.

Other major projects in the Berrigan Shire LGA include the Finley Solar Farm (determined 29/01/2018), which resulted in the removal of 378 ha of PCT 76 in a derived condition, and the replacement of the Murray River Bridge, which was determined in 2004 and for which no assessment documents are currently available.

The subject land is situated in a landscape which has undergone extensive historical clearing for the purposes of agriculture. The disturbance footprint is situated within one of relatively few paddocks in the local landscape which has not been used for intensive agriculture and therefore retains what is presumed to be a natural grassland. Similarly, wooded vegetation most often occurs locally as isolated paddock trees, giving the small fragments found within the disturbance footprint and study area disproportionate habitat value. The impacts of this proposal are, by themselves, very small; however, considering the scarcity of native cover within the wider landscape and the absence of large, connected areas of woodland or natural grassland, these impacts are not inconsequential. Considered individually, this proposal is highly unlikely to result in significant adverse impacts to biodiversity at either local or state level. Taken cumulatively, however, the impacts of this and other local development activities contribute to the ongoing decline in biodiversity values across the state.

6.7 Avoidance, Minimisation and Mitigation

The following avoidance measures have been integrated into the design and/or are suggested for the implementation of the project:

- The locations of the magazines were altered to bring the magazines closer together and reduce the impacts to native vegetation (i.e. clearing and fragmentation) associated with the longer access tracks in the initial design. A comparison of the initial and final footprints is given in **Figure 6-1**.
- Magazines have been sited in areas close to existing infrastructure where vegetation condition is generally poorer.
- Targeted surveys have been carried out where possible to confirm that specific threatened species do not occur within the site.
- The proposed impact area has been reduced in the planning phase to minimise impacts to native vegetation on the subject land. Exclusion zones have been

implemented to avoid impacts to most woodland vegetation and to some wetland areas.

- In addition, minimisation and mitigation methods will be implemented. **Table 6-3** outlines recommended environmental safeguards to reduce impacts on vegetation, soil and biodiversity.

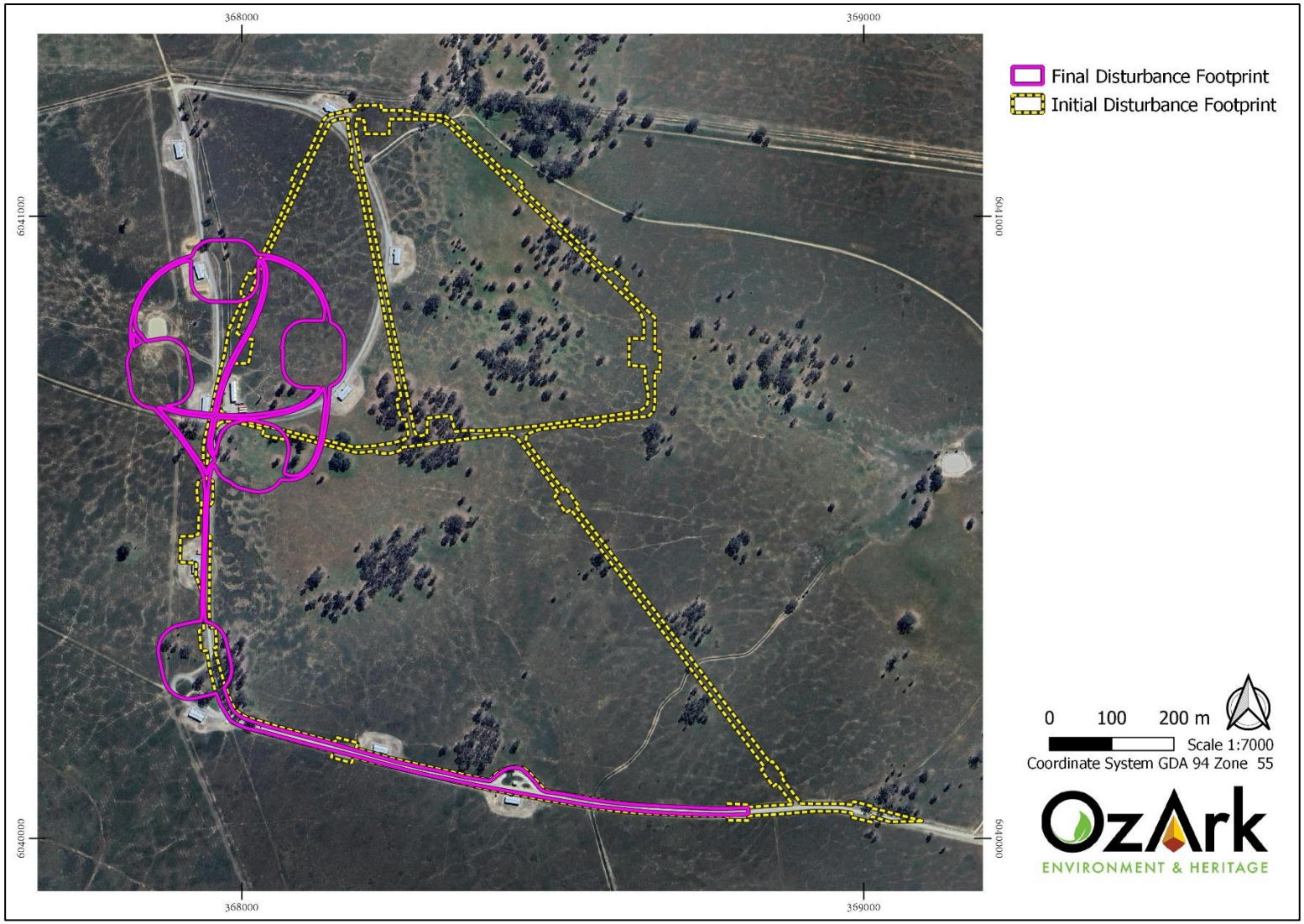


Figure 6-1. Comparison of initial and final proposal footprints, showing reduction in overall extent.

Note that the extent of clearing required by the initial footprint is underestimated in this figure as allowances had not been made for APZs.

Table 6-3. Mitigation measures for implementation.

Aspect	Environmental safeguards	Responsibility	Timing
General	1. Any change in design outside the assessed impact footprint (subject site) will require further ecological survey and assessment. 2. All personnel working on site will be made aware of the environmental sensitivities of the site and safeguards/mitigations to be implemented, e.g., site induction and 'toolbox' style briefings. This includes all native vegetation, threatened ecological communities and potential threatened flora and fauna. Evidence of all personnel receiving an induction will be kept on file (e.g., signed induction sheets).	Proponent	Pre-construction, construction, operation
Clearing of native vegetation	3. All construction personnel should be inducted to be aware that any deliberate or accidental damage of a stand of native vegetation outside the subject site has legislative consequences under Part 4 or 5 of the EP&A Act. Evidence of all personnel receiving this induction would be kept on file (signed induction sheets etc.). 4. Before starting work, a physical vegetation clearing boundary at the approved clearing limit is to be demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, parawebbing or similar. 5. Vegetation would be removed in such a way as to avoid damage to surrounding vegetation. 6. Groundcover disturbance would be kept to a minimum. 7. Any stockpile and compound sites should be located using the following criteria: • At least 40 m away from the nearest waterway • In areas of low ecological conservation significance (i.e. previously disturbed land) • On relatively level ground • Outside the one in 10-year Average Recurrence Interval (ARI) floodplain 8. Stockpiling materials and equipment and parking vehicles would be avoided within the dripline (extent of foliage cover) of any tree. 9. Where possible, vegetation to be removed would be mulched on-site and re-used to stabilise disturbed areas.	Proponent / contractor	Pre-construction, construction
Threatened Species	10. Provide identification resources for personnel to enable identification of threatened species that might occur on the work site, i.e. those species listed in **Table 5-1.** 11. Construction work to occur only during daylight hours to avoid indirect impacts on threatened fauna such as vehicle strikes. 12. On site speed limits should not exceed 20 km/hr to reduce the risk of vehicle strike	Contractor	Pre-construction and construction

Aspect	Environmental safeguards	Responsibility	Timing
	13. If unexpected threatened fauna or flora species are discovered, stop works immediately and contact a suitably qualified ecologist for advice. 14. Keep records of any threatened species recorded on site during works.		
Light	15. Any artificial lighting to be used during construction or operation should follow the Best Practice Lighting Design within the National Light Pollution Guidelines (DoEE 2020). In particular, all lighting should be kept close to the ground, directed, and shielded to avoid light spill.	Proponent/Contractor	Pre-construction, construction, operation
Soil Management	16. A Construction Environmental Management Plan (CEMP) is required. 17. Install erosion and sediment controls in line with Landcom's Managing Urban Stormwater, Soils & Construction Guidelines (The Blue Book. Landcom 2004). 18. Where practicable, spread mulch made from vegetation cleared on site on areas of bare soil to stabilise, preventing dust and erosion. 19. Erosion and sedimentation controls are to be checked and maintained on a regular basis. This includes clearing of sediment from behind barriers and after heavy rainfall events. 20. Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised. 21. Stockpile topsoil removed to be redistributed across site at completion of construction. 22. Implement dust suppression activities.	Contractor	Pre-construction and construction
Introduction and spread of priority weeds and pathogens	23. Construction crew should be briefed on the identification of priority weeds that occur on site during inductions (see **Table 4-3)**. 24. If declared priority weeds are identified during construction they will be managed according to the requirements of the *Biosecurity Act 2015*. 25. Construction machinery (bulldozers, excavators, trucks, loaders and graders) will be cleaned using a high-pressure washer or other suitable device before entering and exiting work sites. 26. Machinery will be inspected by designated personnel following washdown to ensure no soil, mud, or vegetative material remains. Records of inspections to be maintained. 27. All pesticides will be used in accordance with the requirements on the label. Any person carrying out pesticide (including herbicide) application will be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation. 28. Keep records of any weed control activities that take place.	Contractor	Construction

Aspect	Environmental safeguards	Responsibility	Timing
Disturbance to fallen timber, dead wood, and bush rock	29. Any fallen timber, dead wood, and bush rock encountered on site would be left *in situ* (where possible) or relocated to a suitable place nearby.	Contractor	Construction
Rehabilitating cleared areas	30. Revegetation of any bare soil or cleared areas with locally occurring native flora species typical of the original habitat types is usually recommended. 31. Stockpiled topsoil to be re-spread over cleared areas.	Proponent, contractor	Construction and post-construction
Exacerbating invasive fauna	32. All food scraps and rubbish are to be appropriately disposed of in sealed receptacles to prevent providing forage habitats for foxes, rats, dogs, and cats.	Contractor	Construction
Increased risk of fire	33. If any "hot works" are to be undertaken, these activities will not take place on days of extreme fire danger (where possible).	Contractor	Construction

6.8 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government.

The EPBC Act protected matters search has identified seven wetlands of international importance, five TECs, 36 threatened species, nine migratory species and 16 marine species that could possibly occur in the 10 km search area (**Appendix A**). Of these, 15 threatened and/or migratory species were assessed as potentially occurring on the subject land, based on habitat available and nearby records (**Table 6-4; Appendix D**). An assessment of impact significance has been undertaken for each of these threatened and migratory species following EPBC guidelines, as detailed in **Appendix D**. It is concluded that no MNES will be significantly impacted by the proposal. A summary of these matters and whether the proposal is likely to impact them is provided in **Table 6-5**.

Table 6-4. EPBC Act-listed threatened and/or migratory species potentially impacted by the proposal.

Scientific Name	Common Name	+Comm. Status	BioNet Records < 10 km?
Anthochaera phrygia	Regent Honeyeater	CE	0
Apus pacificus	Fork-tailed Swift	C,J,K	2
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	20
Crinia sloanei	Sloane's Froglet	E	0
Falco hypoleucos	Grey Falcon	V	0
Grantiella picta	Painted Honeyeater	V	0
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0

Lathamus discolor	Swift Parrot	CE	0
Lophochroa leadbeateri leadbeateri	Pink Cockatoo	E	0
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	E	0
Neophema chrysostoma	Blue-winged Parrot	V	2
Polytelis swainsonii	Superb Parrot	V	4
Stagonopleura guttata	Diamond Firetail	V	0
Swainsona murrayana	Slender Darling Pea	V	0
Swainsona plagiotropis	Red Darling Pea	V	0

+V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K= ROKAMBA

Table 6-5. Impacts to Matters of National Environmental Significance and Commonwealth land.

Consideration	Potential impact?
Any impact on a listed threatened species or communities?	Yes (non-significant, **Appendix D**)
Any impacts on listed migratory species?	Yes (non-significant, **Appendix D**)
Any impacts on a Ramsar wetland of international importance?	No
Any impacts on a Commonwealth marine environment?	No
Any impacts on a World Heritage property?	No
Any impacts on a National Heritage place?	No
Any impacts on the Great Barrier Reef Marine Park?	No
Does the proposal involve a nuclear action (including uranium mining)?	No
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	No
Additionally, any impact (direct or indirect) on Commonwealth land?	No

7 Biodiversity Credit and Offset Report

7.1 Management Zones

The BAM considers future vegetation condition of different areas of the disturbance footprint when calculating biodiversity credits and offsets. It has been assumed that all vegetation within the disturbance footprint will be cleared (i.e., its future Vegetation Integrity [VI] Score will be 0). Therefore, offset requirements have been assessed assuming only one management zone.

7.2 Vegetation Integrity Assessment

VI Scores have been calculated for each vegetation zone based on patch size, area to be impacted, vegetation composition, structure and function, as defined below.

Patch size – Area in hectares of total vegetation zone patch (i.e. the connected woody and non-woody vegetation). See **Section 4.3.2**.

Area – Area within the property that will be subject to clearing, modification or other treatment by the Proposal. There is only one management zone as described above.

Composition (Comp.) – Score calculated based on species richness, i.e. the number of native species present.

Structure (Struct.) – Score calculated based on the cover (%) of each native species growth form.

Function (Funct.) – Score calculated based on habitat features, i.e. presence of tree sizes, hollow trees, coarse woody debris, litter cover (%) and high threat weed cover (%). The function score does not apply to grassland PCTs.

Benchmark data for the PCTs is also used in this calculation.

Data required for the calculation was collected in the field using the methodology specified in the BAM, as described above. The VI assessment for each vegetation zone, including the loss of VI due to the proposal, is shown in **Table 7-1**.

Table 7-1. Vegetation Integrity (VI) assessment.

Vegetation Zone	PCT	Area	Comp.	Struct.	Funct.	Current VIS	Management Zone	Future VIS	Change in VIS
9_Remnant	9	1.30	34.7	82	66.2	57.3	Disturbance footprint	0	-57.3
45_Moderate	45	3.01	56.7	81.2	-	67.9	Disturbance footprint	0	-67.9
74_Remnant	74	0.22	26	40.4	78.1	43.5	Disturbance footprint	0	-43.5

7.3 Ecosystem Credit Summary

Based on the VI score and area of PCT impacted, 167 Ecosystem Credits are required to be offset for the proposal. The ecosystem credits required for the proposal are summarised in **Table 7-2**. The full biodiversity credit summary report is provided in **Appendix E**.

Table 7-2. Ecosystem credits requiring offsetting (copied from BAM-C).

Vegetation zone name	BAM-C Zone	Current VIS	Change in VIS	Area (ha)	BC Act listing status	EPBC Act listing status	TEC name	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
9_Remnant	1	57.3	-57.3	1.30	Not a TEC	Not a TEC	No associated TEC	High Sensitivity to Gain	1.25	False	33
45_Moderate	2	67.9	-67.9	3.94	Not a TEC	CEEC	Natural Grasslands of the Murray Valley Plains	High Sensitivity to Gain	2.00	False	128
74_Remnant	3	43.5	-43.5	0.22	CEEC	Does not fit listing	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	High Sensitivity to Gain	2.00	True	6
TOTAL											**167**

7.4 Species Credit Summary

In total, two species credit species were assumed to be present for part or all of the disturbance footprint, generating an obligation to retire 52 species credits. The species credits required for the proposal are summarised in **Table 7-3**. The full biodiversity credit summary report is provided in **Appendix E.**

Table 7-3. Species credit summary.

Scientific Name	Common Name	Species presence	Impacted area	Biodiversity risk weighting	Potential SAII	Species credits generated
Myotis macropus	Southern Myotis	Assumed present	0.3 ha	2.00	False	10
Phascogale tapoatafa	Brush-tailed Phascogale	Assumed present	1.5 ha	2.00	False	42
TOTAL						**52**

7.5 Offset Requirement

Offsetting is required for the 167 Ecosystem Credits and 52 Species Credits listed above.

The proponent intends to purchase and retire the necessary number of credits on the open market or, if not available, offset credits through a direct payment into the Biodiversity Conservation Fund.

8 Summary and Conclusions

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica Australia Pty Ltd (the proponent) to prepare a BDAR for the proposed upgrade of the existing Explosives Reserve Magazine Compound at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire LGA. The Project will be assessed as a State Significant Development (SSD-64923965) and enters the BOS by virtue of its status as an SSD.

The proposal would occupy up to 7.05 ha, of which 4.53 ha possesses remnant native vegetation. The native vegetation present in the disturbance footprint consists of three Plant Community Types (PCTs):

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

Each PCT was recorded in a single condition state and assigned to a single vegetation zone: 9_Remnant, 45_Moderate, and 74_Remnant.

PCT 74 was found to belong to the BC Act-listed CEEC *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*. Up to 0.22 ha of this community would be impacted by the proposal. PCT 45 was found to belong to the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains*. Up to 3.01 ha of this community would be impacted by the proposal.

In total, 36 ecosystem credit species were generated by the BAM-C. The habitat suitability of the subject land for these species was assessed. Three species were removed from the list due to habitat constraints; consequently, 33 species were assumed present as ecosystem credit species, generating a total of 167 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 16 species were eliminated by targeted surveys. Two species – the

Southern Myotis (*Myotis macropus*) and Brush-tailed Phascogale (*Phascogale tapoatafa*) – could not be ruled out by constraints or surveys and have been assumed present, generating an obligation to retire a total of 52 species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within this BDAR. Therefore, a referral of the proposal to DCCEEW for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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Appendix A: Database Search Results

NSW Biodiversity Values Map and Threshold Report

NSW GOVERNMENT Department of Planning and Environment

Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to your local council to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under the Biodiversity Conservation Regulation 2017 (Cl. 7.2 & 7.3).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

Biodiversity Values Map and Threshold Report

Date of Report Generation		18/09/2025 11:28 AM
1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)		
1.1	**Does the development Footprint intersect with BV mapping?**	no
1.2	**Was ALL BV Mapping within the development footprinted added in the last 90 days?** (dark purple mapping only, no light purple mapping present)	no
1.3	**Date of expiry of dark purple 90 day mapping**	N/A
1.4	**Is the Biodiversity Values Map threshold exceeded?**	no
2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)		
2.1	**Size of the development or clearing footprint**	69,663.2 sqm
2.2	**Native Vegetation Area Clearing Estimate (NVACE)** (within development/clearing footprint)	3,800.0 sqm
2.3	**Method for determining Minimum Lot Size**	LEP
2.4	**Minimum Lot Size** (10,000sqm = 1ha)	1,200,000 sqm
2.5	**Area Clearing Threshold** (10,000sqm = 1ha)	10,000 sqm
2.6	**Does the estimate exceed the Area Clearing Threshold?** (NVACE results are an estimate and can be reviewed using the Guidance)	no
REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area? (Your local council will determine if a BDAR is required)		**no**

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NSW GOVERNMENT Department of Planning and Environment

What do I do with this report?

• If the result above indicates the BOS Threshold has been exceeded, your local council **may require** a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor.

• If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.

• If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.

• If **all** Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

For more detailed advice about actions required, refer to the **Interpreting the evaluation report** section of the Biodiversity Values Map Threshold Tool User Guide .

Review Options:

• If you believe the Biodiversity Values mapping is incorrect please refer to our BV Map Review webpage for further information.

• If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the Guide for reviewing area clearing threshold results from the BMAT Tool.

Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: _____ Date: _____

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

18/09/2025 11:28 AM

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Department of Planning and Environment

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

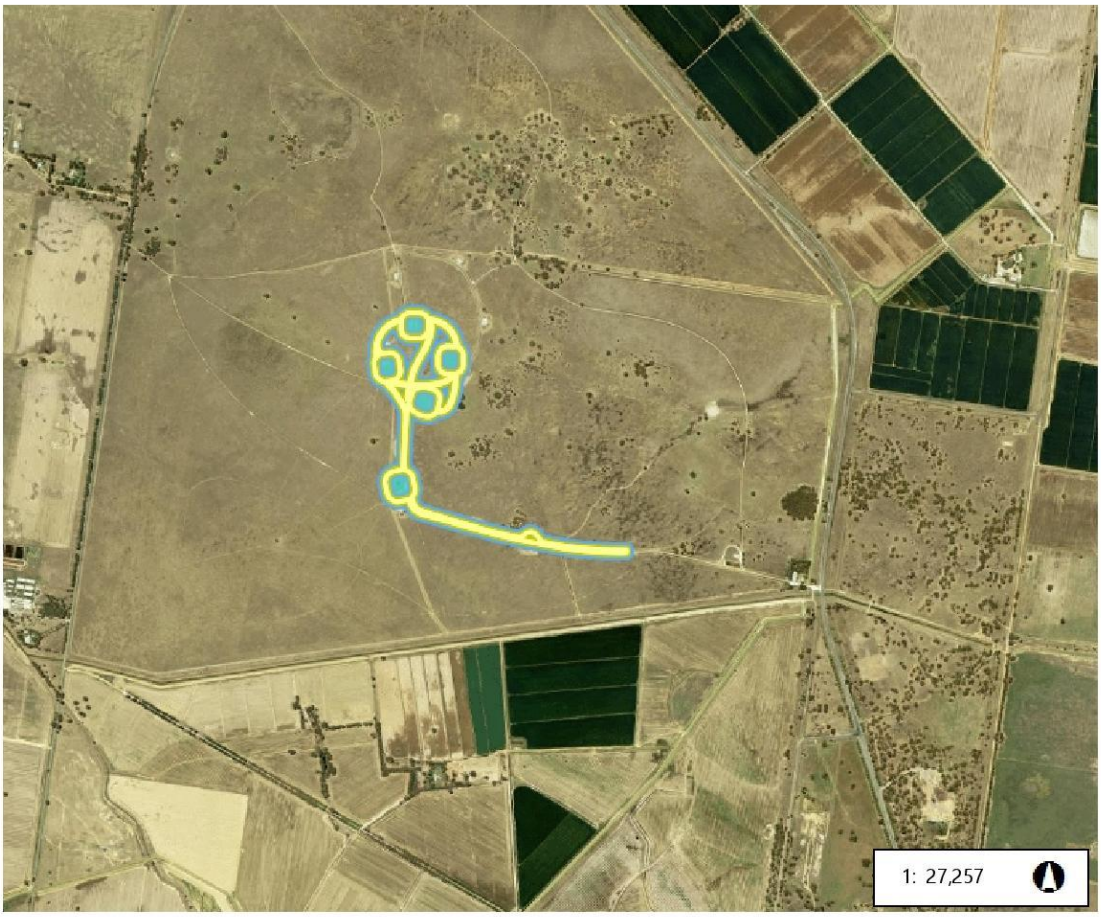
This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the Biodiversity Values Map webpage.

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the Biodiversity Values Map Review webpage.

If you need help using this map tool see our Biodiversity Values Map and Threshold Tool User Guide or contact the Map Review Team at map.review@environment.nsw.gov.au or on 1800 001 490.

Biodiversity Values Map



1,384.6 0 692.32 1,384.6 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days
- Native Vegetation Area Clearing Estimate (NVACE)
- Development area selected by proponent

18/09/2025 11:28 AM

Imagery © Airbus DS/Spot Image 2016

© NSW Department of Customer Service, Basemaps 2019

© NSW Department of Planning and Environment

The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the Biodiversity Values Map viewer for mapping updates is recommended.

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Berrigan Local Environmental Plan 2013 – Terrestrial Biodiversity Values Mapping.

The red polygon shows the approximate location of the subject land.

EPBC Act Protected Matters Report

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 18-Sep-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	43
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	3
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	400 - 500km upstream from Ramsar site	In feature area
Barmah forest	Within 10km of Ramsar site	In feature area
Gunbower forest	50 - 100km upstream from Ramsar site	In feature area
Hattah-kulkyne lakes	200 - 300km upstream from Ramsar site	In feature area
Nsw central murray state forests	Within 10km of Ramsar site	In feature area
Riverland	400 - 500km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	500 - 600km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area	In feature area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area	In feature area
Mallee Bird Community of the Murray Darling Depression Bioregion	Endangered	Community may occur within area	In feature area

Community Name	Threatened Category	Presence Text	Buffer Status
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area	In feature area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area	In buffer area only
Weeping Myall Woodlands	Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Endangered	Species or species habitat may occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area	In feature area
CRUSTACEAN			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Euastacus armatus Murray Crayfish [81537]	Vulnerable	Species or species habitat likely to occur within area	In feature area
FISH			
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Endangered	Species or species habitat known to occur within area	In buffer area only
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area	In buffer area only
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat known to occur within area	In buffer area only
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
Crinia sloanei Sloane's Froglet [59151]	Endangered	Species or species habitat likely to occur within area	In feature area
Litoria raniformis Southern Bell Frog, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In feature area
INSECT			
Synemon plana Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
Amphibromus fluitans			
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area	In feature area
Austrostipa wakoolica			
[66623]	Endangered	Species or species habitat known to occur within area	In feature area
Brachyscome muelleroides			
Mueller Daisy [15572]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lepidium aschersonii			
Spiny Peppercress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium monoplocoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area	In feature area
Myriophyllum porcatum			
Ridged Water-milfoil [19919]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pimelea spinescens subsp. spinescens			
Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Sclerolaena napiformis			
Turnip Copperburr [11742]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Swainsona plagiotropis Red Darling-pea, Red Swainson-pea [10804]	Vulnerable	Species or species habitat may occur within area	In feature area
REPTILE			
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [15260]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Murray Valley	National Park	NSW	In buffer area only
River Murray Reserve	Natural Features Reserve	VIC	In buffer area only
Strathmerton B.R.	Natural Features Reserve	VIC	In buffer area only

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Millewa Forest	NSW	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		(Particular Manner)		

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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BioNET Atlas search – threatened species predicted to occur within the Murray Fans subregion of the Riverina bioregion.

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Amphibia	*Crinia sloanei*	Sloane's Froglet	E1,P	E	104
Amphibia	*Litoria raniformis*	Southern Bell Frog	E1,P	V	26
Aves	^^*Anthochaera phrygia*	Regent Honeyeater	E4A,P,2	CE	13
Aves	^^*Falco hypoleucos*	Grey Falcon	V,P,2	V	1
Aves	^^*Lophochroa leadbeateri*	Pink Cockatoo	V,P,2		26
Aves	*Actitis hypoleucos*	Common Sandpiper	P	C,J,K	3
Aves	*Anseranas semipalmata*	Magpie Goose	V,P		20
Aves	*Aphelocephala leucopsis*	Southern Whiteface	V,P	V	142
Aves	*Apus pacificus*	Fork-tailed Swift	P	C,J,K	7
Aves	*Ardeotis australis*	Australian Bustard	E1,P		4
Aves	*Arenaria interpres*	Ruddy Turnstone	P	C,J,K	3
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		539
Aves	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	118
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		67
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	P	C,J,K	44
Aves	*Calidris canutus*	Red Knot	P	E,C,J,K	1
Aves	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	20
Aves	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	15
Aves	*Calidris ruficollis*	Red-necked Stint	P	C,J,K	20
Aves	*Calidris subminuta*	Long-toed Stint	P	C,J,K	5
Aves	*Calidris tenuirostris*	Great Knot	V,P	V,C,J,K	2
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3	E	1
Aves	*Cecropis daurica*	Red-rumped Swallow	P	C,J,K	1
Aves	*Certhionyx variegatus*	Pied Honeyeater	V,P		2
Aves	*Chlidonias leucopterus*	White-winged Black Tern	P	C,J,K	5
Aves	*Chthonicola sagittata*	Speckled Warbler	V,P		11
Aves	*Cinclosoma castanotum*	Chestnut Quail-thrush	V,P		1
Aves	*Circus assimilis*	Spotted Harrier	V,P		30
Aves	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P	V	2528
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		280
Aves	*Epthianura albifrons*	White-fronted Chat	V,P		66
Aves	*Falco subniger*	Black Falcon	V,P		50
Aves	*Gallinago hardwickii*	Latham's Snipe	P	J,K	44
Aves	*Gelochelidon nilotica*	Gull-billed Tern	P	C	7
Aves	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet	V,P,3		5
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		12
Aves	*Grantiella picta*	Painted Honeyeater	V,P	V	10
Aves	*Grus rubicunda*	Brolga	V,P		44
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		193

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Aves	*Hamirostra melanosternon*	Black-breasted Buzzard	V,P,3		2
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		97
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	4
Aves	*Hydroprogne caspia*	Caspian Tern	P	J	14
Aves	*Lathamus discolor*	Swift Parrot	E1,P	CE	17
Aves	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	1
Aves	*Limosa limosa*	Black-tailed Godwit	V,P	E,C,J,K	5
Aves	*Lophoictinia isura*	Square-tailed Kite	V,P,3		10
Aves	*Melanodryas cucullata cucullata*	South-eastern Hooded Robin	E1,P	E	138
Aves	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		59
Aves	*Neophema chrysostoma*	Blue-winged Parrot	V,P	V	12
Aves	*Neophema pulchella*	Turquoise Parrot	V,P,3		2
Aves	*Ninox connivens*	Barking Owl	V,P,3		27
Aves	*Ninox strenua*	Powerful Owl	V,P,3		3
Aves	*Numenius phaeopus*	Whimbrel	P	C,J,K	1
Aves	*Oxyura australis*	Blue-billed Duck	V,P		32
Aves	*Pachycephala inornata*	Gilbert's Whistler	V,P		64
Aves	*Pachycephala olivacea*	Olive Whistler	V,P		1
Aves	*Pedionomus torquatus*	Plains-wanderer	E1,P,3	CE	59
Aves	*Petroica boodang*	Scarlet Robin	V,P		330
Aves	*Petroica phoenicea*	Flame Robin	V,P		3682
Aves	*Philomachus pugnax*	Ruff	P	C,J,K	7
Aves	*Pluvialis fulva*	Pacific Golden Plover	P	C,J,K	4
Aves	*Pluvialis squatarola*	Grey Plover	P	C,J,K	2
Aves	*Polytelis anthopeplus monarchoides*	Regent Parrot (eastern subspecies)	E1,P,3	V	29
Aves	*Polytelis swainsonii*	Superb Parrot	V,P,3	V	806
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		1056
Aves	*Rostratula australis*	Australian Painted Snipe	E1,P	E	5
Aves	*Stagonopleura guttata*	Diamond Firetail	V,P	V	247
Aves	*Stictonetta naevosa*	Freckled Duck	V,P		40
Aves	*Tringa glareola*	Wood Sandpiper	P	C,J,K	3
Aves	*Tringa nebularia*	Common Greenshank	P	C,J,K	23
Aves	*Tringa stagnatilis*	Marsh Sandpiper	P	C,J,K	30
Aves	*Tyto novaehollandiae*	Masked Owl	V,P,3		3
Mammalia	*Antechinomys laniger*	Kultarr	E1,P		1
Mammalia	*Chalinolobus picatus*	Little Pied Bat	V,P		2
Mammalia	*Conilurus albipes*	White-footed Tree-rat	E4,P	X	1
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	2

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Mammalia	*Lasiorhinus krefftii*	Northern Hairy-nosed Wombat	E4,P	CE	1
Mammalia	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		1
Mammalia	*Myotis macropus*	Southern Myotis	V,P		9
Mammalia	*Nyctophilus corbeni*	Corben's Long-eared Bat	V,P	V	1
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	V,P		60
Mammalia	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E1,P	V	1
Mammalia	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		2
Mammalia	*Phascolarctos cinereus*	Koala	E1,P	E	99
Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		100
Flora	^^*Prasophyllum sp. Moama*		E4A,P,2		556
Flora	^^*Pterostylis despectans*		E4A,P,2	E	3
Flora	*Amphibromus fluitans*	Floating Swamp Wallaby-grass	V	V	1255
Flora	*Austrostipa metatoris*	A spear-grass	V	V	21
Flora	*Austrostipa wakoolica*	A spear-grass	E1	E	39
Flora	*Brachyscome muelleroides*	Claypan Daisy	V	V	P
Flora	*Cullen parvum*	Small Scurf-pea	E1		3
Flora	*Eriocaulon australasicum*	Austral Pipewort	E1	E	P
Flora	*Eucalyptus leucoxylon subsp. pruinosa*	Yellow Gum	V		18
Flora	*Lepidium monoplocoides*	Winged Peppercress	E1	E	1
Flora	*Lepidium pseudopapillosum*	Formbe Peppercress	E1	V	P
Flora	*Maireana cheelii*	Chariot Wheels	V	V	9
Flora	*Pilularia novae-hollandiae*	Austral Pillwort	E1,3		2
Flora	*Sclerolaena napiformis*	Turnip Copperburr	E1	E	1058
Flora	*Swainsona murrayana*	Slender Darling Pea	V	V	15
Flora	*Swainsona plagiotropis*	Red Darling Pea	V	V	P
Flora	*Swainsona sericea*	Silky Swainson-pea	V		2
Flora	*Wilsonia rotundifolia*	Round-leafed Wilsonia	E1		2

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
+Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.
‘Records: Number of records, P = predicted to occur, K = known to occur.

BioNET Atlas search – threatened ecological communities predicted to occur within the Murray Fans subregion of the Riverina bioregion.

TEC	*NSW status	+Comm. status	[1]Records
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	E		K
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	E		K
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions		E	K
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		E	K
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E		K
Mallee Bird Community of the Murray Darling Depression Bioregion		E	K
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E		K
Natural Grasslands of the Murray Valley Plains		CE	K
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions		CE	K
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	E		K
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains		CE	K
Weeping Myall Woodlands		E	K
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	CE		K
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	K

*E=Endangered, CE=Critically Endangered

+E=Endangered, CE=Critically Endangered

[1]K=Known

BioNET Atlas search – key threatening processes (KTPs) predicted to occur within the Murray Fans subregion of the Riverina bioregion.

Threats	NSW status	Comm status	Records*
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala* (Latham, 1802)	KTP	KTP	P
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P
Anthropogenic Climate Change	KTP	KTP	P
Bushrock removal	KTP		P
Clearing of native vegetation	KTP	KTP	P
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)	KTP	KTP	P
Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758	KTP	KTP	P
Competition from feral honey bees, *Apis mellifera* L.	KTP		P
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P
Habitat degradation and loss by Feral Horses (brumbies, wild horses), *Equus caballus* Linnaeus 1758	KTP		P
Herbivory and environmental degradation caused by feral deer	KTP		P
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P
Importation of Red Imported Fire Ants *Solenopsis invicta* Buren 1972	KTP	KTP	P
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P
Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP	P
Introduction of the Large Earth Bumblebee *Bombus terrestris* (L.)	KTP		P
Invasion and establishment of exotic vines and scramblers	KTP		P
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	KTP		P
Invasion and establishment of the Cane Toad (Bufo marinus)	KTP	KTP	P
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.	KTP		P
Invasion of native plant communities by *Chrysanthemoides monilifera*	KTP		P
Invasion of native plant communities by exotic perennial grasses	KTP		P
Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* (Fr. Smith) into NSW	KTP		P
Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. Lat)	KTP		P
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	P
Loss of Hollow-bearing Trees	KTP		P
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P
Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	KTP		P
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP		P
Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)	KTP	KTP	P
Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)	KTP	KTP	P
Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758	KTP	KTP	P

Threats	NSW status	Comm status	Records*
Removal of dead wood and dead trees	KTP		P

*P=predicted.

Appendix B: BAM Plot Locations and Photographs

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO01	9	Remnant	368528	6040974		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO03	74	Remnant	368222	6040698		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO06	45	Moderate	368004	6040858		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO07	9	Remnant	367972	6040294		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TOX01	45	Moderate	367875	6040690		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs
NN	0	Non-native	368104	6040673	

Appendix C: Field Survey Results

Flora Species List

In total, 62 plant species were detected during the July and October field surveys. These species are given in the table below. Of this number, 33 (53.23%) are native and 29 (46.77%) are introduced. Three are listed as High-threat Exotic species (HTE) under the BAM. One HTE species – Silver-Leaved Nightshade (*Solanum elaeagnifolium*) – is also listed as a Weed of National Significance (WoNS) and as a Priority Weed (PW) for the Murray.

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
TG	*Eucalyptus camaldulensis*	River Red Gum	N	No	No	No
TG	*Eucalyptus melliodora*	Yellow Box	N	No	No	No
SG	*Atriplex semibaccata*	Creeping Saltbush	N	No	No	No
SG	*Enchylaena tomentosa*	Ruby Saltbush	N	No	No	No
SG	*Sclerolaena muricata*	Black Rolypoly	N	No	No	No
GG	*Austrostipa aristiglumis*	Plains Grass	N	No	No	No
GG	*Austrostipa scabra*	Speargrass	N	No	No	No
GG	*Chloris truncata*	Windmill Grass	N	No	No	No
GG	*Enteropogon acicularis*	Curly Windmill Grass	N	No	No	No
GG	*Enteropogon ramosus*	Curly Windmill Grass	N	No	No	No
GG	*Juncus amabilis*	Rush	N	No	No	No
GG	*Juncus subsecundus*	Rush	N	No	No	No
GG	*Panicum effusum*	Hairy Panic	N	No	No	No
GG	*Rytidosperma caespitosum*	Ringed Wallaby Grass	N	No	No	No
GG	*Rytidosperma duttonianum*	Brown-backed Wallaby Grass	N	No	No	No
GG	*Sporobolus caroli*	Fairy Grass	N	No	No	No
GG	*Walwhalleya proluta*	Rigid Panic	N	No	No	No
FG	*Asperula conferta*	Common Woodruff	N	No	No	No
FG	*Centipeda cunninghamii*	Common Sneezeweed	N	No	No	No
FG	*Crassula sieberiana*	Australian Stonecrop	N	No	No	No
FG	*Goodenia pinnatifida*	Scrambled Eggs	N	No	No	No
FG	*Haloragis aspera*	Rough Raspwort	N	No	No	No
FG	*Lythrum hyssopifolia*	Hyssop Loosestrife	N	No	No	No
FG	*Oxalis perennans*	Grassland Wood-sorrel	N	No	No	No
FG	*Pseudognaphalium luteoalbum*	Jersey Cudweed	N	No	No	No
FG	*Ranunculus pachycarpus*	Thick-Fruit Buttercup	N	No	No	No
FG	*Rhodanthe corymbiflora*	Small White Sunray	N	No	No	No

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
FG	*Rumex dumosus*	Wiry Dock	N	No	No	No
FG	*Sida corrugata*	Corrugated Sida	N	No	No	No
FG	*Solanum esuriale*	Quena	N	No	No	No
FG	*Vittadinia gracilis*	Woolly New Holland Daisy	N	No	No	No
EG	*Marsilea drummondii*	Common Nardoo	N	No	No	No
OG	*Convolvulus angustissimus*	No common name	N	No	No	No
TG	*Schinus molle* var. *areira*	Pepper Tree	I	No	No	No
GG	*Avena fatua*	Wild Oats	I	No	No	No
GG	*Eragrostis curvula*	African Lovegrass	I	Yes	No	No
GG	*Hordeum glaucum*	Northern Barley Grass	I	No	No	No
GG	*Hordeum leporinum*	Barley Grass	I	No	No	No
GG	*Lolium* sp.	Ryegrass	I	No	No	No
FG	*Arctotheca calendula*	Capeweed	I	No	No	No
FG	*Centaurea melitensis*	Maltese Cockspur	I	No	No	No
FG	*Chenopodium murale*	Nettle-Leaf Goosefoot	I	No	No	No
FG	*Cirsium vulgare*	Spear Thistle	I	No	No	No
FG	*Echium plantagineum*	Paterson's Curse	I	No	No	No
FG	*Erodium moschatum*	Musky Crowfoot	I	No	No	No
FG	*Hypochaeris radicata*	Flatweed	I	No	No	No
FG	*Lactuca serriola*	Prickly Lettuce	I	No	No	No
FG	*Lepidium africanum*	African Peppercress	I	No	No	No
FG	*Lysimachia arvensis*	Scarlet Pimpernel, Blue Pimpernel	I	No	No	No
FG	*Malva parviflora*	Small-Flowered Mallow	I	No	No	No
FG	*Marrubium vulgare*	White Horehound	I	No	No	No
FG	*Medicago polymorpha*	Burr Medic	I	No	No	No
FG	*Moraea setifolia*	Thread Iris	I	No	No	No
FG	*Romulea minutiflora*	Small-Flowered Onion Grass	I	No	No	No
FG	*Solanum elaeagnifolium*	Silver-Leaved Nightshade	I	Yes	Yes	Yes
FG	*Solanum nigrum*	Black-Berry Nightshade	I	No	No	No
FG	*Sonchus oleraceus*	Common Sowthistle	I	No	No	No
FG	*Trifolium angustifolium*	Narrow-Leaved Clover	I	No	No	No
FG	*Trifolium arvense*	Haresfoot Clover	I	No	No	No
FG	*Trifolium subterraneum*	Subterranean Clover	I	No	No	No

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
FG	*Urtica urens*	Small Nettle	I	No	No	No
FG	*Xanthium spinosum*	Bathurst Burr	I	Yes	No	No

[1]Growth form: FG = forb, GG = grass and grass-like, SG = shrub, TG = tree, EG = fern, OG = other. [2]Status: N = native, I = introduced. [3]High-threat exotic species (Yes/No). [4]Weed of National Significance (Yes/No). [5]Priority weed for the LLS Region (Yes/No).

Fauna species list

In total, 37 fauna species were detected during the field surveys. Of these, 30 (81.08%) were native and seven (18.92%) introduced. No threatened species were detected.

Class	Scientific name	Common name	Status[1]	BC Act Status	EPBC Act Status	Seen	SM4 Recorder	Camera Trap
Amphibia	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	N	-	-	x		
Amphibia	*Limnodynastes tasmaniensis*	Spotted Grass Frog	N	-	-	x		
Aves	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	N	-	-	x		
Aves	*Acanthiza nana*	Yellow Thornbill	N	-	-	x		
Aves	*Acridotheres tristis*	Common Myna	I	-	-	x		
Aves	*Anas superciliosa*	Pacific Black Duck	N	-	-		x	
Aves	*Aquila audax*	Wedge-tailed Eagle	N	-	-	x		
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	N	-	-		x	
Aves	*Cacatua sanguinea*	Little Corella	N	-	-		x	
Aves	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	N	-	-		x	
Aves	*Chenonetta jubata*	Australian Wood Duck	N	-	-		x	
Aves	*Cincloramphus timoriensis*	Tawny Grassbird	N	-	-		x	
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	N	-	-	x		
Aves	*Corvus coronoides*	Australian Raven	N	-	-		x	
Aves	*Corvus mellori*	Little Raven	N	-	-		x	
Aves	*Cracticus nigrogularis*	Pied Butcherbird	N	-	-		x	
Aves	*Entomyzon cyanotis*	Blue-faced Honeyeater	N	-	-	x		
Aves	*Eolophus roseicapilla*	Galah	N	-	-		x	
Aves	*Grallina cyanoleuca*	Magpie-lark	N	-	-	x	x	

Class	Scientific name	Common name	Status[1]	BC Act Status	EPBC Act Status	Seen	SM4 Recorder	Camera Trap
Aves	*Falco cenchroides*	Nankeen Kestrel	N	-	-	x		
Aves	*Gymnorhina tibicen*	Australian Magpie	N	-	-	x	x	
Aves	*Malurus cyaneus*	Superb Fairy-wren	N	-	-	x		
Aves	*Manorina melanocephala*	Noisy Miner	N	-	-	x	x	
Aves	*Ninox boobook*	Southern Boobook	N	-	-		x	
Aves	*Ocyphaps lophotes*	Crested Pigeon	N	-	-	x	x	
Aves	*Pardalotus striatus*	Striated Pardalote	N	-	-		x	
Aves	*Passer domesticus*	House Sparrow	I	-	-	x		
Aves	*Philemon corniculatus*	Noisy Friarbird	N	-	-	x		
Aves	*Platycercus eximius*	Eastern Rosella	N	-	-		x	
Aves	*Psephotus haematonotus*	Red-rumped Parrot	N	-	-		x	
Aves	*Ptilotula penicillata*	White-plumed Honeyeater	N	-	-		x	
Aves	*Strepera graculina*	Pied Currawong	N	-	-	x		
Aves	*Sturnus vulgaris*	Common Starling	I	-	-	x		
Mammalia	*Bos taurus*	Domesticated cow	I	-	-	x		x
Mammalia	*Oryctolagus cuniculus*	Rabbit	I	-	-	x		
Mammalia	*Rattus rattus*	Black Rat	I	-	-			x
Mammalia	*Vulpes vulpes*	European Red Fox	I	-	-			x

[1]N=Native, I=Introduced.

BAM Data Sheets

BAM Plot - Field Survey Sheet

Page 1 of (2)

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO01	**Zone ID**	9_Remnant
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			227
Easting	368528	**Northing**	6040974	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Inland Riverine Forests
Plant Community Type	9
Condition state	Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	1
	Shrubs	0
	Grasses etc	6
	Forbs	2
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	15
	Shrubs	0
	Grasses etc	41.2
	Forbs	0.2
	Ferns	0
	Other	0
High threat weed cover		0.1

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	1	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	+	For multistemmed trees, record only the largest stem
20 - 29	+	Presence of <5cm stems records regeneration
10 - 19	+	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	+	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows	<20cm -	Total #
	>20cm** -	1
Length of logs		Total (m)
		112.8

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	75	30	55	70	45	55
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO01	Zone ID	9_Remnant
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus camaldulensis*		15		N	
GG	*Rytidosperma caespitosum*		25		N	
GG	*Rytidosperma duttonianum*		10		N	
GG	*Hordeum glaucum*		30		E	
GG	*Lolium* sp.		10		E	
FG	*Trifolium angustifolium*		0.1	10	E	
FG	*Trifolium arvense*		0.1	20	E	
GG	*Panicum effusum*		1		N	
FG	*Arctotheca calendula*		8		E	
FG	*Lysimachia arvensis*		0.1	30	E	
GG	*Austrostipa scabra*		5		N	
FG	*Lepidium africanum*		0.1	20	E	
GG	*Chloris truncata*		0.1	20	N	
FG	*Erodium moschatum*		0.1	10	E	
FG	*Oxalis perennans*		0.1	8	N	
FG	*Xanthium spinosum*		0.1	2	HTE	
FG	*Rumex dumosus*		0.1	5	N	
FG	*Sonchus oleraceus*		0.1	20	E	
GG	*Sporobolus caroli*		0.1	10	N	
FG	*Cirsium vulgare*		0.1	2	E	
FG	*Echium plantagineum*		0.1	8	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Page 1 of (2)

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO03	**Zone ID**	74_Remn.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			88
Easting	368222	**Northing**	6040698	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Floodplain Transition Woodlands
Plant Community Type	74 — **Condition state**: Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m ~~10 x 40 m~~

		Sum values*
Native Richness (count of native species)	**Trees**	1
	Shrubs	0
	Grasses etc	3
	Forbs	1
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	25
	Shrubs	0
	Grasses etc	11
	Forbs	0.1
	Ferns	0
	Other	0
High threat weed cover		0.3

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m ~~10 x 100 m~~

Tree stem DBH (cm)	
>80	1
50 - 79	1
30 - 49	+
20 - 29	+
10 - 19	+
5 - 9	-
< 5	-

Notes on function attributes:
- Stem size class records # large trees (cf. benchmark)
- Record stems for living trees only, and for all species
- For multistemmed trees, record only the largest stem
- Presence of <5cm stems records regeneration
- Record # trees with hollows, not number of hollows
- Count as one stem where tree is multistemmed
- Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	1
Length of logs			Total (m) 58.5

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	1	90	60	45	80	55.2
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO03	Zone ID	74_Remn.
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus melliodora*		25		N	
FG	*Cirsium vulgare*		0.1	7	E	
GG	*Austrostipa scabra*		2		N	
GG	*Rytidosperma caespitosum*		8		N	
FG	*Trifolium arvense*		0.2	60	E	
GG	*Lolium* sp.		5		E	
FG	*Arctotheca calendula*		2		E	
FG	*Marrubium vulgare*		0.1	10	E	
FG	*Solanum elaeagnifolium*		0.1	30	HTE	
FG	*Erodium moschatum*		0.1	40	E	
GG	*Hordeum* sp.		50		E	
FG	*Echium plantagineum*		0.2	100	E	
GG	*Walwhalleya proluta*		1		N	
FG	*Medicago polymorpha*		0.2	60	E	
GG	*Avena fatua*		25		E	
FG	*Xanthium spinosum*		0.2	40	HTE	
FG	*Crassula sieberiana*		0.1	100	N	
TG	*Schinus molle var. areira*		0.1	1	E	
FG	*Chenopodium murale*		0.1	3	E	
FG	*Malva parviflora*		0.1	10	E	
FG	*Solanum nigrum*		0.1	8	E	
FG	*Urtica urens*		0.1	1	E	
FG	*Lepidium africanum*		0.1	20	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO06	**Zone ID**	45_Mod.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			3
Easting	368004	**Northing**	6040858	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Riverine Plain Grasslands
Plant Community Type	45

Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	0
	Shrubs	2
	Grasses etc	6
	Forbs	3
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0.3
	Grasses etc	87
	Forbs	2.2
	Ferns	0.1
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	0	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	-	For multistemmed trees, record only the largest stem
20 - 29	-	Presence of <5cm stems records regeneration
10 - 19	-	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm -	Total #
	>20cm** -	0
Length of logs		Total (m)
		0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	2	1	0	0	1	0.8
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO06	Zone ID	45_Mod.
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
SG	*Sclerolaena muricata*		0.2	1	N	
GG	*Enteropogon ramosus*		35		N	
GG	*Juncus amabilis*		10		N	
GG	*Juncus subsecundus*		2		N	
GG	*Rytidosperma caespitosum*		25		N	
FG	*Asperula conferta*		2		N	
FG	*Trifolium subterraneum*		0.1	30	E	
FG	*Hypochaeris radicata*		0.1	70	E	
FG	*Ranunculus pachycarpus*		0.1	1	N	
GG	*Austrostipa scabra*		5		N	
FG	*Erodium moschatum*		0.1	20	E	
FG	*Rumex dumosus*		0.1	4	N	
EG	*Marsilea drummondii*		0.1	1	N	
FG	*Echium plantagineum*		0.1	40	E	
SG	*Enchylaena tomentosa*		0.1	1	N	
GG	*Walwhalleya proluta*		10		N	
FG	*Arctotheca calendula*		0.1	10	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

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Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO07	**Zone ID**	9_Remnant
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			175
Easting	367972	**Northing**	6040294	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Inland Riverine Forests
Plant Community Type	9

Condition state Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	1
	Shrubs	1
	Grasses etc	2
	Forbs	2
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	**Trees**	25
	Shrubs	0.1
	Grasses etc	10.1
	Forbs	0.2
	Ferns	0.1
	Other	0
High threat weed cover		0.2

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	1	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	+	For multistemmed trees, record only the largest stem
20 - 29	+	Presence of <5cm stems records regeneration
10 - 19	+	Record # trees with hollows, not number of hollows
5 - 9	+	Count as one stem where tree is multistemmed
< 5	+	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows	<20cm -	Total #
	>20cm** -	1
Length of logs		Total (m)
		8.2

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	90	90	75	85	100	88
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO07	Zone ID	9_Remnant
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus camaldulensis*		25		N	
GG	*Rytidosperma caespitosum*		10		N	
GG	*Lolium* sp.		35		E	
GG	*Eragrostis curvula*		0.1	1	HTE	
FG	*Echium plantagineum*		0.1	20	E	
FG	*Medicago polymorpha*		0.1	10	E	
FG	*Trifolium subterraneum*		0.1	6	E	
FG	*Arctotheca calendula*		0.1	30	E	
FG	*Sonchus oleraceus*		0.1	10	E	
FG	*Chenopodium murale*		0.1	5	E	
FG	*Vittadinia gracilis*		0.1	3	N	
FG	*Lactuca serriola*		0.1	2	E	
EG	*Marsilea drummondii*		0.1	1	N	
GG	*Juncus subsecundus*		0.1	10	N	
FG	*Oxalis perennans*		0.1	5	N	
FG	*Malva parviflora*		0.1	1	E	
FG	*Cirsium vulgare*		0.1	2	E	
SG	*Atriplex semibaccata*		0.1	1	N	
FG	*Solanum nigrum*		0.1	3	E	
FG	*Solanum elaeagnifolium*		0.1	1	HTE	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

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Date	10/10/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TOX01	**Zone ID**	45_Mod.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			11
Easting	367875	**Northing**	6040690	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Riverine Plain Grasslands
Plant Community Type	45

Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	0
	Shrubs	0
	Grasses etc	6
	Forbs	7
	Ferns	1
	Other	1
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0
	Grasses etc	83.1
	Forbs	0.7
	Ferns	0.1
	Other	0.1
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	0	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	-	For multistemmed trees, record only the largest stem
20 - 29	-	Presence of <5cm stems records regeneration
10 - 19	-	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	0
Length of logs			Total (m)
			0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	0	2	0	1	0	0.6
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	10/10/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TOX01	Zone ID	45_Mod.
GF code	*Genus species* (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
GG	*Austrostipa aristiglumis*		2		N	
GG	*Rytidosperma duttonianum*		65		N	
FG	*Arctotheca calendula*		0.1	30	E	
FG	*Goodenia pinnatifida*		0.1	5	N	
FG	*Sida corrugata*		0.1	2	N	
FG	*Oxalis perennans*		0.1	10	N	
FG	*Rhodanthe corymbiflora*		0.1	3	N	
FG	*Erodium moschatum*		1		E	
OG	*Convolvulus angustissimus*		0.1	2	N	
FG	*Medicago polymorpha*		2		E	
GG	*Juncus subsecundus*		0.1	8	N	
FG	*Echium plantagineum*		0.1	30	E	
GG	*Lolium* sp.		0.3	100	E	
GG	*Enteropogon acicularis*		1		N	
GG	*Austrostipa scabra*		10		N	
FG	*Trifolium arvense*		2		E	
GG	*Walwhalleya proluta*		5		N	
FG	*Solanum esuriale*		0.1	1	N	
FG	*Haloragis aspera*		0.1	20	N	
FG	*Vittadinia gracilis*		0.1	8	N	
FG	*Moraea setifolia*		0.1	1	E	
FG	*Trifolium subterraneum*		5		E	
EG	*Marsilea drummondii*		0.1	20	N	
FG	*Romulea minutiflora*		0.1	10	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Page 1 of (2)

Date	10/10/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	NN	**Zone ID**	0_NN
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			255
Easting	368104	**Northing**	6040673	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Non-native Vegetation
Plant Community Type	0

Condition state Non-native

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)

Dimensions (circle applicable size)

20 x 20 m ~~10 x 40 m~~

		Sum values*
Native Richness (count of native species)	**Trees**	0
	Shrubs	0
	Grasses etc	2
	Forbs	0
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0
	Grasses etc	2
	Forbs	0
	Ferns	0
	Other	0
High threat weed cover		0.2

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)

Dimensions (circle applicable size)

20 x 50 m ~~10 x 100 m~~

Tree stem DBH (cm)	
>80	0
50 - 79	0
30 - 49	-
20 - 29	-
10 - 19	-
5 - 9	-
< 5	-

Notes on function attributes:

- Stem size class records # large trees (cf. benchmark)
- Record stems for living trees only, and for all species
- For multistemmed trees, record only the largest stem
- Presence of <5cm stems records regeneration
- Record # trees with hollows, not number of hollows
- Count as one stem where tree is multistemmed
- Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	0
Length of logs			Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	-	-	-	-	-	-
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	10/10/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	NN	Zone ID	0_NN
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
GG	*Lolium* sp.		5		E	
GG	*Hordeum* sp.		50		E	
GG	*Austrostipa scabra*		1		N	
FG	*Cirsium vulgare*		0.1	20	E	
FG	*Marrubium vulgare*		0.1	5	E	
FG	*Xanthium spinosum*		0.1	8	HTE	
FG	*Trifolium arvense*		1	3	E	
GG	*Walwhalleya proluta*		1		N	
FG	*Malva parviflora*		0.1	10	E	
FG	*Chenopodium murale*		0.1	7	E	
GG	*Avena fatua*		30	8	E	
FG	*Solanum elaeagnifolium*		0.1	4	HTE	
FG	*Centaurea melitensis*		0.1	2	E	
FG	*Arctotheca calendula*		1		E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

Appendix D: EPBC Act Habitat Assessment and Matters of National Environmental Significance

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. The EPBC Act policy *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013) forms the basis of determining if impact to protected matters is significant.

The EPBC Act protected matters search has identified seven wetlands of international importance, seven TECs, 43 threatened species, 9 migratory species and 17 marine species that could possibly occur in the 10 km search area (**Appendix A**).

The following tables give an overview of the assessments of these threatened entities and shows that the proposed activity:

1. Is not likely to have a significant impact on a matter of national environmental significance. The matters of national environmental significance are:
    i. World heritage properties.
    ii. National heritage places.
    iii. Wetlands of international importance.
    iv. Threatened species and ecological communities.
    v. Migratory species.
    vi. Commonwealth marine areas.
    vii. The Great Barrier Reef Marine Park, and
    viii. Nuclear actions (including uranium mines).
    ix. A water resource, in relation to coal seam gas development and large coal mining development.
2. Is not likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Notes:

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

a) is likely to be key source populations either for breeding or dispersal
b) is likely to be necessary for maintaining genetic diversity
c) is at or near the limit of the species range.

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE, 2013).

Species life cycle information in Likelihood of Occurrence section below is sourced from https://www.environment.nsw.gov.au/threatenedSpeciesApp

Wetlands of International Importance

Name	Proximity	Assessment of significance required (Yes / No)
Banrock Station Wetland Complex	500 – 600 km upstream	No, the proposal does not occur close to the wetland.
Barmah Forest	10 – 20 km upstream	No, the proposal is not connected to this wetland (**Section 3.9**).
Gunbower Forest	50 – 100 km upstream	No, the proposal does not occur close to the wetland.
Hattah-Kulkyne Lakes	200 – 300 km upstream	No, the proposal does not occur close to the wetland.
NSW Central Murray State Forests	10 – 20 km upstream	No, the proposal is not connected to this wetland (**Section 3.9**).
Riverland	400 – 500 km upstream	No, the proposal does not occur close to the wetland.
The Coorong, and Lakes Alexandrina and Albert Wetland	500 – 600 km upstream	No, the proposal does not occur close to the wetland.

EPBC Act-listed Threatened Ecological Communities

Name	Status	Assessment of significance required (Yes / No)
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	No, this community does not occur within the subject land.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	No, this community does not occur within the subject land.
Mallee Bird Community of the Murray Darling Depression Bioregion	Endangered	No, this community does not occur within the subject land.
Natural grasslands of the Murray Valley Plains	Critically Endangered	Yes, this community occurs within the subject land.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	No, this community does not occur within the subject land.
Weeping Myall Woodlands	Endangered	No, this community does not occur within the subject land.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	No, this community does not occur within the subject land.

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
THREATENED BIRDS					
Anthochaera phrygia	Regent Honeyeater	CE	0	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example, the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark *Eucalyptus eugenioides* and other Stringybark species, and Broad-leaved Ironbark *E. fibrosa* can also contribute important nectar flows at times. Nectar and fruit from the mistletoes *Amyema miquelii*, A. pendula and *A. cambagei* are also utilised. When nectar is scarce lerp and honeydew can comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. **Moderate (foraging) – Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes
Aphelocephala leucopsis	Southern	V	0	The southern whiteface typically inhabits arid open woodlands with	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
	Whiteface			a shrubby or grassy understory, as well as grass plains throughout much of southern Australia. It prefers *Acacia* woodlands, particularly those dominated by mulga and drought-resistant chenopod shrub species, including saltbush and bluebush. **Low – Subject land is within the known distribution of the species. However, vegetation communities within the site are a poor match for the known preferences of the species and there are no records within 10 km.**	
Botaurus poiciloptilus	Australasian Bittern	E	0	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch. **Absent - No appropriate marsh habitat present.**	No
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands. **Absent - No appropriate wetland habitat present.**	
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. **Absent - No appropriate wetland habitat present.**	No
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	20	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. 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, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years. **High – Subject land is within the known distribution of the species, an associated vegetation community (PCT 74) is present, and there are 20 records within 10 km.**	Yes
Falco hypoleucos	Grey Falcon	V	0	The Grey Falcon is sparsely distributed in NSW, chiefly throughout	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. **Moderate – Subject land is within the predicted distribution of the species and an associated vegetation community (PCT 45) is present. However, there are no records within 10 km.**	
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South. The species is widespread in Tasmania and is found in all regions of Victoria except for the north-west. Most birds spend the non-breeding period at sites located south of the Richmond River in New South Wales. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent - No appropriate wetland habitat present.	
Grantiella picta	Painted Honeyeater	V	0	The Painted Honeyeater 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. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km.**	Yes
Lathamus discolor	Swift Parrot	CE	0	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*. **Moderate (foraging) - Subject land is within the known distribution of the species and associated vegetation**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				communities (PCT 9 and 74) are present. However, there are no records within 10 km.	
Lophochroa leadbeateri leadbeateri	Pink Cockatoo	E	0	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres. **Absent (surveyed) - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km. However, this species was eliminated via targeted surveys.**	No
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	E	0	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Neophema chrysostoma	Blue-winged Parrot	V	2	The main populations of Blue-winged Parrots are in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania. Sparser populations are found in western New South Wales and eastern South Australia, extending to south-west Queensland and occasionally into the Northern Territory. The species is a partial migrant, with variable numbers of birds migrating across the Bass Strait in winter. **Moderate – Subject land is within the known distribution of the species and there are two records within 10 km. However, there are no associated vegetation communities present.**	Yes
Pedionomus torquatus	Plains-wanderer	CE	0	Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. The Plains-wanderer has declined greatly since European settlement. Areas where the species was formerly common and is now so reduced in numbers that it is effectively extinct include eastern NSW, south-western Victoria, and south-eastern South Australia. Its current stronghold is the western Riverina of southern NSW. Areas of secondary importance include north-central Victoria and central-western Queensland. The bird was formerly fairly common until about 1920 on the Slopes and Tablelands, and there are two earlier records of birds near Sydney. The main reason for the decline in the numbers and distribution of Plains-wanderers in all eastern States has been the conversion of native grasslands to dense introduced pasture or croplands. If native grasslands are not overgrazed or cultivated then Plains-wanderers are largely sedentary, though there is some recent evidence to suggest that birds may not remain sedentary during prolonged drought conditions. **Low – Subject land is within the known distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Polytelis swainsonii	Superb Parrot	V	4	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. **High – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9, 45, 74) are present, and there are four records within 10 km.**	
Rostratula australis	Australian Painted Snipe	E	0	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. **Absent - No appropriate wetland habitat present.**	No
Stagonopleura guttata	Diamond Firetail	V	0	The Diamond Firetail 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. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45,**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				and 74) are present. However, there are no records within 10 km.	
CRUSTACEANS					
Euastacus armatus	Murray Crayfish	V	0	Murray Crayfish is endemic to lotic waters of the southern Murray-Darling Basin. The species has experienced declines in distribution and abundance. There are records from the upper sections of the Lachlan and Macquarie river basins. Given its widespread distribution in stream habitat occurring through pasturelands to sclerophyll forest, and its occurrence in waterways on a spectrum from large rivers to small creeks, and particularly its broad altitudinal range, it appears that the species is tolerant of a variety of in-stream habitat conditions. At a microhabitat scale, the species prefers cool, flowing-water habitats (lotic) proximal to clay banks for burrowing, and wood or rock cover is characteristic of occupied areas. **Absent – No suitable aquatic habitat present.**	No
FISH					
Bidyanus bidyanus	Silver Perch, Bidyan	E	0	Silver Perch, once abundant in the Murray-Darling river system, have experienced a significant decline and are now scarce or absent from most of their original range. The only remaining secure and self-sustaining population is located in NSW, specifically in the central Murray River downstream of Yarrawonga weir, as well as in several anabranches and tributaries. These fish have been found in diverse habitats and climates throughout the Murray-Darling Basin, typically preferring faster-flowing water such as rapids and races, as well as more open sections of rivers. Successful spawning and recruitment are closely tied to high flows and overbank flooding in their environment. **Absent – No suitable aquatic habitat present.**	No
Craterocephalus fluviatilis	Murray Hardyhead	E	0	Murray Hardyhead school in open water habitats, preferring relatively salty fringing wetlands in floodplains and lakes. Historically they survived in isolated wetlands on floodplain fringes during dry seasons, dispersing out over the floodplain during wet seasons. **Absent – No suitable aquatic habitat present.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Galaxias rostratus	Flathead Galaxias	CE	0	Flathead Galaxias, also known as Murray jollytail, is a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong. Flathead Galaxias are found in still or slow-moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation. Flathead Galaxias spawn in spring and lay slightly adhesive demersal eggs. **Absent – No suitable aquatic habitat present.**	No
Maccullochella macquariensis	Trout Cod	E	0	Trout Cod tend to occupy areas which have lots of large in-stream woody debris or 'snags', which provide complex habitats for each stage of the species' life cycle. They form pairs and spawn during spring and early summer when the water temperature is around 15ºC. Females produce 1,200 – 11,000 adhesive eggs (2.5 – 3.6 mm in diameter) that attach to hard substrates and are guarded by the male. **Absent – No suitable aquatic habitat present.**	No
Maccullochella peelii	Murray Cod	V	0	The Murray Cod inhabits a wide range of warm and temperate water habitats, from clear, rocky, fast-flowing upland streams (such as those in the upper western slopes of NSW and the ACT) to turbid, slow-moving or still waters in lowland rivers, tributaries, anabranches (including larger billabongs), and lakes. The species prefers waterways with plenty of structural features that offer shelter and include deep pools and waterholes up to 5 metres deep. It is also present in various impoundments (dams, reservoirs, or weirs). In large impoundments, the Murray cod may be found at depths below 5 metres, where water temperatures or dissolved oxygen levels are not too low. All stages of its life cycle rely on structural features in waterways, such as snags in lowland streams and boulders or bedrock in upland streams, which help slow water flow	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				during high or fast flows and provide shelter **Absent – No suitable aquatic habitat present.**	
Macquaria australasica	Macquarie Perch	E	0	The Macquarie Perch is a moderate-sized fish with an elongate-oval body which is laterally compressed. In the Murray-Darling Basin the species varies from almost black or dark silvery grey to bluish grey or green-brown above, paler to off-white below, often with a yellowish tinge. Macquarie Perch have declined considerably from their historical distribution within NSW, and they are now considered isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers in southern NSW (Ingram et al. 1990). It is also found in low numbers in the Mongarlowe River (Lintermans 2008). Other populations exist in Cataract Dam in the Nepean River catchment, as well as a 2008 record from Georges River near Campbelltown, the first record from the river since 1894 (NSW DPI 2008a). It persists in the Burrinjuck, Cotter (Murrumbidgee) and Wyangala impoundments (McDowall 1996). A breeding population in the Queanbeyan River upstream of the Googong Reservoir exists solely due to a translocation of individuals from the reservoir past a natural barrier (Lintermans 2006). The Googong reservoir population is believed to be effectively extinct. Macquarie perch may occasionally become displaced downstream from the Queanbeyan River into Googong, but they do not form a population in the reservoir (Lintermans pers comm 2009). Hawkesbury and Shoalhaven River populations, seem abundant. Records have also been made in the Dharawal State Conservation Area, the Metropolitan Special Area and in adjacent areas around Appin (Bio-Analysis Pty Ltd 2009). The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks (Cadwallader & Eden 1979). Spawning occurs just above riffles (shallow running water). Populations may survive in impoundments if able to access suitable spawning sites (Wager & Jackson 1993). **Absent – No suitable aquatic habitat present.**	No
FROGS					

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Crinia sloanei	Sloane's Froglet	E	0	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It has not been recorded recently in the northern part of its range and has only been recorded infrequently in the southern part of its range in NSW. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. **Moderate – Subject land is within the known distribution of the species, and an associated vegetation community (PCT 74) is present. However, there are no records within 10 km.**	Yes
Litoria raniformis	Southern Bell Frog	V	0	In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation Area in recent years. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
INSECTS					
Synemon plana	Golden Sun Moth	CE	0	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				which groundlayer is dominated by wallaby grasses *Austrodanthonia spp*. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	
MAMMALS					
Nyctophilus corbeni	Corben's Long-eared Bat	V	0	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, buloke *Allocasuarina luehmannii* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. **Low – Subject land is within the predicted geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Phascolarctos cinereus	Koala	E	58	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. **Absent – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9 and 74) are present, and there are 58 records within 10 km. However, this species was eliminated via targeted surveys.**	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	0	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	
PLANTS					
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	0	There are many historic collections in the City of Greater Albury. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire. It is also found in Victoria and in Tasmania. *Amphibromus fluitans* grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile, and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with *Potamogeton* and *Chamaeraphis* species. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present, and no records within 10 km.**	No
Austrostipa wakoolica	A spear-grass	E	4	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South West	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any individuals within the site.**	
Brachyscome muelleroides	Claypan Daisy	V	0	The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with *Pycnosorus globosus, Agrostis avenacea* and *Austrodanthonia duttoniana*. Also recorded from the margins of lagoons in mud or water, and in association with *Calotis anthemoides*. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any individuals within the site.**	No
Lepidium aschersonii	Spiny Peppercress	V	0	Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). In the north of the State recent surveys have recorded a number of new sites including Brigalow Nature Reserve, Brigalow State Conservation Area, Leard State Conservation Area and Bobbiwaa State Conservation Area. Also known from the West Wyalong area in the south of the State. The Spiny Peppercress occurs in periodically wet sites such as gilgai depressions and the margins of freshwater and saline marshes and shallow lakes, usually on heavy clay soil. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
Lepidium monoplocoides	Winged Peppercress	E	0	Widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. There is a single	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				collection from Broken Hill and only two collections since 1915, the most recent being 1950. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any individuals within the site.**	
Sclerolaena napiformis	Turnip Copperburr	E	0	Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of *Austrostipa nodosa* and *Chloris truncata*, in grey cracking clay to red-brown loamy clay. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Senecio macrocarpus	Large-fruit Fireweed	V	0	Woodland, grassland, and sedgeland. Tablelands east and north of the ACT. Shrub or herb to about 0.7 m high or sprawling, arising from a perennial rootstock, sparsely to moderately greyish-cobwebbed hairy below, becoming hairless above. Leaves alternating up the stems, 4–15 cm long, 2–10 mm wide, entire to distantly and minutely toothed, rarely prominently toothed or shallowly and distantly lobed. Flower heads 7–18 mm long, plumply cylindrical, with 50–150 florets, 0 petals, surrounded by 13–33 appressed bracts. Flower heads usually in clusters of about 2–10. Flowers mostly winter–spring. **Low – Subject land is within the predicted geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Swainsona murrayana	Slender Darling Pea	V	0	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. **Absent –This species is considered to be confined to the Hay Plain, a region of inland NSW that is variably defined but which excludes the Tocumwal area – see, for example Porteners (1993), who defines the Hay Plain as excluding the region contained in the Berrigan 1:100,000 topographic map, which contains the subject land.**	
Swainsona plagiotropis	Red Darling Pea	V	0	Occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. Most NSW records are from the Jerilderie area, with possible collections from the Louth-Bourke area and a disjunct record in the north-western plains from Buttabone Stud Park 35 km NW of Warren. Also rare in Victoria, restricted to a few sites in the central north, mostly between Bendigo and the Murray River south of Echuca. Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. **Absent – This species is considered to be confined to the Hay Plain. It has been excluded for the reason given for *S. murrayana* above.**	No
REPTILES					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	0	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
MIGRATORY SPECIES					
Migratory Marine Birds					

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Apus pacificus	Fork-tailed Swift	C,J,K	2	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide; however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. **Moderate – Subject land is within the known geographic distribution of the species, and two records occur within 10 km. However, there are no associated vegetation communities present.**	Yes
Migratory Terrestrial Species					
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km.**	Yes
Motacilla flava	Yellow Wagtail	M	0	Widespread wagtail, favoring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration. Like other wagtails, walks on ground and pumps its long, white-sided tail up and down. Plumage highly variable, but breeding	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				male wholly bright yellow below, with greenish back. Male head pattern varies regionally: in U.K. has greenish head with yellow eyebrow; in northern Europe head slaty gray overall; in central and southwest Europe head blue-gray with white eyebrow. Individuals of several subspecies may winter together. Female and nonbreeding plumages drabber and paler, with ghosting of male patterns. Uncertainty exists regarding this species presence outside of northern Europe. **Low – Subject land is not within the known geographic distribution of the species, there are no associated vegetation communities present, and no records within 10 km.**	
Migratory Wetlands Species					
Actitis hypoleucos	Common Sandpiper	C,J,K	0	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. **Absent - No appropriate wetland habitat present.**	No
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. **Absent - No appropriate wetland habitat present.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Absent - No appropriate wetland habitat present.**	No
Calidris melanotos	Pectoral Sandpiper	J,K	0	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Absent - No appropriate wetland habitat present.**	No
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales. **Absent - No appropriate wetland habitat present.**	
Pandion haliaetus	Osprey	Bonn, M		The Osprey has a global distribution with four subspecies previously recognised throughout its range. Eastern Ospreys are found right around the Australian coastline, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea **Low – Subject land is not within the recorded geographic distribution of the species and does not contain vegetation communities known to be used by the species.**	No
OTHER MATTERS PROTECTED BY THE EPBC ACT					
Listed Marine Species					
Actitis hypoleucos	Common Sandpiper	C,J,K	0	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent – See above.	
Apus pacificus	Fork-tailed Swift	C,J,K	2	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide; however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. **Moderate – See above.**	Yes
Bubulcus ibis as *Ardea ibis*	Cattle Egret	C,J	0	In Australia it is most widespread and common in north-eastern Western Australia across the Top End, Northern Territory, and in south-eastern Australia from Bundaberg, Queensland to Port Augusta, South Australia, including Tasmania. The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps and is often seen with cattle and other stock. **Low – Subject land is within the known geographic distribution of the species. However, the site lacks the preferred habitat for this species and there are no records within 10 km.**	No
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. **Absent – See above**	No
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Absent – See above.**	
Calidris melanotos	Pectoral Sandpiper	J,K	0	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Absent – See above.**	No
Chrysococcyx osculans	Black-eared Cuckoo	M	0	The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. The species is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds. **Low – Subject land is within the species known geographic distribution. However, there are no associated vegetation communities present or records within 10 km.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales. **Absent – See above.**	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	C	6	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9, 45, and 74) are present, and there are six records within 10 km. However, this species is considered absent due to habitat constraints (no vegetation within 1 km of a suitable watercourse or waterbody).	
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate – See above.**	Yes
Lathamus discolor	Swift Parrot	CE	0	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				dominated by Tasmanian Blue Gum *Eucalyptus globulus*. **Moderate (foraging) – See above.**	
Merops ornatus	Rainbow Bee-eater	J	0	The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. It is not found in Tasmania, and is thinly distributed in the most arid regions of central and Western Australia (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands (Gibson 1986; Jones 1986; Leach 1988; Longmore 1978; McEvey & Middleton 1968; Saunders & Ingram 1995; Woinarski et al. 1988, 1989) and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages **Low – Subject land is within the species known geographic distribution. However, there are no associated vegetation communities present or records within 10 km.**	No
Motacilla flava	Yellow Wagtail	M	0	Widespread wagtail, favoring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration. Like other wagtails, walks on ground and pumps its long, white-sided tail up and down. Plumage highly variable, but breeding male wholly bright yellow below, with greenish back. Male head pattern varies regionally: in U.K. has greenish head with yellow eyebrow; in northern Europe head slaty gray overall; in central and southwest Europe head blue-gray with white eyebrow. Individuals of several subspecies may winter together. Female and nonbreeding plumages drabber and paler, with ghosting of male patterns. Uncertainty exists regarding this species presence outside of northern Europe. **Low – See above.**	No

***NSW Status:** ^^=Sensitive species: location of records generalised, P=Protected, V=Vulnerable, E1=Endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.

+ Comm. Status: V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K=ROKAMBA, Bonn = Convention on Migratory Species of Wild Animals (Bonn Convention), M=Migratory.

EPBC Act-listed Critically Endangered and Endangered Ecological Communities

Natural grasslands of the Murray Valley Plains	
Significant Impact Guideline	**Assessment**
Reduce the extent of an ecological community	The proposal will result in the loss of up to 3.01 ha of this community. This will not reduce the overall extent of occurrence of the community, as defined by the International Union for Conservation of Nature (IUCN), which consists of an imaginary polygon enclosing all known examples of a taxon or, as in this case, a community. The impacts of this proposal are situated within a larger local occurrence of this proposal, which would remain; consequently, the extent of occurrence would be unchanged. Nevertheless, the actual total extent of the community would undergo a decline.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposal would introduce new roads, bisecting the grassland and therefore introducing fragmentation to the community. These roads would be relatively narrow (c. 5-6 m) and it is unclear to what extent this would reduce gene flow for flora species or impede the movement of fauna. The local occurrence of the community is already fragmented by similar roads and most of the additional fragmentation would take place within an area that is already affected by this fragmentation.
Adversely affect habitat critical to the survival of an ecological community	Habitat critical to the survival of this community has not been formally identified; however, as the impacts would be confined to 3.01 ha of a much larger occurrence (>100 ha, conceivably up to c. 700 ha), the disturbance footprint by itself is unlikely to be considered critical.
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	Regular burning and harvesting of flora and fauna are not expected to result from this proposal; however, some changes to the local composition of the community may result from “edge effects” such as the proliferation of weeds. This is discussed further below but is not expected to significantly impact the local occurrence of this population.
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.**	All construction activity carries a risk of facilitating the spread of invasive species. By clearing native vegetation to facilitate construction, the proposal may create niches that can be exploited by fast-growing weeds, which may then be able to colonise surrounding lands. The native vegetation would also be subject to edge effects associated with altered drainage patterns and changed microclimate, which may introduce additional stresses to the population and facilitate the spread of more opportunistic weed species. This may alter the overall species composition of the community, but is unlikely to do so on a large scale, suggesting that most of the local occurrence of the community would be unaffected. No additional use of harmful chemical has been identified by the proponent as a component of this proposal. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of an ecological community.	The major identified threatening process for this community is the clearance, conversion, and fragmentation of remaining examples, with weed invasion also contributing. This proposal will exacerbate these threats. Given the small scale of the proposed impacts and the large extent of the local occurrence, this is unlikely to significantly interfere with the recovery of the community.

Conclusion	**No significant impact**

EPBC Act-listed Critically Endangered and Endangered Species

Sloane's Froglet (*Crinia sloanei*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 0.22 ha of potential habitat for this species. The subject land is not within a priority management area for the species. This species was not detected during 7 nights of audio recording conducted during the breeding season. Since no records occur within 10 km of the subject land, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	Considering the above, the habitat within the subject land is unlikely critical habitat for the species. Furthermore, suitable habitat within the subject land consists of only two small areas (the largest being approximately 17 m × 6 m).
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population 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 proposal will remove/modify up to 0.22 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Fragmentation and degradation of habitat; reduction of water quality; drought and climate change; and susceptibility to the amphibian chytrid fungus are the main threats to this species. Although this proposal will exacerbate clearing of up to 0.22 ha of marginally suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Regent Honeyeater (*Anthochaera phrygia*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 1.52 ha of potential habitat for this species. The land is not within a priority management area for the species. No records occur within 10 km of the subject land and the species was not detected during the field survey. Furthermore, the subject land occurs outside of the two known key breeding regions in NSW (Capertee Valley and the Bundarra-Barraba region). As such, it is unlikely the subject land is critical habitat for this species. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Within NSW key breeding areas are in the Capertee Valley and Bundarra-Barraba region. The subject land does not fall within these regions. As such, this proposal will not disrupt the breeding cycle for any population 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 proposal will remove/modify up to 1.52 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum Woodland, is a major threat to this species. Although this proposal will exacerbate clearing of up to 1.52 ha of marginally suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Swift Parrot (*Lathamus discolor*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal would impact up to 1.52 ha of potential habitat for this species. The subject land is not within a priority management area for the species. This species breeds exclusively within Tasmania. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population 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 proposal will remove/modify up to 1.52 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Clearing of woodlands, heavy grazing of feeding areas resulting in the removal of seeding grasses and preventing regeneration of food plants, loss of existing and future hollow-bearing trees, and illegal nest-robbing and trapping are the main threats to this species. Although this proposal will exacerbate clearing of up to 1.52 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Hooded Robin (south-eastern form, *Melanodryas cucullata cucullata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal would impact up to 1.52 ha of potential habitat for this species. The subject land is not within a priority management area for the species. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population exists at the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population 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 proposal will remove/modify up to 1.52 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Clearing of woodlands, resulting in loss and fragmentation of habitat; modification and destruction of ground habitat through heavy grazing and compaction by stock, removal of litter and fallen timber, introduction of exotic pasture grasses and frequent fire; aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners; reduction in resources due to drought; and disturbance and changes to vegetation structure due to forestry activities (e.g. fire and harvesting) are the main threats to this species. Although this proposal will exacerbate the clearing and fragmentation of woodland, due to the clearing of up to 1.52 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

EPBC Act-listed Vulnerable Species

Brown Treecreeper (south-eastern subspecies, *Climacteris picumnus victoriae*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up to 0.22 ha of potential habitat for this species. The subject land is not within a priority management area for the species, nor is it at the edge of the species' distribution. No evidence of this species or its nests was detected during the field survey. Furthermore, half of the 20 records within the 10 km search area are located within 1 km of the Murray River system. The closest record (from 2007) occurs ~ 3.2 km from the subject land. the closest of which occurs ~ 4.6 km from the subject land. In light of this, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	Considering the above, the habitat within the subject land is unlikely critical habitat for the species. Furthermore, suitable habitat within the subject land consists of only two small areas (the largest being approximately 17 m × 6 m).
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.22 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Historical loss of woodland, forest and mallee habitats as a result of agriculture, forestry, mining and residential development; fragmentation of woodland and forest remnants which isolates populations and causes local extinctions; ongoing degradation of habitat, particularly the loss of tree hollows and fallen timber from firewood collection and overgrazing; and the lack of regeneration of eucalypt overstorey in woodland due to overgrazing and too-frequent fires are the main threats facing this species. Although this proposal will exacerbate the loss of woodland, due to the clearing of up to 0.22 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Grey Falcon (*Falco hypoleucos*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.53 ha of potential habitat for this species. The subject land is not within a Priority Management Area for this species. However, it is near the edge of the species' distribution. As such, if a population is present, it would be considered an important population. The species was not detected during the field survey and no records occur within 10 km. The subject land is also likely to be of, at most, marginal suitability for the species as it does not conform to the preference of the species for wooded watercourses. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land. Furthermore, the preferred wooded watercourses do not occur within the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.53 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Identified threats to this species include grazing and clearing of habitat, secondary poisoning through pest control activities, and collecting of eggs. Although this proposal will exacerbate the loss of habitat, due to the clearing of up to 4.53 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Painted Honeyeater (*Grantiella picta*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 1.52 ha of potential habitat for this species. The subject land is not within a priority management area for the species identified at state level, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey, no records occur within 10 km, and no impacts to the preferred food source of this species – mistletoes – are likely to result from the proposal. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land. Furthermore, the preferred food source of this species – mistletoes - do not occur within the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 1.52 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Habitat clearance, disturbance and fragmentation; the removal of large trees with heavy mistletoe infestations; overgrazing of grassy woodlands; habitat incursion by exotic weeds; inappropriate fire regimes; and competition with larger, more aggressive honeyeaters are the main threats to this species. Although this proposal will exacerbate the clearing of vegetation, due to the clearing of up to 1.52 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

White-throated Needletail (*Hirundapus caudacutus*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.53 ha of potential habitat for this species. The subject land is not within a priority management area for the species, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.53 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Vegetation clearing and windfarms are the main threats for this species. Although this proposal will exacerbate the clearing of vegetation, due to the clearing of up to 4.53 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

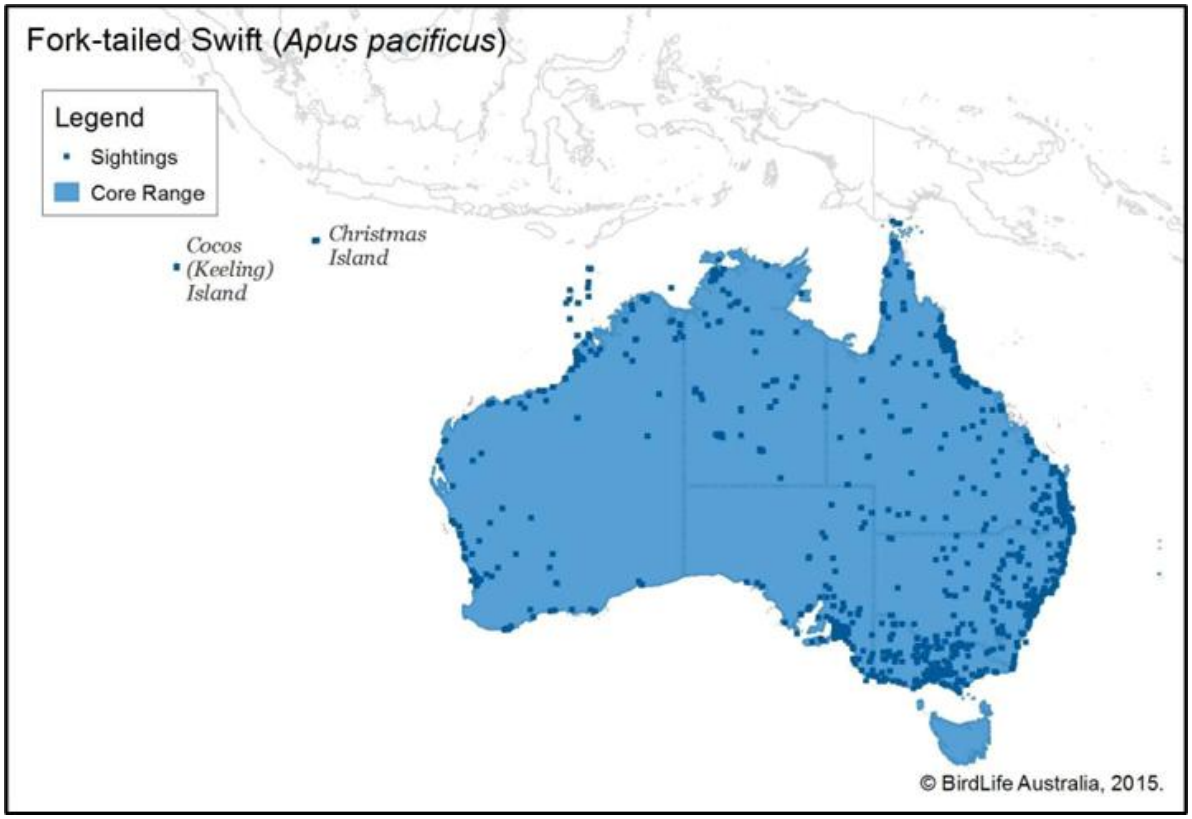
Blue-winged Parrot (*Neophema chrysostoma*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will not impact any associated PCTs for this species. The subject land is not within a specific priority management area for the species, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey and only two records (from 1999 to 2004) occur within 10 km. The closest record (from 2004) occurs ~ 3.8 km from the subject land. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify any associated PCTs for the species. As such, the proposal will not isolate any habitat for this species and is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	habitat loss, degradation, fragmentation and removal; climate change; predation from invasive species; invasive weeds; firewood collection; and competition with noisy miners (*Manorina melanocephala*) are the main threats for this species. Although this proposal will exacerbate the loss of habitat, due to the clearing/modifying of up to 5.64 ha of native vegetation, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Superb Parrot (*Polytelis swainsonii*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.53 ha of potential habitat for this species. The subject land is not within a specific priority management area for the species, nor is it at the edge of the species' distribution. This species occurs throughout eastern inland NSW, but has distinctive breeding areas where it resides during the breeding season (September to January). Key breeding areas are bounded roughly by Cowra and Yass to the east, and Grenfell, Cootamundra and Coolac to the west. In addition, key breeding sites exist in the Riverina in the riparian corridors of the Murray, Edward and Murrumbidgee Rivers, where Superb Parrots remain year-round. As the site is close to the Murray River, any population within this area would be considered an important population. However, the species was not detected during the field surveys and only four records (from 1982 to 2019) occur within 10 km. The closest record (from 1982) occurs ~ 4.8 km from the subject land. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.53 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Loss or degradation of habitat, loss of or competition for hollows, road kills, illegal collection of wild birds, psittacine beak and feather disease, and climate change are the main identified threats to this species. Although this proposal will exacerbate habitat loss, due to the clearing of up to 4.53 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Diamond Firetail (*Stagonopleura guttata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.53 ha of potential habitat for this species. The subject land is not at the edge of the species' distribution. Priority sites have not been identified for this species; however, considering the small extent and heavily modified condition of the vegetation within the subject land, it is highly unlikely that the site supports a "key source population" for the species, as per the formal definition of an important population. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.53 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection; poor regeneration of open forest and woodland habitats; and the invasion of weeds, resulting in the loss of important food plants are the main threats facing this species. Although this proposal will exacerbate the clearing and fragmentation of woodland, due to the clearing of up to 4.53 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

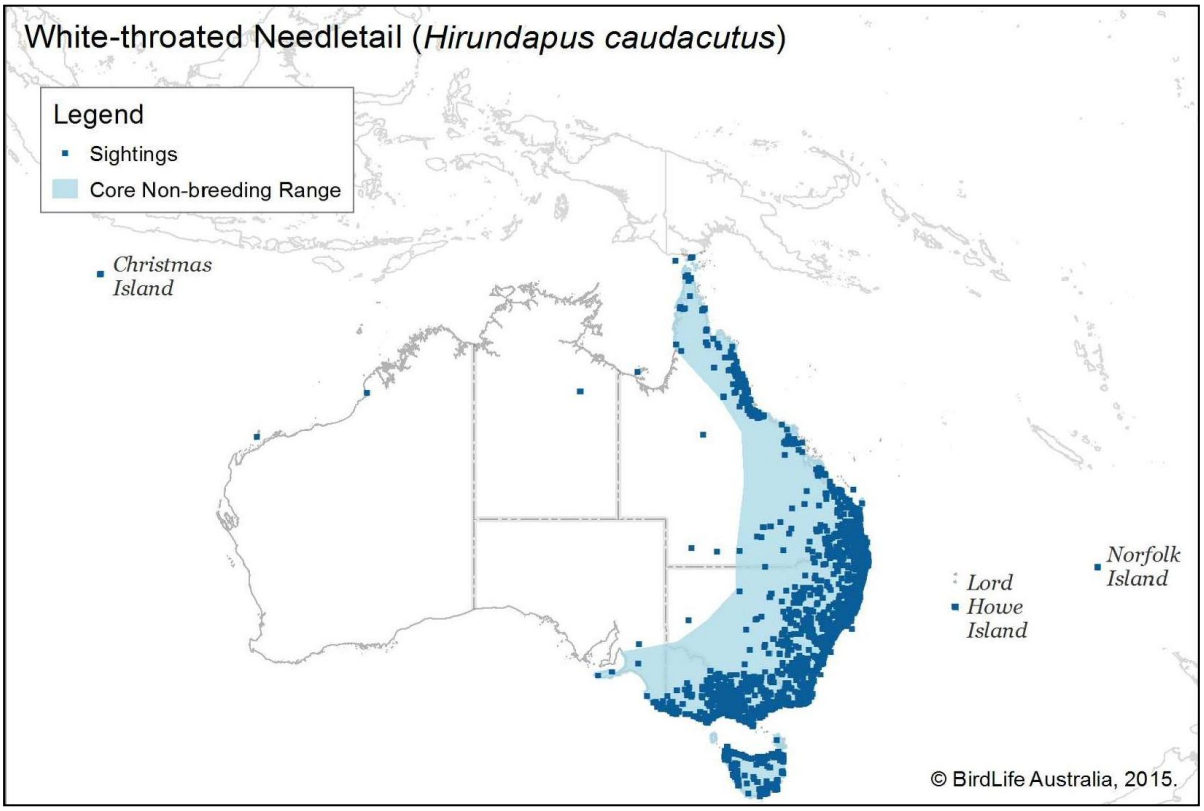
EPBC Act-listed Migratory Species

Fork-tailed Swift (*Apus pacificus*)	
Significant Impact Guideline	**Assessment**
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	*Apus pacificus* is widespread throughout Australia with the entire country being mapped as within their "core range". The species was not observed during the field survey and only two records (from 2003) occur within the 10 km search area. Both records occur along the Murray River system ~ 4.9 km from the subject land. As this species forages aerially and breeds outside of Australia, the proposal is unlikely to substantially modify, destroy or isolate any area of important habitat for this migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	While there is potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species, environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	It is unlikely that an ecologically significant proportion of the population occurs within or is dependent on the proposal site. The proposal is unlikely to seriously disrupt the lifecycle for this species
Conclusion	**No significant impact**



Fork-tailed Swift Core Range

White-throated Needletail (*Hirundapus caudacutus*)	
Significant Impact Guideline	**Assessment**
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	This species is widespread in eastern Australia from Tasmania to Cape York, most often observed above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. The subject land falls within the mapped "non-breeding core range" for this species. This species was not observed during the field survey and no records occur within the 10 km search area. As this species forages aerially and breeds outside of Australia, the proposal is unlikely to substantially modify, destroy or isolate any area of important habitat for this migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	While there is potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species, environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	It is unlikely that an ecologically significant proportion of the population occurs within or is dependent on the proposal site. The proposal is unlikely to seriously disrupt the lifecycle for this species
Conclusion	**No significant impact**



White-throated Needletail Core Range

Appendix E: BAM Credit Summary Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00041985/BAAS21028/23/00041986	Tocumwal Magazine Compound Upgrade	28/10/2024
Assessor Name	Report Created	BAM Data version *
David Orchard	10/06/2025	Current classification (live - default) (80)
Assessor Number	BAM Case Status	Date Finalised
BAAS21028	Finalised	10/06/2025
Assessment Revision		Assessment Type
2		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

NSW GOVERNMENT

BAM Credit Summary Report

Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion											
2	45_Moderate	Natural Grasslands of the Murray Valley Plains	67.9	67.9	3.9	Environment Protection and Conservation Act listing status	Low Sensitivity to Gain	Not Listed	Critically Endangered	2.00	134
										Subtotal	**134**
River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion											
1	9_Remnant	Not a TEC	57.3	57.3	0.5	PCT Cleared - 66%	Low Sensitivity to Gain			1.25	9
										Subtotal	**9**

BAM Credit Summary Report

Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion												
3	74_Remnant	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	43.5	43.5	0.1	Population size	Low Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.00	True	2
											Subtotal	**2**
											Total	**145**

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

NSW GOVERNMENT

BAM Credit Summary Report

Myotis macropus / Southern Myotis (Fauna)									
9_Remnant	57.3	57.3	0.07	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
								Subtotal	**2**

Assessment Id
00041985/BAAS21028/23/00041986

Proposal Name
Tocumwal Magazine Compound Upgrade

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Appendix F: Weather data and detections of *Pilularia novae-hollandiae*

Numerical values are rainfall tallies in millimetres. Yellow cells indicate days with reported detections of Austral Pillwort (*Pilularia novae-hollandiae*) based on BioNet records.

Lake Cowal

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Nov 2022	33.0													22.0																

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Dec 2022												9.0																			

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan 2023																2.0	8.0					12.0	3.5						12.0	11.5

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
May 2023	2.5						5.5																			3.0					

Moulamein

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Sep 2022									5.0	2.5			4.0			4.0				3.4		17.0				2.0	3.0	9.2		

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Oct 2022					13.0	10.0	5.8					2.4	52.0	25.0							0.4			57.2	13.4	6.0					1.0

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Sep 2023								2.4													1.2					0.4				

Tocumwal

Numerical values are ranges of potential rainfall based on two weather stations, Yarroweyah and Finley. Rainfall is not available for the site itself but is likely to fall within the range of measurements recorded at these two locations. The blue cell indicates the date of the targeted flora survey for Austral Pillwort.

Month Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Oct 2023			0.6-1.6	58.0-83.0	6.0-6.2	0-1.8					0-0.2		0-1.4			0.2-4.0															