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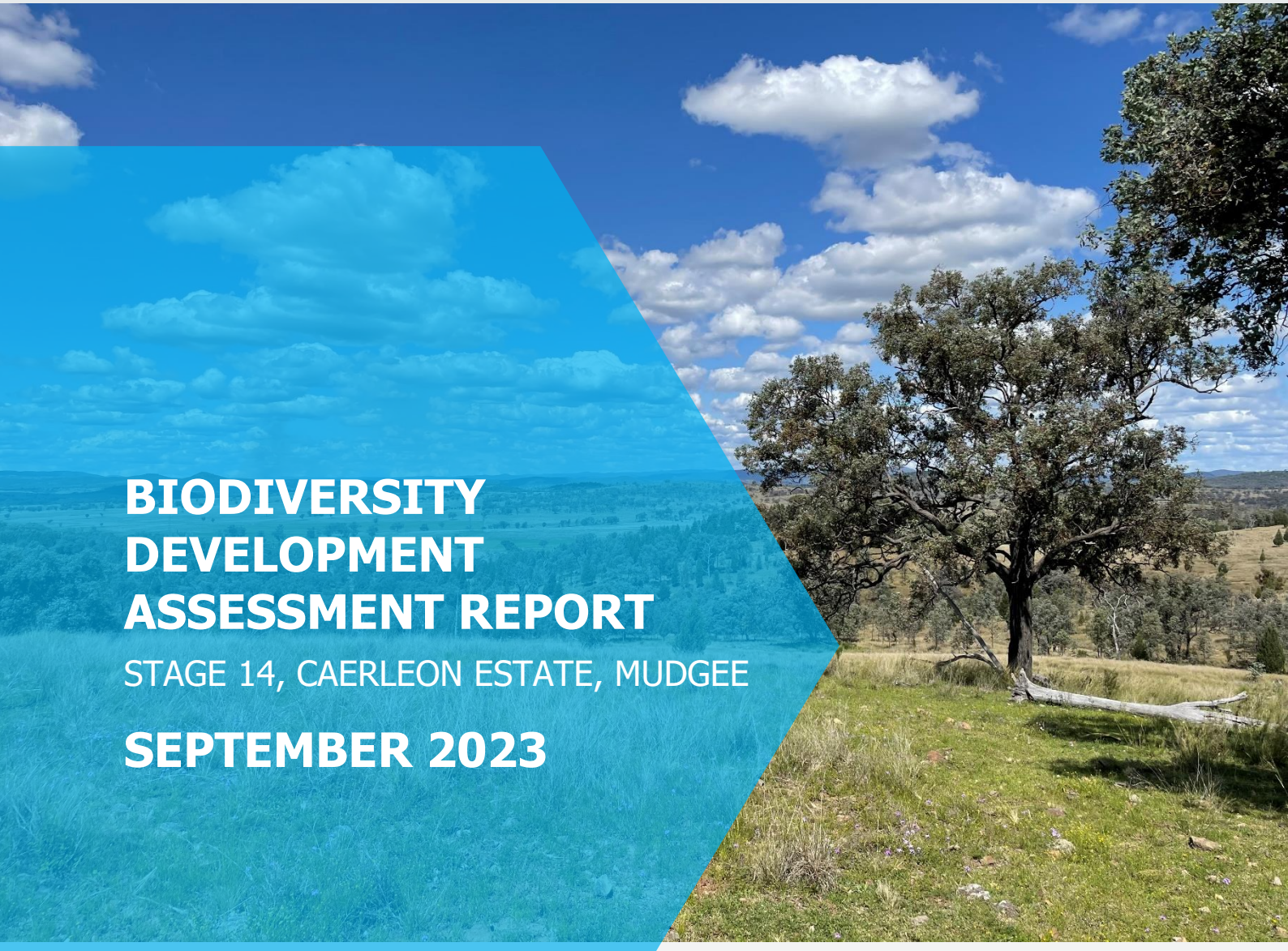

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

STAGE 14, CAERLEON ESTATE, MUDGEE

SEPTEMBER 2023

Contents

List of Tables

List of Figures

Document Control Page

Version Control

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Assessor Name	Accreditation number	Signature	Date
Lachlan Webster	BAAS23020		26/09/2023

Project Number: ENS5848

Our Document Reference: ENS5848-BEC-REP-Bathla-CaerleonStage14BDAR-rev2.0

Executive Summary

This report has assessed the impact of the proposed Stage 14 subdivision at Lot 617 DP 1272616, Hone Creek Drive, Caerleon, NSW. The proposed works are to occur over approximately 30.7 ha within the broader Subject Land. Data used within this report was collected by ecologists employed by Premise Consulting.

The Subject Land and Development Footprint is zoned R1 General Residential and MU1 Mixed Use. The extent of clearing required exceeds the clearing threshold (0.25 ha) prescribed under the Biodiversity Assessment Method 2020 (BAM 2020) and also impacts on land mapped as Biodiversity Values. A Biodiversity Development Assessment Report (BDAR) is therefore required to submit with the development application.

Two plant community types were identified in the Development Footprint of varying vegetation condition which resulted in five Vegetation Zones. The total area of native vegetation that will require removal for the development is 30.7 ha. This impact is recommended to be offset through purchase and retirement of appropriate ecosystem credits as described in this report.

An area of Biodiversity Values associated with Regent Honeyeater Important Area Mapping and occurs in the west of the Subject Land and will be impacted as a result of the Development.

The Development Footprint contains vegetation that conforms to the CE TEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* as described under the *BC Act* and *EPBC Act*.

The Development Footprint contains entities the are considered to have Serious and Irreversible Impacts. These are the CE TEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland,* and habitat that is mapped for the CE Regent Honeyeater. Relevant information has been provided in this BDAR.

No threatened flora species were detected within the Development Footprint despite targeted survey by suitably qualified BAM accredited assessors and senior Botanist.

The targeted fauna survey failed to detect any threatened fauna on the Development Footprint.

Direct impacts of the proposal will be limited to vegetation and habitat removal of PCT 266 and PCT 281 which exists in a highly fragmented and degraded state. A number of mitigation measures will be implemented to reduce potential offsite impacts to adjacent habitat during the construction phase. Indirect impacts that may be associated with the proposal are considered to be minor and can be mitigated through the measures described in this report. Impacts of the proposed development will be offset through purchase and retirement of the appropriates ecosystem credits.

Abbreviations

Table 1: List of abbreviations within report

BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
Bio Aus.	Biodiversity Australia
BOS	Biodiversity Offset Scheme
DAWE	Department of Agriculture, Water and the Environment
DEC	Department of Environment and Conservation
DPE	Department of Planning and Environment
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
HBT	Hollow-bearing Tree
KFT	Koala Food Tree
KPoM	Koala Plan of Management
KTP	Key Threatening Process
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	Plant Community Type
PIR	Passive Infrared Camera
SAII	Serious and Irreversibly Impacts
SAT	Spot Assessment Technique
SEPP	*State Environmental Protection Policy*
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TSR	Travelling Stock Route
VMP	Vegetation Management Plan

STAGE 1 - BIODIVERSITY ASSESSMENT

1. Introduction

Biodiversity Australia (Bio Aus) was requested to undertake a Biodiversity Development Assessment Report (BDAR) for proposed subdivision and development of Lot 617 DP1272616, Hone Creek Drive, Caerleon, NSW.

1.1 Requirement for the BDAR

The property exists under multiple land zones including R1 – General Residential and MU1 – Mixed Use. A search of NSW Biodiversity Values Map and Threshold Tool suggests a 450 m^2 minimum lot size applies. In accordance with the Biodiversity Assessment Method 2020 (BAM) this allows for a maximum clearing area of 0.25 ha.

The Subject Land also contains areas of mapped Biodiversity Values across the Subject Land (Figure 5) in the form of regent honeyeater important areas.

1.2 Definitions Used in the Report

This report uses the following key definitions:

- **Assessment Area:** includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land (or 500 m buffer zone for linear proposals) that is determined as per Subsection 3.1.2 of the BAM. (Figure 5)
- **Subject Land:** Lot 617 DP1272616, Caerleon which is an area of 283.2 ha (Figure 2)
- **Development Footprint:** Refers to the area that will be directly impacted by the proposed action which covers approximately 30.70ha of the Subject Land (Figure 2)

These definitions are in line with the BAM Methodology, which provides further explanation of definitions and legal terms that may be used in this report.

1.3 Structure of the Report

This report has been structured using guidance provided in Appendix K of the BAM. It is structured as follows:

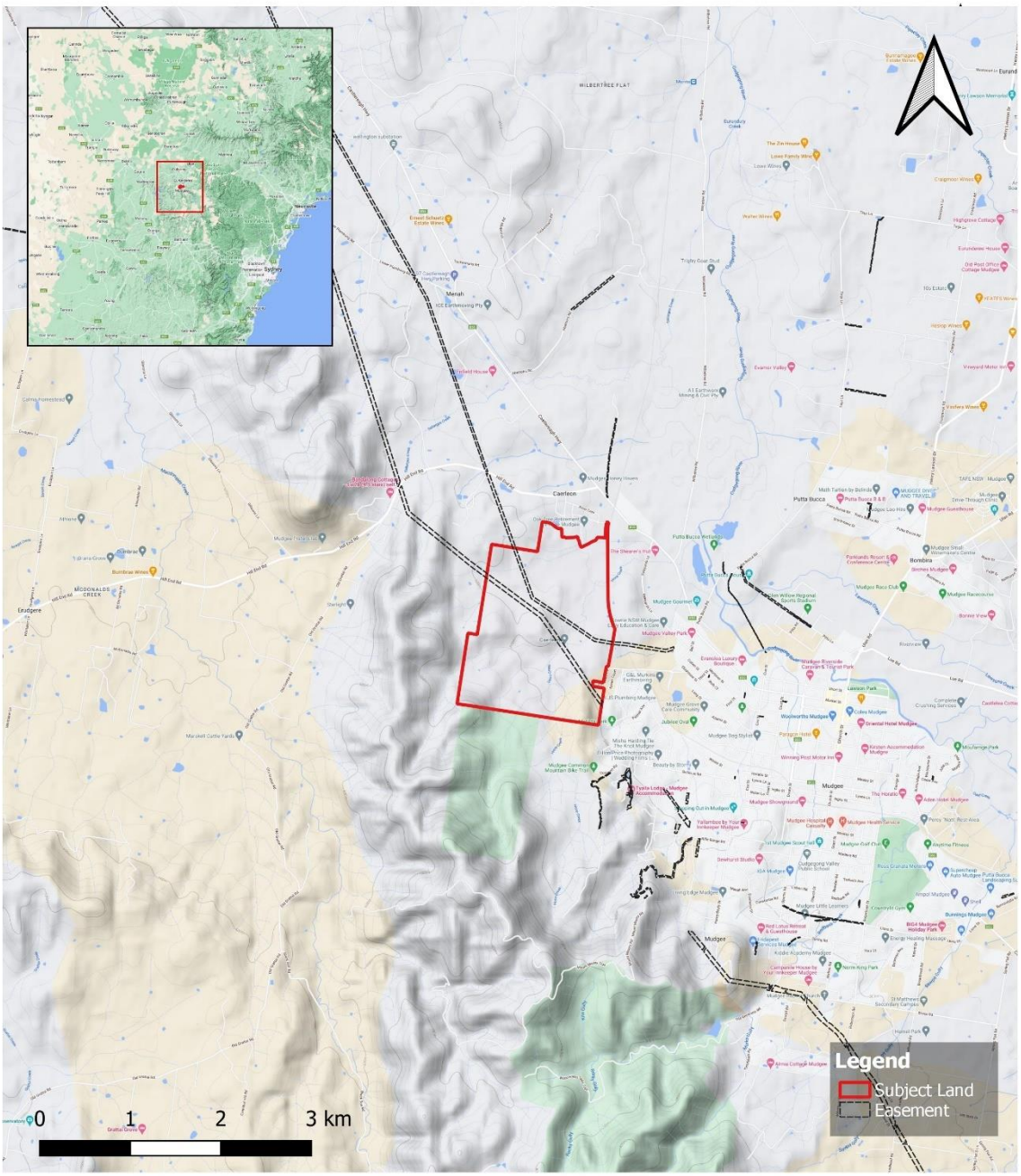
- Section 1 – Introduction, provides background information for the assessment.
- Section 2 – Landscape Context, describes the landscape features of the Subject Land and Assessment Area.
- Section 3 - Native Vegetation, describes the native vegetation features of the Subject Land.
- Section 4 – Threatened Species, describes the threatened species and habitat features associated with the Subject Land.
- Section 5 – Avoid and Minimise Impacts, details avoidance and minimisation measures for the proposal.
- Section 6 – Impact Summary and Biodiversity Credit Report, provides an impact summary and the number and type of credits required to offset impacts.

1.4 Description of the Subject Land

The Subject Land comprises a 283.2 ha property located on Hill End Road, Caerleon, NSW. The location is within the Mid-Western Regional Council in central NSW. The Subject Land is formally described as Lot 617 DP1272616 and is zoned largely as R1 – General residential and R5 – Large Lot Residential. Other land zones including RE1 and C3 also exist. The context of the Subject Land is provided within Figure 1.

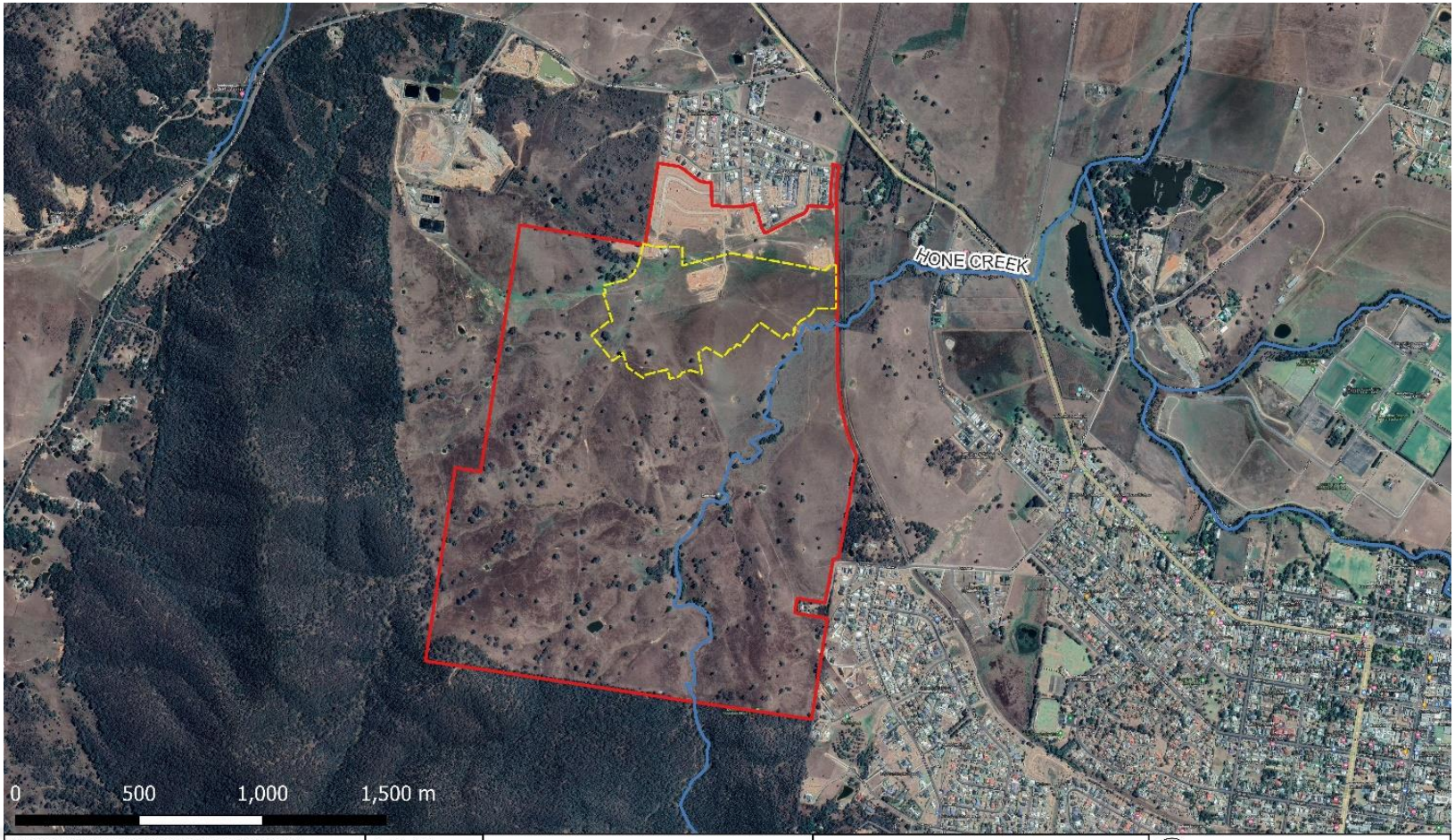
The broader Subject Land consists of number vegetation communities with largely degraded integrity conditions from previous land uses. This has resulted in numerous vegetation zones. Within the Development Footprint, two vegetation communities were present, both disturbed from historical land use practices. The Subject Land is utilised for livestock grazing with large areas of largely cleared land. One small area of vegetation in the south-west still remains connected to contiguous vegetation outside of the Subject Land. Vegetation within the proposed Development Footprint is largely devoid of trees with only scattered trees in the western portion of the footprint.

The Subject Land is bordered by agricultural land to the east and north. A continuous patch of vegetation borders the south and west of the Subject Land, however this is approximately 1 km west of the Development Footprint and will not be directly impacted. Residential land exists on the south-east and northern corners of the property.



This mapping is to be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Biodiversity Australia where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, ect. should be placed upon this map without independent validation of the information by the user. Biodiversity Australia takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification. QGIS	Project Manager: KR	Figure Name: Location of Subject Land	Biodiversity AUSTRALIA	
	Drawn By: LW	Site: Caerleon Estate, Caerleon	Job Number: ENS5848	Scale: 1:65,000
	Date: July 2023	Client: Bathla	Spatial Reference: MGA Zone 56/GDA2020	

Figure 1: Location of the Subject Land



This mapping is to be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Biodiversity Australia where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, ect. should be placed upon this map without independent validation of the information by the user. Biodiveristy Australia takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification.

Project Manager	KR
Drawn By:	JH
Date:	August 2023
Map Projection:	MGA Zone 56
Datum:	GDA 94

Figure Name:
Subject Land and Development Footprint

Site:
Caerleon Estate, Stage 14

Client:
Bathla

Legend
Stage 14
Development Footprint
Subject Land

N

Biodiversity AUSTRALIA
QGIS

Job Number ENS5848	Scale: 16,624
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Figure 2: Subject Land and Development Footprint

Photo 1: Images of the Subject Land


Photo 7

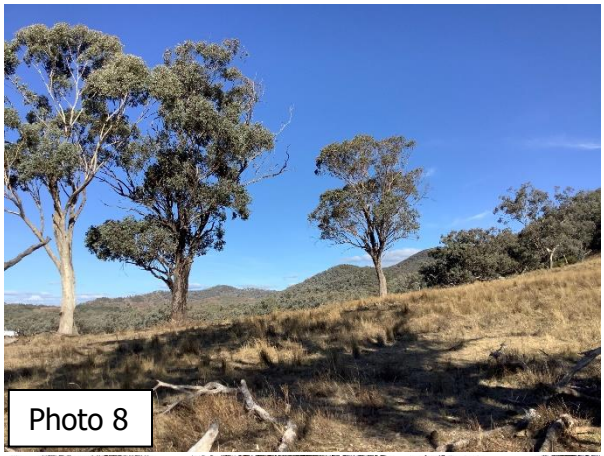
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Photo 9


Photo 10

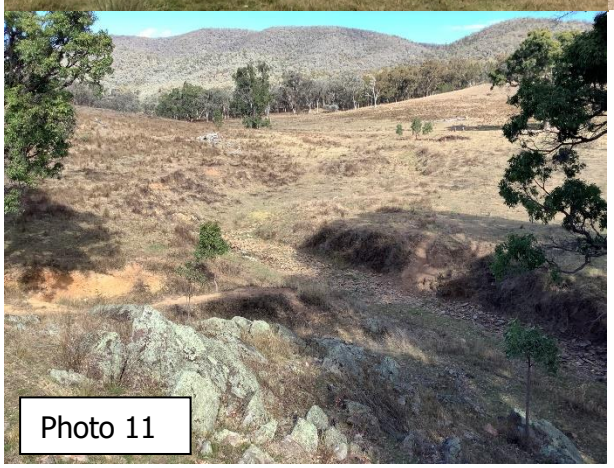
Photo 11


Photo 12

Photo 13

Photo 14

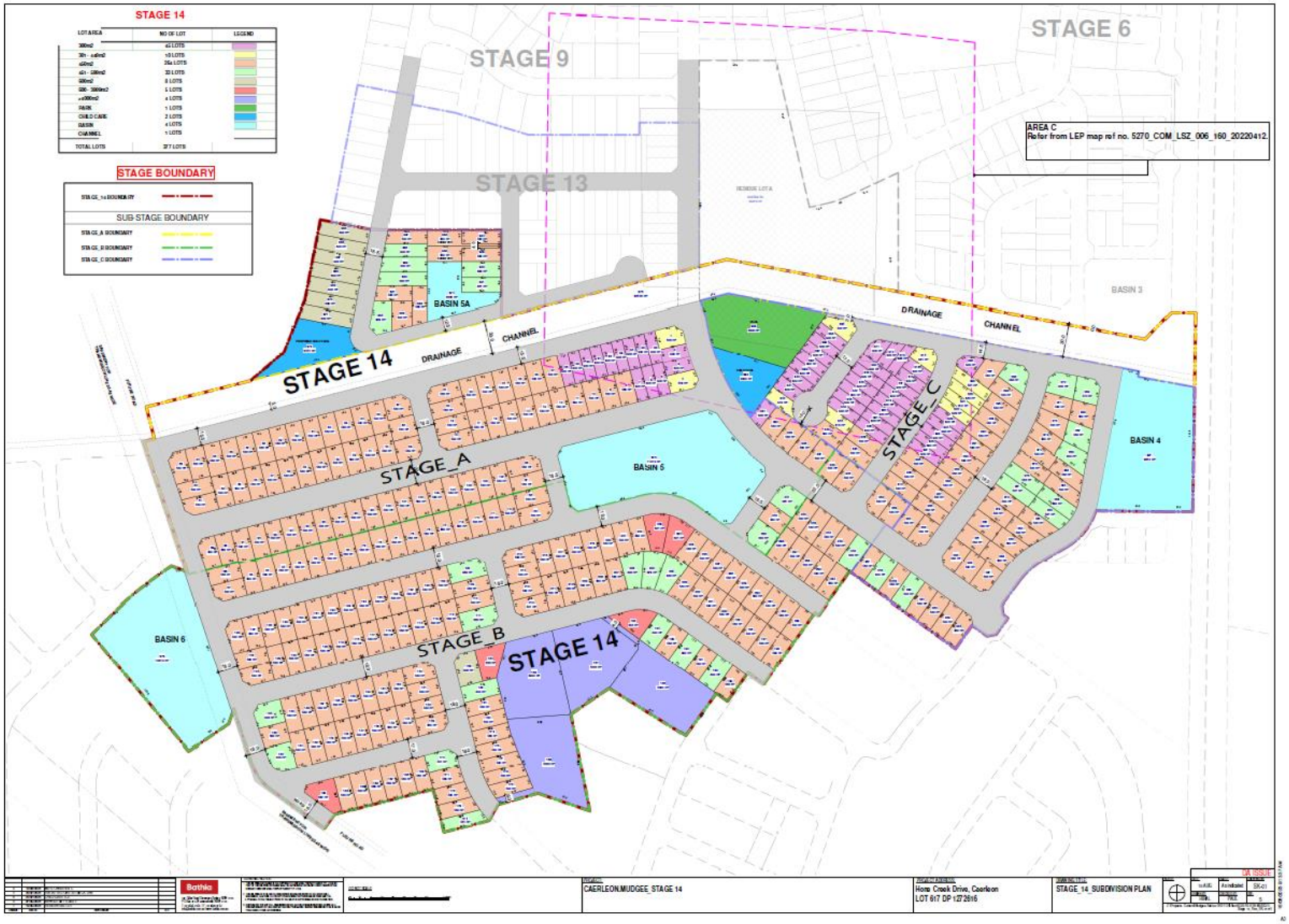

Figure 3: Proposed development layout

1.5 Information Sources

The following databases and Geographic Information System (GIS) layers were searched/obtained:

- Department of Agriculture, Water and the Environment Protected Matters Search Tool (DAWE 2023a).
- Department of Agriculture, Water and the Environment MNES SPRAT Profiles (DAWE 2023b).
- Department of Customer Service, Spatial Services, Environmental Spatial Programs, NSW Water Theme and Hydrology (DCS 2021).
- Office of Environment and Heritage Threatened Biodiversity Data Collection (OEH 2023).
- NSW Department of Planning, Industry and Environment - BioNet/Atlas of Wildlife (DPIE 2023a).
- NSW Department of Planning and Environment - Regional Corridors and Key Habitat Mapping (DPE 2023b).
- NSW Department of Planning and Environment – Soil Profile and Landscape Information, eSPADE Spatial Viewer (DPE 2023c).
- NSW Department of Planning and Environment - Biodiversity Values Map and Threshold Tool and digital data layer (DPE 2023d).
- NSW Department of Planning and Environment – NSW State Vegetation Type Map (DPE 2023e).

2. Site Context

2.1.1 IBRA Bioregions and Subregions

The Subject Land is located in the NSW South West Slopes bioregion and the Inland Slopes subregion. The Subject Land is located on the Goonoo Slopes and Gulgong Ranges Mitchell Landscape.

2.1.2 Native Vegetation Extent in 1500m Buffer

A 1500 m buffer was established around the Subject Land (Figure 6). Analysis with GIS has determined that there is approximately 25 % native vegetation cover within the 1500 m buffer.

2.1.3 Cleared Areas

Cleared areas occur both on and adjacent to the Subject Land. The majority of the Subject Land has been cleared for agriculture. The Development Footprint itself is largely devoid of canopy and shrub stratum.

2.1.4 Landscape Features

The following table shows the presence of landscape features on the Development Footprint and provides details of these features if present.

Table 2: Landscape features present

Feature	Present on site?	Present on adjoining land?	Description
Rivers and Streams	No	Yes	Hone Creek and Cudgegong River occur in the surrounding land. These will not be impacted by the Stage 14 Subdivision.
Important Local Wetlands	No	No	No Nationally Important Wetlands are mapped within the Study Area
Connectivity Features	No	Yes	While the Subject Land has four remnant patches, they are all >50m from one another. The Subject land is considered isolated within the greater landscape.
Areas of Geological Significance (e.g. karst, caves, crevices, cliffs)	No	No	-
Soil Hazard Features	No	No	The DPIE eSPADE Search tool – interactive map was consulted and showed no limitations related to soil acidification hazard, structural decline, shallow soil depth and imperfect subsurface drainage of the soils.,

2.1.5 Biodiversity Values

The Subject Land contains an area mapped as Biodiversity Values Area (Figure 5). This area corresponds to a defined "important area" for the Regent Honeyeater (*Anthochaera phrygia)* and exists as a single mature White Box and a single mature Blakely's Red Gum.

This mapping is to be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Biodiversity Australia where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, ect. should be placed upon this map without independent validation of the information by the user. Biodiveristy Australia takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification.

Project Manager	KR
Drawn By:	JH
Date:	August 2023
Map Projection:	MGA Zone 56
Datum:	GDA 94

Figure Name: IBRA Regions and Subregions

Site: Caerleon Estate, Stage 14

Client: Bathla

Legend
Stage 14
IBRA Regions
IBRA Subregions
Subject Land

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Page:	1 of 1
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Figure 4: IBRA Regions

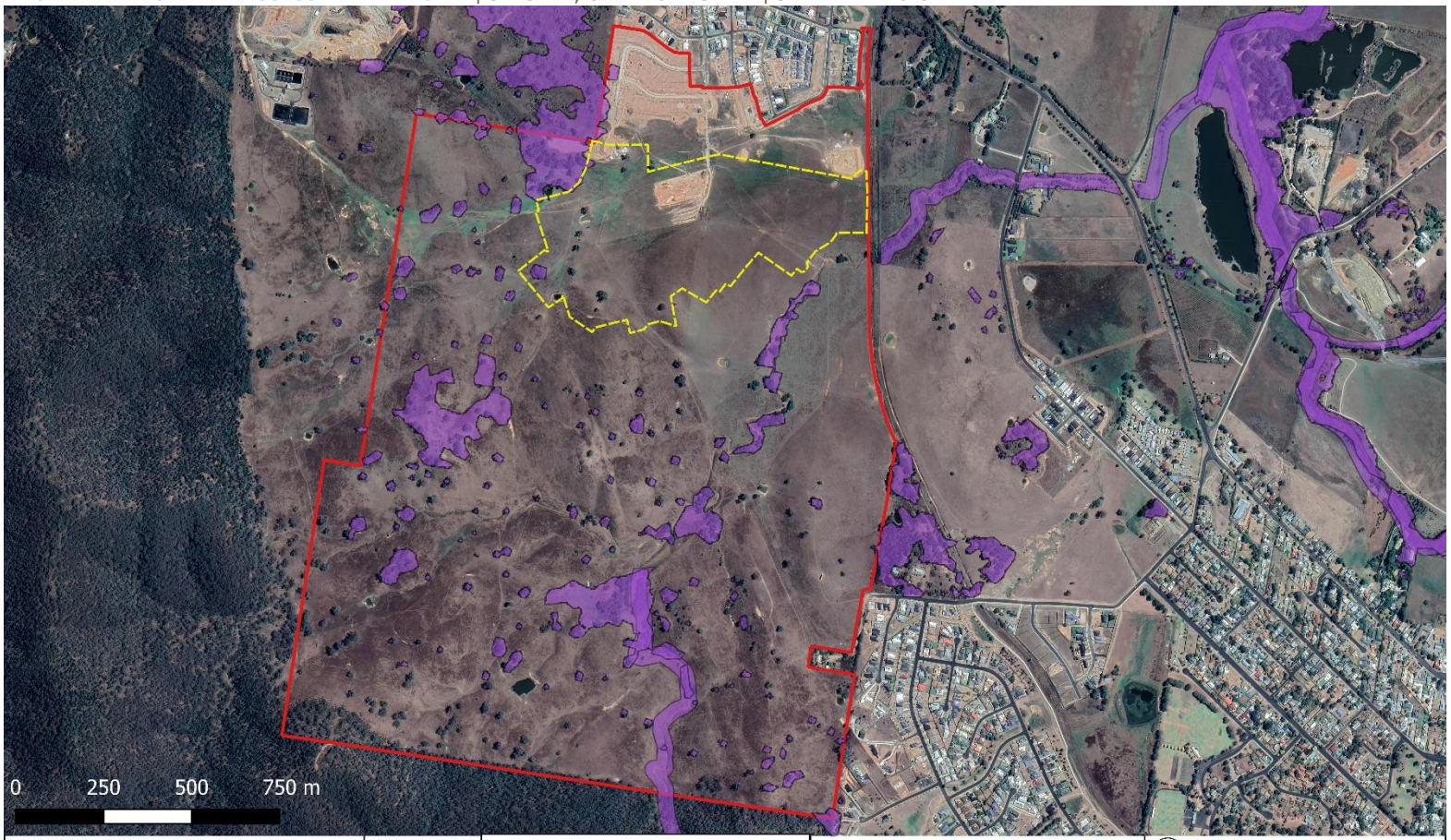
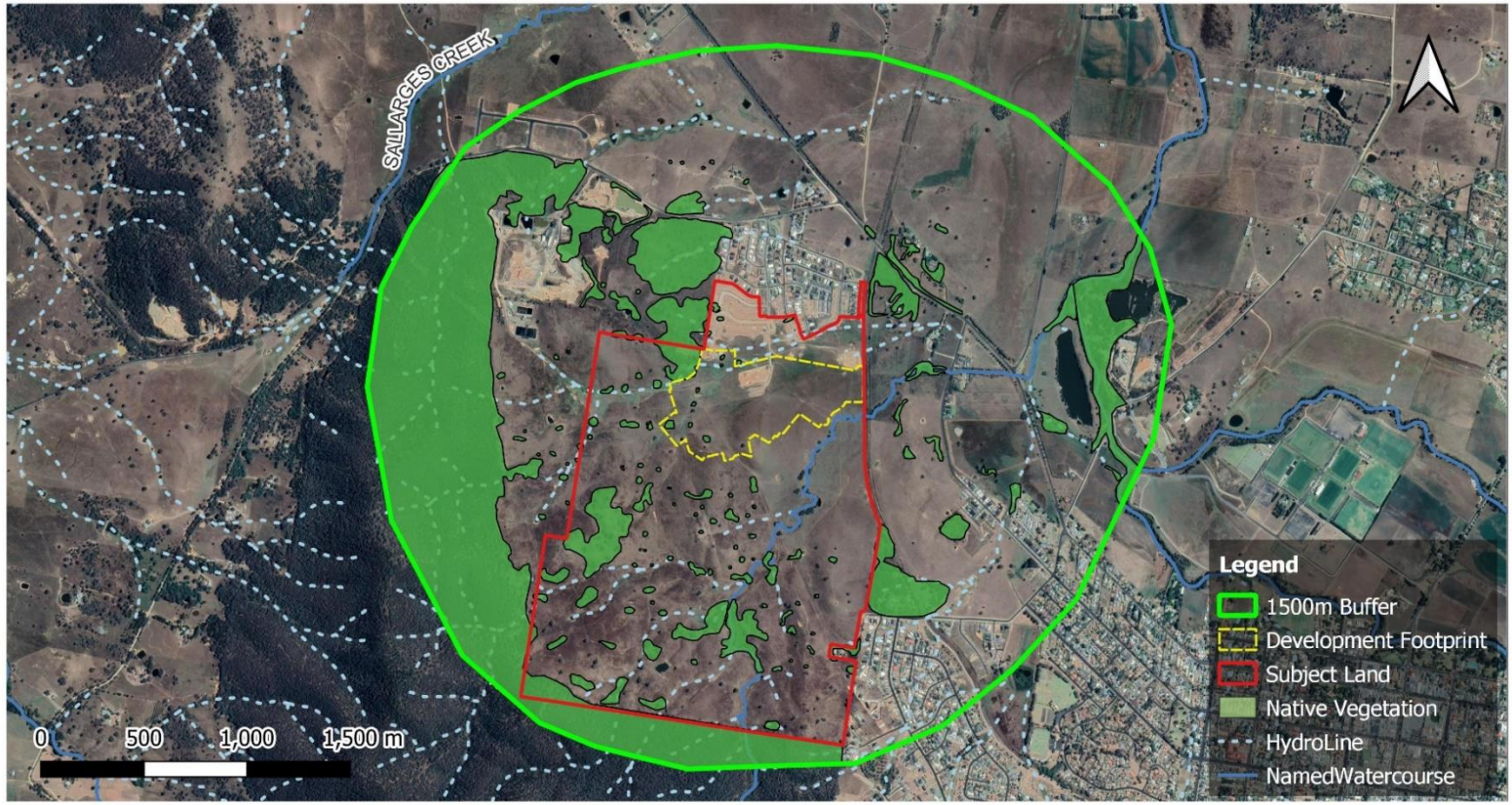


Figure 5: Biodiversity Values map



This mapping is to be considered indicative only and all derivations (e.g., vegetation communities) are best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any subsequent error losses etc. that may arise from the use of this data without independent verification.	Project Manager: KR	Figure Name: Site COntect & NAtive Vegetation	Biodiversity AUSTRALIA	
	Drawn by: LW	Location: Stage 14, Caerleon Estate, Mudgee		
	Date: August 2023	Client: Bathla	Job Number: ENS5848	Spatial Reference: MGA Zone 56/GDA 94 Scale: 1:30,000

Figure 6: Site context and Native Vegetation

3. Native Vegetation

3.1 Survey Methods

Vegetation plots and Targeted flora searches were undertaken by Premise BAM accredited assessors and Botanists on November 30 to December 2, 2021, and January 25, 2022.

3.1.1 Vegetation Integrity Survey

Vegetation integrity survey plots were undertaken within the Development Footprint as per the BAM 2020 methodology. Each consists of a 20x20 metre plot in which floristic composition and structural attributes are collected, and a 20x50 metre plot which collects ecosystem function attributes.

The vegetation within the Subject Land has been disturbed over many years and as such the structure of the Vegetation Zones varies substantially. The establishment of multiple Vegetation Zones is one method which has been adopted to categorise these differences in structure of integrity. In this circumstance, the method for locating plots was used as an additional measure to ensure that plot data was representative of the numerous Vegetation Zones throughout the Subject Land. Randomly allocated locations and bearings were not considered appropriate as it allowed a high probability of misrepresenting the Vegetation Zone. For this reason, plots were located to ensure they capture the attributes relevant to that Vegetation Zone as per Section 4.3.4 (3)(c) of the BAM 2020. Section 4.3.4 (5) was also fully considered and adopted in this process. In some circumstances, this meant that plot locations fell within 50m of ecotones.

The following information was collected within each vegetation plot:

- Observer, location and date;
- Plot dimensions and orientation;
- Photographic record of vegetation;
- Vegetation Class and Plant Community Type (PCT);
- Physical features and disturbance history;
- Full flora list;
- Growth-form cover and abundance of each species;
- Exotic and High Threat Exotic (HTE) plant cover;
- Number of large trees;
- Recruitment;
- Presence of hollow-bearing trees;
- Length of logs; and
- Litter cover.

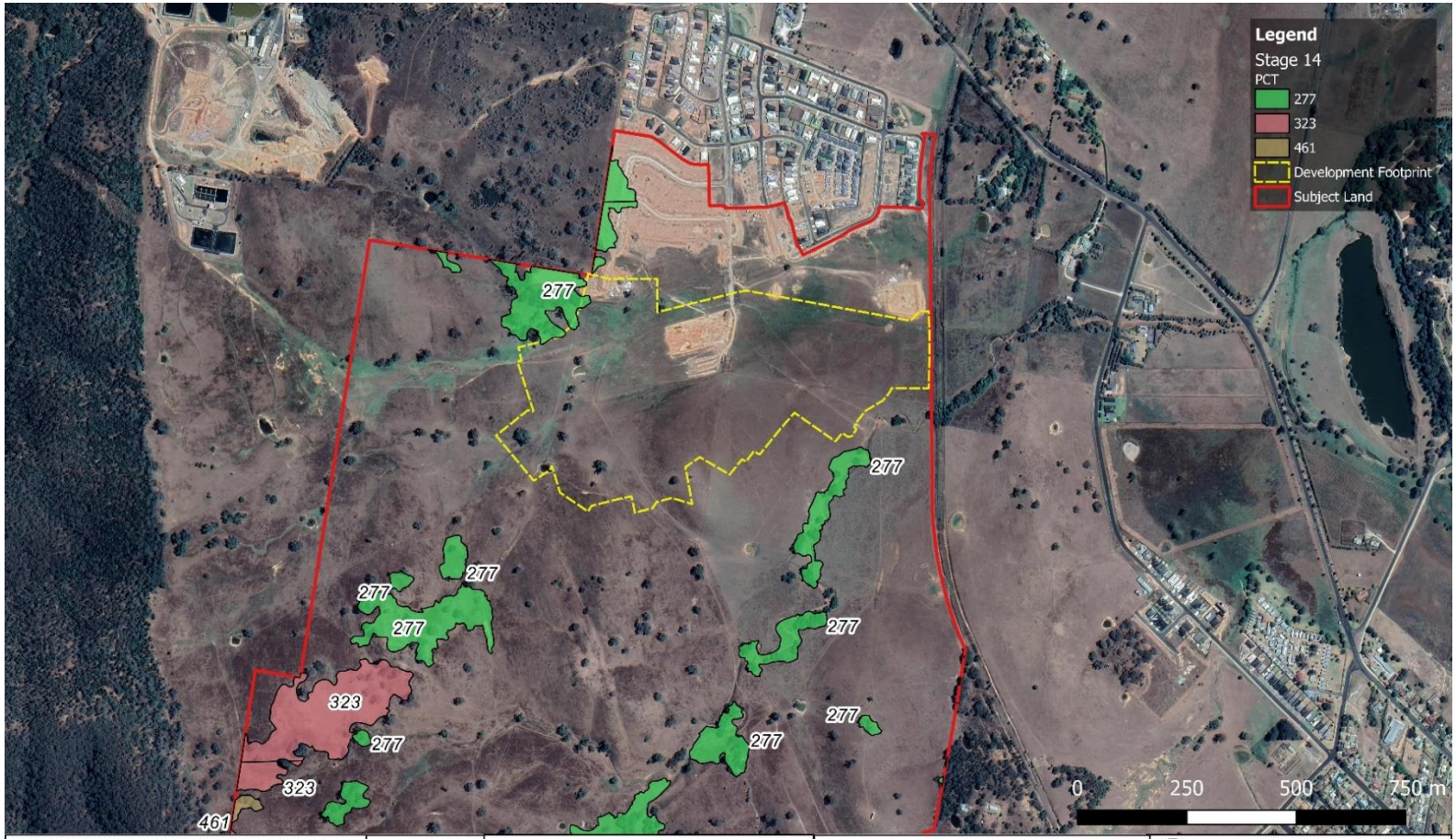
The field data collected was tallied and input into the BAM calculator to determine a vegetation integrity score for each vegetation zone.

3.1.2 Vegetation Classification and Mapping

Vegetation communities were sampled by the vegetation plots described above and through a scattered tree assessment. Due to the limited extent of vegetation on the Subject Land this provided 100 % coverage.

The vegetation communities were described from data collected during the vegetation plots and random meander transects. The vegetation classification is based on the NSW Plant Community Type (PCT) Classification.

Plant species were identified to species or subspecies level and nomenclature conforms to that currently recognised by the Royal Botanic Gardens and follows Harden and PlantNET for changes since Harden.



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Project Manager	KR
Drawn By:	JH
Date:	August 2023
Map Projection:	MGA Zone 56
Datum:	GDA 94

Figure Name: Plant Community Type Mapping

Site: Stage 14, Caerleon Estate, Mudgee

Client: Bathla

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Page: 1 of 1	Variation A

Figure7: NSW Plant Community Type Mapping

3.2 Plant Community Type Descriptions

Native vegetation exists within the Subject Land as scattered isolated paddock trees and corridors along the Castlereagh Highway, Hone Creek and Cudgegong River. The grasslands that dominate the Subject Land consist of native and exotic grasses and forb species. PCT's 281 and 266 were mapped on the Subject Land and throughout the development footprint. Data collected from within the field has led to the determination that the PCT's that best describe the vegetation on the Development Footprint include:

- PCT 266 White Box Woodland – Remnant woodland dominated by Yellow Box (*Eucalyptus mellidora*) and White Box (*Eucalyptus albens*) with a mixed understorey.
- PCT 266 Derived Native Grassland (Good) – Native grassland dominated by Wheatgrass (*Anthosachne* scabra), Western Rat-tail (*Sporobolus* creber) and Speargrass (*Austrostipa* puberula) near White Box and Yellow Box trees.
- PCT 266 Derived Native Grassland (Poor) – Mixed grassland dominated by native grasses including Western Rat-tail (*Sporobolus* creber), Weeping Lovegrass (*Eragrostis parviflora*), Browns Lovegrass (*Eragrostis brownii*) and Common Couch (*Cynodon dactylon*). Located near White Box Trees and contains high volume of exotics such as Wimmera Ryegrass (*Lolium rigidum*) and Soft Brome (*Bromus hordeaceus*).
- PCT 281 Rough-barked Apple, Red Gum, Yellow Box Woodland – Remnant Woodland dominated by White Bpx (*E.albens*), Blakely's Red Gum (*Eucalyptus blakeyli*) and Rough-barked Apple (*Angophora floribunda*). Exotics dominate the understorey.
- PCT 281 Exotic Grassland – Grassland composed of mixed native and exotics including Common Couch (*Cynodon dactylon*), Windmill Grass (*Chloris truncata*), Wimmera Ryegrass (*Lolium rigidum*) and Soft Brome (*Bromus hordeaceus*).

The following provides a description of the native vegetation within the Subject Land that will be affected by the proposal. As described below, two Plant Communities were identified within the Development Footprint. Both PCT 281 and 266 are apart of the community commonly known as Box-Gum Woodland which is listed under the NSW BC Act (DPIE, 2021c) and the Commonwealth EPBC Act. It is also known as the *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community*.

These communities are not consistent with the extant NSW State Vegetation Type Mapping. State Vegetation Type Map which maps vegetation as PCT 277. Vegetation zones have been more accurately mapped following the field verifications. These are presented within Figure 7. A description of the vegetation communities sampled is provided below, with photos following.

3.2.1 Community 1

Table 3: Vegetation community 1 – PCT 266 – White Box Woodland (Good)

Vegetation Community (NSW PCT)	No 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Vegetation Class	Western Slopes Grassy Woodland
EEC Status	PCT 266 is associated with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the *BC act* and the *EPBC act*.
Clearing Extent	0.93ha
Vegetation Zones	Good
Number of Plots	2
Location	Scattered patches of the PCT occur across the northern and south to southwestern portions of the Development Footprint.
Description	**Canopy:** Structure and Species: Open Woodland with White Box (*Eucalyptus* albens) dominant, and Yellow Box (*E. melliodora*) in the western portions. **Shrub layer:** Structure and Species: Shrub Layer species were absent from this PCT in its current state. **Ground layer:** Structure and Species: The ground stratum is typically dominated by exituc grasses and forbes including Blue Couch (*Cynodon incompletes*), Kikuyu Grass (*Cenchrus calcitrapa*) and Praire Grass (*Bothriochloa macra*). While Native grasses are rare, species such as Weeping Grass (*Microlaena stipoides*), Windmill Grass (*Chloris truncata*), and Red Grass (*Bothriochloa macra*) are present. Native forbs present include Grassland Wood-sorrel (*Oxalis perennans*), Swamp Dock (*Rumex brownii*) and Small St John's Wort (*Hypericum gramineum*). **a) Lianas, scramblers, etc.:** Layer was absent from this PCT in its current state.
Condition	Good Condition

Photo 2: PCT 266 – White Box Woodland

Table 4: Vegetation community 1 – PCT 266 – White Box Grassy Woodland Derived Native Grassland

Vegetation Community (NSW PCT)	No. 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Vegetation Class	Western Slopes Grassy Woodland
EEC Status	PCT 266 is associated with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the *BC act* and the *EPBC act.*
Clearing Extent	2.64ha
Vegetation Zones	DNG
Number of Plots	2
Location	Located in the western portion of the Development Footprint
Description	**Canopy:** Structure and Species: Canopy Layer species were absent from this PCT in its current state. **Shrub layer:** Structure and Species: Shrub Layer species were absent from this PCT in its current state. **Ground layer:** The ground layer is a mix of native and exotic grasses and forbs. Dominant characteristic native grasses include Red Grass (*Bothriochloa macra*) and Weeping Grass (*Microlaena stipoides),* with lower covers of Windmill Grass (Chloris truncata). Ringed Wallaby Grass (*Rytidosperma caespitosum*), Hairy Panic (*Panicum effusum*) and Purple Wiregrass (*Aristida ramose*). Exotic grasses are less diverse and include Wimmera Ryegrass (*Lolium rigidum*) and Goose Grass (*Eleusine tristachya*). Other native groundcover species include the forbs Grassland Wood-sorrel (*Oxalis perennans*), Swamp Dock (*Rumex brownii*), Small St John's Wort (*Hypericum gramineum*),

	Fuzzweed (*Vittadinia cuneata*) and Yellow Autumn-lily (*Tricoryne elatior*), and the fern Rock Fern (*Cheilanthes sieberi*). **b) Lianas, scramblers, etc.:** Layer was absent from this PCT in its current state.
Condition	Good

Photo 3: Community 1 PCT 266 - White Box Grassy Woodland Derived Native Grassland (Good)

Table 5: Vegetation community 1 PCT 266 – White Box Graddy Woodland Derived Native Grassland (Poor)

Vegetation Community (NSW PCT)	No 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
Vegetation Class	Western Slopes Grassy Woodland
EEC Status	PCT 266 is associated with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the *BC act* and the *EPBC act*..
Clearing Extent	5.29ha
Vegetation Zones	Poor
Number of Plots	3
Location	One patch in the south western to central portion of the developmental footprint.
Description	**Canopy:** Structure and Species: Canopy Layer species were absent from this PCT in its current state.

	Shrub layer: Shrub Layer species were absent from this PCT in its current state. **Ground layer:** Structure and Species: Ground Layer is a mixture of native and exotic grasses and forbs. Areas on the lower slopes are dominated by the exotic grasses Wimmera Ryegrass (*Lolium rigidum*) and Soft Brome (*Bromus hordeaceus*), while upper slopes are dominated by the natives Slender Rat's Tail (*Sporobolus creber*), Common Couch (*Cynodon dactylon*). Characteristic native grasses include Windmill Grass (*Chloris truncata*), Purple Wiregrass (*Aristida ramose*), Red Grass (*Bothriochloa macra*), Weeping Grass (*Microlaena stipoides*), Hairy Panic (*Panicum effusum*) and Ringed Wallaby Grass (*Rytidosperma caespitosum*). Other native groundcover species include the forbs Grassland Wood-sorrel (*Oxalis perennans*) and Yellow Autumn-lily (*Tricoryne elatior*), and the fern Rock Fern (*Cheilanthes seiberi*). **c) Lianas, scramblers, etc.:** Layer was absent from this PCT in its current state.
Condition	Poor

Photo 4: Community 1 PCT 266 - White Box Grassy Woodland Derived Native Grassland (Poor)

3.2.2 Community 2 – PCT 281

Table 6: Vegetation community 2 – PCT 281 Rough-barked Apple Woodland (Moderate)

Vegetation Community (NSW PCT)	PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Vegetation Class	Western Slopes Grassy Woodland
Land Zones & Area	Moderate
EEC Status	PCT 281 is associated with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the *BC act* and the *EPBC act*.

Clearing Extent	0.64ha
Number of Plots	1
Location and Area	The PCT patch is located in western portion of development footprint.
Description	**Canopy:** Structure and Species: Blakely's Red Gum (*Eucalyptus* blakeyli) present **Shrub layer:** Structure and Species: Shrub Layer species were absent from this PCT in its current state. **Ground layer:** Groundcover is dominated by exotic species including the grasses Wimmera Ryegrass (*Lolium rigidum*), Praire Grass (*Bromus catharticus*), Goose Grass (*Eleusine tristachya*), Barley Grass (*Hordeum leporinum*) and the forb Subterranean Clover (*Trifolium subterraneum*). Characteristic grasses and forbs occur in low abundances and include the grasses Juncus spp. and Carex spp., while native forbs include Grassland Wood-sorrel (*Oxalis perennans*). **Lianas, scramblers, etc.:** *Grona varians occurrence in low abundance.*
Condition	Moderate

Photo 5: Community 2 PCT 281 DNG

Table 7: Vegetation community 2 – PCT 281 Exotic Grassland (Poor)

Vegetation Community (NSW PCT)	PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Vegetation Formation	Western Slopes Grassy Woodland
EEC Status	PCT 281 is associated with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the *BC act* and the *EPBC act*. However does not conform to the definition of the TEC under the *EPBC Act* or the *BC Act*.
Clearing Extent	20.39ha
Vegetation Zones	Poor
Number of Plots	4
Location and Area	The PCT covers the majority of the Development Footprint. Dominant in the north and eastern sections of the development footprint.
Description	**Canopy:** Structure and Species: Canopy Layer species were absent from this PCT in its current state. **Shrub layer:** Shrub Layer species were absent from this PCT in its current state. **Ground layer:** Structure and Species: The ground layer is generally dominated by exotics such as Wimmera Ryegrass (*Lolium rigidum*), Soft Brome (*Bromus hordeaceus*), Kikuyu Grass (*Cenchrus clandestinus*) and Goose Grass (*Eleusine tristachya*). Characteristic native grasses were rare and include Wheatgrass (*Anthosachne scabra*), Weeping Grass (*Microlaena stipoides*), Red Grass (*Bothriochloa macra*), Juncus spp. and Wallaby Grass (*Rytidosperma racemosum*). Other characteristic groundcover species include the forb Grassland Wood-sorrel (*Oxalis perennans*) and the fern Rock Fern (*Cheilanthes sieberi*). **Lianas, scramblers, etc.:** Layer was absent from this PCT in its current state.
Condition	Poor

Photo 6: Community 2 at PCT 281 Exotic Grassland

3.2.3 Justification of PCT and Vegetation Zones

Table 8 and 9 summarises the steps taken to identify the PCT that describes the vegetation present on the Subject Land with justification on condition below.

Table 8: PCT 266 Justification

PCT 266 White Box grassy woodland of the NSW Southwest Slopes Bioregion and Inland Slopes Subregion		
Justification of PCT selection	**Search Term**	**Selection**
	IBRA Region	NSW South Western Slopes
	IBRA Sub-region	Inland Slopes

	Vegetation Formation	Grassy Woodland
	Upper Stratum	*Eucalyptus albens*
	PCT List	Thirteen PCTs remained after the above search terms were used. These Included PCT 266, 267, 268, 272, 274, 275, 282, 347, 426, 434, 483, 1383 and 1609
	Selection	PCTs were removed on the basis of having co-dominant species that did not occur within the Subject Land or surrounds. **PCT 266 matched the floristic characteristics recorded on the Subject Land.**

- PCT 266 - This community has the necessary floristics and landscape position to enable its identification at this Subject Land. The area of PCT is present in a moderately disturbed state canopy species partially cleared and the shrub layer absent. The area;
  - Does contains few hollow bearing trees,
  - Does contain large trees over 49cm DBH,
  - Contains limited fallen logs,
  - Species diversity is low in shrub and canopy layer but moderate to high in the ground layer, &
  - Weed coverage is moderate to high.

Table 9: PCT 281 Justification

PCT 281 White Box grassy woodland of the NSW Southwest Slopes Bioregion and Inland Slopes Subregion		
Justification of PCT selection	**Search Term**	**Selection**
	IBRA Region	NSW South Western Slopes
	IBRA Sub-region	Inland Slopes
	Vegetation Formation	Grassy Woodland
	Upper Stratum	*Angophora floribunda*

	PCT List	Eleven PCTs remained after the above search terms were used. These Included PCT 81, 274, 281, 421, 437, 483, 1171, 1383, 1693, 1696 and 1767.
	Selection	A number of the PCTs were removed due to the co-dominant species being absent i.e. White Cypress Pine. Others were removed due to the vegetation formation being inconsistent with that recorded on the subject land. **PCT 281 best described floristic characteristics and landscape position recorded on the Subject Land.**

- PCT 281 - This community has the necessary floristics and landscape position to enable its identification at this Subject Land. The area of PCT is present in a moderately disturbed state canopy species partially cleared and the shrub layer absent. The area;
  - Does contains few hollow bearing trees,
  - Does contain large trees over 49cm DBH,
  - Contains limited fallen logs,
  - Species diversity is low in shrub and canopy layer but moderate to high in the ground layer, &
  - Weed coverage is moderate to high.

3.3 Vegetation Integrity Assessment

3.3.1 Vegetation Zones and Integrity Scores

Table 10 shows the vegetation integrity scores of each zones.

Table 10: Vegetation zone and current integrity score

Vegetation Community	Vegetation Zone	Condition Class	No. of plots	Patch Size Category	Area Impacted	Vegetation Integrity (VI) Score			
						Composition	Structure	Function	Total
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1	Good	1	>100 ha	1.9 ha	54.2	33.8	30.6	38.3
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2	DNGGood	2	>100 ha	3.3 ha	71.5	59.6	4.2	26.2
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	3	DNGPoor	3	>100 ha	5.3 ha	64.2	55.3	0.0	4
PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	4	Moderate	4	>100 ha	0.4 ha	40.6	21.1	40.8	32.7
PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	5	Poor	5	>100 ha	22.3 ha	31.7	51.0	2.0	14.9

This mapping is to be considered indicative only and all derivations (e.g., vegetation communities) are best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any subsequent error losses etc. that may arise from the use of this data without independent verification.	Project Manager: KR	Figure Name: Plant Communities & Zones	Biodiversity AUSTRALIA	
	Drawn by: LW	Location: Stage 14, Caerleon Estate, Mudgee		
	Date: August 2023	Client: Bathla	Job Number: ENS5848	Spatial Reference: MGA Zone 56/GDA 94 Scale: 1:5000

Figure 7: Vegetation zones and survey locations

4. Threatened Species

4.1 Ecosystem Credit Species

Ecosystem credit species are threatened species which can be reliably predicted to occur by vegetation surrogates and landscape features. Targeted survey is not required for these species.

Some species which have specialised breeding requirements have dual credit classes to account for differences in foraging and breeding habitat. For example, Glossy Black Cockatoo foraging habitat can be reliably predicted through vegetation associations, however breeding habitat is specialised and requires hollow-bearing trees with hollows greater than 15 cm diameter and greater than five metres above the ground (OEH 2020a).

The BAM calculator produces a list of ecosystem credit species based on a number of attributes including Bioregion and subregion, patch size and the vegetation and habitat data collected in the field.

4.1.1 List of Species Derived

The threatened species derived from the BAM calculator are presented in Table 11: Ecosystem credit species predicted to occur. Any additional species determined likely to be present by Bio Aus. were also added to the list and entered as an additional species in the BAM calculator.

These species have been predicted to occur based on the vegetation and habitat types present and are classed with ecosystem credits. Additional species, predicted to occur by the BAM calculator, which have been excluded from this list due to not meeting habitat and/or geographic requirements are listed in Table 12.

Table 11: Ecosystem credit species predicted to occur

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	*Ninox connivens*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black Falcon	*Falco subniger*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Corben's Long-eared Bat	*Nyctophilus corbeni*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Common Name	Scientific Name	Vegetation Types(s)
Diamond Firetail	*Stagonopleura guttata*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Flame Robin	*Petroica phoenicea*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Gang-gang Cockatoo	*Callocephalon fimbriatum*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	*Pteropus poliocephalus*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Eagle	*Hieraaetus morphnoides*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	*Glossopsitta pusilla*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Pied Bat	*Chalinolobus picatus*	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Masked Owl	*Tyto novaehollandiae*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Powerful Owl	*Ninox strenua*	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Common Name	Scientific Name	Vegetation Types(s)
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Regent Honeyeater	*Anthochaera phrygia*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Rosenberg's Goanna	*Varanus rosenbergi*	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	*Petroica boodang*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	*Chthonicola sagittata*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	*Circus assimilis*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	*Dasyurus maculatus*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Square-tailed Kite	*Lophoictinia isura*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Superb Parrot	*Polytelis swainsonii*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	*Lathamus discolor*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	*Neophema pulchella*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Varied Sittella	*Daphoenositta chrysoptera*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	*Hirundapus caudacutus*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Common Name	Scientific Name	Vegetation Types(s)
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Table 12: Ecosystem credit species not predicted to occur on the Subject Land

Common Name	Scientific Name	Habitat/Geographic constraints
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	BAM Habitat constraints - Presence of *Allocasuarina* and *Casuarina* species **BAM constraints not met:** *Habitat* - The Subject Land does not contain any *Allocasuarina* or *Casuarina* species at quantities high enough to form a foraging resource for the species. .
Painted Honeyeater	*Grantiella picta*	BAM Habitat constraints - Presence of Mistletoe **BAM constraints not met:** *Habitat* – No mistletoe recorded on development footprint.

4.2 Species Credit Species

Species credit species are threatened species or elements of their habitat that cannot be confidently predicted by vegetation surrogates and landscape features. Targeted survey is required for these species if the Subject Land contains suitable habitat and is within the predicted range of the species.

4.2.1 List of Species Derived

The following table lists the candidate threatened species (species credits) that have been derived from the BAM calculator. Any additional species determined likely to be present by Bio Aus. were also added to the list and entered as an additional species in the BAM calculator. An assessment has been undertaken to determine if the habitat and geographic requirements are met on the Subject Land, and if targeted survey is required.

The species with suitable habitat/geographic requirements on the site requiring targeted survey are provided in Table 13: List of candidate species credit species, along with the survey timing for each species (from the OEH Threatened Species profile database) in which targeted surveys should be undertaken. Targeted survey has been undertaken for these species using the survey methods described in Section 4.3.

Species that have been excluded from the candidate species list are provided in Table 14: List of candidate species credit species excluded, along with the assessment of habitat and geographic requirements which were not met. Targeted survey is not required for these species.

Table 13: List of candidate species credit species

Common Name	Scientific Name	Survey Timing
Flora		
Ausfeld's Wattle	*Acacia ausfeldii*	Aug-Oct
Bluegrass	*Dichanthium setosum*	Nov-May
Tumut Grevillea	*Grevillea wilkinsonii*	Oct
Cotoneaster Pomaderris	*Pomaderris cotoneaster*	Oct-Nov
Tarengo Lekk Orchid	*Prasophyllum petilum*	Sep-Dec
-	*Prasophyllum sp. Wybong*	Sept-Oct
Small Purple-pea	*Swainsona recta*	Sep-Nov
Silky Swainson-pea	*Swainsona sericea*	Sep-Nov
Silky Swainson-pea	*Swainsona sericea*	Sept-Nov
Fauna		
Regent Honeyeater	*Anthochaera prygia*	Important Habitat
Pink-tailed Legless Lizard	*Aprasia parapulchella*	Sep-Nov
Bush-stone Curlew	*Burhinus grallarius*	All year
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Oct-Jan

Common Name	Scientific Name	Survey Timing
White-bellied Sea-eagle	*Haliaeetus leucogaster*	Jul-Dec
Little Eagle	*Hieraaetus morphnoides*	Aug-Oct
Key's Matchstick Grasshopper	*Keyacris scurra*	Mar-May/Aug-Dec
Booroolong Frog	*Litoria booroolongensis*	Oct-Dec
Square-tailed Kite	*Lophoictinia isura*	Sept-Jan
Barking Owl	*Ninox connivens*	May-Dec
Squirrel Glider	*Petaurus norfolcensis*	Jan-Dec
Brush-tailed Phascogale	*Phascogale tapoatafa*	Dec-Jun
Koala	*Phascolarctos cinereus*	All Year
Superb Parrot	*Polytelis swainsonii*	Sep-Nov
Masked Owl	*Tyto novaehollandiae*	May-Aug

Table 14: List of candidate species credit species excluded

Common Name	Scientific Name	Habitat/Geographic constraints
Fauna		
Yass Daisy	*Ammobium craspedioides*	BAM Habitat constraints – Geographic – South of Cowra **BAM constraints not met:** *Geographic* – The Subject Land is North of Cowra
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	BAM Habitat constraints – Habitat – Hollow bearing trees, Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground. **BAM constraints not met:** *Habitat* – Hollows great than 15cm and 8m above the ground were absent from the Development Footprint.
Large-eared Pied Bat	*Chalinolobus dwyeri*	BAM Habitat constraints – Habitat – Cliffs, Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels **BAM constraints not met:** *Habitat* – Suitable breeding habitat was absent from the Development Footprint
Swift Parrot	*Lathamus discolor*	BAM Habitat constraints – Habitat – As per Important Habitat Map **BAM constraints not met:** *Habitat* – Important Habitat Mapping is absent from the Development Footprint.
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	BAM Habitat constraints – Habitat – Caves, Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave, " observation type code "E nest-roost, " with numbers of individuals >500 **BAM constraints not met:** *Habitat* – Suitable breeding habitat was absent from the Subject Land
Squirrel Glider in the Wagga Wagga Local Government Area	*Petaurus norfolcensis - endangered population*	BAM Habitat constraints – Geographic – Wagga Wagga LGA **BAM constraints not met:** *Geographic* – The Subject Land does not fall within the Wagga Wagga LGA
Brush-tailed Rock-wallaby	*Petrogale penicillata*	BAM Habitat constraints – Habitat – Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines. **BAM constraints not met:** *Habitat* – Suitable rocky habitat is absent within the Subject Land and Study Area.

Common Name	Scientific Name	Habitat/Geographic constraints
Grey-headed Flying-fox	*Pteropus poliocephalus*	BAM Habitat constraints – Habitat – Breeding Camps **BAM constraints not met:** *Habitat* – No breeding camps were present on the Subject Land.
Golden Sun Moth	*Synemon plana*	BAM Habitat constraints – Geographic – South of Mid-Western Highway **BAM constraints not met:** *Geographic* – The Subject Land is North of the Midwestern Highway

4.3 Targeted Survey Methods

Targeted surveys were undertaken for the candidate species identified in Table 13: List of candidate species credit species. These were undertaken by a senior botanist and two senior ecologists. The surveys were conducted under Biodiversity Australia's scientific licence and animal research authority.

A detailed description of the survey methods used is provided in the following sections. Location of targeted survey are depicted in Figure 8.

4.3.1 Threatened Flora Survey

A targeted survey for the following threatened flora species was undertaken over the Subject Land on 30th November and 2nd December 2021 and 25 January 2022 by Premise Ecologists. The following listed species were the focus of these surveys however searches incorporated all potentially occurring threatened species.

- Ausfeld's Wattle (*Acacia ausfeldii*)
- Yass Daisy (*Ammobium craspedioides*)
- Bluegrass (*Dichanthium sericeum*)
- Capertee Stringybark (*Eucalyptus cannonii)*
- *Euphrasia arguta*
- Tumut Grevillea (*Grevillea wilkinsonii)*
- Tarengo Lekk Orchid (*Prasophyllum petilum)*
- *Prasophyllum sp. Wybong*
- Silky Swainson-pea (*Swainsona sericea*)
- Small Purple-pea (*Swainsona recta)*
- Hoary Sunray (*Leucochrysum albicans subsp.. tricolor*)
- *Ozothamnus tesselatus*

Survey effort was concentrated to suitable grassland habitat most appropriate the above listed species. Survey timing and seasonal conditions were optimal for detection of the threatened species predicted to occur due to above average rainfall falling in the preceding season. Flora traverses were undertaken in areas where the highest quality habitat exists.

4.3.2 Fauna Survey

In consideration of the survey requirements of the candidate threatened fauna species as listed within the Bionet Atlas, and other potentially occurring fauna species (DEC 2004, DECC 2007), the following survey methods were utilised during targeted fauna surveys. These surveys were carried out from the 30th of November – 2nd December 2021:

- Habitat evaluation;
- Active Herpetological Searches
- Diurnal bird surveys;
- Spotlighting and torch searches;
- Call playback and detection;
- Koala Spot Assessment Technique (SAT) surveys.

Surveys were undertaken by experienced Ecologists employed by Premise. The methods per survey measure are detailed below.

4.3.2.1 Habitat Evaluation

This was the main survey method employed to assess the suitability of site habitats for threatened species recorded in the locality, or in broadly similar habitats in the region.

Habitats on and adjacent to the Subject Land were defined and assessed according to parameters such as:

- Structural and floristic characteristics of the vegetation e.g. understorey type and development, crown depth, groundcover density, etc.
- Degree and extent of disturbance e.g. fire, logging, weed invasion, modification to structure and diversity, etc.
- Presence of water in any form e.g. rivers, dams, creeks, drainage lines, soaks.
- Size and abundance of hollows and fallen timber.
- Availability of shelter e.g. rocks, logs, hollows, undergrowth.
- Wildlife corridors, refuges and proximate habitat types.
- Presence of mistletoe, nectar, gum, seed, sap, etc. sources.

This information is considered for evaluation of the potential occurrence of threatened species on or adjacent to the site based on cited ecology and personal experience/knowledge of the species.

4.3.2.2 Active Herpetological Searches

Physical habitat searches were conducted around partially buried rocks, and fallen timber, decorticating bark, rocks and debris, and inspection of dense vegetation and leaf litter for reptiles. Species included in searches:

- Pale-tailed Legless Lizard (*Aprasia parapulchella*)
- Striped Legless Lizard (*Delma impar)?*

Total survey effort was not reported in Premise data package.

4.3.2.3 Diurnal Bird Survey

This involved passive surveys (e.g. listening for bird calls) and active observation/binocular searches while walking around the entire Subject Land; and opportunistically during other activities. Bird surveys were undertaken primarily within two hours of dawn or dusk to coincide with periods of peak activity. Targeted searches for large stick nests were also undertaken across the Development Footprint.

A total of two (2) hours was spent targeting diurnal bird surveys over two (2) days across 1st & 2nd December 2021. Although all avian species were recorded, targeted survey for the following species and their breeding habitat was undertaken by Premise Ecologist:

- Brown Tree-creeper (*Climacteris picumnus victoriae*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum)*
- Spotted Harrier (*Circus assimilis)*
- Black Falcon (*Falco subniger*)
- White-throated Needle-tail (*Hirundapus caudacutus)*
- Little Lorikeet (*Glossopsitta pusilla*)
- Major Mitchell Cockatoo (*Lophochroa leadbeateri*)
- Turquoise Parrot (*Neophema pulchella*)
- Superb Parrot (*Polytelis swainsonii*)
- Scarlet Robin (*Petroica boodang*)
- Flame Robin (*Petroica phoenicea*)
- Regent Honeyeater (*Anthochaera phrygia*)
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)
- White-bellied Sea-eagle (*Haliaeetus leucogaster*),
- Little Eagle (*Hieraaetus morphnoides*), and
- Square-tailed Kite (*Lophoictinia isura*)

4.3.2.4 Spotlighting and Torch Searches

Spotlighting was undertaken on 1st and 2nd of December 2021. Two 680 m spotlight transects were conducted through suitable habitat with hand held spotlights. The target species for spotlighting included the following species:

- Gey-headed Flying-fox (*Pteropus poliocephalus*)
- Koala (*Phascolarctos cinereus*)
- Barking Owl (*Ninox connivens*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Koala (*Phascolarctos cinereus)*

4.3.2.5 Call Play Back and Detection

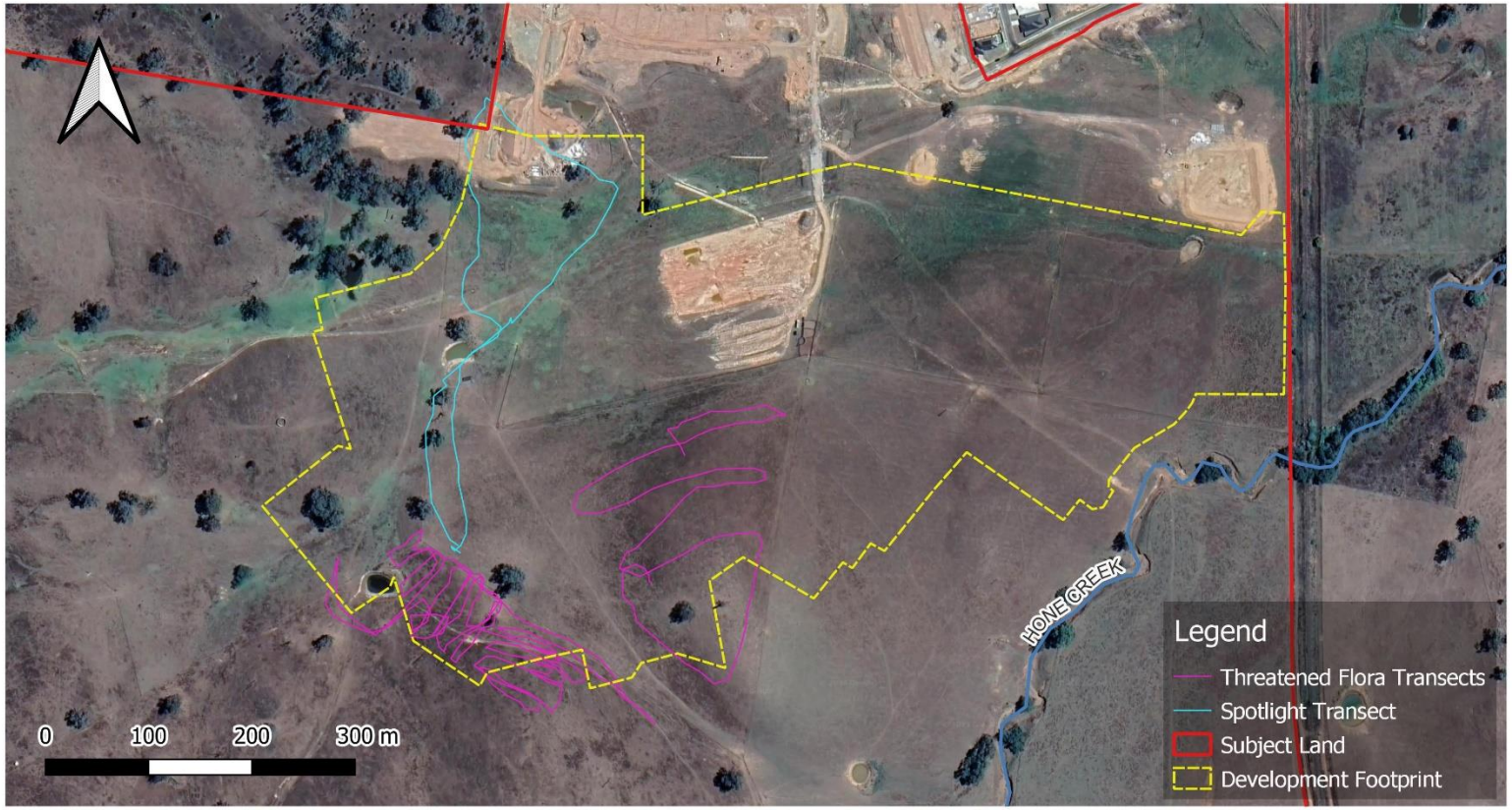
Call play back technique was undertaken using pre-recordings of target species. was undertaken during nocturnal surveys. This involved playing recordings for 10 minute interval interspersed with 5 minutes of silence. A 30 minute survey was undertaken on the both the 1st and 2nd of December 202. This method was used for the following species.

- Barking Owl (*Ninox connivens*)

A total of 1 hour of surveys was undertaken for the species in the development footprint.

4.3.2.6 Koala Spot Assessment Technique

The Koala Spot Assessment Technique was not implemented as it is formally described by Phillips & Callaghan 2011 due to extensive general habitat survey and relatively low abundance of trees present with in the Development Footprint. As the SAT method uses a subset of trees present within the landscape to describe Koala use, visiting all trees to inspect for hollows allowed complete survey of all KFT's to assess Koala use. One Koala Spot Assessment was carried out on the 1st of December and the 2nd of December 2021. Inspection of potential koala food tree effort was supplemented by spotlight surveys



This mapping is to be considered indicative only and all derivations (e.g., vegetation communities) are best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any subsequent error losses etc. that may arise from the use of this data without independent verification.	Project Manager: KR	Figure Name: Location of Threatened Entities	Biodiversity AUSTRALIA	
	Drawn by: LW	Location: Stage 14, Caerleon Estate, Mudgee		
	Date: Sept 2023	Client: Bathla	Job Number: ENS5848	Spatial Reference: MGA Zone 56/GDA 94 Scale: 1:6000

Figure 8: Location of surveys for threatened entities.

4.3.3 Survey Timing and Limitations

4.3.3.1 Flora

Targeted surveys for species credit species were conducted within their respective survey periods. Survey periods were conducted within optimal conditions with considerable rainfall in the months preceding the survey periods. This has given the best possible chance of detecting target species. This, along with the adoption of survey methods outlined in the *Surveying for threatened plants and their habitats* (DPE 2020) guidelines that the likelihood of a true negative for target species is high. Transects were not conducted in areas of high degradation as the likelihood of threatened species being present in these areas was extremely low.

4.3.3.2 Fauna

Fauna detectability is limited by seasonal, behavioural or lifecycle characteristics of each species, and even by habitat variations (e.g. flowering periods), which can occur within a year, between years, decades, etc. (DEC 2004). The fauna survey period fell in spring 2021 and summer 2022 which is a period of high activity for arboreal mammals, Microchiropteran bats, frogs and birds (DEC 2004).

The survey timing coincided with the recommended survey period for all of the targeted fauna species. Survey effort for a number of species was not per the defined method however due to the degraded state of the Development Footprint it is considered unlikely that many of the species predicted to occur do not utilise the habitat in its current state.

4.3.4 Weather Conditions

Two separate survey periods were necessary to meet survey periods of threatened species 31st November – 2nd December & 25th January 2022. Weather during these periods saw a moderate amount of rainfall with 61 mm falling in November. 14 mm in December 2021 and 26 mm in January 2022. Daily temperatures during this period ranged between 20.1 - 28.0 C. (BOM 2023 – nearest weather station – Mudgee, Airport AWS).

4.4 Targeted Survey Results

4.4.1 Flora

Threatened flora surveys failed to detect the presence of any target threatened flora species within the Development Footprint. A detailed flora list of species recorded on the Subject Land is presented in Appendix 2.

4.4.2 Fauna

4.4.2.1 Habitat Features

The Subject Land has historically been cleared for livestock grazing. As such the presence of features providing potential habitat for threatened fauna were limited. A range of habitat features were recorded which are described in the following table.

Table 15: Summary of site habitat values

Habitat/ Attribute Type	Development Footprint
Groundcover	Open to dense groundcover layer, depending on canopy cover. Native forbs and grasses dominant in patches.
Leaf litter	Litter was typically light across the Development Footprint.
Logs and debris	Coarse woody debris varied in cover depending on canopy cover.
Hollows	Four hollow bearing trees were higher quality vegetation mapped as PCT 266.
Nectar Sources	Eucalypt species including *Eucalyptus albens, E. melliodora* and *E. blakelyi* were present.
Sap and gum sources	Eucalypt species including *Eucalyptus albens, E. melliodora* and *E. blakelyi* were present.
Primary preferred Koala browse trees	Koala feed species (*Eucalyptus albens, E. melliodora and E. blakelyi*) – all considered feed species in the Central Tablelands Koala Management Area under Appendix A of the NSW State Environmental Planning Policy (Koala Habitat Protection) 2019 (Koala Habitat Protection SEPP) (DPIE, 2018a; 2020d);
Allocasuarinas	Absent.
Aquatic/ wetland habitats	One farm dam and one stream (Hone Creek) runs along the south-eastern boundary of the site, approximately 60 m away.
Fruiting species	Absent
Forest bird habitat	Poor quality habitat exists for woodland birds with canopy trees present in highly fragmented patches across the development footprint.
Caves, cliffs, overhangs, culverts, bridges	Absent. Absence of roosts for obligate Microchiropteran bats.
Small terrestrial prey	Likely to be low prey abundance over most of the zone due to limited vegetation and litter cover and livestock grazing practices. Some habitat provided by grasses and coarse woody debris around isolated paddock trees.

Habitat/ Attribute Type	Development Footprint
Habitat Linkages	Vegetation present within this zone is restricted to isolated patches and likely provides limited connectivity value across the Subject Land.

4.4.2.2 Observed/Detected Fauna

The surveys detected a range of fauna species over the Subject Land. Birds were the most common species detected (13), followed by amphibians (1).

Despite targeted survey there were no threatened fauna detected within the Development Footprint.

4.4.3 Species Credit Species

4.4.3.1 Species detected

The following table provides a list of the candidate species credit species subject to targeted survey.

The remaining targeted candidate species credit species were not detected on the Subject Land. There were no additional species identified during targeted survey. Details of each of these are presented in Table 16: Species credit species survey results.

Table 16: Species credit species survey results

Common Name	Credit Class	Habitat components	Are habitat components met?	Are survey timing constraints met?	Species detected?
Candidate species credit species					
Acacia ausfeldii Ausfeld's Wattle	Species	Footslopes and rises on sandstone	Yes	Yes	No
Anthochaera phrygia Regent Honeyeater	Species	Important Habitat Map	Yes	Yes	No
Aprasia parapulchella Pink-tailed Legless Lizard	Species	Rocky areas or within 50 m of such habitat	Yes	Yes	No
Burhinus grallarius Bush Stone-curlew	Species	Fallen/standing dead timber	Yes	Yes	No
Callocephalon fimbriatum Gang-gang Cockatoo	Species	Hollow bearing trees at least 3m above the ground and diameter of 7 cm or larger.	Yes	Yes	No
Dichanthium setosum Bluegrass	Species	N/A	Yes	Yes	No
Euphrasia arguta Euphrasia arguta	Species	N/A	Yes	Yes	No
Grevillea wilkinsonii Tumut Grevillea	Species	N/A	Yes	Yes	No
Haliaeetus leucogaster White-bellied Sea-Eagle	Species	Living or dead trees within suitable vegetation within 1km of waterbody.	Yes	Yes	No

Common Name	Credit Class	Habitat components	Are habitat components met?	Are survey timing constraints met?	Species detected?
Hieraaetus morphnoides Little Eagle	Species	Nest trees	Yes	Yes	No
Keyacris scurra Key's Matchstick Grasshopper	Species	N/A	Yes	Yes	No
Litoria booroolongensis Booroolong Frog	Species	N/A	Yes	Yes	No
Lophoictinia isura Square-tailed Kite	Species	Nest Trees	Yes	Yes	No
Ninox connivens Barking Owl	Species	Hollows greater than 20cm and 4m above the ground	Yes	Yes	No
Ninox strenua Powerful Owl	Species	Hollows greater than 20cm and 4m above the ground	Yes	Yes	No
Petaurus norfolcensis Squirrel Glider	Species	N/A	Yes	Yes	No
Phascogale tapoatafa Brush-tailed Phascogale	Species	N/A	Yes	Yes	No
Phascolarctos cinereus Koala	Species	Presence of Koala Use trees	Yes	Yes	No
Polytelis swainsonii Superb Parrot	Species	Living or dead tree Eucalypt with hollow greater than 5cm and 4m above the ground and greater than 30 cm dbh	Yes	Yes	No

Common Name	Credit Class	Habitat components	Are habitat components met?	Are survey timing constraints met?	Species detected?
Pomaderris cotoneaster Cotoneaster Pomaderris	Species	East of Tumut	Yes	Yes	No
Prasophyllum petilum Tarengo Leek Orchid	Species	N/A	Yes	Yes	No
Prasophyllum sp. Wybong Prasophyllum sp. Wybong	Species	Living or dead mature trees within suitable vegetation within 1km of waterbody	Yes	Yes	No
Swainsona recta Small Purple-pea	Species	N/A	Yes	Yes	No
Swainsona sericea Silky Swainson-pea	Species	N/A	Yes	Yes	No
Tyto novaehollandiae Masked Owl	Species	Hollows greater than 20cm and 4m above the ground	Yes	Yes	No

STAGE 2 - IMPACT ASSESSMENT

5. Avoidance and Minimisation

5.1 Impact Avoidance

The Development Footprint is mapped as R1 - General Residential and MU1 – Mixed Use as per the Mid-Western Regional Council Local Environmental Plan 2012.

The proposal has applied a pragmatic and iterative approach to avoiding areas of high biodiversity value. The development footprint sought to avoid in the first instance, the Biodiversity Values mapped land along Hone Creek and areas zoned as Conservation to the Northeast. The proposed development footprint impacts on vegetation predominantly of low integrity and isolated paddock trees.

5.2 Direct Impacts

5.2.1 Vegetation and Habitat Removal

There will be 30.7 ha of vegetation removal associated with the proposal. This includes ~0.2 ha of mapped Biodiversity Values land associated with Regent Honeyeater habitat. No further vegetation loss will be required through the operational phase of the development. This loss will be offset through biodiversity credits.

The vegetation to be affected may provide foraging habitat for a limited number of fauna species. This includes nectar and prey habitat for birds, Microbats and reptiles. The hollow-bearing trees and dead standing timber recorded in the development footprint and have the potential to provide nesting/denning habitat for hollow-obligate fauna species.

5.3 Indirect Impacts

The following potential indirect impacts may be associated with the proposal:

5.3.1 Fragmentation

The removal of vegetation for the development will contribute to local habitat. Fragmentation of faunal habitat has the potential to impact the dispersal of fauna, modify gene flow and alter the microclimate in the area by directly reducing accessibility to habitat and increasing the area of vegetation subject to edge effects (Battisti 2003; Offerman *et al* 1995; Saunders *et al* 2012). Fragmentation and the associated landscape changes at all scales is major factor in the decline of biodiversity, the modification of ecosystems, and alteration of ecosystem processes. Its effects vary with factors such as distance of fragments from similar habitat, their position in the landscape, the forms of habitat modification of isolates that occurs (e.g. due to edge effects), and types of surrounding land uses in the matrix, the ecology of the species affected, and how these factors influence the movement of organisms between the isolates and larger areas of habitat (Lindenmayer and Fisher 2006, DPIE 2020b).

The vegetation requiring removal for the proposed development is present in a variety of conditions as described within the previous sections of this report. The vegetation that exists within the Development Footprint is present in a highly fragmented state and provides limited connectivity value for even the most mobile of species. Although the vegetation provides a

minute portion of foraging habitat in the broader landscape it is unlikely to impact on the survival of local fauna populations.

5.3.2 Erosion and Sedimentation

Sedimentation and erosion impacts can occur at both the construction and establishment phases. Erosion/sedimentation may occur via erosion of fill material and disturbed soils, scouring of exposed soil, earthen banks and habitats adjacent to the development area via directed flow (e.g. stormwater), or where runoff is concentrated. If unmitigated, these can lead to the reduction water quality of downstream waterways and cause siltation, having flow-on effect to flora and fauna (Queensland Government 2019). This is particularly important within the study area as mapped Coastal Wetland SEPP occur along the northern and eastern boundaries.

Standard mechanisms and controls will be required to ensure the prevention of erosion and sedimentation during construction and post-development and such impacts do not extend beyond the development footprint. The development of a Soil Erosion & Sediment Control Plan (SESCP) developed by a Certified Practitioner in Erosion and Sediment Control is recommended as the development footprint occurs on soil types mapped as moderate to low capability soils as assessed through the Great Soil Group mapping layer.

5.3.3 Injury/mortality during clearing

Animals within hollows and fallen logs, as well as dense vegetation and leaf litter have the potential to be injured or killed during clearing operations. Such fauna may be placed under stress, injured or killed during tree felling via:

- Being nocturnal or in torpor, and unable to escape prior to the tree falling.
- Collapse of the hollow when it impacts the ground.
- Collision with internal walls or via being thrown out when the tree falls.
- Being present as young e.g. eggs.

This risk increases during breeding seasons (generally spring to late autumn) and in cooler seasons when mammals and reptiles enter torpor.

The Development Footprint contains areas of dense groundcover, isolated fallen habitat logs and hollow-bearing trees, therefore providing a risk of fauna mortality during clearing. Although habitat is of a limited extent the presence of an ecologist during all clearing activities to mitigate the risk of injury to fauna is recommended. Further detail of the mitigation measures proposed to reduce injury or mortality during clearing is provided in Section 5.5.

5.3.4 Edge effects

Changes to the edges of vegetation communities has been attributed to a range of detrimental effects on different ecosystems. These changes have been linked to effects such as the alteration of environmental conditions, changes in species abundance and distributions and changes in species interactions (Murcia 1995). The Subject Land in its current state is highly fragmented and the edge effects on remaining vegetation are considerable. The proposed

development is unlikely to increase the edge effects on remnant vegetation once the development is operational as vegetation already exists in a highly fragmented state. the Surrounding land is also highly disturbed and the development isn't likely to impact on this land considerably in regards to edge effects.

5.3.5 Weed invasion

An increase in vehicle and foot traffic within the Subject Land has potential to increase the spread of weeds onto and through the property. The introduction of weeds can have a significant impact on native flora and fauna by altering the balance of natural ecosystems and outcompeting native flora when it comes to necessary sunlight, shade, nutrients and space (DPIE 2020d). This can result in long-term effects unless appropriate mitigation and management measures are implemented.

The Subject Land is currently subject to moderate to high levels of weeds. The proposed development may increase the potential for spread of weeds within the study area to some extent. Mitigation measures to limit the potential for spread and minimise impacts from weeds are further discussed in Section 5.5. These include using only weed-free construction plant, the restriction of exotic ornamental plantings for landscaping and the development. It is possible that the subdivision will impact on the Conservation Zoned areas to the north east of the Development Footprint. As such a Vegetation Management Plan may be necessary to control weed invasion of this land.

5.3.6 Fauna Vehicle Strike

The proposed development may lead to increased vehicle activity on the Subject Land which has the potential to increase the incidence of fauna vehicle collisions. Studies have shown a significant increase in fauna vehicle strike incidents where road densities and vehicle speeds are high, which can result in the direct mortality of fauna (Clevenger *et al* 2002; Gurriga *et al* 2012).

Vehicle strike during the construction phase of proposed development is likely to be low due to low speeds used on active construction sites (e.g. 40km/h). The likelihood of fauna vehicle strike once the project is operational is likely to decrease with decreased vehicle traffic.

5.3.7 Noise, vibration and anthropogenic disturbances

A significant/frequent increase in noise levels have been documented to impact on behavioural changes, population densities, community structure and breeding success of fauna (Barber *et al* 2009). These responses can result from the frequent disturbance to daily activities via evoking anti-predatory responses as well as by blocking call signals between individuals (Barber *et al* 2009).

The clearing and construction phase of the proposed development is likely to result in increased levels of noise and vibration within and immediately surrounding the Subject Land. This increase in noise and vibration is however only expected to have a minimal effect on local fauna due to the following:

- noise and vibration levels are unlikely to significantly increase beyond that which already occurs during other agricultural tasks;

- works will to be diurnal only; and
- the clearing and construction phase is temporary.

Once established, noise and vibration levels will return to levels typical of a rural area which is generally low to nil at night and be its greatest depending on seasonal activities. As fauna occurring in and adjacent to the Subject Land are expected to have a substantial tolerance to the current level of anthropogenic noise in the area, long-term impacts are not anticipated.

5.3.8 Light Spill

The introduction of additional artificial light has the potential to effect fauna within and adjacent to the Subject Land. Studies have shown both and increase in orientation and increase in disorientation as a result of additional illumination to an area. This can have the potential to alter normal foraging, communication and reproductive behaviours (Longcore and Rich 2004; Chepesiuk 2009).

During the construction phase, no additional illumination is expected as all works are to be conducted diurnally. Operationally, the solar farm may require artificial lighting for security and safety reasons. Artificial lighting is recommended to be kept to a minimum and strategically placed so as not to disturb fauna in adjacent habitats. These mitigation measures are further detailed in Section 5.5.

5.3.9 Introduction of feral and domestic predators

Urban, industrial and rural developments are often associated with the introduction of non-native species i.e. rodents, cats and dogs accidentally and intentionally e.g. via creating habitat for such species (e.g. rats, Indian Myna) as well as pets.

The proposed development being residential in nature is likely to increase domestic predators above the level that currently exists on the Subject Land and may impact surrounding Conservation Zoned land and the Conservation Area to the West of the Development Footprint.

5.3.10 Movement obstruction

Fences have potential to obstruct the movement of threatened fauna across the Development Footprint. Some threatened fauna can be injured by collision with wire fences, particularly barbed wire e.g. the Owls and Squirrel Glider have been recorded being injured by barbed wire fences (Lindenmayer 2002).

Temporary and permanent fencing to be constructed for the proposed development has the potential to restrict fauna movements (e.g. colorbond) or inflict injury (e.g. barbed wire fence). Mitigation measures to eliminate this risk have been outlined in Section 5.5.

5.3.11 Increased dust levels

The service roads proposed for the development have the potential to increase dust levels however is dependent on the number of light vehicle movement across the Development Footprint.

There may be an increase in dust during the construction phase of the project, however this will be managed through a Construction Environmental Management Plan (CEMP)

5.3.12 Increased risk of starvation

The vegetation proposed for removal comprises scattered patches of canopy vegetation amongst a greater area of native and exotic derived grassland. With the limited vegetation proposed to be removed and the vast areas of remnant vegetation within the study area / locality, food resources are not anticipated to decrease to a level that will pose a risk of starvation to fauna.

5.3.13 Critical loss of shade or shelter

Some tree loss will be required for the development. This is unlikely to lead to a critical loss of shade or shelter due to the limited extent of vegetation to be removed and vastness of adjoining habitats.

5.3.14 Increased soil salinity

An increase in soil salinity can be detrimental to native species with surfaced salts becoming toxic to a large majority of native flora. An increase in soil salinity has been linked to large-scale land clearing and is usually associated with agricultural clearing (Australian Bureau of Statistics 2013). The proposed development footprint is largely devoid of canopy vegetation to the extent that the associated clearing is unlikely to impact water table levels to an extent that dryland salinity would become an issue.

5.3.15 Rubbish dumping

The risk of rubbish dumping is not anticipated to increase as a result of the proposed development. Suitable waste disposal facilities will also be provided as part of the development.

5.3.16 Wood collection

All materials required for the development will be sourced externally and wood resources to remain on the Subject Land are considered too sparse to attract wood collection.

5.3.17 Bush rock removal and disturbance

No bush rock was recorded within the Subject Land.

5.3.18 Increased risk of fire

The proposed development will not increase the risk of fire in the area.

5.4 Prescribed Impacts

The following potential indirect impacts have been considered and determined to not be associated with the proposal:

5.4.1 Karst, Caves, Crevices, Cliffs, Rocks and Other Geological Features of Significance

The Subject Land does not contain features such as karst, caves, crevices, cliffs, rocks or other significant geological features of that kind.

5.4.2 Human-made Structure and Non-native Vegetation

The Subject Land does not contain human-made or non-native vegetation that provides meaningful habitat to threatened species.

5.4.3 Habitat Connectivity

There are no mapped regional habitat corridors on the Subject Land. On a more local scale, forested areas of a higher vegetation integrity occur to the west of the subject land which provide connectivity for flora and fauna along moving north/south across the landscape. The Development Footprint itself does not hold significant connectivity value.

Additionally, the iterative design process will largely avoid the riparian area along Hone Creek.

5.4.4 Water Bodies, Water Quality and Hydrological Processes

The Development Footprint contains one farm dam and borders Hone Creek in the south-east (Figure 6). The risks of poor water quality, hydrological process have the potential to impact on the adjoining landscape if left un -mitigated. It is recommended that a Sedimentation and Erosion Control Plan is adopted to ensure that this risk is appropriately managed following the guidelines out lined in *Managing Urban Stromwater – Soils and Construction* (DECC 2008)

5.4.5 Wind Farm Developments

The proposed development is not a wind farm development.

5.4.6 Vehicle Strike

The proposed development may lead to increased vehicle activity on the Subject Land which has the potential to increase the incidence of fauna vehicle collisions. Studies have shown a significant increase in fauna vehicle strike incidents where road densities and vehicle speeds are high, which can result in the direct mortality of fauna (Clevenger et al 2002; Gurriga et al 2012).

The new service roads proposed for the development will be of low speeds and are not anticipated to pose a considerably increased risk to local fauna as they allow for increased fauna detection and greater likelihood of avoided collision.

5.5 Measures to Minimise Impacts

The proposal would be subject to a number of mitigation measures and environmental controls to reduce the overall impact of the development on biodiversity and ensure potential offsite impacts are minimised. The conclusions of this assessment have assumed that these will be implemented.

5.5.1 Protection and Rehabilitation of the Biodiversity Values Area

The proposed development impacts on a small area of mapped Biodiversity Values associated with Regent Honeyeater habitat. This impacts to threatened fauna and ecosystem credit species that utilise the Development Footprint will be offset through the retirement of credits through the Biodiversity Offset Scheme.

5.5.2 Biosecurity Management Plan

A Biosecurity Management Plan (BMP) is to be prepared to manage the risk of declared entities under NSW and Commonwealth legislation entering the property and adjacent habitats. This should detail the hygiene practices, timeframes parties responsible for implementing appropriate management actions prior to construction. It will also detail monitoring future monitoring requirements of declared weeds for the site.

5.5.3 General Clearing Measures

The following measures are recommended to manage clearing:

- Site induction is to specify that no clearing is to occur beyond the marked area. All vehicles are only to be parked in designated areas.
- Clearing and earthworks is to avoid damage to root zones of the retained trees.
- No materials or fill are to be placed under retained trees or within adjacent vegetation.
- Weeds are not to be mulched with native vegetation and should be taken to a licenced landfill facility.

5.5.4 Replacement Nest Boxes

The hollows to be removed for the proposal are recommended to be offset with replacement nest boxes at a ratio of one per observed hollow (potential or actual). Nesting boxes specifically catering to owls, gliders, small parrots and Microchiropteran bats are recommended given current hollow size. These are recommended to be mounted within the Conservation Zoned land to the Northwest of the Development Footprint.

The boxes are to be sourced by a reputable supplier and installed by an ecologist on retained mature trees before clearing commences.

5.5.5 Soil Erosion and Sedimentation Control

Standard soil and sedimentation control measures will be required throughout the earthworks phase to ensure that habitats in the Subject Land, as well as subsequent habitats nearby are not substantially affected. It is recommended that a Soil Erosion and Sediment Control Plan be developed by a Certified Practitioner in Sediment and Erosion Control to meet all standard compliance.

Proposed drainage systems need to be adequately designed and effectively established to prevent the risk of any substantial impacts (e.g. erosion and sedimentation, changed hydrology from stormwater runoff). Guidelines outlined in the 'blue book' (DECC 2008) are recommended to be adopted during the construction and operational phase of the proposed development.

5.5.6 Pre-clearing Survey and Clearing Supervision

The clearing extent is to be inspected for fauna by a qualified ecologist immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. Pre-clearing checks would include searches of habitat (e.g. lifting and destructive searches of logs) and searches for bird nests. If possible, any detected fauna is to be relocated off-site to nearby suitable areas (preferably within their natural home range) prior to clearing.

During the pre-inspection, any habitat features detected (e.g. hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing.

The ecologist is to be present on site to supervise all clearing works to retrieve any fauna detected during works and undertake appropriate action (e.g. humanely euthanise severely injured animals and/or relocate uninjured animals where possible). The fauna spotter must also be present during de-watering of any water bodies on the site to rescue and relocate and stranded aquatic fauna species.

A report detailing the results of the clearing monitoring is to be provided to the consent authority within 14 days of works completion.

5.5.7 Hollow-bearing Tree Removal Protocol

Hollow-bearing trees are to be felled in a manner that will minimise the risk of injury/mortality of denning/roosting fauna within the limitation of Work Health and Safety (WHS) Guidelines. This is suggested to be achieved by the following general procedure:

- The hollow-bearing trees are to be gently bumped several times prior to removal to encourage any fauna present to vacate.
- Trees are to be felled in a manner that minimises injury to fauna. This includes gently pushing or 'soft felling' with an excavator or gradual cut down by an arborist.
- A qualified ecologist is to be present during felling and sectioning of the hollow-bearing tree (at the proponent's cost) in case of animal injury. Hollows are to be inspected for fauna once the tree is deposited. All uninjured animals are to be released in the retained habitat on site.
- If the hollow is determined to be occupied and fauna do not require assistance (e.g., roosting bats), the entrance is to be blocked and the log placed in a shaded and protected area on the edge of the site. The obstacle is to be removed just prior to dusk to allow passive escape of the fauna within. The log may then be removed if required.

Upon completion of this exercise, a brief written report (with photos) detailing the above is to be submitted to Council within 14 days of the removal of the hollow-bearing trees.

5.5.8 Weed Control

Disturbance of the Subject Land's soils has potential to encourage weed invasion. Hence, it is recommended that:

- Disturbance of vegetation and soils on the site should be limited to the areas of the proposed work and should not extend into adjacent vegetation.
- All plant used for clearing and construction works is certified as weed free.
- Appropriate collection and disposal of all weed material removed via clearing.
- Any recent weed invasions within the development area should be removed, and
- Ongoing weed control in the development area.
- Any vehicle leaving the site should undertake a weed wash down as soon as particle to reduce the spread of Boxthorn (*Lycium ferocissimum).*

5.5.9 Artificial Lighting

To ensure anthropogenic impacts are minimised, it is recommended that artificial lighting be kept to a minimum and be of a localised and low luminosity, with light directed to the ground and not onto retained trees/adjacent vegetation. Sufficient artificial lighting will likely be required for security reasons and in the event any evening works are required. Security lighting is preferred to be sensor-based to reduce energy consumption and contributions to Climate Change.

5.5.10 Fencing

Temporary and permanent fencing may be required upon construction of the subdivision. Fences have potential to obstruct the movement of fauna across the site. It is unlikely that Koalas utilise that habitat within the Development Footprint as such permeable fencing throughout the subdivision is not deemed as necessary. However, no fencing that could pose a barrier or risk of entanglement to fauna (e.g., barbed wire) is to be used. Fencing that borders conservation zoned land should be adequately secure keeping domestic pets contained to the occupier's land and does not allow them to roam freely through the Conservation Zoned area.

5.5.11 Mitigation Measure summary

The following table provides a summary of the mitigation measures and the timing and responsibility.

Table 17: Mitigation measure summary

Mitigation measure	Responsibility	Technique	Frequency	Risk of Failure
Prior to clearing works				
Define clearing limits on site	Clearing contractor / surveyor	Set up bunting or temporary fencing	Before commencement of works, must be maintained during extent of works	Low
Site inductions to clearing contractors	Project Environmental Officer	Site inductions to outline ecological mitigation measures, clearing extents etc.	Before commencement of works, new workers or any changes will	Low

Mitigation measure	Responsibility	Technique	Frequency	Risk of Failure
			require additional inductions	
Sediment and erosion control measures	Clearing contractor	Exact details will be included in sediment erosion control plan. Will include measures such as sediment fences	Before commencement of works, must be maintained during extent of works	Low
Ensuring all plant is weed free	Clearing contractor	Allocated washdown area	Every time plant enters the site	Low
Pre-clearing survey and habitat tree mark-up	Project ecologist	Ecologist to conduct survey for habitat and mark with flagging tape	Before commencement of works	Low
During clearing works				
Pre-clearance inspection	Project ecologist	The clearing extent is to be inspected for fauna by a qualified ecologist immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. Any habitat features detected (e.g., hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing.	Each morning prior to clearing	Low
Clearing supervision	Project ecologist	The ecologist is to be present on site to supervise all clearing works to retrieve any fauna detected during works and undertake appropriate action (e.g., humanely euthanise severely injured animals and/or relocate uninjured animals where possible).	At all times during clearing	Low
Hollow bearing tree removal	Clearing contractor, Project ecologist	If necessary, hollow-bearing trees are to be felled in a manner that will minimise the risk of injury/mortality of denning/roosting fauna	At all times during clearing	Low
Maintain sediment and erosion control measures	Clearing contractor, Project Environmental Officer	Exact details will be included in sediment erosion control plan. Will include measures such as maintenance of sediment fences	At all times during clearing	Low
Removal of weeds and disposal at a licenced landfill facility	Clearing contractor	Appropriate collection and disposal of all weed material removed via clearing	Daily during clearing	Low
Monitoring of extent of clearing works i.e., no clearing beyond marked footprint (continual)	Project coordinator	Project coordinator to check on ground on all clearing days	At all times during clearing	Low
Post clearing works				
Removal of any new weed infestations and ongoing weed control	Bush regenerator/ Ecologist	Foliar spray, manual removal	Continual	Low
Strategic placement of artificial lighting	Project coordinator	Artificial lighting should be kept to a minimum and be of a localised	Continual	Low

Mitigation measure	Responsibility	Technique	Frequency	Risk of Failure
		and low luminosity, with light directed to the ground and not onto retained trees/adjacent vegetation.		
Restriction of domestic animals	Project coordinator/Owner/Occupants	Domestic dogs should be restricted to fenced yards and domestic cats are not allowed to roam in adjoining vegetation	Continual	Low
Restriction of exotic species in landscaping	Project coordinator	Landscape plan to include natives and limit exotics	During planning stages and continual during on ground works	Low
Fencing	Project coordinator	Any fencing should confine domestic pets to backyards to limit impact on remnant areas.	Continual	Low

6. Impact Summary

6.1 Assessment of Serious and Irreversible Impacts

6.1.1 Identification of SAII Entities

Section 6.5 of the *Biodiversity Conservation Act 2016* (BC Act) requires developments to consider Serious and Irreversible Impacts (SAII) on threatened species and ecological communities which meet the following criteria:

- are in a rapid rate of decline.
- have a very small population size.
- have a very limited geographic distribution; and
- are unlikely to respond to measures to improve habitat.

These criteria have been applied to all threatened species and ecological communities listed under the *BC Act*. Entities that meet the criteria under one or more principles are identified as 'potential' SAII species/communities in the guidance document Guide to assist decision-maker to determine a serious and irreversible impact (OEH 2017b).

One of the ecosystems and one species credits species impacted by this proposed activity are listed as SAII. These include:

- *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC,* and
- Regent Honeyeater (*Anthochaera phrygia*)

Additional information considered in the context of this development is present below.

6.1.1.1 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

The vegetation that is mapped under PCT 266 Woodland Good, PCT 266 DNG Good and PCT 281 Woodland Moderate that is proposed to be removed conforms to the community description of the TEC under the *BC Act 2016.* The final determination does not contain specific condition thresholds to allow a decision-making pathway, however, PCT 266 and PCT 288 are both associated with the TEC as shown on NSW Vegetation Classification database.

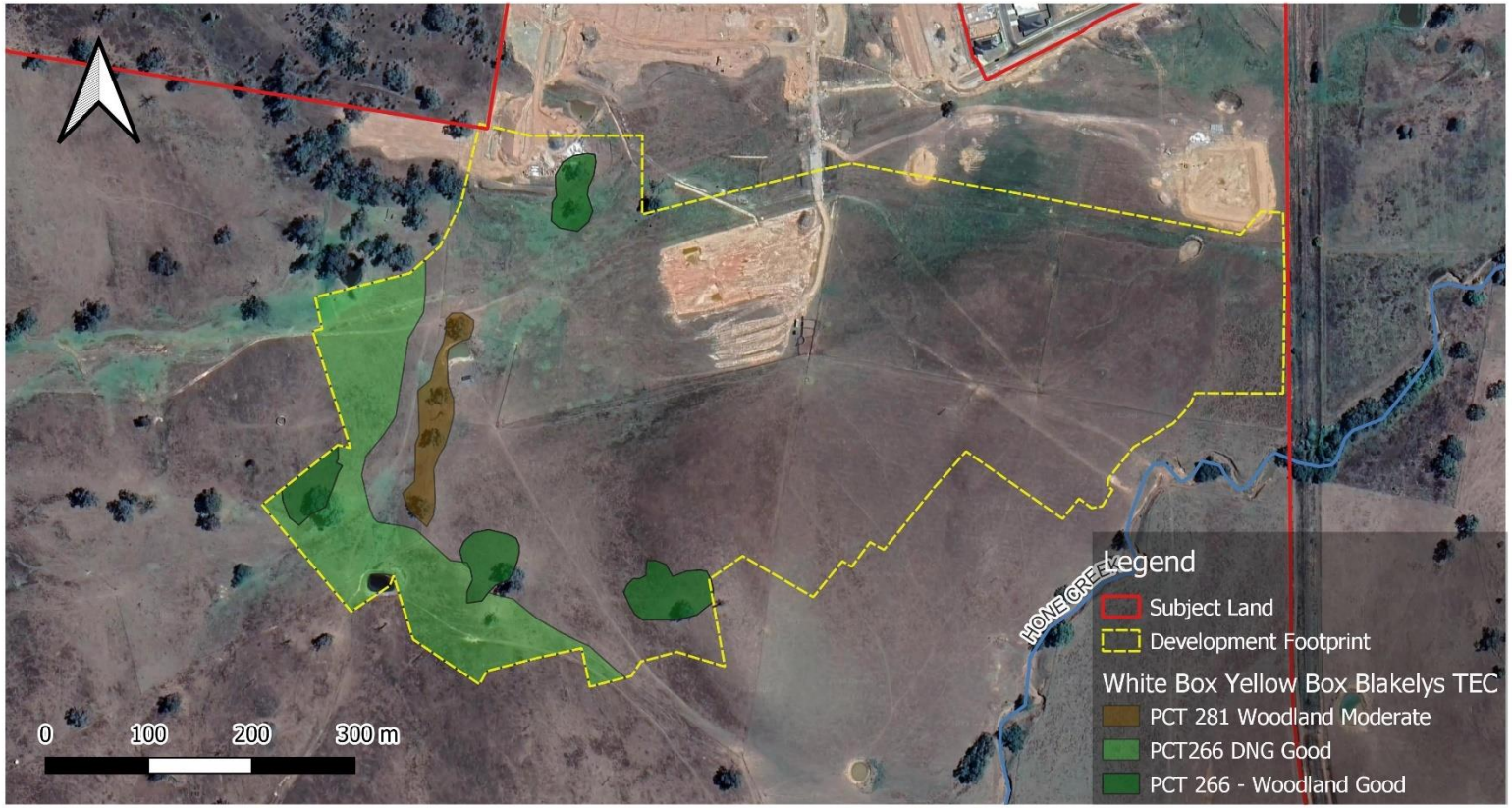
Under both PCTs the TEC is in moderate condition with the above-mentioned vegetation zones achieving a VI scores of 38.3, 26.2 and 32.7 respectively. The remaining vegetation zones did not have integrity scores of a high enough value to require offsetting. The low VI scores for the mapped PCTs can be attributed to the lack of canopy cover as well as limited diversity of ground layer species particularly non-grass groundcovers. Intense grazing pressure and long term historical agricultural use of the land has contributed to the reduced species richness of shrub and ground covers and also terrestrial habitat (logs and leaf litter).

Remnants of the TEC are likely to be responsive to management activities where condition of the community is of a reasonable level, however, these areas a relatively small (<5ha). It is likely that the small loss of area to the TEC could be offset successfully in remnant patches within the broader subject land or within the IBRA region through the BOS. The net benefit of offsetting through the BOS is likely to have a greater outcome that retention of the current vegetation under the current land management activity.

Additional information in the consideration of the proposed development and its impact on this SAII entity are presented in Table 18.

Table 18: Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Subject	Additional Information
Avoidance	Stage 14 subdivision will result in the removal of 6.6 ha of vegetation that conforms to the White Box- Yellow Box- Blakely's Red Gum Grassy Woodland TEC under the *BC Act*. Due to the location of future staged subdivisions, the Development Footprint cannot be moved.
Area of TEC impacted	6.6 ha
Vegetation Condition	The TEC was in a degraded condition with vegetation integrity scores achieving the following results: PCT 266 Good: 38.3 PCT 266 DNG Good: 26.2 PCT 281 Moderate: 32.7.
Extent and condition of the community in the surrounds	The Subject Land exists in a largely agricultural region with similar land use practices on surrounding properties that exhibit similar vegetation condition to that of the Subject Land. A large patch of remnant vegetation is the exception to the west of the Subject Land which includes Avisford Nature Reserve is the exception and covers an area of approximately 12,000 ha (NPWS, 2008). Avisford Nature Reserve likely contains areas of the TEC on lower slopes which exist in good condition.
Extent in IBRA sub region	No specific information on the TECs extent in in the Inland Slopes sub-region.
Extent in reserves	No specific information on the TECs extent in the Southwest Slopes Bioregion and Inland Slopes sub-region. Remnants are known to occur in the Avisford Nature Reserve.
Other Impacts	- The TEC is not considered to be groundwater dependent. No sub-surface aquifers or groundwater are known to reach the surface in the study area. Nor will vegetation be removed to extent to effect ground water tables. - It's possible the Development may impact surface water flows that could affect canopy trees of the TEC in nearby remnant woodland patches. - The Subdivision will not lead to any change to existing practices that support the TEC. Existing land use is largely agricultural and likely reduces the potential of recovery of the TEC. - The invasion of weeds into the TEC is unlikely to increase in surrounding patches as remnant vegetation contains numerous exotic species as it currently exists. - The subdivision would not increase the likelihood of inessive fauna due to its current proximity to urban areas. Such species likely frequent the Subject Land.
Fragmentation	Vegetation on the subject land is highly fragmented in its current state and the development is unlikely to impact further on local fragmentation.
Recovery	The Save Our Species Program has an extensive focus on the protection of TEC remnants and their recovery. The program has nine Priority Management Sites in the Southern West Slopes Bioregion. The vegetation on the Development Footprint is too degraded to be considered for the Save Our Species program.



This mapping is to be considered indicative only and all derivations (e.g., vegetation communities) are best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any subsequent error losses etc. that may arise from the use of this data without independent verification.	Project Manager: KR	Figure Name: White Box Yellow Box Blakely's TEC	Biodiversity AUSTRALIA	
	Drawn by: LW	Location: Stage 14, Caerleon Estate, Mudgee		
	Date: Sept 2023	Client: Bathla	Job Number: ENS5848	Spatial Reference: MGA Zone 56/GDA 94 Scale: 1:6000

Figure 9: Threatened Ecological Community within the Development Footprint

6.1.1.2 Regent Honeyeater (*Anthochaera phrygia*)

Important Habitat is mapped for the Regent Honeyeater on the Development Footprint and broader Subject Land and is potentially at risk of SAII. A small patch (0. ha) of potentially suitable habitat has been confirmed on the west of the Development Footprint and included A single white box (*Eucalyptus albens*) and a single Blakely's red gum (*Eucalyptus blakelyi*) and surrounding derived native grassland has been included in the Important Area mapping for the species. Vegetation was surveyed and determined to be in moderate condition with a VI score of 38.3. Offsetting for the Vegetation Zone is required.

Mudgee is identified as a Priority Management Site for the species under the Save Our Species Program. The Subject Land, however, lies outside the boundary of the intended rehabilitation area. The Important Area identified on the Development Footprint, PCT 266 exists in a moderate condition with the canopy containing mature eucalypts, lacking shrub layer strata and the ground layer was predominantly exotic species although native species exhibited higher diversity. Remnant trees may be utilised as nesting and foraging habitat and as vectors to movement across the landscape.

Further information relevant to the assessment is presented in Table 19.

Table 19: Assessment of Regent Honeyeater on the Development Footprint as SAII

Subject	Additional Information
Avoidance	Stage 14 subdivision will result in the removal of 0.14 ha of vegetation that identifies as Important Area for Regent Honeyeaters. Due to the larger subdivision design the Stage 13 layout cannot be moved.
Size of local population	350-400 mature individuals across the species range (Garnett et. al. 2011).
Exceedance threshold	There is no threshold set by the TBDC to assess SAII status.
Likely impact on habitat	<u>Estimate of change in habitat available to the local population as a result of the proposed development:</u> The proposed development will remove 0.14 ha of regent honeyeater habitat. The habitat to be removed is northwest of the Mudgee locality. The species is known to be more common to the east of Mudgee where more suitable nesting, foraging and known breeding habitat occurs. The impact to the species is likely to be minimal as the 0.14 ha of habitat to be removed equates to 0.00001% of the overall regent honeyeater habitat within the Mudgee Priority Site (217,328.55 ha) and is of poor quality. <u>The proposed loss, modification, destruction, or isolation of the available habitat used by the local population:</u> The proposed development will result in the loss of two potential habitat trees. This is considered unlikely to significantly impact the species as a remnant woodland patch exists directly to the west of the development footprint and provides a higher quality foraging resource. <u>Modification of habitat required for the maintenance of processes important to the species life cycle, genetic diversity and long-term evolutionary development:</u> The intended vegetation removal is unlikely to impact on the lifecycle of the species as no individuals were recorded breeding in the trees marked for removal. These trees are likely to be used only during flowering and contribute a minute foraging resource. In addition, the removal of the two eucalypts is unlikely to impede on the movement of the species across the landscape therefore would be unlikely to impact on gene flow and broader evolutionary development within the local population.

Likely impact on the ecology of the local population	<u>Breeding:</u> Breeding of the species typically coincides with flowering of eucalypt and mistletoe during spring and summer (Franklin et. Al. 1989). This species commonly maintains one nest site through their life span; however pairs have been recorded to change breeding sites over seasons. Territories may extend 5-40m form the nest tree (Higgins et al. 2001). The Mudgee-Wollar Priority Management Site has been mapped as a breeding area by DAW (DE. 2016). The species forms a cup shaped nest in the canopy of rough-barked apple (*Angophora spp*), Sheoaks (*Casuarina spp.*) and Ironbarks (*Eucalyptus spp.*) Although Yellow Box are considered a key tree species, the Regent Honeyeater is highly unlikely to utilise these trees for breeding as they are > 60 m from the potential foraging trees (DE, 2016). The Subject Land is also considered too degraded and exposed to support this species which is more likely to inhabit the surrounding area which contains more suitable and protected nest trees (DE, 2016). <u>Foraging:</u> The Regent Honeyeater primarily feeds on Eucalyptus and mistletoe nectar, as well as invertebrates and fruit (DE, 2016). They prefer tall, mature eucalypt species with large DBH. Three of the four Yellow Box trees mapped as an Important Area contain suitable DBH measurements and may be potential foraging trees. However, this is considered unlikely due to their isolation and the variety of foraging trees in the surrounding area. It is unlikely that the removal of the trees suitable for foraging will impact on the species foraging in the locality. <u>Roosting:</u> The species roosts in groups or large flocks in the canopy of trees or saplings with dense foliage. The trees on the Development Footprint are considered unsuitable due to their low canopy cover and isolation from suitable variation in the surrounding area. <u>Dispersal or movement:</u> Mature scattered trees are considered vital for the movement of the species throughout degraded agricultural areas. The two trees within the Development Footprint and the remnant woodland adjacent to the Development footprint do provide connection to higher quality habitat further to the west which forms part of Avisford Nature Reserve. Removal of 0.14 ha of vegetation is unlikely to significantly impact on the function of the remnant woodland as an agent for dispersal of the species across the landscape.
Fragmentation or isolation	The intended vegetation removal will not fragment or isolate a known population of the species or potential habitat for the species.
Relationship of local population to other populations of the species	Not applicable as the species considered a single population.
Increase threats (invasive flora and fauna) and indirect impacts	According to Ford et. Al (1993), regent honeyeaters nest together in groups to exclude larger honeyeater species from nearby foraging resources. Due to declining population these aggregations are rare resulting in an increase in competition for foraging resources from more aggressive species reducing the reproductive output of the species. The removal of two trees is unlikely to contribute to increased competition for nesting and foraging habitat. Furthermore, larger honeyeater species such as noisy miners were not recorded on during the survey period. The removal of trees may displace other species known to predate on regent honeyeater eggs such as the Australian Magpie. Though the species is known to occur on the Subject Land, it is unlikely to impact on predation as it likely frequents the surrounding area and in areas of higher quality habitat.
Estimate of the area or number of populations and size of populations	The extent of occurrence for the species is approximately 600,000km^2 in comparison to the area of occupancy is 300km^2 (TSSC, 2015). Both area of occurrence and occupancy are considered to be declining.
Measures to aid the recovery of the species in the IBRA subregion	The species is known to breed at Mudgee Priority Management Site, east of the Subject Land. This area is subject to active management and protection methods, fire planning, pest/weed management, restoration ecology and ongoing monitoring to assess threat status (DPIE, n.d.2)

6.2 Ecosystem Credits

Table 20: Ecosystem credit requirements, details the credit requirement for the vegetation zones that will be impacted by the development. The full credit report is provided in Appendix 3

6.3 Species Credits

Table 21 details the species credit requirements identified for the proposed development. The full credit report is provided in Appendix 3

Table 20: Ecosystem credit requirements

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
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW Southwestern Slopes Bioregion and Brigalow Belt South Bioregion												
4	281_Moderate	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, Southeastern Highland	32.7	32.7	0.4	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	8
5	281_ExoticGrassland	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, Southeastern Highland	14.9	14.9	22	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
											Subtotal	**8**
White Box grassy woodland in the upper slopes sub-region of the NSW Southwestern Slopes Bioregion												

1	266_Good	Not a TEC	38.3	38.3	1.9	PCT Cleared - 94%	High Sensitivity to Gain			2.50		45
2	266_DNGPoor	Not a TEC	4	4.0	5.3	PCT Cleared - 94%	High Sensitivity to Gain			2.50		0
3	266_DNGGood	Not a TEC	26.2	26.2	3.3	PCT Cleared - 94%	High Sensitivity to Gain			2.50		54
											Subtotal	**99**
											Total	**107**

Table 21: Species Credit Species Requirements

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Anthochaera phrygia / Regent Honeyeater (Fauna)									
266_Good	38.3	38.3	0.06	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Critically Endangered	Critically Endangered	True	2
266_DNGGood	26.2	26.2	0.07	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Critically Endangered	Critically Endangered	True	1
								Subtotal	**3**

7. Conclusion

This report has assessed the impact of the proposed Stage 14 subdivision at Lot 617 DP 1272616, Hone Creek Drive, Caerleon, NSW. The proposed works are to occur over approximately 30.7 ha within the broader Subject Land.

The Subject Land and Development Footprint is zoned R1 General Residential and MU1 Mixed Use. The extent of clearing required exceeds the clearing threshold (0.25 ha) prescribed under the Biodiversity Assessment Method 2020 (BAM 2020) and also impacts on land mapped as Biodiversity Values. A Biodiversity Development Assessment Report (BDAR) is therefore required to submit with the development application.

Two plant community types were identified in the Development Footprint of varying vegetation condition which resulted in five Vegetation Zones. The total area of native vegetation that will require removal for the development is 30.7 ha. This impact is recommended to be offset through purchase and retirement of appropriate ecosystem credits as described in this report.

An area of Biodiversity Values associated with biodiverse riparian land occurs in the west of the Subject Land and will be impacted as a result of the Development.

The Development Footprint contains vegetation that conforms to the CE TEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* as described under the *BC Act* and *EPBC Act*.

The Development Footprint contains entities they are considered to have Serious and Irreversible Impacts. These are the CE TEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland,* and habitat that is mapped for the CE Regent Honeyeater. Relevant information has been provided in this BDAR.

No threatened flora species were detected within the Development Footprint despite targeted survey by suitably qualified BAM accredited assessors and senior Botanist.

The targeted fauna survey failed to detect any threatened fauna on the Development Footprint.

Direct impacts of the proposal will be limited to vegetation and habitat removal of PCT 266 and PCT 281 which exists in a highly fragmented and degraded state. A number of mitigation measures will be implemented to reduce potential offsite impacts to adjacent habitat during the construction phase. Indirect impacts that may be associated with the proposal are considered to be minor and can be mitigated through the measures described in this report. Impacts of the proposed development will be offset through purchase and retirement of the appropriates ecosystem credits.

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Appendices

A-1 Site Vegetation List

Table 22: Flora species recorded on the Subject Land

Common Name	*Scientific Name*
Lesser Joyweed	*Alternanthera denticulata*
Wheatgrass	*Anthosachne scabra*
Greater Beggar's Ticks*	*Bidens subalternans*
Red Grass	*Bothriochloa macra*
Soft Brome*	*Bromus hordeaceus*
Knob Sedge	*Carex inversa*
Saffron Thistle*	*Carthamus lanatus*
Carraway	*Carum carvi*
Windmill Grass	*Chloris truncata*
Flaxleaf Fleabane*	*Conyza bonariensis*
Kidney Weed	*Dichondra repens*
Umbrella Grass	*Digitaria divaricatissima*
Goose Grass*	*Eleusine tristachya*
Paddock Lovegrass	*Eragrostis leptostachya*
Weeping Lovegrass	*Eragrostis parviflora*
White Box	*Eucalyptus albens*
Blakey's Red Gum	*Eucalyptus blakelyi*
Yellow Box	*Eucalyptus melliodora*
Star Cudweed	*Euchiton sphaericus*
Cudweed*	*Gamochaeta calviceps*
Small St John's Wort	*Hypericum gramineum*
Austral Rush	*Juncus australis*
Finger Rush	*Juncus subsecundus*
Prickly Lettuce*	*Lactuca serriola*
Common Peppercress*	*Lepidium africanum*
Argentine Peppercress*	*Lepidium bonariense*
Scarlet Pimpernel*	*Lysimachia arvensis*
Native Pennyroyal	*Mentha satureioides*
Weeping Grass	*Microlaena stipoides*
Red-flowered Mallow*	*Modiola caroliniana*
Grassland Wood-sorrel	*Oxalis perennans*
Chilean Whitlow Wort*	*Paronychia brasiliana*
Shotgrass	*Paspalidium distans*
Paspalum*	*Paspalum dilatatum*
Proliferous Pink*	*Petrorhagia nanteuilii*
Lamb's Tongues*	*Plantago lanceolata*

Common Name	*Scientific Name*
Swamp Dock	*Rumex brownii*
Ringed Wallaby Grass	*Rytidosperma caespitosum*
Slender Rat's Tail Grass	*Sporobolus creber*
Hop Clover*	*Trifolium campestre*
Subterranean Clover	*Trifolium subterraneum*
Purpletop*	*Verbena bonariensis*
Rat's Tail Fescue*	*Vulpia myuros*
Bathurst Burr*	*Xanthium spinosum*
*Exotic Species	

A-2 Site Fauna List

Table 23: Fauna species recorded during surveys.

Common Name	Scientific Name
Amphibian	
Peron's tree frog	*Litoria peronii*
Avian	
Australian king parrot	*Alisterus scapularis*
Australian wood duck	*Chenonetta jubata*
Little crow	*Corvus bennetti*
Black swan	*Cygnus atratus*
Galah	*Eolophus roseicapilla*
Brown falcon	*Falco berigora*
Australian hobby	*Falco longipennis*
Magpie-lark	*Grallina cyanoleuca*
Australian Magpie	*Gymnorhina tibicen*
Rufous songlark	*Megalurus mathewsi*
White-naped honeyeater	*Melithreptus lunatus*
Eastern rosella	*Platycercus eximius*
Red-rumped parrot	*Psephotus haematonotus*
Willie wagtail	*Rhipidura leucophrys*
Common starling	*Sturnus vulgaris*

A-3 Biodiversity Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00042990/BAAS23020/23/00042991	Stage 14 Caerleon	22/06/2023
Assessor Name	Report Created	BAM Data version *
Lachlan Gerald Webster	26/09/2023	61
Assessor Number	BAM Case Status	Date Finalised
BAAS23020	Finalised	26/09/2023
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map and area clearing threshold

* 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

Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
4	281_Moderate	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	32.7	32.7	0.4	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	8

5	281_Exotic Grassland	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	14.9	14.9	22.3	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
											Subtotal	**8**
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion												
1	266_Good	Not a TEC	38.3	38.3	1.9	PCT Cleared - 94%	High Sensitivity to Gain			2.50		45
2	266_DNGPoor	Not a TEC	4	4.0	5.3	PCT Cleared - 94%	High Sensitivity to Gain			2.50		0

3	266_DNG Good	Not a TEC	26.2	26.2	3.3	PCT Cleared - 94%	High Sensitivity to Gain			2.50		54
											Subtotal	**99**
											Total	**107**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Anthochaera phrygia / Regent Honeyeater (Fauna)									
266_Good	38.3	38.3	0.06	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Critically Endangered	Critically Endangered	True	2
266_DNGGood	26.2	26.2	0.07	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Critically Endangered	Critically Endangered	True	1
								Subtotal	**3**

A-4 Biodiversity Credit Report (like-for-like)

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00042990/BAAS23020/23/00042991

Proposal Name
Stage 14 Caerleon

BAM data last updated *
22/06/2023

Assessor Name
Lachlan Gerald Webster

Assessor Number
BAAS23020

BAM Data version *
61

Proponent Names

Report Created
26/09/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
26/09/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Species
Anthochaera phrygia / Regent Honeyeater

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Grantiella picta / Painted Honeyeater

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	10.5	45	54	99
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	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	22.7	8	0	8

266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Western Slopes Grassy Woodlands This includes PCT's: 201, 266, 276, 277, 282, 283, 337, 426, 441, 483, 847, 3394, 3397, 3404, 3405	Western Slopes Grassy Woodlands >=90%	266_Good	Yes	45	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Western Slopes Grassy Woodlands This includes PCT's: 201, 266, 276, 277, 282, 283, 337, 426, 441, 483, 847, 3394, 3397, 3404, 3405	Western Slopes Grassy Woodlands >=90%	266_DNGPoor	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Western Slopes Grassy Woodlands This includes PCT's: 201, 266, 276, 277, 282, 283, 337, 426, 441, 483, 847, 3394, 3397, 3404, 3405	Western Slopes Grassy Woodlands >=90%	266_DNGGood	No	54	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654,	-	281_Moderate	Yes	8	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298,	-	281_ExoticGrassland	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Anthochaera phrygia / Regent Honeyeater	**266_Good, 266_DNGGood**	0.1	3.00

Credit Retirement Options

Like-for-like credit retirement options

Anthochaera phrygia / Regent Honeyeater	Spp	IBRA subregion
	Anthochaera phrygia / Regent Honeyeater	Any in NSW

A-5 Project Team CV's

Our people

Lachlan Webster

Senior Ecologist

BAM Accreditation:#BAAS23020

Professional profile

Lachlan is a BAM Accredited Assessor who has been employed at Biodiversity Australia since 2020 as a Senior Ecologist and has seven years' experience in terrestrial and aquatic fauna and flora management across numerous projects within the NSW and Queensland regions. He has experience in fauna habitat assessments and ecological surveys, the ability to analyse data, produce maps and author technical reports. Lachlan has knowledge of local legislation within NSW and QLD and is able to accurately identify flora and fauna within both regions.

Lachlan has worked in remote sites throughout New South Wales in both the greater Sydney region and Central Coast along with Southeast Queensland where he has developed ecological survey skills and has a solid knowledge of monitoring and research methodology. Additionally he is a capable liaison with stakeholders having undertaken several projects working with government and local councils. Lachlan demonstrates strong field skills and is adept at leading teams in both land and aquatic environments.

Qualifications, Certifications and Memberships

• Bachelor of Marine Biology (Honours)	University of Technology, Sydney	2014
• TransQual 4WD & Recovery Training		
• Australian Chemical Accreditation		
• Construction White Card		
• Advanced Open Water SCUBA		
• QLD Recreational Boat Licence		
• Senior First Aid & CPR		
• BAM Accreditation# BAAS23020		

Career summary

Senior Ecologist	Biodiversity Australia	2020-Current
Aquatic Ecologist	FRC Environmental	2018-2020
Senior Ecologist	Ecosurveys	2015-2020
Bush Regenerator	Hills Bush Care	2016-2018
Research Assistant	Charles Sturt University	2015-2017
Environmental Water Manager	NSW Department of Planning, Industry & Environment	2015

Professional Experience & Volunteer Work

Aquatic Ecologist
FRC Environmental (2018-2020)

Tasks

- Managed a range of aquatic based projects in both marine and freshwater environments
- Strong field skills leading small teams in land and vessel-based projects often requiring up to 10-12-hour days
- Collecting and analysing water samples requiring strong QA/QC and attention to detail
- Liaised with a wide range of clients including governments departments, councils, private companies and landholders
- Analysed data produced maps and authored technical reports.
- Identification marine and freshwater fish, aquatic plants, macroinvertebrates and turtles
- Data management and analysis using Microsoft excel and PRIMER
- Reporting on compliance, impact assessment and ecosystem health
- Knowledge of relevant legislation with QLD government

Senior Ecologist
Ecosurveys Tamborine (2015-2020)

Tasks

- Managed a range of ecosystem monitoring and impact assessment projects for several NSW Government agencies
- Responsible for submitting proposals, collecting field data, data management and reporting.
- Liaised with and provided advise to a range of government agencies and industry experts during projects
- Reporting on ecosystem health, impact assessment including EIS
- Knowledge of relevant NSW legislation
- Identification of NSW Flora and Fauna (including, Birds, Mammals and Amphibians)

Bush Regenerator
Hill Bush Care (2016 - 2018)

Tasks

- Delivered a range of ecological restoration projects across the greater Sydney Region
- Gained understanding of principals of ecosystem restoration in terrestrial and aquatic environments
- Applied restoration techniques and led small teams to achieving restoration outcomes for a number of local government and state government initiatives
- High level of physical fitness

Research Assistant
Charles Sturt University (2015 - 2017)

Tasks

- Assisted with long term intervention programs – a multi-institutional project quantifying impact of environmental water allocation

- Contributed to collecting data pertaining to response of aquatic vegetation along the Edward-Wakool River Catchment
- Knowledge of Aquatic Vegetation of Central NSW
- Experience in Natural Resource Management and Water Management for the environment

Environmental Water Manager
NSW Department of Planning, Industry and Environment (2015)

Tasks

- Assisted with the delivery of environmental water projects within the central Murray River Catchment
- Organised field logistics, collected data and authored technical reports
- Liaised with a range of stakeholders including government, council and local landholders
- Provided advice and project updated at advisory group meetings