Oakdale Rezoning Project

Biodiversity Development Assessment Report

FINAL REPORT

Prepared for Colliers International Engineering and Design Pty Ltd

28 February 2025

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Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work.

We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.

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Glossary

Assessment Area	All land within 1500 m of a subject land
BAM	NSW Biodiversity Assessment Method 2020
BAM-C	BAM Calculator
BC Act	*Biodiversity Conservation Act 2016*
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
Biosecurity Act	*Biosecurity Act 2015*
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CM Act	*Coastal Management Act 2016*
Coastal Management SEPP	NSW State Environmental Planning Policy (Coastal Management) 2018
CoC	Conditions of Consent
DA	Development Application
Cth DCCEEW	Australian Commonwealth Department of Climate Change, Energy, the Environment and Water
DBH	Diameter at Breast Height
DCDB	Digital cadastral database
Development footprint	The area of land that is directly impacted by the proposal
Subject land	The broader area in which the subject land is located.
DoIW	Directory of Important Wetlands
DP	Deposited Plan
DPI	NSW Department of Primary Industries
DTDB	Digital topographic databases
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
Ecosystem credit species	Threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.
EEC	Endangered Ecological Community
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystem

GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	Area located within 10 km radius from the subject land
LPI	NSW Land and Property Information
MNES	Matters of National Environmental Significance protected by a provision of Part 3 of the *EPBC Act*
NPW Act	*National Parks and Wildlife Act 1974*
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SALIS	NSW Soil and Land Information System
SEARs	Secretary's Environmental Assessment Requirements
SEPP	NSW State Environmental Planning Policy
SIS	Species Impact Statement
Species credits	A class of biodiversity credits required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
Species credit species	Threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, the proponent may elect to assume the species is present for development/clearing projects only.
Subject land	The areas within or the combined areas of the subject land, and any indirect and prescribed impacts.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
TPZ	Tree Protection Zone
VEC	Vulnerable Ecological Community
WM Act	*NSW Water Management Act 2000*
WHS	Work Health and Safety

Certification and declarations

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

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

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

Signature:	R.Goodwin
Date:	28/02/2025
BAM Assessor Accreditation Number:	BAAS17067

Summary

Gyde, on behalf Morehuman, proposes to undertake a planning proposal preliminary rezoning 1838 Barkers Lodge Road, 1455 and 1475 Burragorang Road, Oakdale, New South Wales (Lot 1, 2, and 6 DP 73456) which will require vegetation clearing, civil works and landscaping (Figure 1).

The intended outcome of the Planning Proposal is to amend the applicable local planning controls to accommodate up to 185 new residential dwellings with a variety of scale and character reflective of the dominant dwelling type in the Oakdale locality, as well as Community Open Space and a Conservation Area. An indicative draft Master Plan has been developed by Colliers International Engineering and Design Pty Ltd that is reflective of the site's opportunities and constraints in the areas of biodiversity, bushfire management, and stormwater management.

The proposal is based on a significantly revised concept subdivision which responds to feedback from Council, Government agencies and community stakeholders in response to preliminary notification of the planning proposal.

The key changes to the planning proposal are summarised as follows.

- Retention of an additional 195 trees across the site including 4 additional hollow-bearing trees.
- 19-29% reduction in development footprint impacts to two Critically Endangered Ecological Communities (CCECs).
- 11% reduction in lot yield (from 208 to 185).
- Inclusion of a cap of 22 small lots (i.e. lot size between 300m2 and 450m2) by way of a site specific LEP clause.
- Application of 700 m2 minimum lot size to northern residential precinct and lots directly adjoining 1830 Barkers Lodge Road.
- Designating the site an urban release area in accordance with Part 6 of the LEP (thereby requiring the availability of public utility infrastructure and preparation of site-specific development controls prior to the granting of development consent).
- Rationalisation of proposed zones, with all environmental land to be zoned C2 Environmental Conservation.
- Stormwater basins and conservation land to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.

The subject land is approximately 21.98 hectares in size, of which:

- 15.05 ha is proposed to be zoned R2 (Low Density Residential), with this area generally inclusive of all required Asset Protection Zones (APZ).
- 7.40 ha of intact native vegetation is proposed to be zoned C2 (Environmental Conservation).
- Approximately 443 mature remnant native trees are proposed for retention.
- 0.47 ha is proposed to include two Detention Basins. A large number of mature remnant native trees within this area are also currently proposed for retention.

A summary of the key changes and reduction in impacts to biodiversity values, based on a comparison of the 2024 development footprint and the current development footprint, has been provided in Table 1.

Table 1 Summary of biodiversity values and impacts

Biodiversity values	Development site /Subject site	Previous development footprint impacts (2024)	Current development footprint impacts (2025)
PCT 3262 Sydney Turpentine Ironbark Forest (CEEC)	2.69	0.07	0.05
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest (CEEC)	5.02	3.01	2.45
PCT 3616 - Sydney Hinterland Grey Gum Transition Forest	5.27	3.74	3.33
Hollow bearing trees	9	4	0
Individual trees to be retained/removed	760	478	283
Cumberland Plain Land Snail habitat	12.98	6.82	5.83
Southern Myotis habitat	11.29	5.52	0.53
Powerful Owl habitat	3.32	1.2	0.53

The land proposed C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.

The project is considered local development and will be assessed under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). The land is zoned as RU1 – Primary Production and R2 – Low Density Residential under the *Wollondilly Local Environmental Plan 2011* (LEP) and has a clearing threshold of 0.5 hectares. Vegetation within the subject land is designated within the Biodiversity Values Map (DPE 2022a) and as such the removal of vegetation triggers the Biodiversity Offsets Scheme (BOS), and an assessment is required in accordance with the *NSW Biodiversity Assessment Method* (BAM) (DPIE 2020a) and the NSW *Biodiversity Conservation Act 2016* (BC Act). This Biodiversity Development Assessment Report (BDAR) has been prepared by Accredited Assessor Rebecca Goodwin (BAAS17067), Joel Nicholson, Paul Price, Todd Horton, and Julia Hutton to accompany the Planning Proposal. This BDAR describes the outcome of the development assessment case (BAM-C 42951) conducted consistent with the BAM.

Field investigation, undertaken in accordance with the BAM, recorded 12.98 hectares of native vegetation within the subject land, representing four threatened ecological communities (TEC) listed as Critically Endangered Ecological Communities (CEEC) under the BC Act and the Commonwealth *Environment Planning and Biodiversity Conservation Act 1999* (EPBC Act):

- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, BC Act).
- Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (CEEC, BC Act).
- Shale Sandstone Transition Forest of the Sydney Basin Bioregion (CEEC, EPBC Act).
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion (CEEC, EPBC Act).

The vegetation integrity (VI) score of the vegetation to be impacted was calculated as 53.8 for Plant Community Type (PCT) 3321 low condition, 46.3 for PCT 3616 low condition, 30.2 for PCT 3616 scattered tree condition, and 48.5 for PCT 3262 underscrubbed condition. The VI score was also calculated for PCT 3321 in a

high condition (75.4), which represented a transition zone between two PCTs. Two threatened species listed as species credit species for this proposal, Cumberland Plain Land Snail *Meridolum corneovirens* and Southern Myotis *Myotis macropus*, were recorded within the subject land, and one large forest owl, Powerful Owl *Ninox strenua* were assumed present (with winter roosting surveys to be completed in 2024 to determine presence/absence). Due to the limited availability of habitat within the subject land, large home range, and the biodiversity risk weighting being identical for each species (2.0), species credits have been calculated for only one of the Large Forest Owl species. Powerful Owl has been selected as the candidate species for this group of species based on the number of detection records within the locality, type of vegetation and habitat available within the subject land. Four additional threatened microbat species were detected incidentally during targeted surveys, Large-eared Pied Bat *Chalinolobus dwyeri*, Large Bent-winged Bat *Miniopterus orianae oceanensis*, Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*, Greater Broad-nosed Bat *Scoteanax rueppellii*. The additional four microbats incidentally detected do not have breeding habitat onsite, as such, the proposed impacts will be restricted to foraging resources. As such, in accordance with Section 10 of the BAM, offsets are required to be secured for the proposed development.

Avoidance of native vegetation, TEC and threatened species habitat have been undertaken through substantially pulling back the initial development footprint from the south eastern areas of the subject land that contain high condition intact native vegetation, redesigning the development footprint to avoid habitat trees and high quality foraging resources for threatened species to restrict impacts to 5.83 hectares of native vegetation within the development footprint. Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and preliminary design. The Master Plan is the result of a lengthy investigative and assessment process to avoid and minimise impacts on biodiversity values at the regional scale, site scale, and project scale. Field-based vegetation and habitat assessments, and targeted surveys for threatened flora and fauna were used to determine the areas of high biodiversity value within the subject land. The results of these assessments were incorporated into each stage of the development footprint design process to avoid impact to high quality biodiversity values within the subject land and the locality. Additional planning has already commenced to further avoid and minimise impacts at the staging scale, with these details to be lodged with the development application. Mitigation and management measures will also be put in place to adequately address impacts associated with the proposal, both direct, indirect and prescribed, including the implementation of a Vegetation Management Plan (VMP) and Construction Environmental Management Plan (CEMP). The VMP will address the conservation and mitigation of impacts (direct, indirect and prescribed) to the development footprint, including a C2 management zone retaining the high quality vegetation in the subject land. The CEMP will address the mitigation of impacts such as noise, light, air pollution and outline the protection protocols in place for native vegetation and protected species protection.

The biodiversity assessment has conservatively assumed for the purpose of assessment and calculation of impacts that all land within the development footprint, including road verges, and private spaces would be completely cleared of all native vegetation, with the exception of the proposed retention of approximately 443 trees within the subject land. It should be noted that this is an overestimation of the extent of impacts across 21.98 hectares of land. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at Development Application (DA) stage to facilitate the further retention of trees and habitat features within the development. Of importance for assessment, the potential for underestimation of impacts is substantially less than the overestimation of impacts that has been incorporated into the assessment.

At this design level there is necessarily some uncertainty over the extent of indirect impacts, and extent of off-site impacts. Reasonable and justified assumptions have been made on the basis of known information and in consultation with relevant experts on the project team. Indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this

BDAR including implementation of a Construction Environmental Management Plan (CEMP) and VMP (Restore Environmental 2024). Therefore, offsets for indirect impacts are not anticipated to be required for the project.

An assessment against Serious and Irreversible Impacts (SAII) has been prepared for *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* and *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion*. These assessments concluded that the project is unlikely to contribute significantly to the risk of extinction to the two CEECs, in regards to Clause 6.7 of the BC Regulation, if the mitigation measures provided in this report are implemented. In particularly, given impacts to the Shale Sandstone CEEC equate to 30.21 % reduction of the local occurrence of the CEEC, further retention of canopy trees is recommended within the detailed design to reduce the overall impacts to this SAII entity within the locality.

The subject land includes marginal foraging habitat for Large-eared Pied Bat, and a significant impact criteria (SIC) assessment has been prepared for impacts to these species. The Large-eared Pied Bat was detected incidentally on the ultrasonic bat detectors deployed for the threatened fauna surveys in January 2024. The project is not considered likely to result in a significant impact to species or communities listed under the EPBC Act, and as such a referral to the Minister of the Environment and Energy is not required.

Two SIC assessments were completed for the TECs *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* and *Turpentine-Ironbark Forest of the Sydney Basin Bioregion*. The project is considered likely to result in a significant impact to one TEC, *Shale Sandstone Transition Forest of the Sydney Basin Bioregion*, listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and as such a referral to the Minister of the Environment and Energy is required. However, it should be noted that, further avoidance of impacts to Shale Sandstone Transition Forest CEEC (PCT 3321) within the development footprint will be undertaken at DA stage including the retention of approximately 443 trees within the subject land, and a revised SIC should be prepared to consider these avoidance measures once finalised.

This BDAR is a preliminary document prepared for the purpose of a Planning Proposal, so the assessment has not been finalised or submitted within BOAMs.

The extent of impact to be offset would be re-calculated on the basis of final detailed plans at the DA stage. Risk associated with changing legislation, species listings and presence, credit calculations and credit pricing is common to all strategic planning decisions which necessarily rely on unfinalised BDARs.

Sufficient information has been provided to confidently assess project merits and feasibility for rezoning.

The credit summaries in Table 2 and Table 3 below were calculated on 28 February 2025.

Table 2 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Credit requirement
3321_Low	2.36	79
3321_High	0.09	4
3616_ScatteredTrees	0.20	3
3616_Low	3.13	63
3262_Underscrubbed	0.05	2
Total		**151**

Table 3 Offsets required (species credits)

Species	Area (ha)	Credit requirement
Cumberland Plain Land Snail	5.83 ha in development footprint	142
Southern Myotis	4.58 ha in development footprint	114
Powerful Owl	0.53 ha in development footprint	14
Total		**270**

Stage 1 – Biodiversity assessment

1 Introduction

Biosis Pty Ltd was commissioned by Gyde on behalf of Morehuman to undertake a biodiversity assessment of a planning Proposal at 1838 Barkers Lodge Road, 1455 and 1475 Burragorang Road, Oakdale, NSW (the subject land).

The purpose of this assessment was to apply the NSW BAM (DPIE 2020a) to the proposed Planning Proposal, and provide Colliers International Engineering and Design Pty Ltd with a BDAR to support the Planning Proposal for the project. The BDAR is to be submitted to Wollondilly Shire Council (Council) as part of a Planning Proposal under Part 4 of the EP&A Act, for the proposed development.

1.1 Project description

Gyde, on behalf of Morehuman, proposes to undertake a Planning Proposal to amend the applicable local planning controls across 1838 Barkers Lodge Road, 1455 and 1475 Burragorang Road, Oakdale, NSW (Lot 6, Lot 2, and Lot 1 DP 734561, respectively) (Figure 1). The objective of the Planning Proposal is to create a residential community embodying strong conservation principles to support the enhancement of the unique environmental characteristics of the site.

The intended outcome of the Planning Proposal is to amend the applicable local planning controls to accommodate up to 185 new residential dwellings with a variety of scale and character reflective of the dominant dwelling type in the Oakdale locality, as well as Community Open Space and a Conservation Area.

An indicative draft Master Plan has been developed by Colliers International Engineering and Design Pty Ltd that is reflective of the site's opportunities and constraints in the areas of biodiversity, bushfire management, and stormwater management.

Associated works within the subject land shall encompass the removal of trees and vegetation clearing, civil works, and landscaping. Additional activities to be included within the subject land include 6.88 hectares of intact native vegetation zoned C2 (Environmental Conservation).

The project has been assessed as triggering the NSW BOS through the removal of land designated within the Biodiversity Values Map (DPE 2022a) and native vegetation above the clearing threshold. The NSW BC Act requires that the BAM be applied to all proposals that trigger the BOS, and that a BDAR is required to be submitted to the approval authority.

1.2 Purpose of this assessment

This BDAR will:

- Address the BAM (DPIE 2020a) and the BOS.
- Identify how the proponent has avoided and minimised impacts to biodiversity.
- Identify any potential impact that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impact resulting from the proposed development.

- Consider and assess the proposal in accordance with other relevant legislation such as the Commonwealth EPBC Act.

All biodiversity assessments have been undertaken in accordance with the BAM, and this BDAR has been prepared and reviewed by Accredited Assessor Rebecca Goodwin (BAAS17067). This BDAR describes the outcome of the development assessment case (BAM-C 42951) conducted consistent with the BAM.

1.1 The subject land, development footprint and assessment area

The terms subject land, development footprint and assessment area are used throughout this BDAR and are defined below.

- The subject land is located 165 km southwest of the Sydney Central Business District Central Business District (CBD) within the Oakdale township. The land is in the Wollondilly Shire Council Local Government Area (LGA) and the Greater Sydney Local Land Services (LLS) Region and is zoned as RU1 – Primary Production and R2 – Low Density Residential under the Wollondilly Local Environmental Plan 2011 (LEP). The subject land is approximately 21.98 ha and defined as the region confined to the total area of the following lots:
  - 1838 Barkers Lodge Road – Lot 6 DP 734561
  - 1455 Burragorang Road – Lot 2 DP 734561
  - 1475 Burragorang Road – Lot 1 DP 734561
- The development footprint is approximately 14.10 ha in area and comprises the extent of the proposed residential zoning, associated infrastructure and asset protection zone (APZ).
- 6.88 ha of intact native vegetation zoned C2 (Environmental Conservation), will also be managed and protected in perpetuity under a Vegetation Management Plan (Restore Environmental Consultants 2024).
- The assessment area includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land.

1.3 Sources of information

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

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

- Australian Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife, NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), for species, populations and ecological communities listed under the BC Act.
- NSW BAM Calculator.
- Biodiversity values map (DPE 2023a).
- Native vegetation regulatory map.
- BAM Important Areas maps (DPE 2022b).

- PlantNET (The Royal Botanic Gardens and Domain Trust).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.

Other sources of biodiversity information relevant to the assessment area were sourced from:

- The NSW PCTs, as held within the BioNet Vegetation Classification database (NSW DCCEEW 2024a).
- NSW State Vegetation Type Map (DPE 2023b)

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

- Barkers Lodge Road Oakdale Planning Proposal Stage 1 Base Mapping (Black Ash Bushfire Consulting 2024).
- Oakdale Rezoning Project - Arboricultural Impact Appraisal and Method Statement (Naturally Trees 2024).
- Oakdale Rezoning Project - Vegetation Management Plan, Oakdale NSW (Restore Environmental Consultants 2024).

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases (DTDB), with cadastral data obtained from LPI digital cadastral database (DCDB).

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

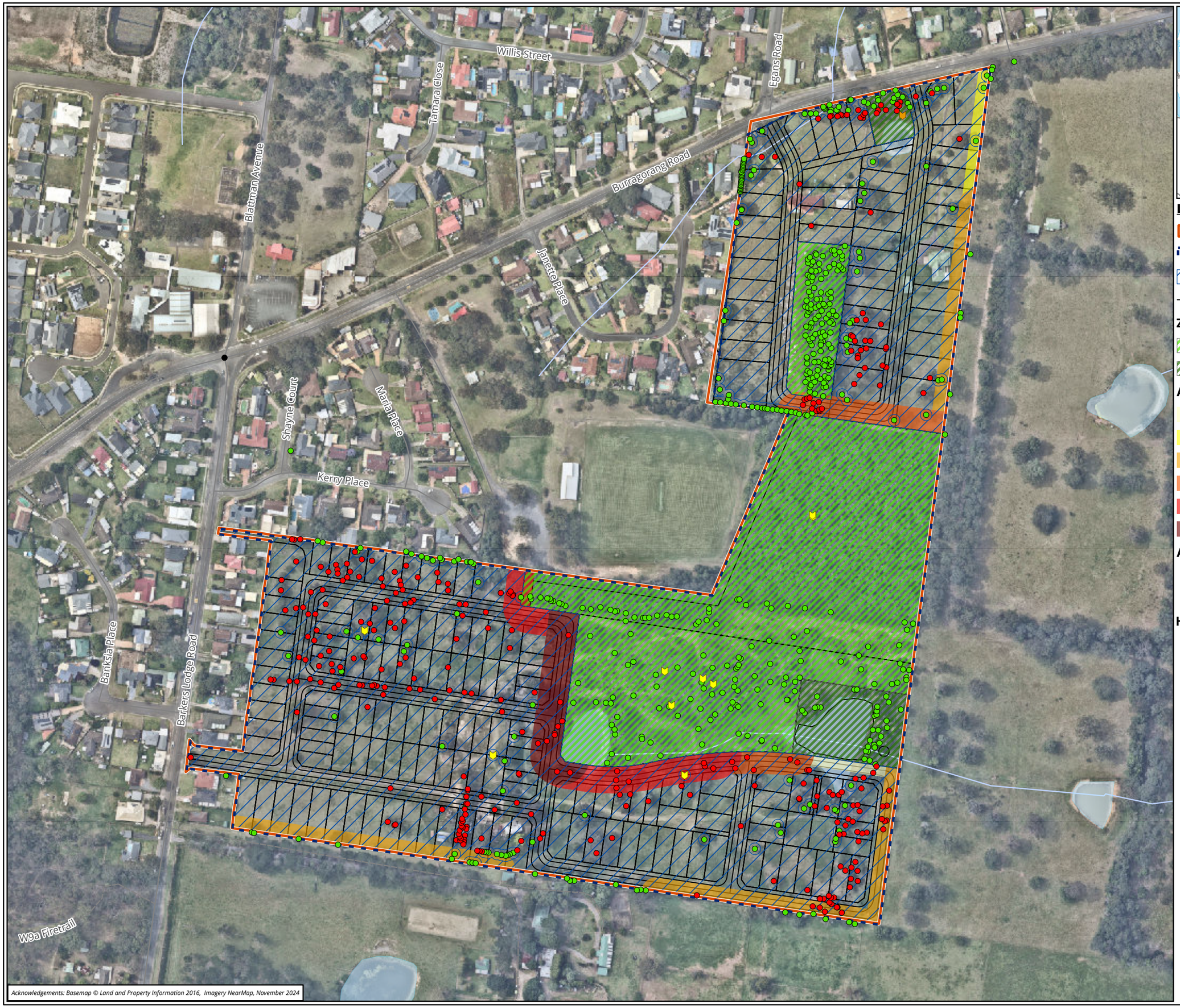
- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- Native Vegetation Map associated with the NSW State Vegetation Type Map (DPE 2023b).
- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (NSW DCCEEW 2024a).
- NSW Soil and Land Information System (SALIS).
- Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:
- Digital mapping with aerial photography showing 1:1000 or finer.
- Site map as described in subsection 3.1.1 of the BAM (DPIE 2020a).
- Location map as described in subsection 3.1.2 of the BAM (DPIE 2020a).
- Landscape map with features including 1,500 m buffer, as described in section 3.1.3 of the BAM (DPIE 2020a).

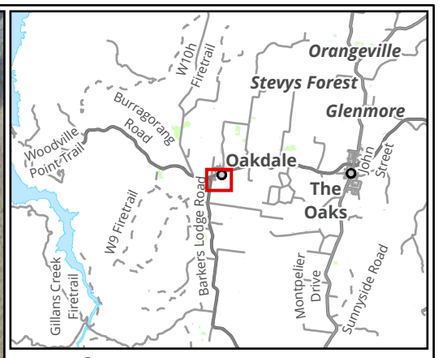
1.4 Legislative requirements

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

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

- *Biodiversity Conservation Act 2016.*
- *Fisheries Management Act 1994.*
- *Biosecurity Act 2015.*
- *State Environmental Planning Policy (SEPP) (Biodiversity and Conversation) 2021.*
- *Wollondilly Local Environmental Plan (LEP) 2011.*
- *Wollondilly Development Control Plan (DCP) 2016.*





Legend

- Subject land
- Development site
- Development footprint
- Proposed works - Subdivision plan

Zoning

- C2 - Conservation
- Detention basin

Asset Protection Zones (APZ)

- APZ - 9m
- APZ - 10m
- APZ - 12m
- APZ - 19m
- APZ - 23m
- APZ - 26m

Arborist trees

- Tree - To be removed
- Tree - Not impacted

Hollow-Bearing Trees

- Hollow-Bearing Tree - To be removed
- Hollow-Bearing Tree - Not impacted

Figure 1 Subject land

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 20 February 2025,
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F1-4.aprx
Layout: 39765_F1_SubjectLand

Acknowledgements: Basemap © Land and Property Information 2016, Imagery NearMap, November 2024

2 Landscape context

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

2.1 Subject land description

The subject land is situated within the semi-rural suburb of Oakdale within the Wollondilly Shire LGA, located 165 kilometres Southwest of the Sydney CBD. The area is primarily zoned as RU1 with two small sections as R2 under the LEP with the land currently used for semi-rural housing and livestock agriculture.

The subject land is approximately 21.98 hectares, primarily consisting of both thinned and intact native vegetation with large areas of cleared canopy consisting of both exotic and native grassland, with a few sections of housing infrastructure.

The subject land is within the Wollongong-Port Hacking 1:100k soil landscape and is entirely mapped as the Blacktown landscape (Hazelton & Tille 1990).

The Blacktown landscape is characterised by gently undulating rises on Wianamatta Group. The soil is shallow to moderately deep Red Podzolic Soils and Brown Podzolic Soils on crests, upper slopes and well-drained areas, deep Yellow Podzolic Soils and Soloths on lower slopes and in drainage depressions and localised areas of poor drainage. Vegetation consists of almost completely cleared tall open forest (wet sclerophyll forest), open forest and woodland (dry sclerophyll forest). Common Canopy species for the area include remnant Sydney Blue Gum *Eucalyptus saligna* and Blackbutt *Eucalyptus pilularis* in higher rainfall areas, with pockets of original woodlands and open forests in drier areas remain to the west and including Forest Red Gum *Eucalyptus tereticornis* and Grey Box *Eucalyptus microcarpa*.

2.1.1 Native vegetation cover

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

The total area of the 1,500 metre buffer around the subject land is 1093 hectares, with the area of native vegetation mapped within the buffer being 683.47 hectares. This is a native vegetation cover of 62.5% (30–70% class as defined in Section 3.2.3 of the BAM (DPIE 2020a)) and this value was entered into the BAM calculator.

2.1.2 IBRA Bioregions and subregions

The assessment area occurs within the Sydney Basin IBRA bioregion and the Burragorang IBRA subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of approximately 3,624,008 hectares. It occupies about 4.53 % of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the central coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the North Coast and Brigalow Belt South bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (DPE 2016a).

2.1.3 Rivers and streams

The subject land is located within the Greater Sydney Local Land Services Region and the Hawkesbury catchment. The closest river-mouth is the Nattai and Wollondilly Rivers located approximately 6.5 kilometres to the west of the subject land. The closest major waterbody is Gillans Creek, located approximately 800 metres to the southwest of the site.

The subject land contains two unnamed watercourses, with two man-made dams in the southern lot and a third near the northern border. The two unnamed first order watercourses (Strahler 1964) flow north east of the subject land where they join the third order watercourse, Back Creek (Figure 3). The two watercourses did not contain water during the survey periods and the riparian area was determined to be in a low degraded condition due to a lack of native terrestrial and aquatic vegetation, the dominance of exotic weed species within the inner riparian zone, and regular disturbance from mechanical trimming and agricultural practices.

There are no Key Fish Habitats as mapped by the NSW Department of Primary Industries (DPI) within the subject land (DPI 2013). Key fish habitat is located at Back Creek approximately 1.8 kilometres downstream of the two water ways mapped on site.

2.1.4 Wetlands

No areas of the subject land, and development footprint, are mapped as a Wetland in the DoIW of Australia (DCCEEW 2004).

2.1.5 Connectivity

The primary connectivity features of the subject land consist of a small patch of native vegetation in the eastern section of the subject land, that has two moderately intact thin corridors leading to the west and north of the subject land. These connectivity features provide breeding, foraging and dispersal resources for terrestrial and arboreal mammals, flying mammals, and avifauna. Habitat fragmentation occurs across the subject land, however connectivity is preserved through bushland extending east towards riparian vegetation associated with Back Creek. Across the broader landscape, the subject land exists on the fringes of Burragorang State Conservation area extending north-west of the subject land.

Aquatic habitat corridors for fish and amphibian species across the subject land includes the unnamed second order watercourse and associated tributaries. Given the extent of modification to habitats along the first and second order waterways identified as being interrupted by the series of inline dams, most particular the barrier to fish passage presented by the dams, there is limited available connectivity along these specific drainage lines. The Vegetated Riparian Corridors (VRZ) within the subject land is degraded may provide minimal movement and dispersal areas for semi-terrestrial species, such as amphibians (Figure 2).

2.1.6 Geological features of significance

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land or within the assessment area. A broader search using LIDAR and available datasets did not locate cliffs within two kilometres of the subject land.

2.1.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity or biodiversity values mapped within the subject land (NSW DCCEEW 2024b).

2.1.8 NSW (Mitchell) Landscape

The subject land occurs within the Silverdale Slopes and Nattai Plateau Mitchell soil Landscapes. The Silverdale Slopes landscape is defined by undulating slopes descending to the east on gently dipping Triassic shales at an elevation between 230 - 630 metres. It is categorised by brown to yellow-brown texture-contrast soils that support woodland to forest with a shrubby understorey (Department of Environment & Climate Change NSW 2002). The Nattai Plateau landscape consists of steeply dissected plateau remnants on lower Triassic lithic sandstone, shale and tuff, with abundant rock outcrops, cliffs and steep debris slopes. The landscape occurs at an elevation of 600 – 700 metres on shallow sand and occasional yellow texture-contrast soils.

2.1.9 Additional landscape features

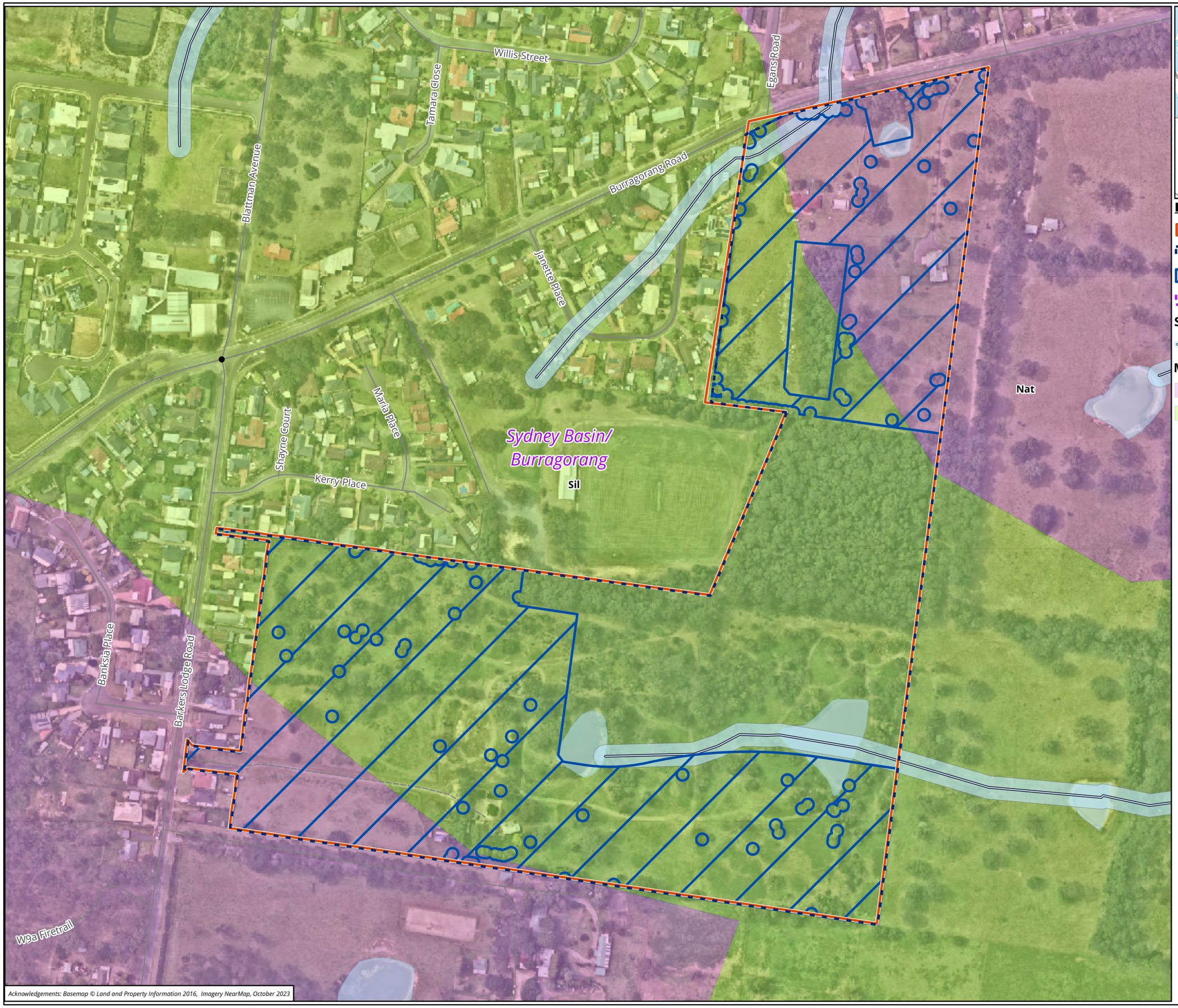
No additional landscape features were identified within the subject land.

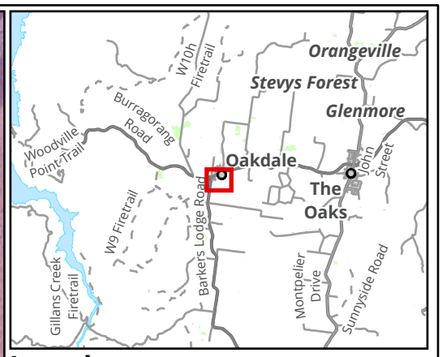
2.1.10 Hydrology

The site is not mapped as having Groundwater Vulnerability (LEP).

2.1.11 Mapped Important Area

The subject land is not within a mapped Important Area (DPIE 2022).





Legend

- Subject land
- Development site
- Development footprint
- IBRA Region/Sub-region

Strahler stream order / buffers

- 1

Mitchell landscapes

- Nat, Nattai Plateau
- Sil, Silverdale Slopes

Acknowledgements: Basemap © Land and Property Information 2016, Imagery NearMap, October 2023

Figure 2 Site map

0 20 40 60 80 100

Metres

N

Scale: 1:3,000 @ A3

Coordinate System:
GDA2020 MGA Zone 56

biosis

APEM Group

Matter: 39765, Date: 20 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F1-4.aprx
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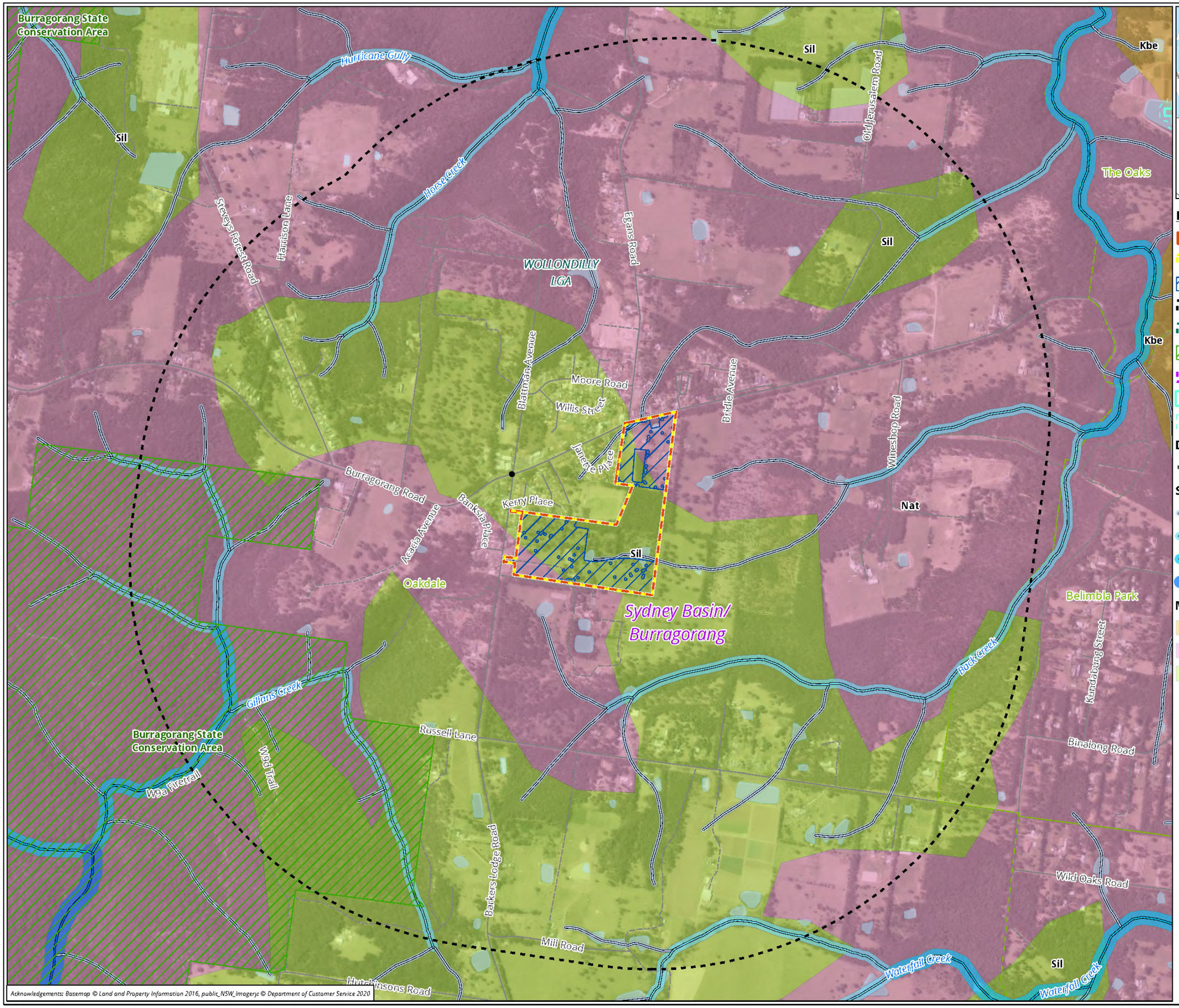

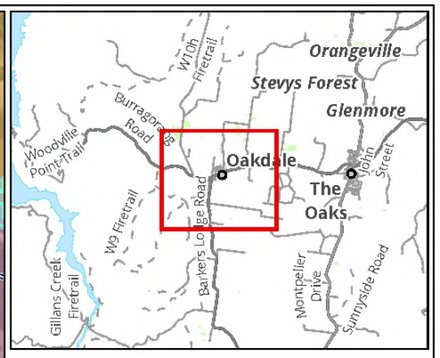

Legend

- Subject land
- Development site
- Development footprint
- Assessment area
- Local Government Area
- National Park/Reserve
- IBRA Region/Sub-region
- Local wetlands
- Riparian buffers - Local wetlands

Destinctive Land Surface - line

- Cliff top

Strahler stream order / buffers

- 1
- 2
- 3
- 4

Mitchell landscapes

- Kbe, Kurrajong Fault Scarp
- Nat, Nattai Plateau
- Sil, Silverdale Slopes

Figure 3 Location map

0 100 200 300 400 500

Metres

Scale: 1:14,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEMGroup

Matter: 39765, Date: 20 February 2025

Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo

Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F1-4.aprx

Layout: 39765_F3_Location

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3 Native vegetation

The subject land is approximately 21.98 hectares in size, and supports 12.98 hectares of native vegetation with varying levels of disturbance. The subject land also includes 9.0 hectares of non-native vegetation, 0.64 hectares of farm dams and 0.15 hectares of man-made structures, and currently consists of a variety of vegetation types ranging from low to high condition as a result of the historical agricultural land use and regular mechanical trimming.

Vegetation was primarily contained to areas of scattered and low condition around the outer edges of the subject land, with a large intact high condition section towards the centre. A large patch of intact native vegetation occurs in the eastern section of the subject land.

3.1 Native vegetation and habitat assessment

3.1.1 Native vegetation extent

The extent of native vegetation, threatened ecological communities, and vegetation integrity within the subject land was determined using the results of site investigations and Section 4 of the BAM (DPIE 2020a).

Figure 4 provides a map of the native vegetation extent recorded within the subject land and development footprint, as assessed during field investigations undertaken in August 2023, September 2023, and February 2024. The figure includes all areas of native vegetation (native ground cover and areas with canopy) within the subject land. Areas not shown as native vegetation cover within Figure 4, are considered cleared / non-native vegetation or waterbodies, and are addressed further below.

3.1.2 Review of existing information

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

- NSW State vegetation Type Map (DPE 2023b).
- Native vegetation mapping.
- Database searches.

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

3.1.3 Field investigation of biodiversity values

A systematic biodiversity assessment was conducted 31 August 2023 by Rebecca Goodwin (Principal Ecologist/BAM Accredited Assessor) and Joel Nicholson (Zoologist) under the terms of Biosis' Scientific Licence issued by the EES under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 May 2024). Fauna survey was conducted between 22 September 2023 and 13 February 2024 under approval CSB 17/892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2028).

Assessment in accordance with the BAM was overseen and carried out by The BAM Assessment was carried out by Accredited Assessor Rebecca Goodwin (BAAS17067).

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

- The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in NSW State Vegetation Type Mapping (DPE 2023b).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to *Surveying Threatened Plants and Their Habitats* (DPIE 2020b).
- Incidental observations using the "random meander" method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the subject land.
- An assessment of the natural resilience of the vegetation of the site.
- Identifying and mapping fauna habitats (e.g., hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species' habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).
- Targeted surveys for threatened fauna species.

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

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

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

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the *NSW State Vegetation Type Map* (DPE 2023b) and NSW BioNet Vegetation Classification database (NSW DCCEEW 2024a). Locations of floristic plots surveyed are shown on Figure 6.

Further details of targeted survey for threatened flora and fauna species are provided in Section 0 below.

3.1.4 Local data

The use of local data was not utilised as a part of this assessment.

3.1.5 Non-native vegetation

A total of 9.00 hectares of the subject land is mapped as Exotic Grassland and Urban Native/Exotic with no native over-storey or mid-storey cover met the definition of non-native vegetation / cleared land (VI Score 0.1 and 0, respectfully) and were not mapped as native vegetation (Figure 5), including:

- Urban Native Exotic (Table 4).
- Exotic Grassland (Table 5).

Areas not shown as native vegetation cover within Figure 5, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE 2020a). Non-native vegetation which does provide habitat for threatened species is required to be assessed. Non-native vegetation (Urban Exotic) has been assessed for threatened species; however it is highly disturbed and subjected to weed ingress, and does not provide habitat features suitable for threatened species.

Table 4 Urban Native Exotic

Urban Native Exotic	
Common name	Urban Native Exotic
Extent within subject land	0.44 ha
Description	The Urban Exotic vegetation within the subject land was primarily represented by an exotic canopy of European Ash *Fraxinus excelsior* and English Oak Quercus robur over a shrub layer that consisted of planted native species such as *Grevillea* 'Robyn Gordon' *banksia* x *bipinnatifida* and Narrow-leaved Bottlebrush *Callistemon linearis* over an largely exotic ground layer that was dominated by Narrow-leafed Carpet Grass *Axonopus fissifolius*, Lamb's Togue *Plantago lanceolata*, Kikuyu *Cenchrus clandestinus,* Catsear *Hypochaeris radicata* with minor occurrences of native John's Wart *Hypericum gramineum.*
Survey effort	One BAM Plot (Figure 6)
Photo: Urban Native Exotic	

Table 5 Exotic Grassland

Exotic Grassland	
Common name	Exotic Grassland
Extent within subject land	8.56 ha
Description	Areas of exotic grassland lacked a functioning canopy or midstorey and were dominated primarily by a variety of exotic grasses and forbs. The dominate species included *Briza subaristata*, Narrow-leafed Carpet Grass, Pale Pidgeon Grass *Setaria parviflora*, Kikuyu, Catsear, Paspalum *Paspalum dilatatum*, Parramatta Grass *Sporobolus africanus*, Whiteye *Richardia brasiliensis* and Lamb's Tongue. Native species were occasionally present in very low cover and included Kangaroo Grass *Themeda australis*, Barbed Wire Grass *Cymbopogon refractus,* Shorthair Plume Grass *Dichelachne micrantha*, Weeping Grass *Microlaena stipoides* and Whiteroot *Lobelia purpurascens*.
Survey effort	Three BAM Plots (Figure 6)
Photo: Exotic Grassland	

3.1.6 Plant community types

The following Plant Community Types (PCT) were assessed as present within the subject land:

- PCT 3262 – Sydney Turpentine Ironbark Forest (Table 5).
- PCT 3321 – Cumberland Shale – Sandstone Ironbark Forest (Table 7).
- PCT 3616 – Sydney Hinterland Grey Gum Transition Forest (Table 8).

Table 6 to Table 8 provide detailed descriptions of the three PCTs recorded within the subject land. PCTs recorded within the subject land are shown in Figure 5.

Table 6 PCT 3262 – Sydney Turpentine Ironbark Forest

PCT 3262: Sydney Turpentine Ironbark Forest	
Common name	Sydney Turpentine Ironbark Forest
Vegetation formation	Wet Sclerophyll Forests (Grassy sub-formation)
Vegetation class	Northern Hinterland Wet Sclerophyll Forests
Extent within subject land	2.69 ha
Condition	This community at the subject land was recorded in under-scrubbed and high condition states. • 0.34 ha in Under-scrubbed condition. • 2.34 ha in High condition.
Description	The community was in a good condition across the subject land with the high condition patch containing a diversity of species across the intact canopy, midstorey, and ground layers with the moderate condition patch lacking an intact midstorey. The canopy was dominated by Turpentine *Syncarpia glomulifera*, Grey Ironbark *Eucalyptus paniculata,* White-topped Box *Eucalyptus quadrangulata* and Grey Gum *Eucalyptus punctata.* The mid storey contained a mix of sclerophyll and mesophyll shrubs including Large Mock-olive *Notelaea longifolia f. longifolia*, Elderberry Panax *Polyscias sambucifolia,* Sweet Pittosporum *Pittosporum undulatum*, Rough Fruit Pittosporum *Pittosporum revolutum,* Scrubby Spurge *Phyllanthus gunnii*, Rough Guinea flower *Hibbertia aspera*, Coffee Bush *Breynia oblongifolia* and White Dogwood *Ozothamnus diosmifolia.* The ground layer was dominated by a variety of grasses, graminoids and ferns which included Weeping Grass, Basket grass *Oplismenus aemulus,* Forest Hedgehog-grass *Echinopogon ovatus*, Wiry Panic *Entolasia stricta*, Bordered Panic *Entolasia marginata*, *Poa affinis*, Spiny-headed Mat rush *Lomandra longifolia*, *Lomandra filiformis* subsp. *filiformis,* Pale Flax-leaf Lily *Dianella caerulea* var. *producta,* Prickly Rasp Fern *Doodia aspera* and Common Maidenhair *Adiantum aethiopicum*. Various vines were also present across all layers including Wonga Wonga Vine *Pandorea pandorana* subsp. *pandorana,* Old Man's Beard *Clematis aristata*, *Clematis glycinoides* var. *glycinoides*, Milk Vine *Marsdenia rostrata*, and Bearded Tylophora *Tylophora barbata.* Exotic species were in low cover and abundance within this community. Species present included Mickey Mouse Plant *Ochna serrulata*, African Olive *Olea europaea* subsp. *cuspidata* and *Small*-leaved Privet *Ligustrum sinense.*
Survey effort	Two BAM plots were collected over the course of the field assessment (Figure 6). • PCT 3262 under-scrubbed condition: one BAM plot/transect. • PCT 3262 high condition: one BAM plot/transect.
Justification of PCT	Sydney Turpentine Ironbark Forest within the subject land meets the PCT description (NSW DCCEEW 2024a) via the following: • Soil - occurs on the Blacktown soil landscape. • Structure – A tall sclerophyll to very tall sclerophyll forest with a mid-stratum of sclerophyll and mesophyll species and a ground layer of grasses and forbs in the Sydney Basin. • Dominant species - canopy dominated by Turpentine, Grey Gum and various stringybarks with a mid-storey of Sweet Pittosporum, Coffee bush, Elderberry Panax, White Dogwood and Large Mock-olive with a ground layer containing a mix of grasses and forbs. • IBRA region and subregion – Sydney Basin region and Burragorang subregion.

PCT 3262: Sydney Turpentine Ironbark Forest	
TEC Status	**NSW BC Act:** All under-scrubbed and high condition state patches (with a partially intact seedbank) were determined to meet the criteria for *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion* (CEEC). **Commonwealth EPBC Act:** All patches within the subject land meet the condition thresholds outlined in the Listing Advice for the EPBC Act listed *Turpentine-Ironbark Forest of the Sydney Basin* CEEC, as they contain a canopy cover above 10 % and a remnant patch size of > 1 ha (TSSC 2009). State and Commonwealth TECs are mapped on Figure 8.
Estimate of percent cleared value of PCT (BioNet)	96 % (NSW DCCEEW 2024a).
PCT 3262 photos	 **Photo 1 PCT 3262 in Underscrubbed condition classification**  **Photo 2 PCT 3262 in high condition classification**

Table 7 PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest

PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	
Common name	Cumberland Shale-Sandstone Ironbark Forest
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Extent within subject land	5.02 ha
Condition	This community at the subject land was recorded in a high and low condition states. • 3.97 ha in Low condition. • 1.05 ha in High condition.
Description	Cumberland Shale-Sandstone Ironbark Forest within the subject land exists as an open woodland with canopy dominated by Eucalypt species, a mixed shrub layer and a ground layer consisting of various grasses, graminoids and climbers. The upper canopy was dominated by primarily by two species which included Grey Gum, Thin-leaved Ironbark *Eucalyptus crebra* whilst the lower canopy was dominated by Black She-oak *Allocasuarina littoralis* and Parramatta Wattle *Acacia parramattensis.* The midstorey consisted of both hard and soft-leaved species including Blackthorn *Bursaria spinosa*, Rough Guinea Flower, Tick *Bush Kunzea ambigua*, Sweet Pittosporum, and Rough-fruited Pittosporum. The ground layer was abundant and dominated by a number of grasses and graminoids such as Weeping Grass, Wiry Panic, Three-awn Grass *Aristida vagans* and Tufted Hedgehog Grass *Echinopogon caespitosus* var. *caespitosus,* and Flax-leaf Lily Dianella caerulea. Various forbs and climbers were also present throughout the lower layers and included Variable Glycine *Glycine tabacina*, Small Leaf Glycine *Glycine microphylla,* Slender Trick-trefoil *Grona varians,* Native sarsaparilla *Hardenbergia violacea*, Forest Nightshade *Solanum prinophyllum,* and Whiteroot. The low condition areas of this community were separated as they contained a thinned canopy, lacked and mid storey and contained a ground layer dominated by exotic species. Exotic species present included Pale Pidgeon Grass, Paspalum, Small-leaved Privet, Dandelion *Taraxacum officinale*, Paddy's Lucerne *Sida rhombifolia*, Lamb's Tongue, Farmer's Friend *Bidens Pilosa* and Fireweed *Senecio madagascariensis.*
Survey effort	Three BAM plots were collected over the course of the field assessment. (Figure 6) • PCT 3321 low condition: two BAM plots/transects. • PCT 3321 high condition: one BAM plot/transect.
Justification of PCT	Cumber Shale Sandstone Ironbark Forest within the subject land meets the PCT description (NSW DCCEEW 2024a) via the following: • Soil - occurs on the Blacktown soil landscape. • Structure – A tall sclerophyll open forest with a mid-stratum of dry and soft-leaved species and a ground layer of grasses and graminoids on the fringes of the Cumberland Plain in the Sydney Basin. • Dominant species - canopy dominated by Thin-leaved Ironbark and Grey Gum with a mid-storey of Blackthorn on a ground layer containing a mix of grasses, graminoids and forbs. • IBRA region and subregion – Sydney Basin region and Burragorang subregion.
TEC Status	**NSW BC Act:** All low and high condition state patches (with a partially intact seedbank) were determined to meet the criteria for *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC). **Commonwealth EPBC Act:** All patches within the subject land meet the condition

PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	
	thresholds outlined in the Listing Advice for the EPBC Act listed CEEC, *Shale Sandstone Transition Forest of the Sydney Basin Bioregion*, as they contain a patch size > 0.5 ha, >30 % perennial understorey vegetation cover and is contiguous with patch of native vegetation > 1 ha where native vegetation in each layer present is dominate (TSSC 2009). State and Commonwealth TECs are mapped on Figure 8.
Estimate of percent cleared value of PCT (BioNet)	62% (NSW DCCEEW 2024a).
PCT 3321 photos	 **Photo 3 PCT 3321 in Low condition classification**  **Photo 4 PCT 3321 in High condition classification**

Table 8 PCT 3616 - Sydney Hinterland Grey Gum Transition Forest

PCT 3616 - Sydney Hinterland Grey Gum Transition Forest	
Common name	Sydney Hinterland Grey Gum Transition Forest
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Hinterland Dry Sclerophyll Forests
Extent within subject land	5.27 ha
Condition	This community at the subject land was recorded in a low and scattered tree condition states. • 5.02 ha in Low condition. • 0.25 ha in Scattered Tree condition.
Description	Shale sandstone transition forest within the subject land existed as a tall sclerophyll open forest that was present in a degraded condition due to historical clearing and animal agriculture. The community contained an intact scattered canopy, a sparse midstorey and an understory consisting of a mix of native and exotic grasses and forbs. The canopy was dominated by Thin-leaved Ironbark, Grey Gum and Red Bloodwood *Corymbia gummifera* over a sub canopy of Parramatta Wattle. The midstorey was largely devoid of vegetation however, a few low growing shrubs were present and included Rough Guinea Flower, Native Cherry *Exocarpos cupressiformis,* Sweet Pittosporum, Blackthorn, Thyme Spurge *Phyllanthus hirtellus,* White Dogwood and Native Raspberry *Rubus parvifolius*. The ground layer was dominated by various grasses, low climbers and forbs. Species present included Weeping Grass, Wiry Panic, Forest Hedgehog Grass, Kidney Weed, Whiteroot, Spiny-headed Mat Rush, Blue Flax-lily and Poverty Raspwort *Gonocarpus tetragynus*. Exotic species were primarily restricted to the midstorey and ground layers and included a number of high threat weeds. Exotic species within this community included African Olive, Small-leaved Privet *Ligustrum sinense*, Blackberry, Panic Veldt Grass, Spear Thistle, and Fireweed.
Survey effort	Six BAM plots were collected over the course of the field assessment (Figure 6). • PCT 3616 low condition: five BAM plot/transect. • PCT 3616 scattered trees condition: one BAM plot/transect
Justification of PCT	Sydney Hinterland Grey Gum Transition Forest within the subject land meets the PCT description (NSW DCCEEW 2024a) via the following: • Soil - occurs on the Blacktown soil landscape. • Structure – A tall to very tall open forest with a grassy ground cover found on enriched Hawkesbury or Mittagong sandstone ridges on the margins of the Cumberland Plain. • Dominant species - canopy dominated by Thin-leaved Ironbark, Grey Gum and Red Bloodwood with a mid-storey of Thyme Spurge and *Hibbertia aspera* over a groundcover of various grasses and graminoids. • IBRA region and subregion – Sydney Basin region and Burragorang subregion.
TEC Status	This PCT is not associated with any listed TECs.
Estimate of percent cleared value of PCT (BioNet)	61.88% (NSW DCCEEW 2024a).

PCT 3616 - Sydney Hinterland Grey Gum Transition Forest	
PCT 3616 photos	 **Photo 5 PCT 3616 in Scattered Tree condition classification**  **Photo 6 PCT 3616 in Low condition classification**

3.1.7 Threatened ecological communities

Vegetation within the subject land was found to represent two TECs listed under the NSW BC Act, and two TECs listed under the Commonwealth EPBC Act, as outlined in Table 9 and Table 10 below and illustrated on Figure 8.

Table 9 Summary of BC Act TECs within the subject land

BC Act TEC	Listing status	Subject land (Ha)
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Critically Endangered	5.0
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	2.69

Table 10 Summary of EPBC Act TECs within the subject land

EPBC Act TEC	Listing status	Subject land (Ha)
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	5.0
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	2.69

3.2 Vegetation integrity assessment

3.2.1 Vegetation zones and patch size class

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM, and as described in Table 5 to Table 8 above. This resulted in eight vegetation zones identified within the development footprint. Table 11 describes each of the zones and provides details on the numbers of BAM floristic plots undertaken in each zone.

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

Native vegetation within the subject land was mapped sequentially and it was found to form part of a large patch of connecting vegetation with an area greater than 100 hectares. The connected vegetation comprises large contiguous patches along waterways to the north-west of the subject land.

Patch size classes for each vegetation zone are also outlined in Table 11 below and shown in Figure 7.

Table 11 Vegetation zones within the subject land

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Area (ha)	Max. patch size development footprint
3262_Underscrubbed	3262	Underscrubbed	1	0.34	>100 ha
3262_High	3262	High	1	2.34	>100 ha
3321_Low	3321	Low	2	3.97	>100 ha
3321_High	3321	High	1	1.05	>100 ha
3616_Low	3616	Low	5	5.02	>100 ha
3616_Scattered Trees	3616	Scattered trees	1	0.25	>100 ha
Urban Native Exotic	N/A	-	1	0.44	>100 ha
Exotic Grassland	N/A	-	3	8.56	>100 ha

3.2.2 Vegetation integrity

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

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

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). In total, 15 BAM plots have been completed within the vegetation zones present development footprint, details are provided in Table 12 and shown on Table 13.

Table 12 BAM plots completed within the subject land

BAM plot reference	Vegetation zone	BAM plot reference	Vegetation zone
39765_B01*	3321_Low	**39765_B09**	3616_Low
39765_B02	3616_Low	**39765_B10**	Exotic Grassland
39765_B03	Exotic Grassland	**39765_B11**	Urban Native
39765_B04	3616_Low	**39765_B12**	3262_Underscrubbed
39765_B05	3262_High	**39765_B13**	3616_Low
39765_B06*	3616_Low	**39765_B14**	3616_Scattered Trees
39765_B07	Exotic Grassland	**39765_B15**	3321_Low
39765_B08	3321_High	**39765_B16#**	3321/3262 Transition Zone

** Plot is no longer located in development footprint.*

 # Although the BAM states that BAM Plots should not be collected within transitional zones between PCTs, upon request from Council, a BAM Plot (Plot 16) has been collected within the transition zone of PCT 3262 and PCT 3321, for justification of the vegetation zone boundaries.

Two of the BAM plots included in the assessment are no longer located within the final development footprint as a result of design refinements over the course of the project. These plots have been retained for use in the assessment they are still considered to be representative of the vegetation present within the development footprint and the C2 VMP Zone.

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

3.2.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data is presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 13.

Table 13 Vegetation zone integrity scores

Vegetation zone	Composition score	Structure score	Function score	VI score*	HBTs present
3262_Underscrubbed	72.6	37.8	41.6	48.5	0
3262_High	83.2	41	95.8	68.9	0

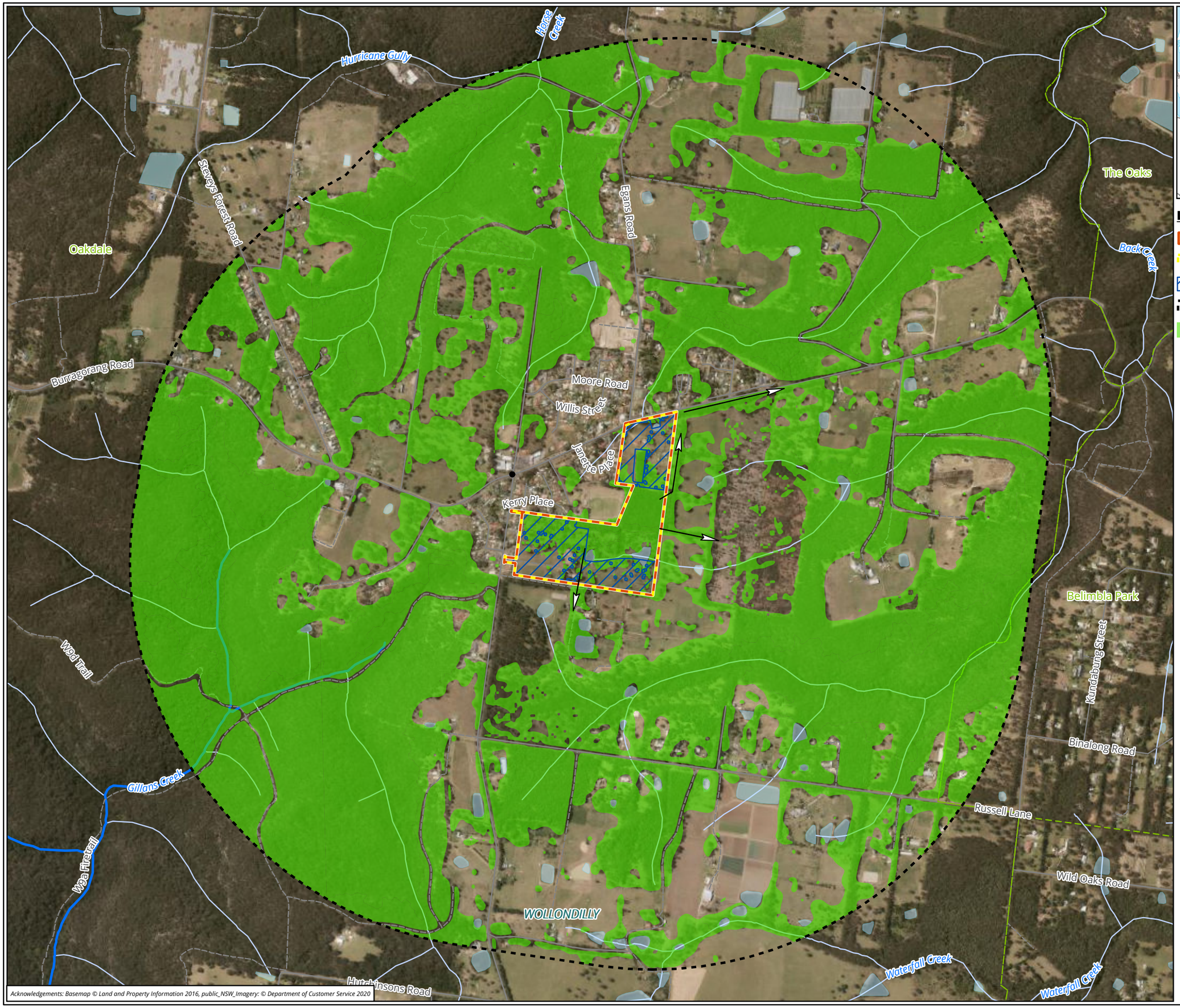
Vegetation zone	Composition score	Structure score	Function score	VI score*	HBTs present
3321_Low	58.8	40.7	65	53.8	2
3321_High	84.5	88	57.6	75.4	1
3616_Low	51.4	54.2	35.6	46.3	0
3616_ScatteredTrees	33.1	17.8	46.8	30.2	0
Urban Exotic	0.8	0.1	0	1	0
Exotic Grassland	11.1	0.3	0	2.2	0

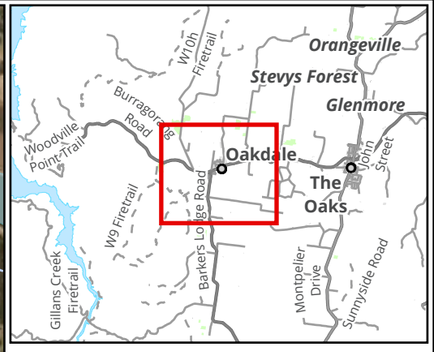
**Benchmark (pristine) condition vegetation would receive a VI score of 100.*

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

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

As such, ecosystem credit offsets are not required for vegetation zone Urban Native Exotic and Exotic Grassland due to their VI score being 0 and 0.1 respectively.





Legend

- Subject land
- Development site
- Development footprint
- Assessment area
- Native vegetation
- Habitat connectivity

Figure 4 Native vegetation extent

0 100 200 300 400 500

Metres

Scale: 1:14,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 20 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F1-4.aprx
Layout: 39765_F4_NativeVeg

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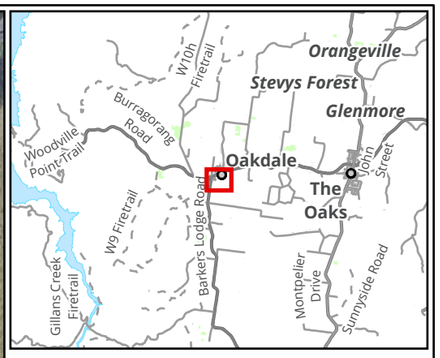

Legend

- Subject land
- Development site
- Development footprint

Hollow-bearing trees

- Extra large hollow (>400mm)
- Large hollow (150-400mm)
- Medium hollow (50-149mm)
- Small hollow (<50mm)

Plant Community Type and condition class

- Exotic grassland
- Urban Native/Exotic
- 3262 - Sydney Turpentine Ironbark Forest - High (EPBC and BC Act)
- 3262 - Sydney Turpentine Ironbark Forest - Underscrubbed
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - High (EPBC and BC Act)
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - Low (EPBC and BC Act)
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Low
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Scattered Trees

Figure 5 Vegetation within the subject land

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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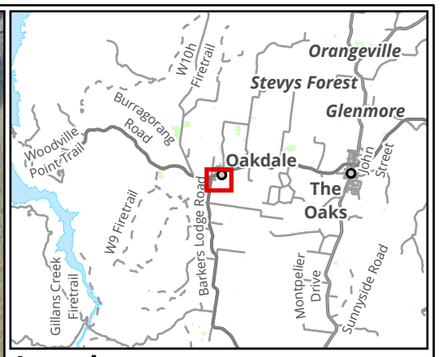
APEM Group

Matter: 39765, Date: 20 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F5-10.aprx
Layout: 39765_F5_BiosisVeg

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © NearMap, November 2024



Legend

- Subject land
- Development site
- Development footprint
- BAM plot

Vegetation zones

- VZ1 - 3262_Underscrubbed
- VZ2 - 3262_High
- VZ3 - 3321_Low
- VZ4 - 3321_High
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 6 Vegetation zones and plot locations

0 20 40 60 80 100

Metres
Scale: 1:3,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

N

biosis
APEM Group

Matter: 39765, Date: 20 February 2025
Prepared for: TH, JN, RG. Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F5-10.aprx
Layout: 39765_F6_VegZones

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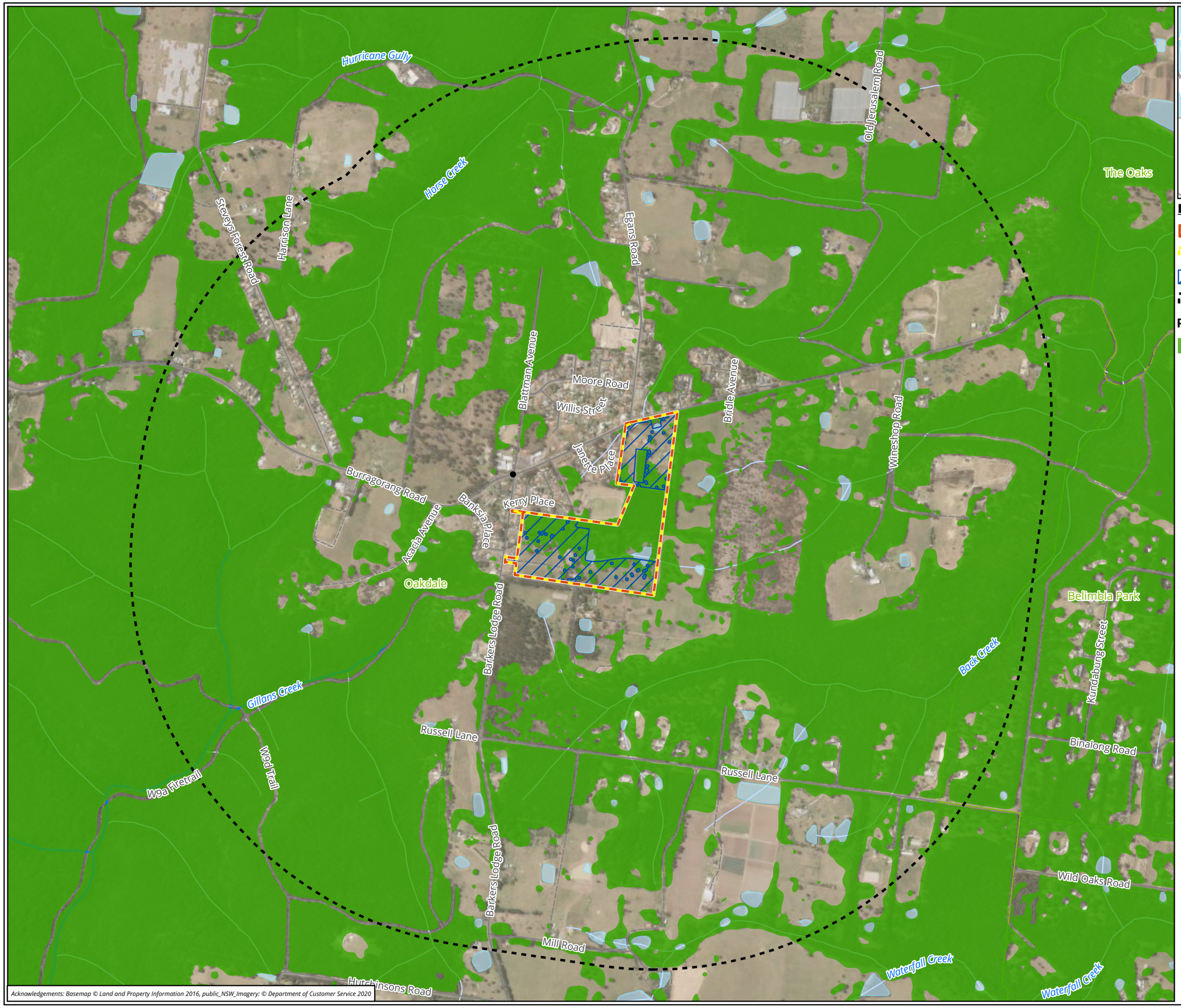

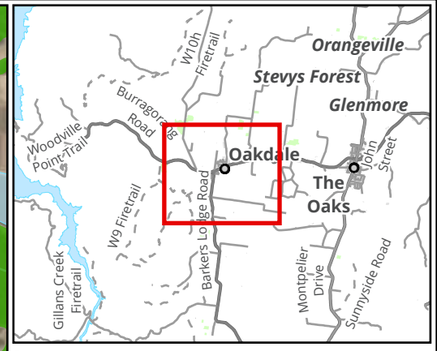

Legend

- Subject land
- Development site
- Development footprint
- Assessment area

Patch size

- ≥100ha

Figure 7 Patch size

0 100 200 300 400 500

Metres

Scale: 1:14,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: Matter: 39765, Date: 20 February 2025
Prepared for: TH, RG, JN. Prepared by: HL, Last edited by: hliswoyo
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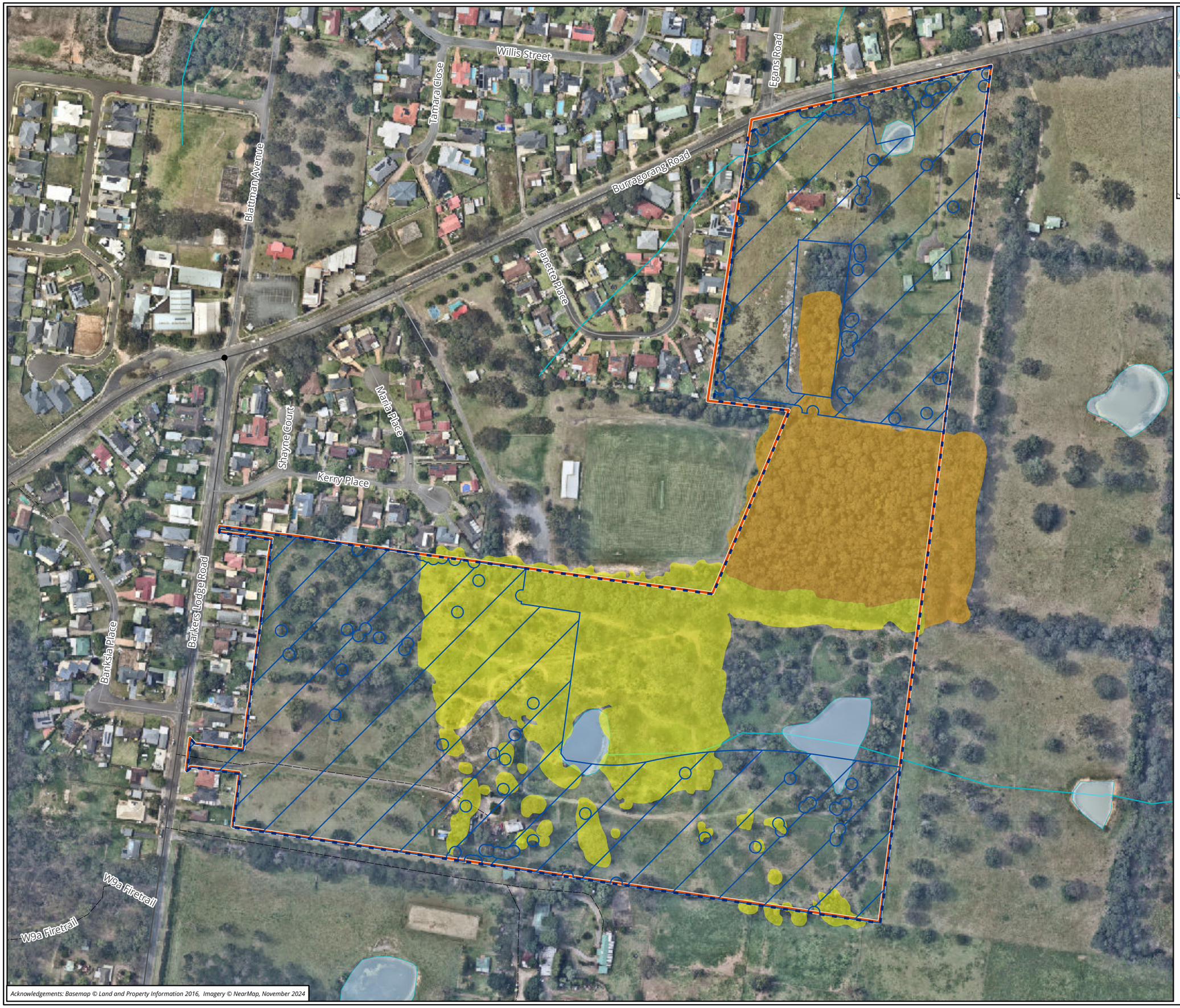
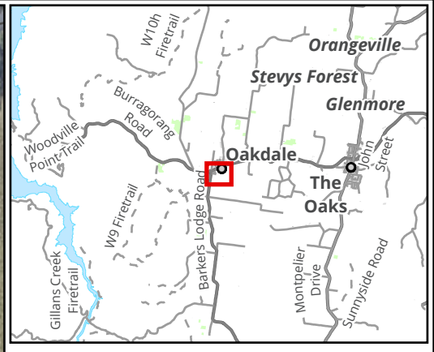
Layout: 39765_F7_PatchSize





Legend

- Subject land
- Development site
- Development footprint

Threatened Ecological Communities (TEC)

- Shale Sandstone Transition Forest of the Sydney Basin Bioregion (EPBC Act) and Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act)
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion (EPBC Act) and Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (BC Act)

Figure 8 Threatened Ecological Communities within the subject land

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 20 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F5-10.aprx
Layout: 39765_F8_TECs

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © NearMap, November 2024

4 Threatened species

4.1 Ecosystem credit species

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM (DPIE 2020a). Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection (TBDC). Table 14 lists the ecosystem credit species that could not be discounted, based on geographical restrictions or a lack of suitable habitat, from using the subject land on occasion. A search of relevant government databases, including the BioNet database and the EPBC Act Protection Matters Search Tool (PMST) was also carried out for a 5 kilometre radius to the development footprint, to identify any additional threatened species not identified by the BAM calculator that have significant records present or predicted.

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

Table 14 Ecosystem credit species (predicted species) with potential to occur

Species name	Common name
Anthochaera phrygia	Regent Honeyeater
Artamus cyanopterus cyanopterus	Dusky Woodswallow
Callocephalon fimbriatum	Gang-gang Cockatoo
Calyptorhynchus lathami	Glossy Black-Cockatoo
Chthonicola sagittata	Speckled Warbler
Circus assimilis	Spotted Harrier
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)
Daphoenositta chrysoptera	Varied Sittella
Dasyurus maculatus	Spotted-tailed Quoll
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Glossopsitta pusilla	Little Lorikeet
Haliaeetus leucogaster	White-bellied Sea-Eagle
Hieraaetus morphnoides	Little Eagle
Hirundapus caudacutus	White-throated Needletail
Hoplocephalus bungaroides	Broad-headed Snake
Lathamus discolor	Swift Parrot
Lophoictinia isura	Square-tailed Kite
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat

Species name	Common name
Miniopterus australis	Little Bent-winged Bat
Miniopterus orianae oceanensis	Large Bent-winged Bat
Neophema pulchella	Turquoise Parrot
Ninox connivens	Barking Owl
Ninox strenua	Powerful Owl
Petaurus australis	Yellow-bellied Glider
Petroica boodang	Scarlet Robin
Petroica phoenicea	Flame Robin
Pteropus poliocephalus	Grey-headed Flying-fox
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Scoteanax rueppellii	Greater Broad-nosed Bat
Stagonopleura guttata	Diamond Firetail
Tyto novaehollandiae	Masked Owl
Varanus rosenbergi	Rosenberg's Goanna

4.2 Species credit species

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

Appendix 2 provides the lists of species credit species predicted to occur within the subject land based on the IBRA subregion(s) on/within which the project occurs, the native vegetation cover present within the 1500 metre buffer area, the PCTs present within subject land, and patch sizes listed in Table 11.

The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM (DPIE 2020a) and species with geographical restrictions, or habitat constraints not present, were not required to be assessed. 12 predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, substantial degradation of existing potential habitat, lack of required microhabitat features, and the subject land not containing the important habitat mapping.

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

No additional species credit species not predicted by the BAM Calculator (BAM-C) or BioNet to occur within the subject land were added to the assessment as candidate species credit species.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 15 (flora species) and Table 16 (fauna species).

Threatened flora

Habitats for threatened flora species within the subject land are largely considered degraded due to the high degree of management, grazing and history of pasture improvement. Open areas are typically dominated by exotic pasture grasses and herbaceous exotics. This comprises the habitats associated with all of the PCT 3616 and low condition areas PCT 3321 within the subject land. Habitats supported by underscrubbed and high condition PCT 3321 and 3262 vegetation were considered to be of higher quality as a result of the lower levels of disturbance present in the understorey and the presence of mature canopy trees.

Table 15 provides a list of candidate flora species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below.

Table 15 Candidate flora species credit species

Species name	Common name	Survey period	Method of assessment
Acacia bynoeana	Bynoe's Wattle	All year	Targeted survey
Acacia pubescens	Downy Wattle	All year	Targeted survey
Callistemon linearifolius	Netted Bottle Brush	October – January	Targeted survey
Epacris purpurascens* var. *purpurascens	-	September – October	Targeted survey
Genoplesium baueri	Bauer's Midge Orchid	February – March	Targeted survey
Grevillea parviflora* subsp. *parviflora	Small-flower Grevillea	August – November	Targeted survey
Hibbertia fumana	-	October - December	Targeted survey
Hibbertia puberula	-	October- December	Targeted survey
Leucopogon exolasius	Woronora Beard-heath	August – September	Targeted survey
Persoonia bargoensis	Bargo Geebung	All year	Targeted survey
Persoonia glaucescens	Mittagong Geebung	January – March	Targeted survey
Persoonia hirsuta	Hairy Geebung	All year	Targeted survey
Pomaderris brunnea	Brown Pomaderris	August – October	Targeted survey
Pterostylis saxicola	Sydney Plains Greenhood	October	Targeted survey
Rhizanthella slateri	Eastern Australian Undergrown Orchid	September - November	Targeted survey
Rhodamnia rubescens	Scrub Turpentine	All year	Targeted survey
Tetratheca glandulosa	-	August – November	Targeted survey

Threatened fauna

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

The subject land provides suitable habitat for a number of threatened species, including arboreal mammals and diurnal birds in the form of intact native vegetation patches for foraging and breeding use, large hollow-

bearing trees for diurnal/nocturnal birds and arboreal mammals, and leaf litter throughout the subject land that was considered suitable habitat for Cumberland Plain Land Snail *Meridolum corneovirens* and Dural Land Snail *Pommerhelix duralensis*.

Farm dams greater than three metres wide are suitable for foraging by Southern Myotis. Hollow-bearing trees within the subject land provide potential roosting habitat for this species and targeted survey was required.

Habitat for Large Forest Owls, in the form of large hollow-bearing trees, was identified within the subject land. Presence has been assumed for three owls, Powerful Owl *Ninox strenua*, Barking Owl *Ninox connivens* and Masked Owl *Tyto novaehollandiae, due targeted surveys yet to be completed.* Targeted winter surveys for these three species will occur in 2024 to determine presence/absence within the subject land. Due to the limited availability of habitat within the subject land, large home range, and the biodiversity risk weighting being identical for each species (2.0), species credits have been calculated for only one of the Large Forest Owl species. Powerful Owl has been selected as the candidate species for this group of species based on the number of detection records within the locality, type of vegetation and habitat available within the subject land. Further details are provided below Table 16.

Table 16 provides a list of candidate fauna species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below.

Table 16 Candidate fauna species credit species

Species name	Common name	Survey period	Method of assessment
Callocephalon fimbriatum	Gang-gang Cockatoo	October – January	• Dusk surveys • Active searches
Calyptorhynchus lathami	Glossy Black-Cockatoo	January - September	• Dusk surveys • Active searches
Cercartetus nanus	Eastern Pygmy-possum	October – March	• Arboreal Camera trapping • Spotlighting
Haliaeetus leucogaster	White-bellied Sea-Eagle	July - December	• Stick nest survey
Hieraaetus morphnoides	Little Eagle	August – October	• Stick nest survey
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	All year	• Terrestrial Camera trapping • Spotlighting
Lophoictinia isura	Square-tailed Kite	September – January	• Stick nest survey
Meridolum corneovirens	Cumberland Plain Land Snail	All year	• Modified SAT Surveys
Myotis macropus	Southern Myotis	October – March	• Ultrasonic detector deployment
Ninox connivens	Barking Owl	May - December	• Habitat assessment of suitable hollows • Assumed present*
Ninox strenua	Powerful Owl	May - August	• Habitat assessment of suitable hollows • Assumed present*
Petauroides volans	Southern Greater Glider	All year	• Arboreal Camera trapping • Spotlighting

Species name	Common name	Survey period	Method of assessment
Petaurus norfolcensis	Squirrel Glider	All year	• Arboreal Camera trapping • Spotlighting
Phascolarctos cinereus	Koala	All year	• SAT surveys • Spotlighting
Pommerhelix duralensis	Dural Land Snail	All year	• Modified SAT Surveys
Pteropus poliocephalus	Grey-headed Flying-fox	October – December	• Camp searches
Tyto novaehollandiae	Masked Owl	May – August	• Habitat assessment of suitable hollows • Assumed present*
** Due to the limited availability of habitat within the subject land, large home range, and the sensitivity to gain being identical for each species, only one of the Large Forest Owl species, has been selected as a candidate species for the purpose of credit calculations. See below for further detail.*			

The following candidate species were discounted from occurring within the subject site due to the following reasons:

- Regent Honeyeater *Anthochaera phrygia* – Habitat constraints (important habitat mapping).
- Giant Burrowing frog *Heleioporus australiacus* – Habitat degraded.
- Broad-headed Snake *Hoplocephalus bungaroides* – Habitat constraints (no rocky areas).
- Swift Parrot *Lathamus discolor* – Habitat constraints (important habitat mapping).
- Green and Golden Bell Frog *Litoria aurea* – Habitat degraded.
- Booroolong Frog *Litoria booroolongensis* – Habitat degraded.
- Stuttering Frog *Mixophyes balbus* – Habitat degraded.
- Brush-tailed Rock-wallaby *Petrogale penicillate* - Habitat constraints (no rocky areas).
- Red-crowned Toadlet *Pseudophryne australis* – Habitat degraded.
- Large Bent-winged bat *Minopterus orianae oceanensis* - Habitat constraints (no cliffs, caves or crevices).
- Little Bent-winged Bat *Miniopterus australis* - Habitat constraints (no cliffs, caves or crevices).
- Large-eared Pied Bat *Chalinolobus dwyeri* - Habitat constraints (no cliffs, caves or crevices).
- Barking Owl *Ninox connivens* – Habitat constraints (limited habitat availability).
- Masked Owl *Tyto novaehollandiae* – Habitat constraints (limited habitat availability).

The Regent Honeyeater and Swift Parrot were discounted as candidate species from this assessment due to the important area mapping (REF) for each of these species does not occur within the subject land and will therefore not be impacting habitat significant for these species.

The Giant Burrowing Frog, Green and Golden Bell Frog, Boorloolong Frog, Stuttering Frog, and Red-crowned Toadlet were discounted as candidate species from this assessment due to the degraded riparian habitat within the subject land. The mapped watercourses within the subject land did not have observable water or riparian vegetation present that would provide habitat for amphibians and the large farm dams have similarly been historically impacted through mechanical vegetation clearing and agricultural practices. Therefore, due to the lack of suitable breeding habitat within the subject land, the five threatened frog species listed have been discounted from this assessment.

The Broad-headed Snake, Brush-tailed Rock-wallaby, and three microbat species, Large Bent-winged bat, Little Bent-winged bat, and Large-eared Pied Bat were discounted as candidate species from this assessment due to lack of rock areas, cliffs, caves or crevices within the subject land, or cliffs, caves and crevices within two kilometres of the subject land. The Broad-headed Snake and Brush-tailed Rock-wallaby require rocky areas for breeding and foraging resources which is not present within the subject land and therefore discounted from this assessment. The three microbat species require cliffs, caves and crevices on or within two kilometres of the subject land to provide suitable roosting habitat and native vegetation home range buffer, therefore the lack of these habitat features has resulted in the discount of these species from this assessment.

The two large forest owls, Masked Owl and Barking owl were discounted as a candidate species from this assessment due to the limited availability of habitat within the subject land. Presence has been assumed for the three large forest owls, Powerful owl, Masked Owl and Barking Owl however due to the limited availability of habitat within the subject land, large home range, and the sensitivity to gain being identical for each species, species credits have been calculated for only one of the Large Forest Owl species. Powerful Owl has been selected as the candidate species for this group of species based on the number of detection records within the locality, type of vegetation and habitat available within the subject land. The biodiversity risk weighing for all three species is 2.0 (Atlas, 2024), therefore the Powerful Owl has been selected as the candidate species due to the detection records and habitat suitability. Masked Owl and Barking Owl has been discounted as candidate species from this assessment.

4.2.1 Threatened species survey details

Targeted threatened species surveys of the subject land were undertaken 22 September 2023 to 13 February 2024. Weather observations for each survey date are shown Table 17.

Table 17 Weather observations during targeted flora and fauna surveys (Camden, NSW)

Survey undertaken	Survey date	Temperature (°C)*		Rain (mm)
		Min.	Max.	
• **September Flora Survey** • **Stick nest and HBT mapping** • **Large-forest owl habitat assessment**	22/09/2023	7.8	20.7	0.6
• **Koala/Snail SAT surveys** • **Spotlighting**	17/10/2023	8.4	19.2	0.4
• **October Flora Survey** • **Koala/Snail SAT surveys** • **Spotlighting**	18/10/2023	9.6	22.8	0
• **Arboreal Camera Trap deployment** • **Bat detector deployment**	15/01/2024	17.0	21.0	27.0
• **Cockatoo Dusk Surveys** • **Spotlighting**	16/01/2024	16.7	24.7	9.6
	17/01/2024	20.0	27.5	12.0
• **Bat detector retrieval**	19/01/2024	14.4	31.1	0
• **Cockatoo Dusk Surveys** • **Spotlighting**	23/01/2024	18.0	26.9	0.6
	24/01/2024	14.2	29.9	0.2
• **Arboreal Camera trap retrieval**	30/01/2024	22.8	27.4	0

Survey undertaken	Survey date	Temperature (°C)*		Rain (mm)
		Min.	Max.	
• **Terrestrial Camera trap deployment**				
• **February Flora Surveys**	08/02/2024	17.0	24.8	0
• **Terrestrial Camera trap retrieval**	13/02/2024	17.6	34.60	0

**Information from the Australia Government Bureau of Meteorology website. Camden NSW Station (068192).*

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

Threatened Flora

An initial site assessment was undertaken on 31 August 2023 to map broad scale vegetation types. Targeted threatened flora surveys were undertaken in areas of suitable habitat by six ecologists over three survey periods in September and October and February. Weather observations for these survey dates are shown above in Table 17.

Survey method and effort

A team of two ecologist in September and October 2023, and four ecologists in February 2024 walked through all suitable habitat for each target species at a 5-10 metre spacing over 8 person hours. The transect spacing is consistent with the spacing described within the NSW *Surveying threatened plants and their habitats* (DPIE 2020b). Figure 9 shows the targeted flora survey effort.

Justification of survey method and effort

Survey guidelines followed included:

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

Survey effort was considered adequate for the area of potential habitat within the subject land and development footprint.

Timing of survey

Survey was conducted in relation to requirements in the TBDC survey guides.

Survey personnel and relevant experience

Targeted flora surveys were undertaken by the Biosis ecologists listed in Table 18.

Table 18 Targeted flora survey personnel and relevant experience

Staff member	Role	Relevant experience
Rebecca Goodwin	Principal Ecologist	Over 16 years' experience undertaking targeted flora surveys in New South Wales.
Paul Price	Senior Botanist	Over 20 years' experience undertaking targeted flora surveys in New South Wales.
Joel Nicholson	Zoologist	Over four years' experience undertaking flora surveys in New South Wales.
Kaisha Edwards	Botanist	Over four years' experience undertaking targeted flora surveys in New South Wales.
Rosie Gray	Botanist	Over two years' experience undertaking targeted flora surveys in New South Wales.
Todd Horton	Botanist	Over two years' experience undertaking targeted flora surveys in New South Wales.

Results

Table 19 provides a summary of the results of the targeted flora surveys completed.

Table 19 Summary of targeted flora survey method and results

Species name	Common name	Survey method	Survey results
Acacia bynoeana	Bynoe's Wattle	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Acacia pubescens	Downy Wattle	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Callistemon linearifolius	Netted Bottle Brush	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys
Epacris purpurascens* var. *purpurascens	-	• 5-10 m wide parallel field traverses in suitable habitat • 22 September 2023	Not recorded during targeted surveys
Genoplesium baueri	Bauer's Midge Orchid	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Grevillea parviflora* subsp. *parviflora	Small-flower Grevillea	• 5-10 m wide parallel field traverses in suitable habitat • 22 September 2023	Not recorded during targeted surveys
Hibbertia fumana	-	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys
Hibbertia puberula	-	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys

Species name	Common name	Survey method	Survey results
Leucopogon exolasius	Woronora Beard-heath	• 5-10 m wide parallel field traverses in suitable habitat • 22 September 2023	Not recorded during targeted surveys
Persoonia bargoensis	Bargo Geebung	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Persoonia glaucescens	Mittagong Geebung	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Persoonia hirsuta	Hairy Geebung	• 5-10 m wide parallel field traverses in suitable habitat • 8 February 2024	Not recorded during targeted surveys
Pomaderris brunnea	Brown Pomaderris	• 5-10 m wide parallel field traverses in suitable habitat • 22 September 2023	Not recorded during targeted surveys
Pterostylis saxicola	Sydney Plains Greenhood	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys
Rhizanthella slateri	Eastern Australian Undergrown Orchid	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys
Rhodamnia rubescens	Scrub Turpentine	• 5-10 m wide parallel field traverses in suitable habitat • 18 October 2023	Not recorded during targeted surveys
Tetratheca glandulosa	-	• 5-10 m wide parallel field traverses in suitable habitat • 22 September 2023	Not recorded during targeted surveys

Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 16 and Appendix 2. Habitat assessments focussed on the presence of the following features within the subject land:

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

- Presence of flying-fox camps.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 20.

Table 20 Habitat features with potential to support threatened species credit species

Habitat feature	Presence within the development footprint
Hollow-bearing trees	Habitat trees supporting hollows of a variety of size classes from small (<50 mm diameter) through to extra-large (> 400 mm diameter) were present across the subject land. These trees have the potential to provide breeding resources for a range of native fauna species including threatened cockatoos (Glossy Black-Cockatoo and Gang-gang Cockatoo), Large Forest Owls (Barking Owl, Sooty Owl and Powerful Owl), and microbats.
Feed tree species	A variety of tree species identified as Koala use trees within the Central and Southern Tablelands Koala management area, which includes the subject land, were detected during the assessment. Trees and shrubs providing food resources for smaller mammals such as Eastern Pygmy-possum, Squirrel Glider, and Grey-headed Flying-fox were also recorded, but in low quality throughout the development footprint.
Major and minor watercourses and waterbodies (i.e. dams)	One unnamed first order watercourse is mapped in the south section of the subject site. The watercourse flows east off the subject site from a farm dam on Lot 6 DP734561. No water, riparian vegetation or watercourse banks were observed during any of the field assessments and therefore does not provide habitat to aquatic or stream-dependent species. Three artificial waterbodies (i.e. farm dams) were identified within the subject site. One waterbody is located in the northern section on Lot 2 DP734561, with the other two waterbodies located on Lot 6 DP734561. The artificial waterbodies are considered to be in a degraded state due to regular mechanical trimming of bank vegetation and historical agricultural practices. The waterbodies contain very little bank and emergent aquatic vegetation.
Woody debris and leaf litter	Woody debris and leaf litter was prevalent in the remnant vegetation patches across development footprints providing potential habitat for the threatened Cumberland Plain Land Snail and Dural Land Snail.

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

These field captured polygons have also been used to refine species polygons developed for those species either recorded by targeted surveys or assumed present.

Diurnal birds

Survey method and effort

The focus of the diurnal bird survey is to determine potential nesting of Glossy Black Cockatoo and Gang-gang Cockatoo within the subject land, detect large stick nests which may be indicate breeding of Little Eagle, White Bellied Sea Eagle, and Square-tailed Kite, and to determine if the remaining smaller species occur within the subject land.

The initial diurnal bird nest survey was undertaken in conjunction with September targeted flora surveys where two ecologists walked the entirety of the subject land at 5-10 metre transect lines. Dusk surveys transect were completed by two ecologists for two hours prior to sunset over four nights to detect any threatened diurnal birds within the subject land and observe if they are nesting on site. Transects will be repeated twice and each survey will be undertaken across a total of two hours with observers walking approximately two kilometres per hour. All species encountered will be recorded.

Opportunistic surveys as well as large stick nest and hollow bearing tree surveys were conducted in September 2023, October 2023, January 2024, and February 2024. Surveys consisted of transects, observing hollows for use and other evidence of breeding.

Justification of survey method and effort

DPE is developing survey guidance for many threatened bird species (DPE 2023c). Methods employed as part of this assessment included:

- Survey for the presence of eucalypts containing hollows that are at least 9 m above the ground, and with hollow diameter of 10 cm or larger.
- Survey for the presence of nest trees supporting large stick nests.
- Survey for the presence of living or dead eucalypt trees containing hollows greater than 5 cm diameter and greater than 4 m above the ground (or with a DBH of greater than 30 cm).

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

Timing of survey

Survey was conducted in relation to requirements in the TBDC survey guides.

Survey personnel and relevant experience

Diurnal bird surveys were undertaken by the Biosis ecologists outlined in Table 21.

Table 21 Targeted Diurnal bird survey personnel and relevant experience

Staff member	Role	Relevant experience
Joel Nicholson	Zoologist	Over four years' experience undertaking fauna surveys in NSW
Julia Hutton	Graduate ecologist	Over two years' experience undertaking fauna surveys in NSW.

Results

Table 22 provides a summary of the results of the nocturnal bird surveys completed.

Table 22 Summary of Diurnal bird survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Hieraaetus morphnoides	Little Eagle	• Stick Nest search • 22 September 2023	Not recorded during surveys	N/A

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Lophoictinia isura	Square-tailed Kite	• Stick Nest search • 22 September 2023	Not detected during targeted surveys	N/A
Haliaeetus leucogaster	White-bellied Sea-Eagle	• Stick Nest search • 22 September 2023	Not detected during targeted surveys	N/A
Callocephalon fimbriatum	Gang-gang Cockatoo	• Active search • 22 September 2023 • Dusk surveys • 16-17 January 2024 • 23-24 January 2024	Not detected during targeted surveys	N/A
Calyptorhynchus lathami	Glossy Black Cockatoo	• Active search • 22 September 2023 • Dusk surveys • 16-17 January 2024 • 23-24 January 2024	Not detected during targeted surveys	N/A

Invertebrates

Survey method and effort

Targeted surveys for Cumberland Plain Land Snail and Dural Land Snails were undertaken by qualified ecologists Rebecca Goodwin (Principal Ecologist), Joel Nicholson (Zoologist) and Julia Hutton (Graduate ecologist) on 17 and 18 October 2023, over four person hours. Active searches for live snails were undertaken in suitable habitat such as beneath leaf litter at the base of trees and any other shelter sites that may be present within the subject land.

Survey methodology utilised by Biosis for the threatened Snails is adapted from the Spot Assessment Technique (SAT) (Phillips & Callaghan 2011). A central feature (particularly Forest Red Gum, woody debris and sheets of bark, rubbish and rock) is chosen, and a search undertaken in around the feature, including scratching the surface of leaf litter, lifting rocks and looking under logs and debris.

Gastropod survey will be undertaken in conjunction with Koala SAT surveys, utilising the same or similar locations proposed for Koala survey. The points selected for Koala SAT survey will be assessed for suitability for both species and if suitable one point will be used for both searches. In the instances where both searches are conducted in the same location, survey for Koala will be undertaken first, followed by the snail survey which at times will involve a higher level of disturbance of the surface material.

Justification of survey method and effort

Survey guidelines followed included:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).

- *Environmental impact assessment guidelines: Cumberland Plain Large Land Snail* (NPWS 2000).

Timing of survey

Survey was conducted in relation to requirements in the TBDC survey guides.

Survey personnel and relevant experience

Invertebrate surveys were undertaken by the Biosis ecologists outlined in Table 23.

Table 23 Targeted Invertebrate survey personnel and relevant experience

Staff member	Role	Relevant experience
Rebecca Goodwin	Principal Ecologist	Over 16 years' experience undertaking targeted fauna surveys in NSW
Joel Nicholson	Zoologist	Over four years' experience undertaking fauna surveys in NSW
Julia Hutton	Graduate ecologist	Over two years' experience undertaking fauna surveys in NSW

Results

Table 24 provides a summary of the results of the invertebrate surveys completed.

Table 24 Summary of invertebrate survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Pommerhelix duralensis	Dural Land Snail	• Modified SAT surveys • 17-18 October 2023	Not detected during targeted surveys	N/A
Meridolum corneovirens	Cumberland Plain Land Snail	• Modified SAT surveys • 17-18 October 2023	Species detected during targeted surveys	5.83 ha in impact area

Mammals

Survey method and effort

Targeted surveys for the mammal species listed in Table 16 include:

- Spotlighting and stag-watching undertaken for six nights in total (17-18 October 2023, 16-17 January 2024, and 23-24 January 2024) to determine presence of mammals within the development footprint.
- Active fauna searches of hollow-bearing trees and suitable habitat during the day on 22 September 2023, 17-18 October 2023.
- Flying fox camp search was undertaken on 17 October 2023.
- Terrestrial Camera trapping was undertaken over 14 nights from 30 January 2024 to 13 February 2024.
- Arboreal Camera trapping was undertaken over 14 nights from 15 January 2024 to 30 January 2024.
- Six Koala Spot Assessment Techniques (SAT) surveys were undertaken to detect presences and use of feed trees within the subject land.

Further detail for the survey method and effort for each survey is provided in the corresponding sections below.

Baited Remote Camera trapping

Survey included the deployment of 20 baited remote cameras, mounted to target terrestrial and arboreal species and deployed for a minimum of two weeks at each setting. Arboreal cameras were mounted to trees at a height greater than 1.5 metres from the ground, facing a bait station mounted on an adjacent tree between one and four metres.

Terrestrial cameras were mounted to trees, facing a bait station attached to a star picket, or where appropriate a habitat feature such as a log or tree, in areas with suitable microhabitat for the target species. Suitable microhabitat will include areas adjacent to or at the edge of dense understorey, near potential den habitat such as hollow logs and piles of coarse woody debris. In some instances it was appropriate to place cameras located along paths created by cattle, as these may be used by fauna during foraging movements.

A total of ten arboreal cameras were deployed throughout the subject land from 15 January 2024 to 30 January 2024 and 10 terrestrial cameras were deployed throughout the subject land from 30 January 2024 to 13 February 2024.

Spotlighting and Stag watching

Six spotlight transect surveys of two hours each, over a two kilometre transect were undertaken within the subject land. The spotlight survey effort was undertaken for both terrestrial and arboreal mammals and was conducted in addition to incidental/general observations which may be made as zoologists move around the site during diurnal bird transect surveys.

Four nights of stag watching occurred one hour prior to and 30 minutes after sunset by two zoologist at large hollow bearing trees within the subject land. The target trees were observed for species leaving or returning to the hollow at dusk to observe occupation and use of these habitat trees.

Spotlighting surveys were undertaken for a total of six nights on 17-18 October 2023, 16-17 January 2024, and 23-24 January 2024. Stag watching was completed for a total of four nights on 16-17 January 2024 and 23-24 January 2024.

Koala Spot Assessment Techniques (SAT) surveys

SAT surveys are the Commonwealth recommended survey method used to determine the presence/absence of Koalas across the assessment area, the activity levels to determine resident aggregation and/or transient sites, the population density and size, and habitat availability. Searches are undertaken to identify direct/indirect evidence of activity of Koala including evidence of scats or characteristic, scratches on the trunks of trees. Preferred Koala feed trees were recorded during flora surveys and during the habitat feature surveys.

SAT survey points are located at the intersection of grid lines with a 150 metre spacing between lines. Where the grid intersections do not fall within the alignment, the point will be shifted across to fall within properties which have land access agreements. A feed tree is selected as close as possible to the proposed SAT location and the 29 closest trees are searched. Each tree is inspected for signs of Koala use (urine stains, scratches, Koala present) followed by a search of the area surrounding the tree for koala scat. A radius of one metre around the tree is searched for Koala scat and trees are searched for an average of two minutes each, noting larger trees will require a longer search time than smaller trees.

Six Spot Assessment Technique (Phillips & Callaghan 2011) survey points (SAT surveys) were undertaken to determine activity levels for Koala in well-timbered areas.

The data collected and photos of the focal tree for each of the six SAT surveys are provided in Appendix 7. The location of each Koala SAT surveys is provided on Figure 9.

Justification of survey method and effort

Survey guidelines followed include:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004b).
- *Survey Guidelines for Australia's Threatened Mammals* (DEWHA 2011).

Timing of survey

Survey was conducted in relation to requirements in the TBDC survey guides.

Survey personnel and relevant experience

Terrestrial and arboreal mammal surveys were undertaken by the Biosis ecologists outlined in Table 25.

Table 25 Targeted mammal survey personnel and relevant experience

Staff member	Role	Relevant experience
Joel Nicholson	Zoologist	Over four years' experience in undertaking threatened mammal surveys
Julia Hutton	Graduate Zoologist	Over two years' experience in undertaking threatened mammal surveys

Results

Table 26 provides a summary of the results of the mammal surveys completed.

Table 26 Summary of mammal survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Cercartetus nanus	Eastern Pygmy-possum	Arboreal Camera Trapping (14 nights) • 15 – 30 January 2024 Spotlighting (four nights) • 16-17 January 2024 • 23-24 January 2024	Not detected during targeted surveys	-
Pteropus poliocephalus	Grey-headed Flying-fox	• Camp search • 17 October 2023	Not detected during targeted surveys	-
Phascolarctos cinereus	Koala	SAT surveys • 17-18 October 2023 Spotlighting (4 nights) • 17-18 October 2023 • 16-17 January 2024 23-24 January 2024	Not detected during targeted surveys	-
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Terrestrial Camera trapping (14 nights) • 30 January - 13 February 2024	Not detected during targeted surveys	-

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		Spotlighting (4 nights) • 17-18 October 2023 • 16-17 January 2024 • 23-24 January 2024		
Petauroides volans	Southern Greater Glider	Arboreal Camera Trapping (14 nights) • 15 – 30 January 2024 Spotlighting (four nights) • 16-17 January 2024 • 23-24 January 2024	Not detected during targeted surveys	-
Petaurus norfolcensis	Squirrel Glider	Arboreal Camera Trapping (14 nights) • 15 – 30 January 2024 Spotlighting (four nights) • 16-17 January 2024 • 23-24 January 2024	Not detected during targeted surveys	-

Microchiropteran bats

Survey method and effort

Ultrasonic call analysis was undertaken using Anabat Insight software and relevant published reference call guides (Pennay et al. 2004). Analysis was run through custom filters/a decision tree to remove noise (frequencies below 7kHz) and files/passes with less than three pulses. The custom decision tree/filter was then run using characteristic frequency and duration to identify calls to genus, or species level where possible.

Any calls identified by the system as significant or uncommon species were checked manually against the NSW reference calls, by visual comparison of sonograms with published reference calls by an experienced bat expert, to ensure accurate results. In addition, calls were chosen for manual vetting from each species/genus grouping for quality assurance of data.

Justification of survey method and effort

Targeted survey for the threatened microbat species included the use of four ultrasonic detectors over four nights (15 – 19 January 2024). The total survey effort of 16 nights meets the survey requirements specified in '*Species credit' threatened bats and their habitats* (OEH 2018). The detectors were set to record 30 minutes before sunset and stop 30 minutes after dawn. Units were placed in a position that maximised the likelihood of recording bats in accordance with the guidelines (along waterways and in flyways).

Timing of survey

Survey was conducted in relation to requirements in the TBDC survey guides.

Survey personnel and relevant experience

Microbat surveys were undertaken by the Biosis ecologists outlined in Table 27.

Table 27 Targeted microbat survey personnel and relevant experience

Staff member	Role	Relevant experience
Felicity Wiliams	Senior Zoologist (Bat Ecology)	Over eight years' experience in undertaking threatened microbat surveys and bat call identification.
Joel Nicholson	Zoologist	Over four years' experience in undertaking threatened microbat surveys
Julia Hutton	Graduate Ecologist	Over two years' experience in undertaking threatened microbat surveys

Results

Table 28 provides a summary of the results of the microbat surveys completed. A complete report of the microbat survey can be found in Appendix 8.

Table 28 Summary of microbat survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Myotis macropus	Southern Myotis	• Ultrasonic recording devices • 15-19 January 2024	Species detected during targeted surveys	4.58 ha development footprint

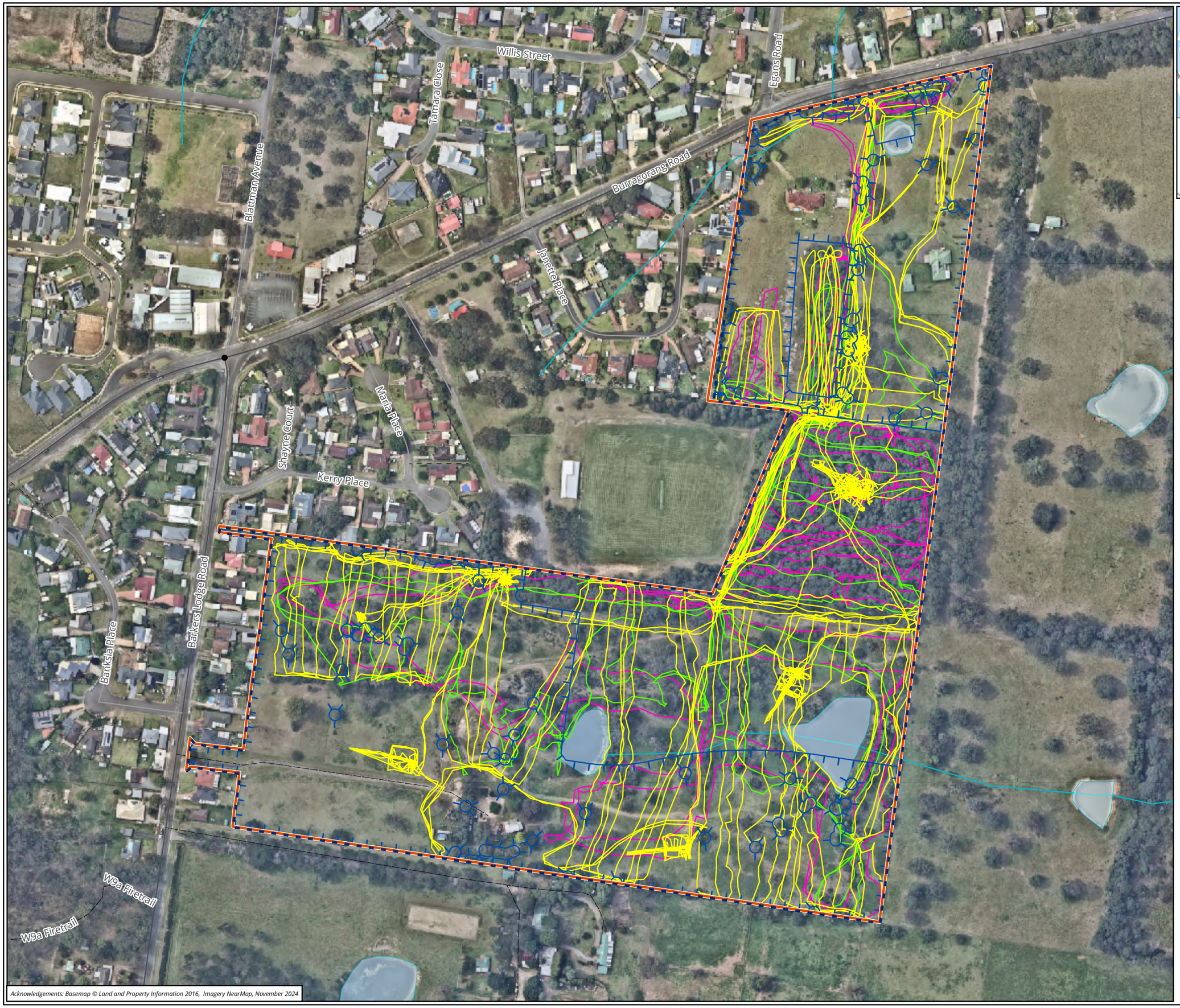
4.2.2 Incidental flora and fauna surveys

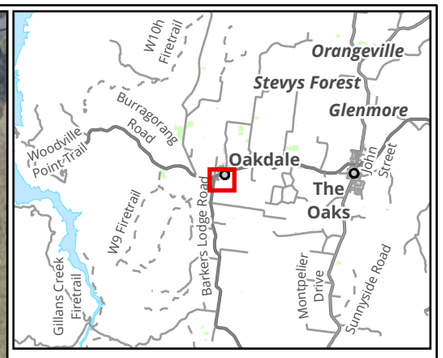
Fauna surveys undertaken on an ongoing basis throughout the field campaign included incidental diurnal bird surveys, active searches of woody debris and leaf litter, incidental aural observations of frog species and incidental observations of various mammal species.

Four threatened fauna species were identified during incidental fauna surveys:

- Large-eared Pied Bat *Chalinolobus dwyeri*
- Large Bent-winged Bat *Miniopterus orianae oceanensis*
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
- Greater Broad-nosed Bat *Scoteanax rueppellii*

The four threatened microbat species were detected incidentally during targeted surveys on Ultrasonic microbat detectors. The four species do not have breeding habitat onsite as such the proposed impact will be restricted to foraging resources addressed in the species credit species under the PCT associated with each species.





Legend

- Subject land
- Development footprint

February Flora Survey – 08/02/2024

- Survey track

October Flora Survey – 18/10/2023

- Survey track

September Flora survey – 22/09/2023

- Survey track

Figure 9.1 Targeted species mapping - Flora

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 21 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
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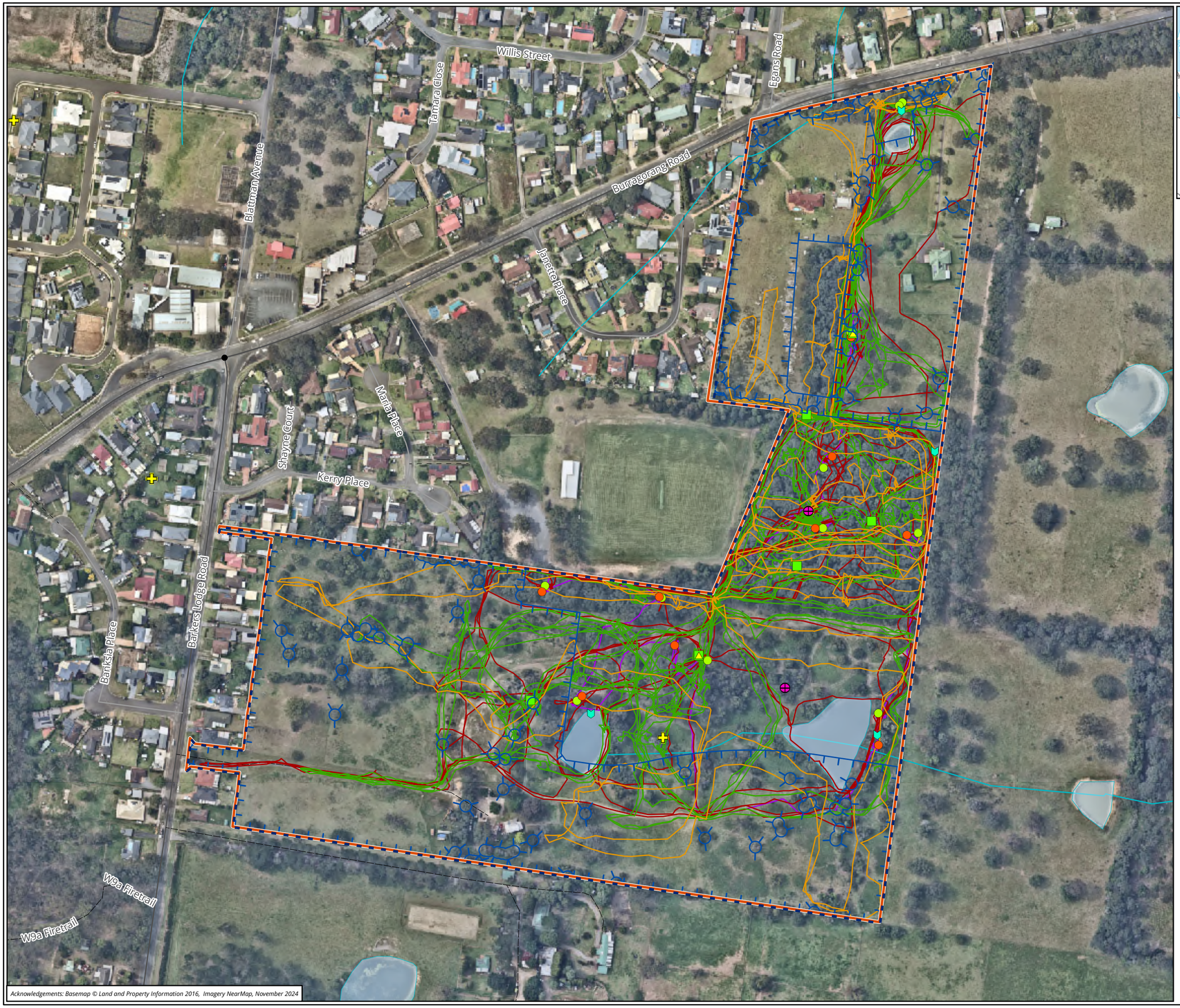
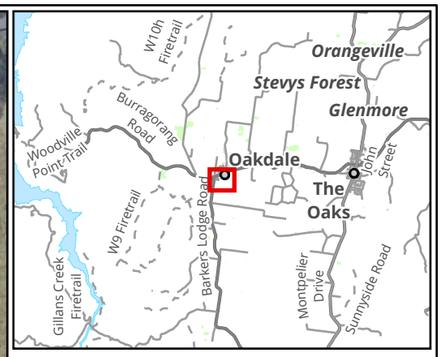
Layout: 39765_F9_TargetedMapping





Legend

- Subject land
- Development footprint
- Stag watch
- Koala / Snail SAT survey
- Ultrasonic bat detector

Camera traps

- Arboreal
- Terrestrial

Survey tracks

- Camera setup
- Cockatoo search
- Spotlighting
- Stick nest search

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Threatened fauna sightings (BioNet)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Figure 9.2 Targeted species mapping - Fauna

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEMGroup

Matter: 39765, Date: 21 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F5-10.aprx
Layout: 39765_F9_TargetedMapping

Acknowledgements: Basemap © Land and Property Information 2016, Imagery NearMap, November 2024

4.2.3 Local data

No local data has been used for threatened species assessment.

4.2.4 Expert reports

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

No expert reports were utilised for the current assessment.

4.2.5 Threatened species summary and polygons

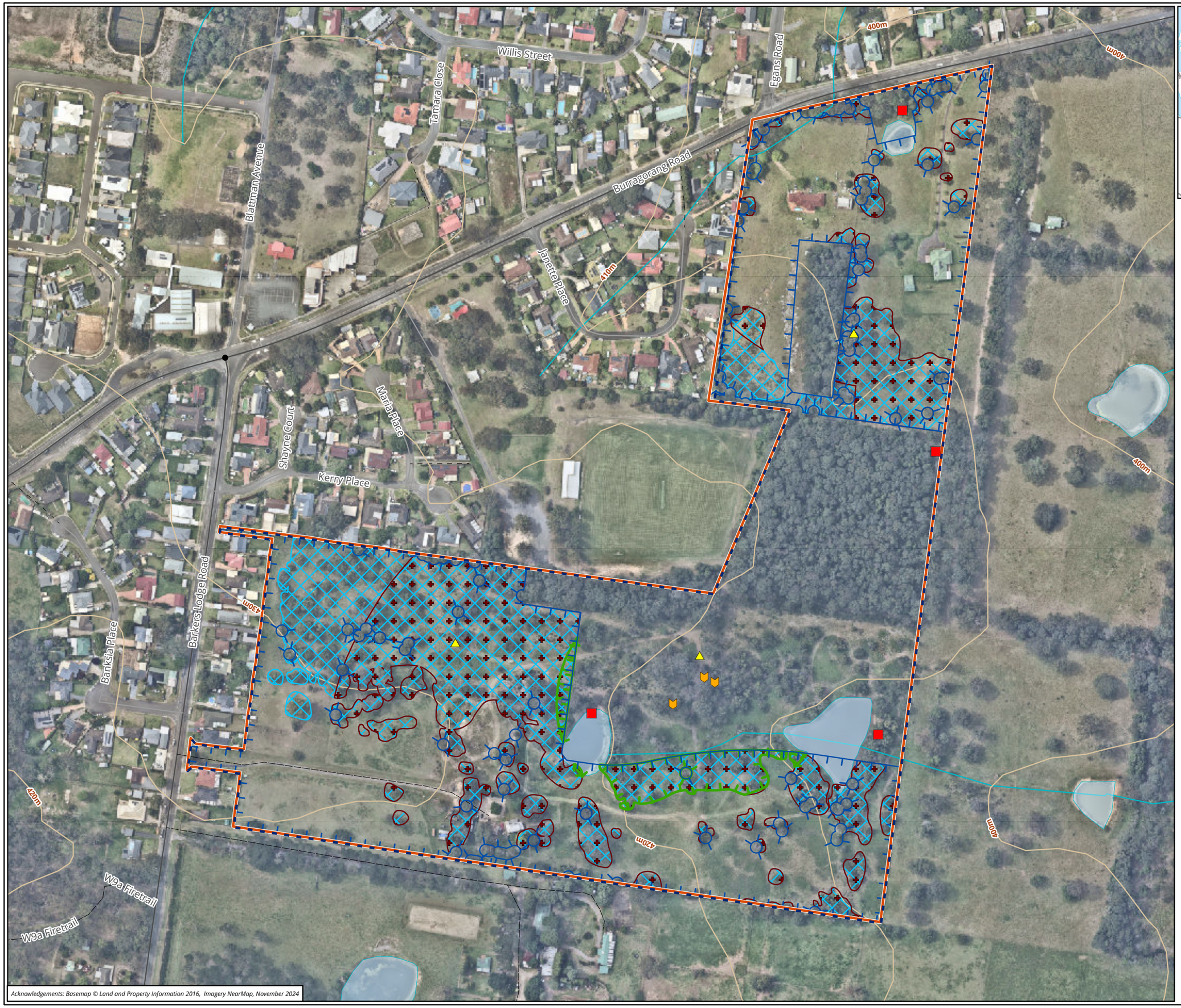
Table 29 provides details of threatened species impacted by the project and outlines the attributes that comprise the threatened species polygons.

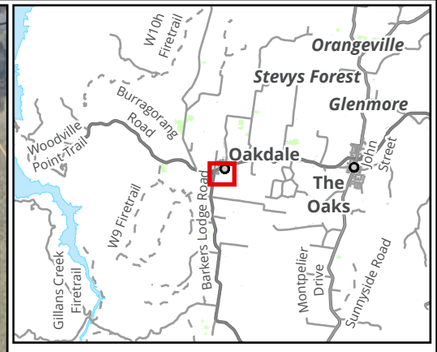
The presence of threatened species impacted by the project is illustrated in Figure 10.

Table 29 Threatened species polygons within the development footprint

Threatened species	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes
Fauna				
Cumberland Plain Land Snail ***Meridolum corneovirens***	5.83	Area	2.00	5.83 ha in development footprint
Southern Myotis ***Myotis macropus***	4.58	Area	2.00	4.58 ha in development footprint
Powerful Owl ***Ninox strenua****	0.53	Area	2.00	0.53 ha in development footprint

** Due to the limited availability of habitat within the subject land, large home range, and the sensitivity to gain being identical for each species, only one of the Large Forest Owl species, has been selected as a candidate species for the purpose of credit calculations. See section 4.2 for further detail.*





Legend

- Subject land
- Development site
- Development footprint
- Microbat sighting (Biosis)
- Cumberland Plain Land Snail sighting (Biosis)
- Hollow-bearing tree - Large Forest Owl habitat

Threatened species polygons

- Powerful Owl polygon - Impact area
- Southern Myotis polygon - Impact area
- Cumberland Plain Land Snail polygon - Impact area

Figure 10 Threatened species polygons

0 20 40 60 80 100

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 21 February 2025
Prepared for: TH, JN, RG, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F5-10.aprx
Layout: 39765_F10_ThrSpecies

Stage 2 — Impact assessment (Biodiversity Values)

5 Avoid and minimise impacts

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

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

5.1 Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the subject land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered below.

Figure 11shows the final development footprint, while Figure 12 shows three alternative footprints/concept designs considered to avoid or minimise impacts on biodiversity values.

The final proposal footprint (including construction and operation) as well as demonstrating prescribed impacts and indirect impact zones where applicable is shown in Figure 13 and Figure 14.

- The intended outcome of the Planning Proposal is to amend the applicable local planning controls to accommodate up to 208 new residential dwellings with a variety of scale and character reflective of the dominant dwelling type in the Oakdale locality, as well as Community Open Space and a Conservation Area. An indicative draft Master Plan has been developed by Colliers International Engineering and Design Pty Ltd that is reflective of the site's opportunities and constraints in the areas of biodiversity, bushfire management, and stormwater management.

Avoidance and minimisation of impacts

Avoidance measures through the design of the Master Plan included:

- Relocation of the roundabout further south, in southern portion of subject land, and reduction in number of lots partially occurring within PCT 3321 within the southern portion of the subject land.
- Redesign of subdivision to retain remnant native vegetation and hollow-bearing trees with a proposed C2 zoning.

- A large portion of the subject land has been exposed to extensive prior disturbance, including grazing and land clearing. The proposed development footprint has been selected within areas of low biodiversity value, including low condition vegetation and cleared land within the subject land.
- Containing required APZ's within the road design and lot boundaries to avoid further impacts to native vegetation.
- Avoidance of 7.40 ha of remnant native vegetation, including 3.31 hectares in high condition, within the central-southern portion of the subject land, under a C2 Environmental Conservation Zoning.

Following feedback from Council, Government agencies and community stakeholders in response to preliminary notification of the planning proposal, further avoidance and measures based on a significantly revised concept subdivision which responds to feedback has occurred. The key changes to the planning proposal are summarised as follows.

- Retention of an additional 195 trees across the site within proposed lot boundaries and road reserves, including 4 additional hollow-bearing trees.
- 19-29% reduction in development footprint impacts to two Critically Endangered Ecological Communities (CCECs).
- 11% reduction in lot yield (from 208 to 185).
- Inclusion of a cap of 22 small lots (i.e. lot size between 300m2 and 450m2) by way of a site specific LEP clause.
- Application of 700 m2 minimum lot size to northern residential precinct and lots directly adjoining 1830 Barkers Lodge Road.
- Designating the site an urban release area in accordance with Part 6 of the LEP (thereby requiring the availability of public utility infrastructure and preparation of site-specific development controls prior to the granting of development consent).
- Rationalisation of proposed zones, with all environmental land to be zoned C2 Environmental Conservation.
- Stormwater basins and conservation land to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.
- The subject land would have resulted in impacts to 12.98 ha of native vegetation prior to implementation of avoidance measures described above. In efforts to avoid and minimise impacts, the final development design was restricted to removal of 5.83 ha of native vegetation.

A summary of the key changes and reduction in impacts to biodiversity values, based on a comparison of the 2024 development footprint and the current development footprint, has been provided in Table 30.

Table 30 Summary of biodiversity values and impacts

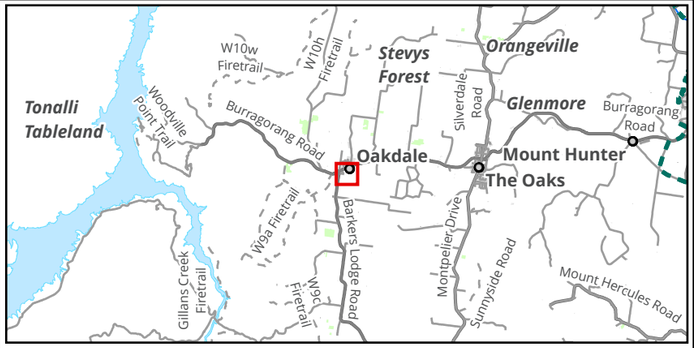
Biodiversity values	Development site /Subject site	Previous development footprint impacts (2024)	Curren development footprint impacts (2025)
PCT 3262 Sydney Turpentine Ironbark Forest (CEEC)	2.69	0.07	0.05
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest (CEEC)	5.02	3.01	2.45
PCT 3616 - Sydney Hinterland Grey Gum Transition Forest	5.27	3.74	3.33
Hollow bearing trees	9	4	0

Individual trees to be retained/removed	760	478	283
Cumberland Plain Land Snail habitat	12.98	6.82	5.83
Southern Myotis habitat	11.29	5.52	4.58
Powerful Owl habitat	3.32	1.2	0.53

Mitigate impacts

To further mitigate impacts on biodiversity the following measures are proposed:

- The proposed works will restrict impacts to up to 5.83 ha of remnant native vegetation within the development footprint.
- Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest CEEC (PCT 3321) and Sydney Turpentine Ironbark Forest CEEC (PCT 3262) within the development footprint, through the retention of an additional 195 trees across the site, including 4 additional hollow-bearing trees.
- A site specific VMP will be prepared to:
  - Protect, manage and restore 0.97 ha of high condition and 1.61 ha of low condition Shale Sandstone Transition Forest CEEC (PCT 3321), 2.34 ha of high condition and 0.29 ha of underscrubbed condition Sydney Turpentine Ironbark Forest (PCT 3262), and 1.62 ha of low condition and 0.04 ha of scattered trees condition Sydney Hinterland Grey Gum Transition Forest (PCT 3616) under a C2 Environmental Conservation zoning and VMP in perpetuity.
  - C2 zoned land to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.
- The VMP will be implemented and protected in perpetuity under a VMP and to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. This would avoid further degradation to the CEEC within the subject site, as a result of leaving it in situ. The VMP will maintain and restore the extent of occurrence of two CEECs, including 2.58 ha of Shale Sandstone Transition Forest CEEC (PCT 3321) and 2.64 ha of Sydney Turpentine Ironbark Forest CEEC (PCT 3262).
- Mitigation measures will be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, notably Shale Sandstone Transition Forest CEEC and Sydney Turpentine Forest CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7.



Legend

- Subject land
- Development site
- Development footprint

Hollow-bearing trees

- Hollow-bearing tree - To be removed
- Hollow-bearing tree - Not impacted

Arborist trees

- Tree - To be removed
- Tree - Not impacted

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail
- Microbat

Threatened fauna sightings (BioNet)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Threatened Ecological Communities (TEC)

- Turpentine-Ironbark Forest of the Sydney Basin Bioregion (EPBC Act) and Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (BC Act)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (EPBC Act) and Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act)

Vegetation zones

- VZ1 - 3262_Underscrubbed
- VZ2 - 3262_High
- VZ3 - 3321_Low
- VZ4 - 3321_High
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 11 Final development footprint

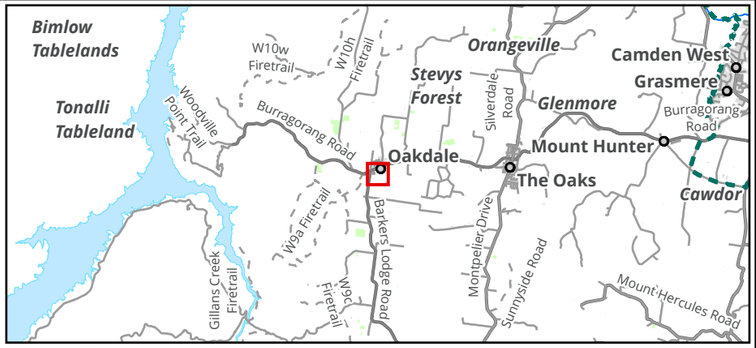
Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

0 40 80 120 160 200
Metres

N

Matter: 39765, Date: 20 February 2025,
Prepared for: TH, RG, JN, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F11-13.aprx
Layout: 39765_F11_FinalDevFootprint

biosis APEM Group



Legend

- Subject land
- Hollow-bearing tree

Preliminary design (18 September 2023)

- Development footprint
- Development site

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Vegetation zones

- VZ1 - 3262_Underscrubbed (CEEC, EPBC act/BC Act)
- VZ2 - 3262_High (CEEC, EPBC act/BC Act)
- VZ3 - 3321_Low (CEEC, EPBC act/BC Act)
- VZ4 - 3321_High (CEEC, EPBC act/BC Act)
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 12.1 Alternate options and avoidance - Preliminary design (18 September 2023)

Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

0 40 80 120 160 200
Metres

N

Matter: 39765, Date: 21 February 2025,
Prepared for: TH, RG, JN, Prepared by: HL, Last edited by: hliswoyo
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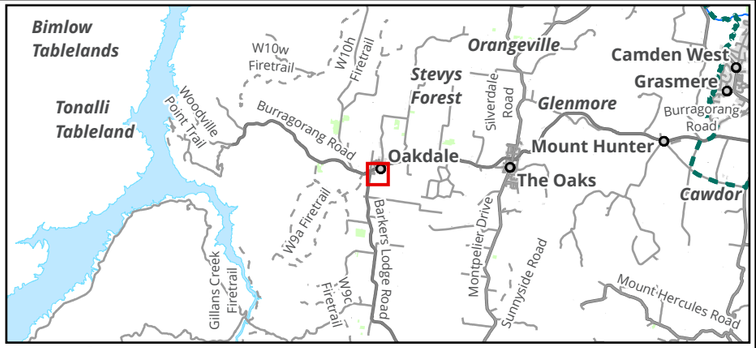
Layout: 39765_F12_AltOptions

biosis
APEMGroup



Legend

- Subject land
- Hollow-bearing tree

Previous development footprint (2 November 2023)

- Development footprint
- Development site

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Vegetation zones

- VZ1 - 3262_Underscrubbed (CEEC, EPBC act/BC Act)
- VZ2 - 3262_High (CEEC, EPBC act/BC Act)
- VZ3 - 3321_Low (CEEC, EPBC act/BC Act)
- VZ4 - 3321_High (CEEC, EPBC act/BC Act)
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 12.2 Alternate options and avoidance - Updated design (2 November 2023)

Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

0 40 80 120 160 200
Metres

N

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Prepared for: TH, RG, JN, Prepared by: HL, Last edited by: hliswoyo
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Layout: 39765_F12_AltOptions

biosis
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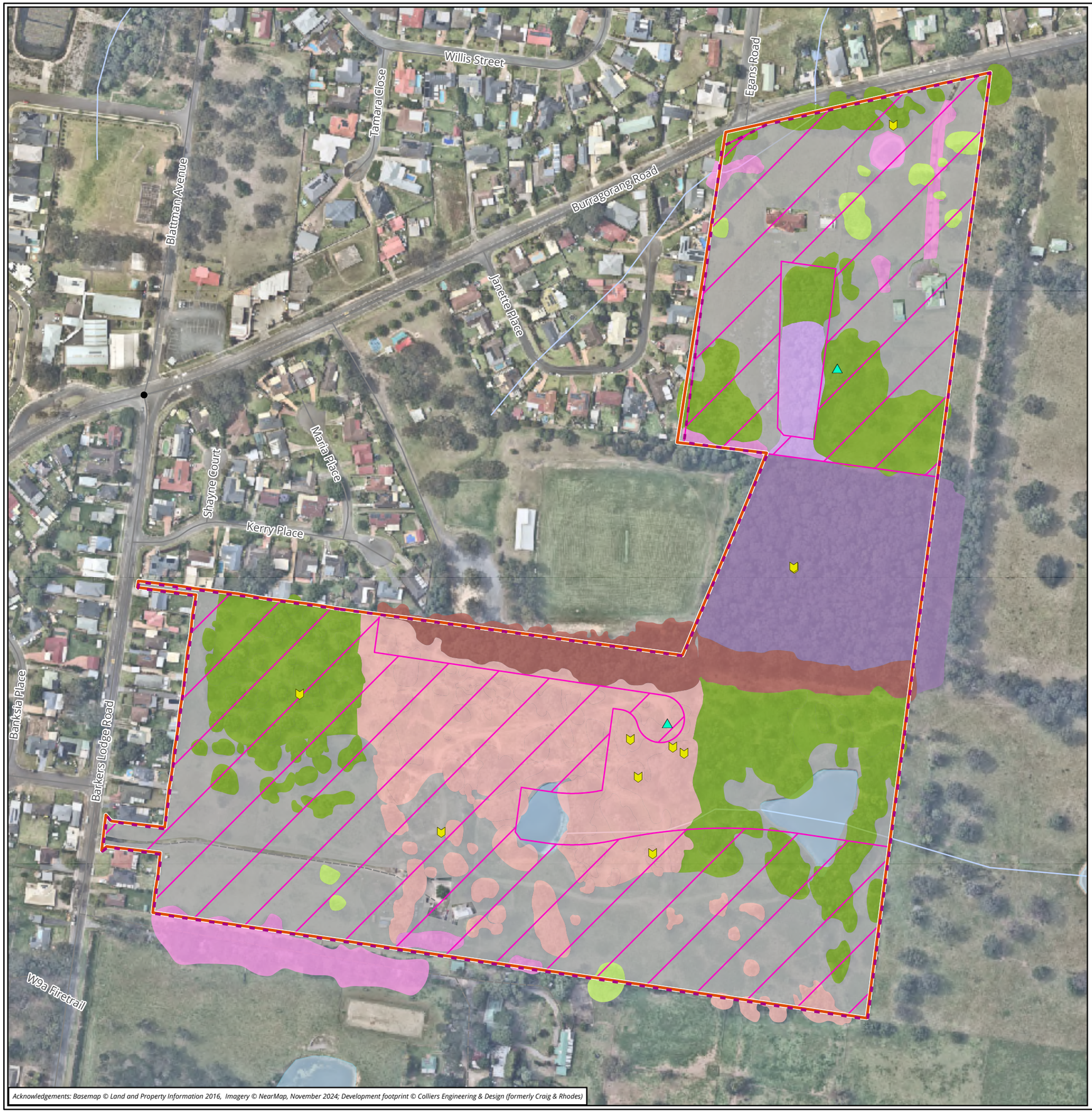

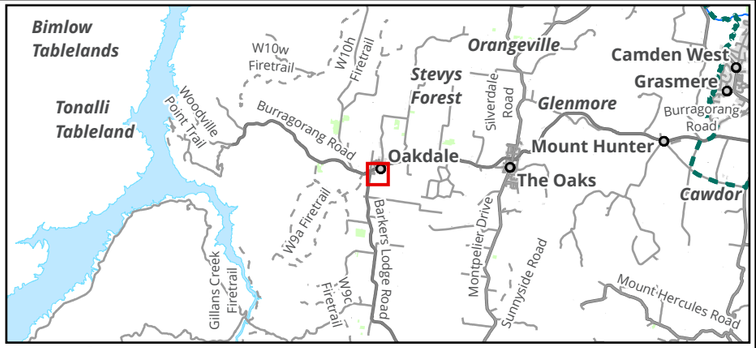

Legend

- Subject land
- Hollow-bearing tree

Previous development footprint (20 February 2024)

- Development footprint
- Development site

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Vegetation zones

- VZ1 - 3262_Underscrubbed (CEEC, EPBC act/BC Act)
- VZ2 - 3262_High (CEEC, EPBC act/BC Act)
- VZ3 - 3321_Low (CEEC, EPBC act/BC Act)
- VZ4 - 3321_High (CEEC, EPBC act/BC Act)
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 12.3 Alternate options and avoidance - Updated design (20 February 2024)

Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

0 40 80 120 160 200
Metres

N

Matter: 39765, Date: 21 February 2025,
Prepared for: TH, RG, JN, Prepared by: HL, Last edited by: hliswoyo
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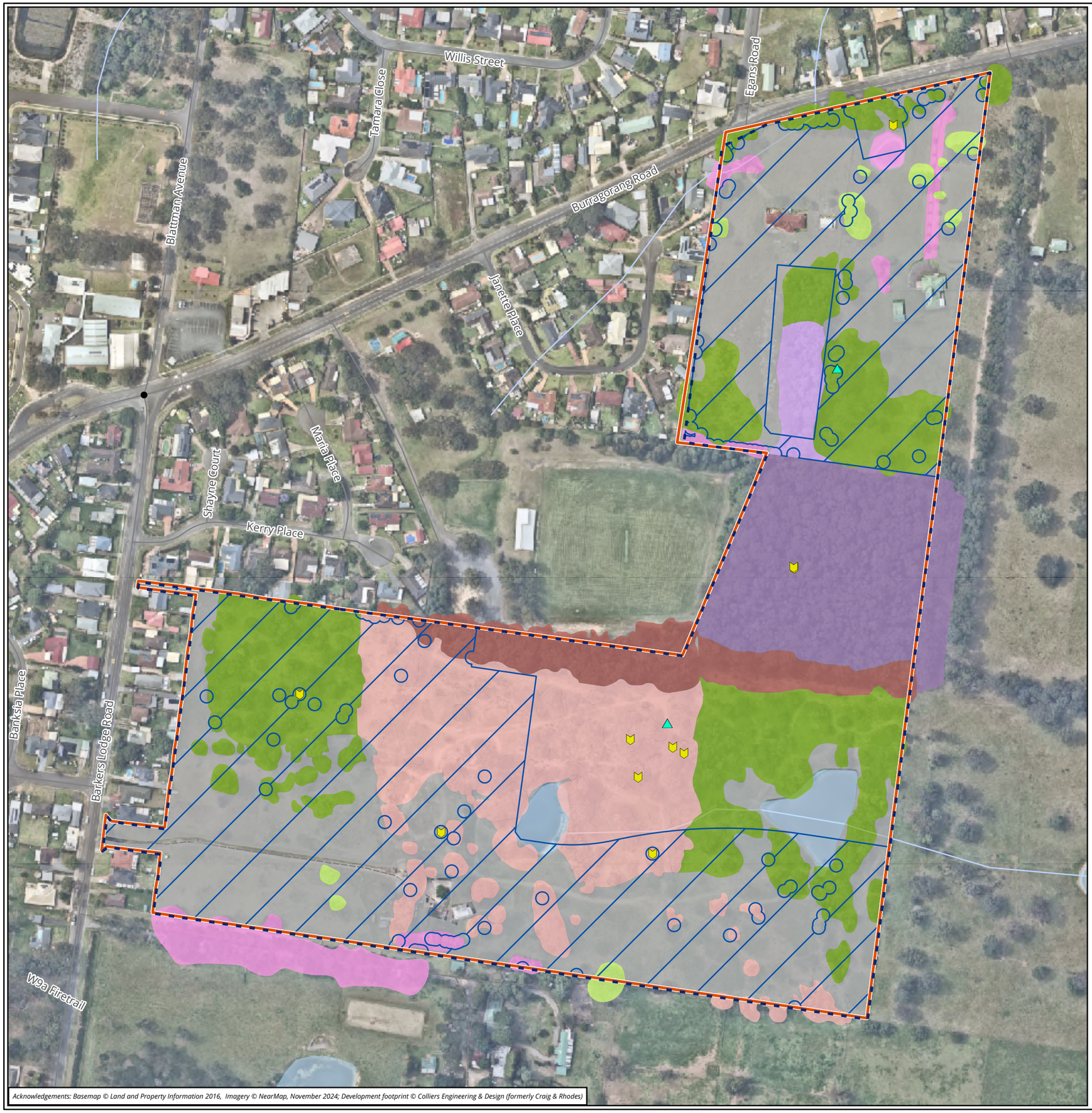
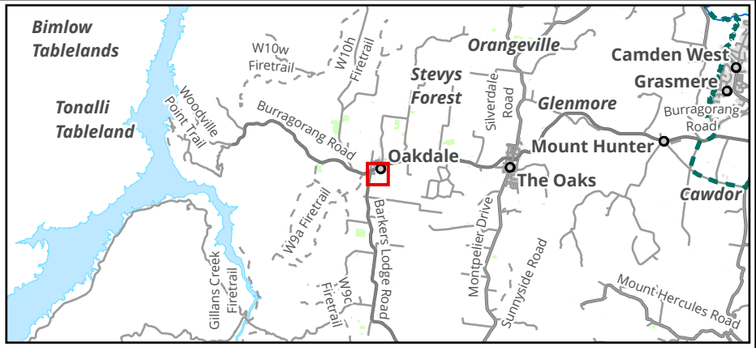
Layout: 39765_F12_AltOptions

biosis
APEMGroup





Legend

- Subject land
- Hollow-bearing tree

Current development footprint

- Development footprint
- Development site

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Vegetation zones

- VZ1 - 3262_Underscrubbed (CEEC, EPBC act/BC Act)
- VZ2 - 3262_High (CEEC, EPBC act/BC Act)
- VZ3 - 3321_Low (CEEC, EPBC act/BC Act)
- VZ4 - 3321_High (CEEC, EPBC act/BC Act)
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 12.4 Alternate options and avoidance - Current design (30 January 2025)

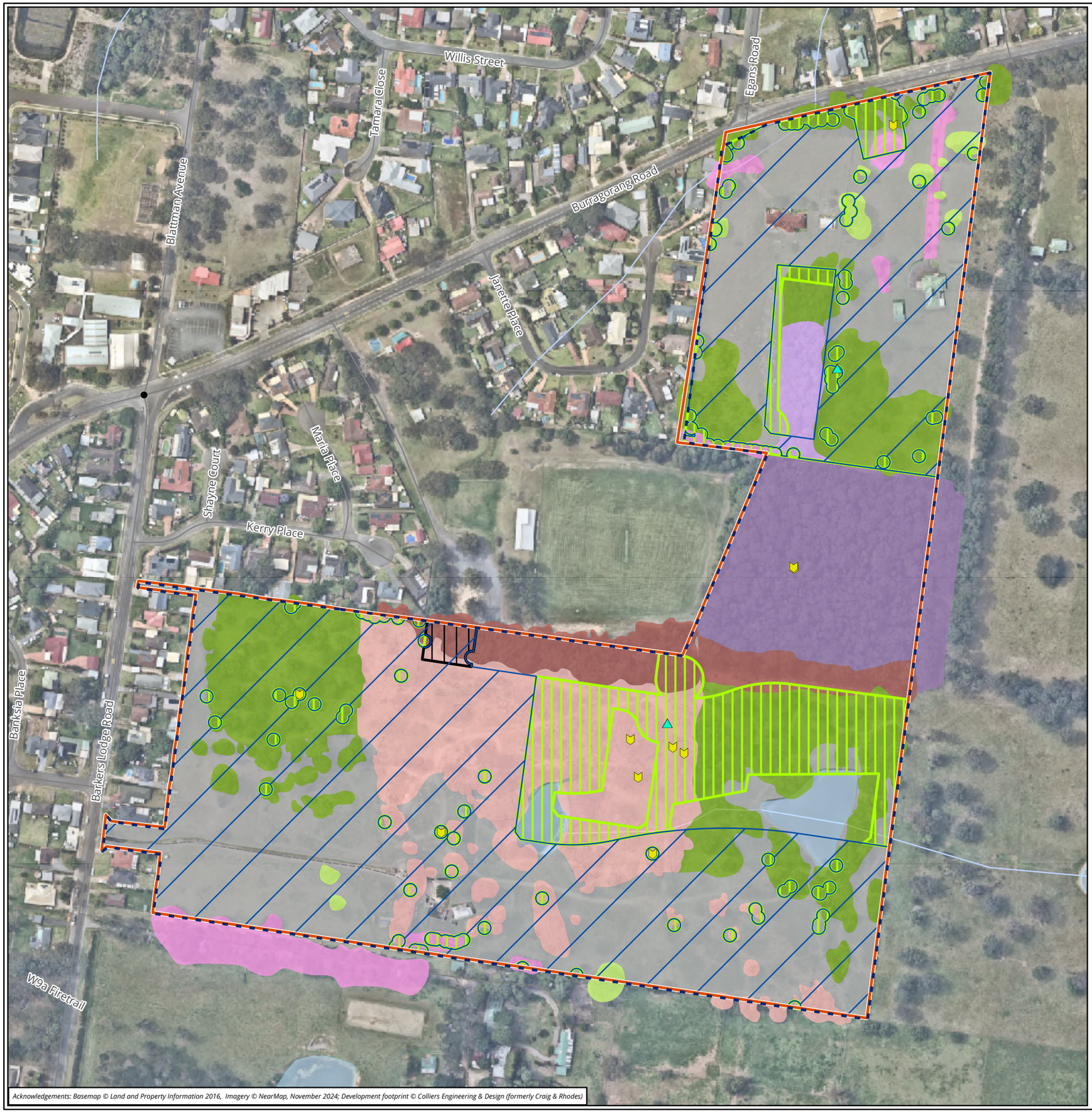
Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

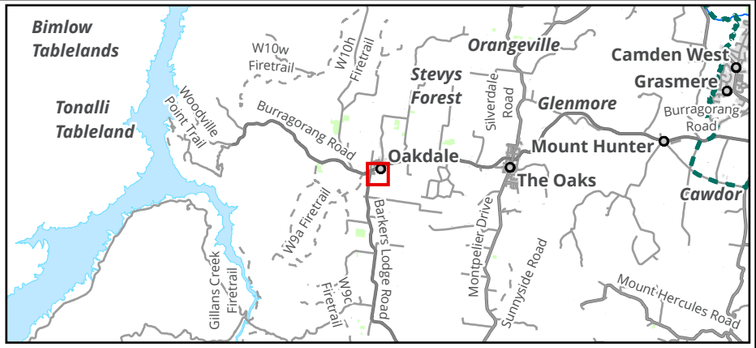
0 40 80 120 160 200
Metres

N

Matter: 39765, Date: 21 February 2025,
Prepared for: TH, RG, JN, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F11-13.aprx
Layout: 39765_F12_AltOptions

biosis
APEM Group





Legend

- Subject land
- Hollow-bearing tree

Current development footprint

- Development footprint
- Development site
- Impacts avoided by current design
- Impacts added by current design

Threatened fauna sightings (Biosis)

- *Meridolum corneovirens* - Cumberland Plain Land Snail

Vegetation zones

- VZ1 - 3262_Underscrubbed (CEEC, EPBC act/BC Act)
- VZ2 - 3262_High (CEEC, EPBC act/BC Act)
- VZ3 - 3321_Low (CEEC, EPBC act/BC Act)
- VZ4 - 3321_High (CEEC, EPBC act/BC Act)
- VZ5 - 3616_Low
- VZ6 - 3616_Scattered Trees
- VZ7 - Urban Native Exotic
- VZ8 - Exotic Grassland

Figure 12.5 Alternate options and avoidance - Final development footprint

Scale: 1:3,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

0 40 80 120 160 200
Metres

N

Matter: 39765, Date: 21 February 2025,
Prepared for: TH, RG, JN. Prepared by: HL. Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F11-13.aprx
Layout: 39765_F12_AltOptions

biosis
APEMGroup

6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a) have been provided below.

This assessment has conservatively assumed, for the purpose of assessment and calculation of impacts, that all land within the development footprint, including road verges, and private spaces would be completely cleared of all native vegetation, with the exception of the proposed retention of approximately 443 trees within the subject land. It should be noted that this is an overestimation of the extent of impacts across 21.98 hectares of land. Lot sizing, and landscaping design for road verges and open spaces in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at Development Application (DA) stage to facilitate the further retention of trees and habitat features within the development. Of importance for assessment, the potential for underestimation of impacts is substantially less than the overestimation of impacts that has been incorporated into the assessment.

At this design level there is necessarily some uncertainty over the extent of indirect impacts, and extent of off-site impacts. Reasonable and justified assumptions have been made on the basis of known information and in consultation with relevant experts on the project team. Indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental Consultants 2024). Therefore, offsets for indirect impacts are not anticipated to be required for the project.

6.1 Direct impacts

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

Direct impacts arising from the project include:

- Removal of 2.45 ha of *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (BC Act) and *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (EPBC Act).
- Removal of 0.05 ha of *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion* (BC Act) and *Turpentine-Ironbark Forest of the Sydney Basin Bioregion* (EPBC Act).
- Removal of 5.83 ha of native vegetation comprising 0.05 ha of underscrubbed condition PCT 3262, 2.36 ha of low condition and 0.09 high condition PCT 3321, 3.13 ha of low condition and 0.20 ha of scattered tree condition PCT 3616.
- Removal of 5.83 ha of Cumberland Plain Land Snail habitat.
- Removal of 0.53 ha of Powerful Owl habitat.
- Removal of 4.58 ha of Southern Myotis habitat.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 7, will provide further avoidance measures to be implemented at the DA stage and minimise the potential impacts to biodiversity values that remain present within the subject land.

A summary of PCTs/zones directly impacted is demonstrated in Table 31 and species credits species in Table 29. AS mentioned above this is an overestimation of impacts and further avoidance measures will be implemented to retain native vegetation within the detailed design (DA) stage.

Table 31 Summary of direct impacts to vegetation

Zone	PCT	TEC	Area within subject land (ha)	Area impacted (ha)	VI Score	Future VI Score
3262_Underscrubbed	3262 - Sydney Turpentine Ironbark Forest	*Turpentine-Ironbark Forest of the Sydney Basin Bioregion* (CEEC, EPBC Act) *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion* (CEEC, BC Act)	0.34	0.05	48.5	0
3321_Low	3321 - Cumberland Shale-Sandstone Ironbark Forest	*Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC, BC Act) *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (EPBC Act)	3.97	2.36	53.8	0
3616_Low	3616 - 3616 Sydney Hinterland Grey Gum Transition Forest	N/A	5.02	3.13	46.3	0
3616_ScatteredTrees	3616 - 3616 Sydney Hinterland Grey Gum Transition Forest	N/A	0.25	0.20	30.2	0
3321_High	3321 - Cumberland Shale-Sandstone Ironbark Forest	*Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC, BC Act) *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (EPBC Act)	1.05	0.09	75.4	0
Urban Exotic	N/A	N/A	0.44	0.36	1	0
Exotic Grassland	N/A	N/A	8.56	7.92	2.2	0

Table 32 Summary of direct impacts species credit habitat or individuals

Species	Sensitivity	Area (ha) or count
Powerful Owl	Moderate Sensitivity to Gain	0.53 ha in development footprint
Cumberland Plain Land Snail	High Sensitivity to Gain	5.83 ha in development footprint
Southern Myotis	Moderate Sensitivity to Loss	4.58 ha in development footprint

6.1.1 Loss of hollow bearing trees

All hollow-bearing trees within the development footprint are to be retained as part of the proposed works. All Large Hollows suitable for Large Forest Owls will be retained within C2 zoned land. One hollow-bearing tree is proposed for removal within the detention basin, however, impacts in this area have not been finalised, and will be confirmed at DA stage.

6.2 Indirect impacts

Potential indirect impacts arising from the project are outlined and addressed in Table 33 and shown in Figure 13.

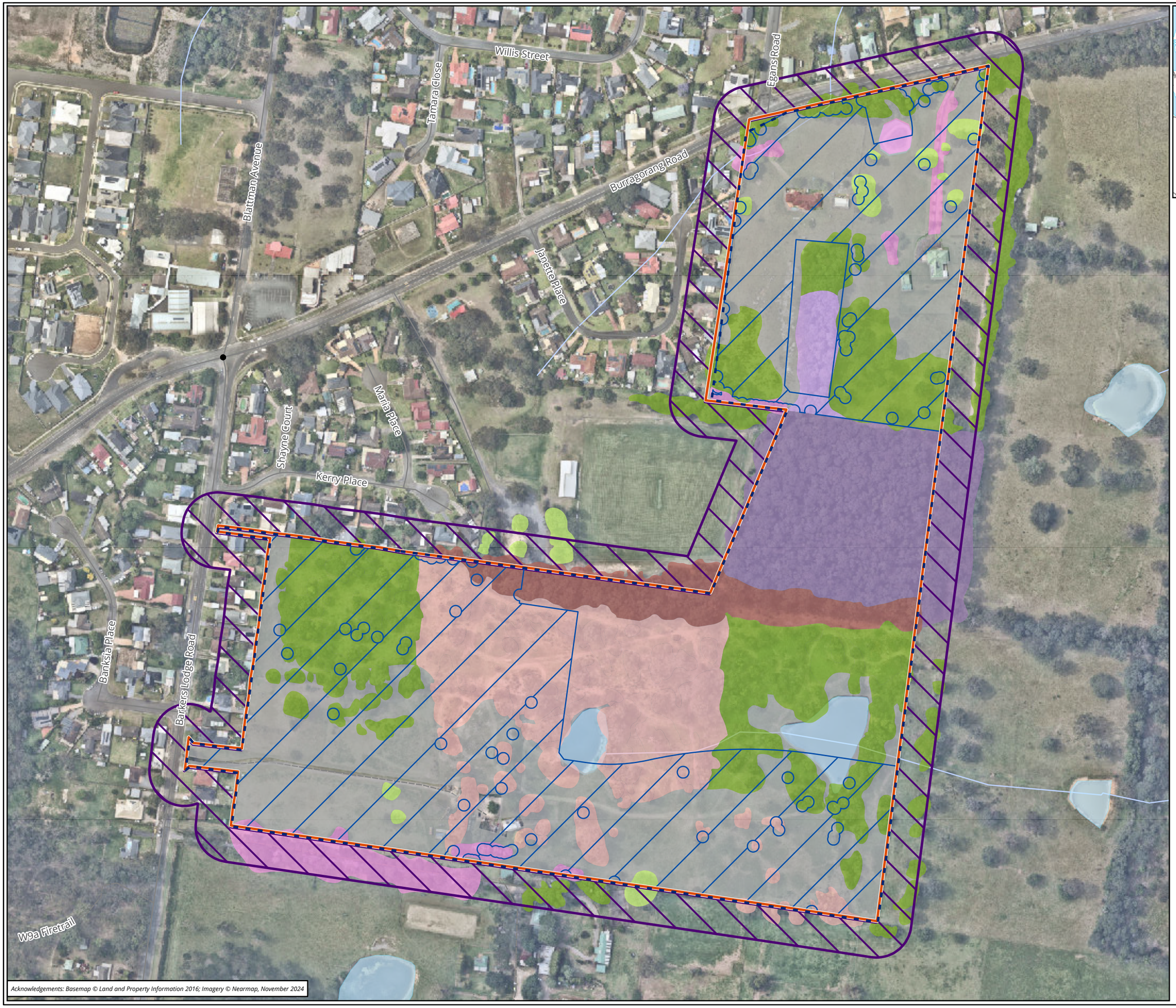
Indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental Consultants 2024). Therefore, offsets for indirect impacts are not anticipated to be required for the project.

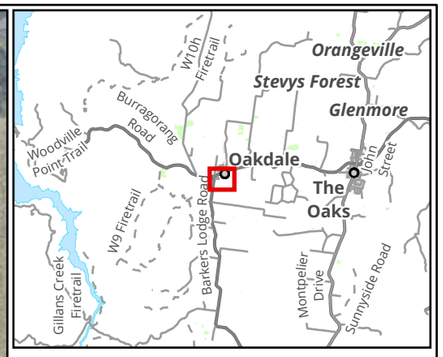
Table 33 Assessment of indirect impacts

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	Impacts to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a CEMP detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards the adjacent retained habitats. A site specific VMP (Restore Environmental 2024) has been prepared to: • Protect and restore 2.34 ha of high condition remnant *Sydney Turpentine Ironbark Forest* CEEC (PCT 3262), and 1.05 ha of high condition *Shale Sandstone Transition Forest* CEEC (PCT 3321), in perpetuity. • Retention of nine hollow bearing trees the C2 zoned land, and within lot boundaries and road reserves.
Reduced viability of adjacent habitat due to edge effects	Adjacent habitats are currently subject to a high degree of edge effects due to prior clearing and surrounding existing residential and agricultural land use. 5.83 ha of native vegetation is to be removed and will likely increase to edge effects to the remnant vegetation within the subject land. However, the impacts to retained vegetation within the C2 zoned land will be mitigated through a VMP (Restore 2024) in perpetuity. The vegetation surrounding the subject land will not be exposed a higher level of edge effects, as a result of the proposed development.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Likelihood and consequences
Reduced viability of adjacent habitat due to noise, dust or light spill	It is predicted that the adjacent habitat will be impacted in a small way by noise, dust and light spill, during construction and operation of the future development of the subject land. However, this will be managed via best practices outlined in a CEMP. The subject land already occurs as a rural residential area, and light and noise pollution is most likely moderate. This will likely not substantially increase due to the proposed future development and will be assessed through a lighting assessment for the vegetation within the subject land.
Transport of weeds and pathogens from the site to adjacent vegetation	Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur but will be managed by biosecurity measures outlined in the CEMP.
Increased risk of starvation, exposure and loss of shade or shelter	The majority of the habitat present in the subject land considered marginal for most fauna species given the disturbed condition, however the large patch of native vegetation in the east of the subject land provides high quality shelter and food resources. The large patch of vegetation in the east and the connectivity to other patches will not be impacted by the proposed works. The proposed future development will not result in an increased risk of starvation, exposure and loss of shade or shelter to native species due to the location of the vegetation being removed within the subject land and locality, and it very small proportion of commensurate habitats available in the immediate vicinity.
Loss of breeding habitats	No specialist breeding habitat will be impacted by the proposed future development. Retained vegetation in adjacent lots provides higher quality habitat and will not be reduced by the proposed works.
Trampling of threatened flora species	No threatened flora species were found, or are considered likely to occur, within the subject land, and thus trampling of threatened flora species is unlikely. This indirect impact will be managed in accordance with the VMP (Restore 2024).
Inhibition of nitrogen fixation and increased soil salinity	This impact is not expected as a result of the proposal. The removal of vegetation from this area will not lead to increased soil salinity or affect nitrogen fixation for vegetation in surrounding areas.
Fertiliser drift	All works associated with vegetation management are specified in the VMP (Restore 2024), which may include use of fertilisers, however no indirect impacts are anticipated to occur from these works.
Rubbish dumping	The subject land is currently partially cleared and presents an opportunity for people to illegally dump rubbish. Standard environmental controls for the development would ensure potential impacts are minimised. The proposed development is likely to result in a decrease in the potential for this impact.
Wood collection	Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future use of the subject land, future landholders are not expected to be likely to undertake wood collection within the retained vegetation to a level that it will have a detrimental effect. Unauthorised access and collection of wood is expected to be minimal.
Removal and disturbance of rocks, including bush rock	The subject land does not support bush rock.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Likelihood and consequences
Increase in predators	The subject land already occurs within a semi-urbanised setting with pets, such as Dogs *Canis familiaris* and Cats *Felis catus*, common. The subject land is already largely cleared. The remaining vegetation clearance proposed by the development, and proposed land use, is unlikely to increase predatory species populations.
Increase in pest animal populations	The proposal occurs in a semi-urbanised area with impacts including introduced domestic pets such as cats currently occurring within the locality. Pest animals such as Rats *Rattus rattus* and European Rabbit *Oryctolagus cuniculus* are also widely spread within the region and are likely to occur across the locality. The proposal will not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations. Suitable waste disposal implemented during and post construction will further reduce the resources available for pest species.
Changed fire regimes	The proposal occurs in a semi-urbanised area. Appropriate asset protection zones and fire mitigation systems will be implemented for the future development and the proposal will not result in an increased risk of fire.
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds	The proposed works will not impact specialist breeding and foraging habitat for any threatened species.
Fragmentation of movement corridors	Movement corridors are currently restricted in width and availability through the locality. The project will result in the removal of 5.83 ha of native vegetation that occurs the subject land to the north, south and west. The removal of vegetation along the south may fragment movement corridors from the north and south, however extensive remnant vegetation exists to the southeast of the subject site down to the riparian corridor of Back Creek and vegetation (possible movement corridors) to the west of the subject land to the state conservation area will remain intact and not be fragmented.





Legend

- Subject land
- Development site
- Development footprint
- Potential indirect impacts

Plant Community Type and condition class

- Exotic grassland
- Urban Native/Exotic
- 3262 - Sydney Turpentine Ironbark Forest - High (EPBC and BC Act)
- 3262 - Sydney Turpentine Ironbark Forest - Underscrubbed
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - High (EPBC and BC Act)
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - Low (EPBC and BC Act)
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Low
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Scattered Trees

Figure 13 Estimated zones of indirect impact for the proposal

0 20 40 60 80 100

Metres

Scale: 1:3,000@ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 20 February 2025,
Prepared for: RG, JN, TH, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\
39765_Oakdale_BDAR_F11-13,
Layout: 39765_F13_IndirectImpacts

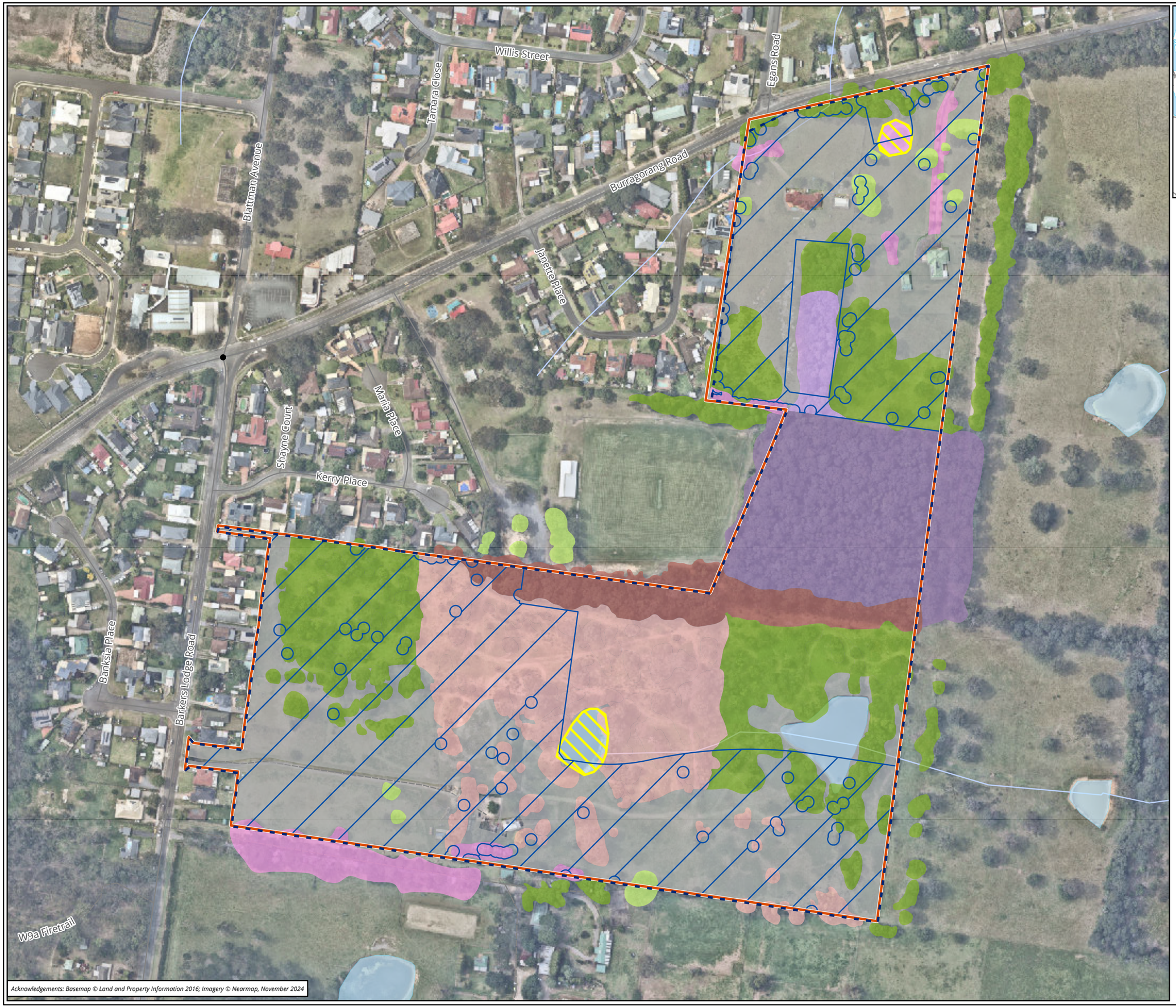
6.3 Prescribed impacts

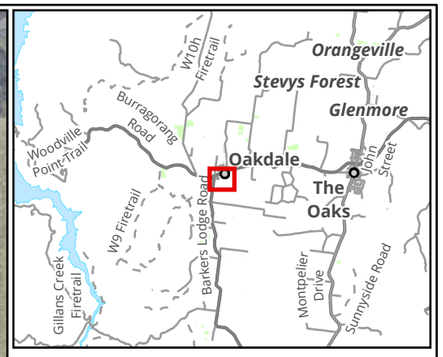
Identification and assessment of prescribed biodiversity impacts are outlined and addressed in Table 34, and the section below, and shown in Figure 14.

Table 34 Identification of prescribed impacts

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Importance of habitat feature to impacted species
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No areas of geological significance occur within the subject land. The development will not impact on threatened species or ecological communities associated with karst, caves, crevices or cliffs.	N/A	N/A
Occurrences of human-made structures and non-native vegetation	Several human-made structures will be impacted by the development, however no threatened species or communities associated with human made structures will be impacted by the development. Non-native vegetation has been mapped across the development footprint and may provide low quality foraging habitat to threatened species.	Powerful Owl	Negligible. Human-made structures to be impacted do not provide habitat for threatened species. Non-native vegetation may act as marginal foraging habitat for large forest owls, given increased visibility of prey. However, these areas are not likely to contain a sufficient amount of a particular resource to be considered important to the fauna species recorded in relation to the amount of forested areas that will be retained both within and adjacent to the subject land. Owls will continue to forage in adjacent forested and cleared areas. Improve and maintain principles to be applied within the VMP implemented for the Project.
Corridors or other areas of connectivity linking habitat for threatened entities	As the subject land is already largely cleared of native vegetation and canopy trees, the removal of 5.83 ha of native vegetation is expected to have a moderate impact on the connectivity of threatened species habitat. The occurrences of habitat connectivity occurs predominantly in south, where vegetation that extends in these areas beyond the development footprint will remain intact.	*Turpentine-Ironbark Forest* CEEC *Shale Sandstone Transition Forest* CEEC Powerful Owl Cumberland Land Snail Southern Myotis	Moderate. Habitat connectivity is critical for maintaining healthy populations, as it promotes biological diversity through the exchange of genes. All fauna species and ecological communities within the subject land rely on habitat connectivity to some degree for persistence. Habitat connectivity is more important for species with reproductive strategies that require movement of individuals or reproductive material through the landscape. While the project will decrease local connectivity, connectivity will be maintain through the landscape and locality, and this is unlikely to prevent genetic exchange of the threatened entities known, or assumed to be, inhabiting the subject land and broader study area.

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Importance of habitat feature to impacted species
			Retained vegetation to the east of the development footprint will be managed in accordance with the VMP (Restore 2024).
Water bodies or any hydrological processes that sustain threatened entities	Three large dams and ephemeral drainage lines occur within the subject land. The dams appear to be of low foraging quality for fauna, and are heavily degraded due to previous agricultural use of the landscape.	Southern Myotis	Low. The proposed works are not expected to further impact hydrological process within the subject land. Removal and modification of the dams within the development footprint are not considered likely to have a significant or substantial impact on threatened species. Two dams within the development footprint will be decommissioned and backfilled as part of the project and Biosis recommend that a dam dewatering is implemented, whereby all rescued fauna are relocated to adjacent dams and/or waterways. The two dams in the southern section of the subject site will be retained and reshaped to fit the development footprint and prevent habitat loss.
Protected animals that may use the proposed wind farm subject land as a flyway or migration route	There are no wind turbines involved in this project.	N/A	N/A
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	The project may result in increased vehicle traffic during the construction and, to a lesser extent, during the operational phase of the project. This increased vehicle traffic has the potential to impact upon native fauna species that are active during the day, and generally with a higher potential for impact in areas where refuge/forage habitat exists immediately adjacent to areas where vehicle movements will occur. However, the majority of the development occurs in locations that are generally already cleared of native vegetation.	N/A	Negligible. No threatened ground-dwelling species that are prone to vehicle strike will be impacted by the project. Non-threatened, ground dwelling fauna known to inhabit the general area, macropods such as Eastern Grey Kangaroo are notoriously prone to vehicle strike. Vehicle strike of small marsupials and macropods is likely to be an impact already in place, which may be exacerbated during construction. Low or reduced speed limits and construction timing during construction will be proposed as part of the CEMP to reduce impacts to macropods and nocturnal species.





Legend

- Subject land
- Development site
- Development footprint
- Prescribed impact (Southern Myotis)

Plant Community Type and condition class

- Exotic grassland
- Urban Native/Exotic
- 3262 - Sydney Turpentine Ironbark Forest - High (EPBC and BC Act)
- 3262 - Sydney Turpentine Ironbark Forest - Underscrubbed
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - High (EPBC and BC Act)
- 3321 - Cumberland Shale-Sandstone Ironbark Forest - Low (EPBC and BC Act)
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Low
- 3616 - Sydney Hinterland Grey Gum Transition Forest - Scattered Trees

Figure 14 Prescribed impacts

0 20 40 60 80 100

Metres

Scale: 1:3,000@ A3

Coordinate System: GDA2020 MGA Zone 56

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biosis

APEM Group

Matter: 39765, Date: 20 February 2025,
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Location: P:\39700s\39765\Mapping\
39765_Oakdale_BDAR_F11-13,
Layout: 39765_F14_PrescribedImpacts

6.4 Impacts considered uncertain

There are no impacts considered uncertain for the current assessment. However, it should be noted that this assessment provides an overestimation of the extent of impacts across 21.98 hectares of land. Lot sizing, and landscaping design for road verges and open spaces in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further retention of trees and habitat features within the development. Of importance for assessment, the potential for underestimation of impacts is substantially less than the overestimation of impacts that has been incorporated into the assessment.

At this design level there is necessarily some uncertainty over the extent of indirect impacts, and extent of off-site impacts. Reasonable and justified assumptions have been made on the basis of known information and in consultation with relevant experts on the project team. Indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental Consultants 2024). Therefore, offsets for indirect impacts are not anticipated to be required for the project.

6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

Assessment of the potential for the subject land to support groundwater dependant ecosystems (GDEs) was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). The subject land is not mapped as supporting GDEs associated with an aquifer in Appendix 8 of the Risk Assessment Guidelines for Groundwater Dependent Ecosystems (DPI 2012). The subject land is not mapped as having Groundwater Vulnerability (Wollondilly LEP 2011).

6.6 Aquatic habitat impacts relating *Fisheries Management Act* matters

There are no aquatic habitat impacts relating to the Fisheries Management Act 1994.

7 Mitigation and management of impacts

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

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

Identification of measures for mitigating impacts related to:

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

Table 35 Measures to mitigate and manage impacts

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	A CEMP should be implemented that would include the following sub-plans or protocols: • Vegetation clearance protocol. • Hollow-bearing tree removal specification. • Fauna injury protocol. • Nest Box Management Plan.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.
	Any hollow-bearing trees marked for removal should be removed according to a vegetation clearance protocol to ensure no injury or loss of fauna, including: • Hollow-bearing trees to be inspected immediately prior to removal, by a qualified ecologist.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.
	Any hollow-bearing trees to be removed should be placed in areas of retained vegetation to provide additional fauna habitat.	Mitigate impacts to resident fauna.	Immediately following vegetation clearance.	Qualified ecologist and construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	Nest boxes should be installed in retained vegetation to compensate for loss of hollows from the subject site. A Nest Box Management Plan should be implemented.	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing	Qualified ecologist and construction contractor.
Indirect impacts on native vegetation and habitat	Install appropriate stormwater and erosion controls on site.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Installation of appropriate exclusion fencing around trees and vegetation to be retained in the subject land: • The radius of the tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height by 12, in accordance with the Standards Australia Committee (2009). • A TPZ should not be less than 2 m, or greater than 15 m, except where crown protection is required (Standards Australia 2009). • This would include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. Identify the location of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan.	No further degradation to retained vegetation and habitats.	Before and throughout construction.	Construction contractor.
	Reduction of impacts resulting from external lighting is recommended, and can be adapted from Part 4 (good lighting design principles) of the Dark Sky Planning Guideline (DPE 2016b), including: • Installing light fitting shields with an opaque cover, mounted horizontally across the top of the lighting module. These	No indirect impact to fauna in retained vegetation and habitats.	Ongoing.	Construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	shielding attachments allow only the downward projection of light. • Direct lights downwards and avoid shining directly onto the public amenities, which have the potential to reflect light skywards. Utilise low beam angles that are close to vertical where possible to minimise light glare.			
	All material stockpiles, vehicle parking and machinery storage will be located within cleared areas proposed for clearing, and not in areas of native vegetation that are to be retained.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Where appropriate native vegetation cleared from the subject land should be mulched for re-use on the site, to stabilise bare ground.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
Mitigating prescribed biodiversity impacts	**Habitat connectivity** • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas (VMP). • Retained vegetation to the east of the development footprint will be protected and managed in accordance with the VMP (Restore 2024). • Clearing protocols. **Water bodies, water quality and hydrology** Prepare a CEMP and OEMP that will: • Describe measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants from the site during construction of the project. • Establish erosion and sedimentation controls	Effective management of prescribed impacts such that they do not occur or are minimal.	Ongoing/Throughout construction.	Construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	within impacted sections of riparian corridors. Decommissioned and backfilled as part of the project and Biosis recommend that a dam dewatering is implemented for dams to be decommissioned and backfilled, whereby all rescued fauna are relocated to adjacent dams and/or waterways.			
Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain	Implementation of an appropriate CEMP during works. Implementation of a VMP (Restore Environmental Consultants 2024) in perpetuity to protect and rehabilitate the existing CEECs within the subject land. Preparation of a Tree Retention Plan and Landscape Plan for Lot design, road verges and open spaces in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, at DA stage to facilitate the further retention of trees and habitat features within the subject land.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

7.1 Adaptive management strategy

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

8 Impact summary

8.1 TECs and threatened species

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

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

Figure 15 shows the extent of TECs at risk of an SAII within the subject land.

Figure 16 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

8.2 Serious and irreversible impacts

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

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

Two TECs considered to meet the above principles and will be impacted by the development are *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC) and *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion* (CEEC). Detailed SAII assessment are provided in Appendix 5 and Figure 15.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

A detailed SAII assessment is provided in Appendix 6, in accordance with *Guidance to assist a decision-maker to determine a serious and irreversible impact* (DPIE 2019). This assessment concluded that the project is unlikely

to contribute significantly to the risk of extinction to the Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC, in regards to Clause 6.7 of the BC Regulation, if the mitigation measures provided in this report are implemented.

The project will directly impact 2.45 ha of PCT 3321 vegetation that meets the BC Act listing and EPBC Act requirements for Shale Sandstone Transition Forest CEEC. The vegetation to be removed occurs in the following conditions:

- Low: 2.36 ha – VI score of 53.8.
- High: 0.09 – VI score of 75.4.

Measures undertaken by the proponent to avoid and minimise impacts to the CEEC (3321) are provided in Section 7 of this BDAR. Specifically, substantial efforts have been made to ensure that impacts to the high condition Shale Sandstone Transition Forest have been avoided and further impacts to the low condition CEEC have been minimised throughout the design phase of the project. Throughout the assessment process, ecological information collected by Biosis including vegetation mapping indicating locations of ground-truthed PCTs, TECs, and threatened flora and fauna habitat was provided following field investigation and used to influence alignment design options, construction options, and avoidance opportunities during the preparation of the Master Plan. Opportunities to avoid impacts to the high condition Shale Sandstone Transition Forest were a key focus, due to a desire to minimise impacts to the CEEC, minimise the potential need to refer the project to the Commonwealth, and to minimise the cost of offsets.

Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and further avoidance will be undertaken at the detailed design stage. Avoidance and minimisation of impacts to Shale Sandstone Transition Forest were achieved through:

- Avoidance of the majority of PCT 3312 in high condition (0.97 ha) within the subject land, under a C2 Environmental Management Zoning.
- Further avoidance of 1.61 ha of PCT 3312 in low condition, proposed for revegetation under a VMP, and protection under a C2 Environmental Management Zoning.
- 19% reduction in development footprint impacts to Shale Sandstone Transition Forest CEEC.
- The subject land would have resulted in impacts to 12.98 ha of native vegetation prior to implementation of avoidance measures described above. In efforts to avoid and minimise impacts, the final development design was restricted to removal of 5.83 ha of native vegetation.
- A site specific VMP will be prepared to:
    - Protect, manage and restore 0.97 ha of high condition and 1.61 ha of low condition Shale Sandstone Transition Forest CEEC (PCT 3321), under a C2 Environmental Conservation zoning and VMP in perpetuity.
    - C2 zoned land to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.
- The VMP will be implemented and protected in perpetuity under a VMP and to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. This would avoid further degradation to the CEEC within the subject site, as a result of leaving it in situ. The VMP will maintain and restore the extent of occurrence of two CEECs, including 2.58 ha of Shale Sandstone Transition Forest CEEC (PCT 3321) and 2.64 ha of Sydney Turpentine Ironbark Forest CEEC (PCT 3262).
- The subject land would have resulted in impacts to 5.02 ha of Shale Sandstone Forest CEEC prior to implementation of avoidance measures described above. In efforts to avoid and minimise impacts, the final development design was restricted to removal of 2.45 ha of the CEEC within the subject land.
- The proposed development footprint will directly impact 2.36 ha of low condition PCT 3321 and 0.09 ha of high condition PCT 3321 for a total impact of 2.45 ha of TEC vegetation within the subject land. 2.45 ha of

TEC vegetation within the subject land equates to a 30.21 % reduction of the local occurrence of Shale Sandstone Transition Forest and 49% of all Shale Sandstone Transition Forest within the subject land. However, additional trees consistent with the CEEC will be retained within the lot boundaries and road reserves, reducing the overall impact to the CEEC across the subject site.

- Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest (PCT 3262) within the development footprint, through the retention of an additional 195 trees across the site, including 4 additional hollow-bearing trees.
- Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, notably Shale Sandstone Transition Forest CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR.

Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion

A detailed SAII assessment is provided in Appendix 6, in accordance with *Guidance to assist a decision-maker to determine a serious and irreversible impact* (DPIE 2019). This assessment concluded that the project will not contribute significantly to the risk of extinction to the *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* CEEC, in regards to Clause 6.7 of the BC Regulation. A summary of the SAII assessment has been provided below:

The project will directly impact 0.05 ha of PCT 3262 vegetation that meets the BC Act listing and EPBC Act requirements for Sydney Turpentine-Ironbark Forest CEEC. The vegetation to be removed occurs in the following conditions:

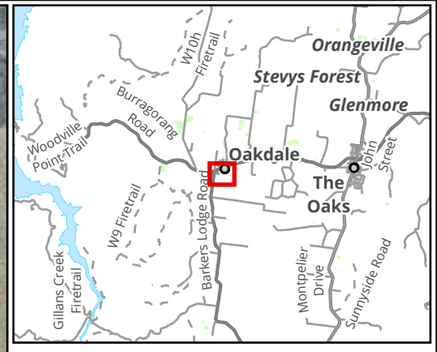
- Underscrubbed: 0.05 ha – VI score of 48.5.

Measures undertaken by the proponent to avoid and minimise impacts to the CEEC (3262) are provided in Section 7 of this BDAR. Specifically, substantial efforts have been made to ensure that impacts to the high condition Sydney Turpentine-Ironbark Forest have been avoided and indirect impacts to the underscrubbed condition CEEC have been minimised throughout the design phase of the project. Throughout the assessment process, ecological information collected by Biosis including vegetation mapping indicating locations of ground-truthed PCTs, TECs, and threatened flora and fauna habitat was provided following field investigation and used to influence alignment design options, construction options, and avoidance opportunities during the preparation of the Master Plan. Opportunities to avoid impacts to the high condition Sydney Turpentine-Ironbark Forest were a key focus, due to a desire to minimise impacts to the CEEC, minimise the potential need to refer the project to the Commonwealth, and to minimise the cost of offsets.

Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and further avoidance will be undertaken at the detailed design stage. Avoidance and minimisation of impacts to Sydney Turpentine-Ironbark Forest were achieved through:

- Avoidance of all PCT 3262 in high condition (2.34 ha) within the subject land, under a C2 Environmental Management Zoning.
- Further avoidance of 0.29 ha of PCT 3262 in underscrubbed condition, proposed for revegetation under a VMP, and protection under a C2 Environmental Management Zoning.
- 29% reduction in development footprint impacts to Sydney Turpentine-Ironbark Forest CEEC.
- The subject land would have resulted in impacts to 12.98 ha of native vegetation prior to implementation of avoidance measures described above. In efforts to avoid and minimise impacts, the final development design was restricted to removal of 5.83 ha of native vegetation.

- A site specific VMP will be prepared to:
  - Protect, manage and restore 2.34 ha of high condition and 0.29 ha of underscrubbed condition Sydney Turpentine-Ironbark Forest CEEC (PCT 3262), under a C2 Environmental Conservation zoning and VMP in perpetuity.
  - C2 zoned land to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.
- The project will result in the direct removal of 0.05 ha of Sydney Turpentine-Ironbark Forest CEEC. However, additional trees consistent with the CEEC will be retained within the lot boundaries and road reserves. Therefore, the proposal will result in 1.86 % reduction in canopy loss of the Sydney Turpentine-Ironbark Forest CEEC within the subject land.
- Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest (PCT 3262) within the development footprint, through the retention of an additional 195 trees across the site, including 4 additional hollow-bearing trees.
- Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, including Sydney Turpentine-Ironbark CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR.



Legend

- Subject land
- Development site
- Development footprint

SAII Entities

- Shale Sandstone Transition Forest of the Sydney Basin Bioregion (EPBC Act) and Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act) (3321_Low, 3321_High)
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion (EPBC Act) and Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (BC Act) (3262_Underscrubbed, 3262_High)

Figure 15 Serious and Irreversible Impacts

0 20 40 60 80 100

Metres

Scale: 1:3,000@ A3

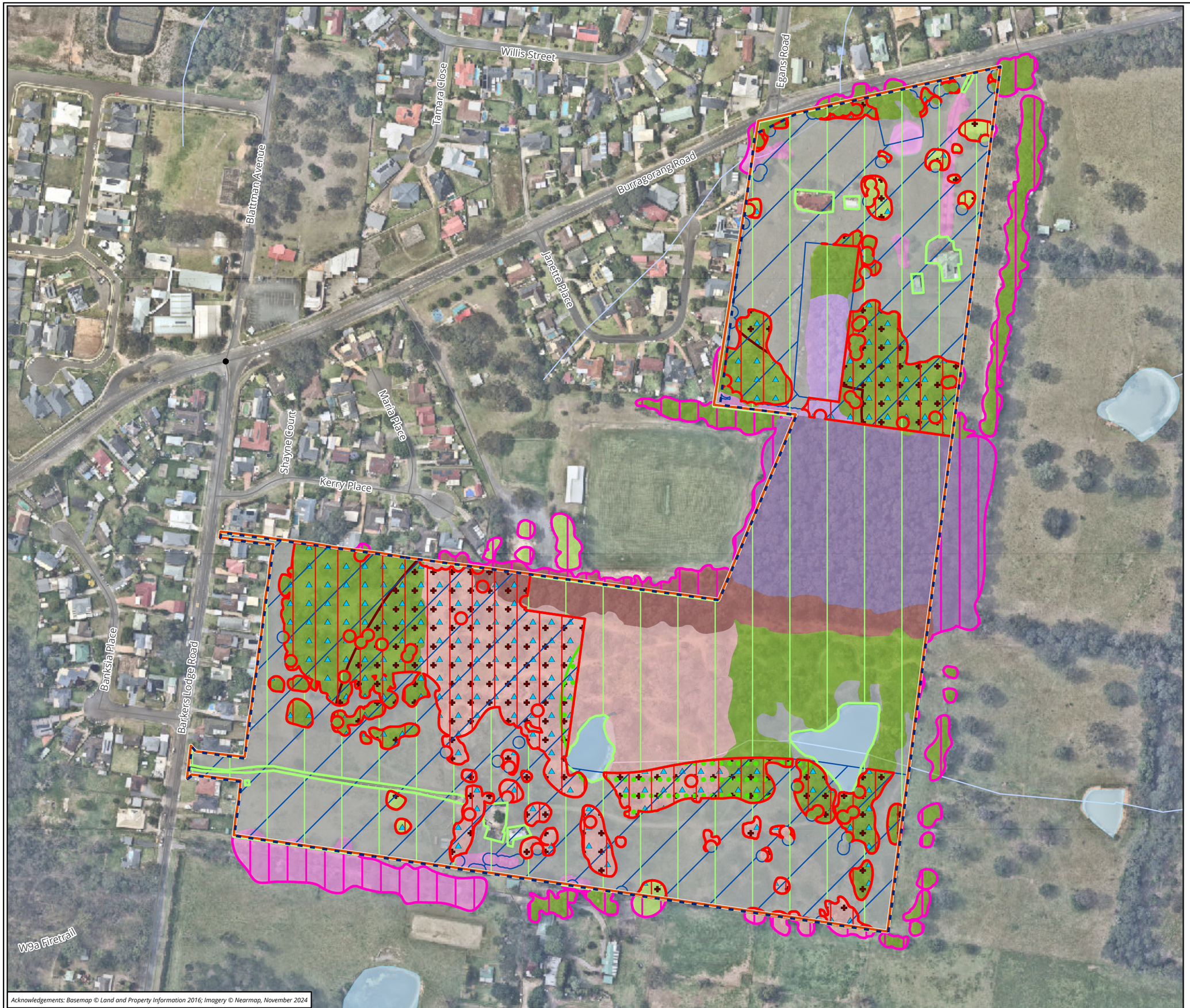
Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 20 February 2025,
Prepared for: RG, JN, TH, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\
39765_Oakdale_BDAR_F11-13,
Layout: 39765_F15_SAII



Legend

Subject land

Development site

Development footprint

Offsets

Impacts requiring offset

Impacts not requiring offset

Areas not requiring assessment

Plant Community Type and condition class

Exotic grassland

Urban Native/Exotic

3262 - Sydney Turpentine Ironbark Forest - High (EPBC and BC Act)

3262 - Sydney Turpentine Ironbark Forest - Underscrubbed

3321 - Cumberland Shale-Sandstone Ironbark Forest - High (EPBC and BC Act)

3321 - Cumberland Shale-Sandstone Ironbark Forest - Low (EPBC and BC Act)

3616 - Sydney Hinterland Grey Gum Transition Forest - Low

3616 - Sydney Hinterland Grey Gum Transition Forest - Scattered Trees

Threatened species polygons

Powerful Owl polygon

Southern Myotis polygon

Cumberland Plain Land Snail polygon

Figure 16 Offsets

0 20 40 60 80 100

Metres

Scale: 1:3,000@ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 39765, Date: 21 February 2025,
Prepared for: RG, JN, TH, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39700s\39765\Mapping\39765_Oakdale_BDAR_F11-13,
Layout: 39765_F16_Offsets

8.3 Identification of impacts requiring offset

8.3.1 Impacts to native vegetation (ecosystem credits)

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

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

On this basis, offsets are required for vegetation zones 3262_Underscubbed, 3321_Low, 3616_Low, 3616_ScatteredTrees as it has a vegetation integrity score greater than 20.

The offset requirement for the proposal was calculated using the BAM Calculator. Table 36 provides a summary of the ecosystem credit offsets required for impacts from proposed development at the subject land.

This BDAR is a preliminary document prepared for the purpose of a Planning Proposal so the assessment has not been finalised or submitted within BOAMs. The extent of impact to be offset would be re-calculated on the basis of final detailed plans at the DA stage. Risk associated with changing legislation, species listings and presence, credit calculations and credit pricing is common to all strategic planning decisions which necessarily rely on unfinalised BDARs.

Table 36 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement
3262_Underscrubbed	0.05	Clearance	48.5	Yes	Yes	No	2
3321_Low	2.36	Clearance	53.8	Yes	Yes	Yes	79
3321_High	0.09	Clearance	75.4	Yes	Yes	No	4
3616_Low	3.13	Clearance	46.3	Yes	No	No	63
3616_ScatteredTrees	0.20	Clearance	30.2	Yes	No	No	3
Total							**151**

8.3.2 Impacts to threatened species and their habitat

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

The offset requirement for the proposal was calculated using the BAM Calculator. Table 37 provides a summary of the species credit offsets required for impacts from proposed development at the subject land.

Table 37 Offsets required (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)	Biodiversity risk weighting	Credit requirement
3321_Low	Cumberland Plain Land Snail	53.8	2.36	2	63
3321_High	Cumberland Plain Land Snail	75.4	0.09	2	3
3616_Low	Cumberland Plain Land Snail	46.3	3.13	2	72
3616_ScatteredTrees	Cumberland Plain Land Snail	30.2	0.20	2	3
3262_Underscrubbed	Cumberland Plain Land Snail	48.5	0.05	2	1
3321_Low	Southern Myotis	53.6	2.36	2	63
3616_Low	Southern Myotis	46.3	1.92	2	44
3616_ScatteredTrees	Southern Myotis	30.2	0.21	2	3
3262_Underscrubbed	Southern Myotis	48.5	0.01	2	1
3321_High	Southern Myotis	75.4	0.09	2	3
3321_Low	Powerful Owl	53.8	0.37	2	10
3616_Low	Powerful Owl	46.3	0.17	2	4

Species polygons for the above three species credit species impacted by the project are illustrated in Figure 10 below.

8.4 Identification of impacts not requiring offset

Following assessment, the following impacts do not require offsetting in accordance with BAM:

- Removal of 7.92 ha of Exotic grassland.
- Removal of 0.36 ha of Urban Native Exotic.

8.5 Identification of areas not requiring assessment

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

- 0.15 ha of existing cleared areas containing roads and residential houses.

9 Assessment against biodiversity legislation

9.1 Environment Protection and Biodiversity Conservation Act 1999

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

An assessment of the impacts of the proposed development on MNES, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the proposed development to the Commonwealth Minister for the Environment is required. MNES relevant to the proposed development are summarised in Table 38.

Table 38 Assessment of the proposed development against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	EPBC listed threatened species previously recorded within the locality include four flora species and 11 fauna species. With the exception of the species listed in Appendix 2, these threatened species were considered to have a low likelihood of occurrence and were not detected during survey. Large-eared Pied Bat is listed under the EPBC Act and has been detected within the subject land (ultrasonic detector). The site does not contain cliffs, caves or crevices required by the species for roosting. GIS mapping indicates that cliffs and caves do not occur within two kilometres of the subject land. Habitat for Large Forest Owls, in the form of large hollow-bearing trees, was identified within the subject land. Presence has been assumed for three owls, Powerful Owl, Barking Owl and Masked Owl T, due targeted surveys yet to be completed. Targeted winter surveys for these three species will occur in 2024 to determine presence/absence within the subject land. Due to the limited availability of habitat within the subject land, large home range, and the biodiversity risk weighting being identical for each species (2.0), species credits have been calculated for only one of the Large Forest Owl species. Powerful Owl has been selected as the candidate species for this group of species based on the number of detection records within the locality, type of vegetation and habitat available within the subject land. Occurrence of threatened fauna is considered to be on a transient basis only and no significant or	A Significant Impact Criteria (SIC) assessment was prepared for this species (Appendix 5) and concluded that a significant impact was not likely. This conclusion was primarily reached on the basis that roosting habitat does not occur on or within two kilometres of the subject land and will therefore not reduce significant habitat availability for this species.

Matter of NES	Project specifics	Potential for significant impact
	restricting habitat was identified within the subject land for these species	
Threatened ecological communities	Two threatened ecological communities were recorded within the subject land: • *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* • *Turpentine-Ironbark Forest of the Sydney Basin Bioregion*	Significant Impact Criteria (SIC) assessment was prepared for these communities Figure 8) and concluded that a significant impact is not likely to occurs for *Turpentine-Ironbark Forest of the Sydney Basin Bioregion.* However, a significant impact was determined likely to occur for *Shale Sandstone Transition Forest of the Sydney Basin Bioregion*. This conclusion was primarily reached on the basis that the proposed works will result in a loss of 2.36 ha of low quality vegetation and 0.09 ha of high condition vegetation, or approximately 48.8% of the total EEC within the subject land. However, it should be noted that, Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest CEEC (PCT 3321) within the development footprint, and a revised SIC should be prepared to consider these avoidance measures once finalised.
Migratory species	Migratory species are unlikely to occur within the subject land given in location in the landscape.	No direct impact is expected to any migratory listed species. Mitigation measures will prevent indirect impacts from occurring during and after construction.
National Heritage Places	There are no National Heritage Places within the subject land.	No potential for impact.
Wetlands of international importance (Ramsar sites)	The closest Important Wetland to the subject land is Thirlmere lakes, which is situated approximately 13 km southeast of the subject land.	No potential for impact.

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

An assessment of the project against the relevant sections of the EP&A Act is provided below.

9.3 State Environmental Planning Policies

9.3.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 3: Koala habitat protection 2020

This chapter aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

This chapter applies to land zoned RU1, RU2 or RU3. The subject land is currently zoned as RU1 Primary Production under the Wollondilly LEP, and is therefore subject to the requirements laid out by this Chapter. Specifically, this means that before a consent authority may grant consent to a DA, it must satisfy itself whether or not the land is potential Koala habitat and core Koala habitat.

A Council is not prevented from granting consent to a DA for consent to carry out development on land if:

- The land does not have an approved KPoM applying to the land, or
- The Council is satisfied that the land is not core Koala habitat.

The definition of potential Koala Habitat under Chapter 3 of the SEPP is the areas of native vegetation where trees of the types listed in Schedule 1 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. The subject land supports one Koala feed tree species, Grey Gum *Eucalyptus punctata,* under Schedule 1 of the SEPP. This tree species is estimated to constitute less than 15% of the total number of trees within the subject land. Therefore, the vegetation within the subject land is not considered potential Koala habitat in accordance with Chapter 3 of the SEPP.

No further consideration is required.

Chapter 4: Koala habitat protection 2021

Similar to Chapter 2, this chapter also aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The subject land is located within the Wollondilly Council (Council) LGA. Wollondilly Council is listed under Schedule 2, Chapter 4 of SEPP, and is therefore subject to the requirements laid out by the policy. Specifically, this means before a consent authority may grant consent to a DA, it must satisfy itself whether or not the land is potential Koala habitat and core Koala habitat.

The subject land does not have an approved Koala Plan of Management (KPoM).

A Council is not prevented from granting consent to a development application for consent to carry out development on land if:

- The land does not have an approved KPoM applying to the land, or
- The Council is satisfied that the land is not core Koala habitat.

The subject land supports fifteen Koala use tree species for the Central Coast Koala Management Area which includes the Wollondilly LGA, as defined in Schedule 3 of the SEPP. The following Koala use tree species were recorded within the subject land:

- Black She-oak *Allocasuarina littoralis*
- Forest Oak *Allocasuarina torulosa*
- Grey Box *Eucalyptus moluccana*

- Grey Gum *Eucalyptus punctata*
- Grey Ironbark *Eucalyptus paniculata*
- Narrow-leaved Ironbark *Eucalyptus crebra*
- Narrow-leaved Stringybark *Eucalyptus eugenioides*
- Red Bloodwood *Corymbia gummifera*
- Smooth-barked Apple *Angophora costata*
- Spotted Gum *Corymbia maculata*
- Sydney Peppermint *Eucalyptus piperita*
- Turpentine *Syncarpia glomulifera*
- White Stringybark *Eucalyptus globoidea*
- White-topped Box *Eucalyptus quadrangulata*
- Woollybutt *Eucalyptus longifolia*

As the vegetation in the subject land has been identified as potential Koala habitat, determination of whether the land constitutes core Koala habitat is required.

Core Koala habitat means:

- An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or
- An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

Two records of Koala have been recorded within five kilometres of the subject land, with the most recent being in 1998 and the closest being approximately 4 kilometres away from the subject land. Six Koala Spot Assessment Technique (SAT) surveys (Phillips & Callaghan 2011) were undertaken within the subject land to determine Koala activity, further detail is provided in section 4.2. No signs (Scats, urine stains, scratches, fur) or individual Koala's were located during the targeted surveys. Furthermore, although there are feed trees present and the vegetation is of high quality, Koalas have not been previously recorded within the subject land in the last 18 years. Therefore, the vegetation in the subject land does not constitute core Koala habitat as defined under Biodiversity and Conservation SEPP.

No further consideration is required.

9.4 Other Environmental Planning Instruments

9.4.1 Wollondilly LEP

The subject land is currently primarily zoned RU1 – Primary production with a few small areas zoned R2 - Low Density Residential under the Wollondilly LEP. The relevant objectives of these zone are stated below:

RU1 – Primary Production

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To provide for a range of land uses (including tourism-related uses) that support the agriculture industry.
- To provide areas within which the density of development is limited in order to maintain a separation between urban areas.
- To support sustainable land management practices and local food production.
- To provide for tourist land uses in connection with environmental, scenic or agricultural uses of land.

R2 – Low Density Residential

- To provide for the housing needs of the community within a low density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.

To support the health and well-being of the community by providing well-connected and walkable residential areas close to services and employment.

The preliminary planning proposal will result in the rezoning of all intended developable land within the development footprint to R2 - Low Density Residential. Therefore, future development will be required to conform to the the objectives of the LEP.

9.4.2 Wollondilly DCP

The Wollondilly DCP has been prepared in accordance with Division 6 of the EP&A Act and with Part 3 of the Environmental Planning and Assessment Regulation 2000. The DCP provides more detailed provisions than the Wollondilly LEP for development within Wollondilly LGA.

9.5 *Local Land Services Act 2013* and *Local Land Services Amendment Act 2016*

The proposed development is located on a range of zones mapped on the Native Vegetation Regulatory Map including:

- Category 1 – Exempt Land (Draft).
- Category 2 – Regulated Land (Draft).
- Category 2 – Sensitive Regulated Land (In-force).

Therefore, all areas mapped as Category 2 lands will be subject to native vegetation land management requirements prescribed under the LLS Act.

9.6 Biodiversity Conservation Act 2016

The BC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened entities, key threatening processes (KTPs) and critical habitat for threatened entities. The project is considered local development and has been assessed under Part 4 of the EP&A Act.

The proposed subdivision will result in the removal of native vegetation within areas mapped under the BV map and above the clearance threshold of 0.5 hectares. Therefore, the biodiversity Offsets Scheme (BOS) was triggered and this BDAR was deemed required in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a) and the *Biodiversity Conservation Act 2016* (BC Act).

9.7 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within NSW or any part of the State. A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

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

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

Three priority weeds for the Greater Sydney LLS Region have been recorded in the subject land and are listed in Table 39, along with their associated Duty.

Table 39 Priority weeds within the subject land

Scientific name	Common name	Relevant biosecurity duty
Olea europaea* subsp. *cuspidata	African Olive	General Biosecurity duty Core infestation area: *Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment.*
***Rubus fruticosus* spp. aggregate**	Blackberry	General Biosecurity Duty
Senecio madagascariensis	Fireweed	General Biosecurity Duty

9.8 Water Management Act 2000

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

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

Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt under Section 91E of the WM Act, Section 4.41 of the EP&A Act, or Part 2 of the *Water Management Regulation 2018*. Waterfront land is defined within the Act as the bed of any river, lake or estuary and any land within 40 metres of the river banks, lake shore or estuary mean high water mark.

DPI Water recommends riparian widths based on watercourse order under the Strahler method in order to protect waterways from damage such as erosion (Strahler 1964). The watercourses mapped within the subject land are classified as Strahler One order streams, which require a riparian corridor width of 10 metres from the 'top of bank' on either side, respectively (DPE 2022g). Works are proposed within 40 metres of the top of the bank along of the waterways. Thus, a controlled activity permit would be required.

The two watercourse and their associated riparian vegetation zones have been heavily degraded through mechanical trimming and historic agricultural practices. The field surveys did not record a noticeable bank, stream bed or flowing water within the subject land at either watercourse (Photo 7 and Photo 8). Biosis recommends consultation with DPI to decommission the watercourses within the subject land.

Photo 7 First order watercourse in the southeastern section of the subject land

Photo 8 First order watercourse in the northwestern section of the subject land

The proposed infilling of the two farm dams in the north and southwest will require a dam dewatering plan to outline the processes required. The method of dam dewatering would be via onsite irrigations in accordance with weather conditions and Australian Standard 1547.

Works should aim to be consistent with the riparian corridor matrix of the NSW Natural Resources Access Regular (NRAR) (DPE 2022c) including establishment a 10 metre vegetated riparian zone (VRZ) for the waterways and may require the preparation of a VMP (DPE 2022g).

9.9 Fisheries Management Act 1994

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

No predicted habitat for threatened aquatic species is mapped on the DPI spatial data portal within the subject land. No records of threatened aquatic species have been recorded within five kilometres of the subject land on the BioNet Atlas of NSW.

As there is no mapped key fish habitat within the subject land or records within five kilometres, the project is unlikely to result in impacts to fish passage.

The waterways within the subject land are classified as a first order streams (Strahler 1964), under the WM Act. No instream woody debris is proposed to be removed within the naturally occurring waterways within the subject land. While dredging and infilling of two farm dams is proposed, these waterbodies are artificial and therefore a permit under Part 7 of the FM Act is required, however notification to Fisheries is required for dam infilling under provision 17AB. NSW DPI is required to assess all projects that involve structures that span the full width of a waterway (including pipe crossings) or modifies the velocity or quantity of water. As the waterways do not support aquatic ecological communities, fish passage is unlikely to be impacted by works.

10 Biodiversity credit report

Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to one vegetation zone at the subject land. A biodiversity credit report is provided on the following pages.

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00042951/BAAS17067/23/00042952	Burragorang Rd Oakdale BDAR_Final Footprint	28/10/2024
Assessor Name	Report Created	BAM Data version *
Rebecca E. Dwyer	28/02/2025	Current classification (live - default) (80)
Assessor Number	BAM Case Status	Date Finalised
BAAS17067	Open	To be finalised
Assessment Revision	BOS entry trigger	Assessment Type
3	BOS Threshold: Area clearing threshold	Part 4 Developments (General)

* 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
Cumberland Shale-Sandstone Ironbark Forest												
2	3321_Low	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	53.8	53.8	2.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	79

7	3321_High	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	75.4	75.4	0.09	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	4
											Subtotal	**83**
Sydney Hinterland Grey Gum Transition Forest												
3	3616_Low	Not a TEC	46.3	46.3	3.1	PCT Cleared - 62%	High Sensitivity to Gain			1.75		63
4	3616_ScatteredTrees	Not a TEC	30.2	30.2	0.21	PCT Cleared - 62%	High Sensitivity to Gain			1.75		3
5	3616_UrbannNativeExotic	Not a TEC	1	1.0	0.36	PCT Cleared - 62%	High Sensitivity to Gain			1.75		0
6	3616_ExoticGrassland	Not a TEC	2.2	2.2	7.9	PCT Cleared - 62%	High Sensitivity to Gain			1.75		0
											Subtotal	**66**

Sydney Turpentine Ironbark Forest												
1	3262_Underscrubbed	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	48.5	48.5	0.05	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	2
											Subtotal	**2**
											Total	**151**

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
Meridolum corneovirens / Cumberland Plain Land Snail (Fauna)									
3321_Low	53.8	53.8	2.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	63
3616_Low	46.3	46.3	3.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	72

3616_Scattered Trees	30.2	30.2	0.21	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	3
3262_Underscrubbed	48.5	48.5	0.05	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1
3321_High	75.4	75.4	0.09	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	3
								Subtotal	**142**
Myotis macropus / Southern Myotis (Fauna)									
3321_Low	53.8	53.8	2.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	63
3616_Low	46.3	46.3	1.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	44
3616_Scattered Trees	30.2	30.2	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3

3262_Underscrubbed	48.5	48.5	0.01	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1
3321_High	75.4	75.4	0.09	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
								Subtotal	**114**
Ninox strenua / Powerful Owl (Fauna)									
3321_Low	53.8	53.8	0.37	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	10
3616_Low	46.3	46.3	0.17	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	4
								Subtotal	**14**

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Appendices

Appendix 1 Survey methods

Appendix 1.1 Nomenclature

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

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

Appendix 1.2 Permits and licences

The flora and fauna assessment were conducted under the terms of Biosis' Scientific Licence issued by EES (SL100758, expiry date 30 June 2024). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Rebecca Goodwin (BAAS17067).

Appendix 1.3 Limitations

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

The field survey was conducted in August 2023 to February 2024 during a range of weather conditions, which is a suitable time to determine the presence of most threatened species.

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

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

Appendix 2 BAM Candidate species assessment

Table A 1: Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Acacia bynoeana Bynoe's Wattle	V	E	Species	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.	Moderate	Yes	Yes – Targeted survey undertaken February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3321 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, Bynoe's Wattle does not require any further consideration.
Acacia pubescens Downy Wattle	V	V	Species	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River	Moderate	Yes	Yes – Targeted survey undertaken February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3262, 3321 and 3616. The closest record for this species exists approximately 600m from the subject land and was recorded in 2008.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravely soils, often including ironstone.					Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint, the Downy Wattle does not require any further consideration.
Callistemon linearifolius Netted Bottle Brush		V	Species	Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	Moderate	Yes	Yes – Targeted survey undertaken in October 2023	Low	Potential habitat for this species within the subject land occurs within PCTs 3262, 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Targeted surveys for this species were undertaken within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									the absence of nearby records, the Netted Bottle Brush does not require any further consideration.
Cynanchum elegans **White-flowered Wax Plant**	E	E	Species	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species of dry rainforests does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the White-flowered Wax Plant does not require any further consideration.
Epacris purpurascens **var. *purpurascens***		V	Species	Erect shrub distributed from Gosford in the north, Silverdale to the west, Narrabeen in the east and Avon Dam in the south. Grows in scrubs and swamps in a variety of communities including Cumberland Dry, Sydney	Medium	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3262, 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Hinterland Dry, Northern Hinterland Wet, and Southern Tableland Wet Sclerophyll Forests, Eastern Riverine Forests, and Coastal Valley Grassy Woodlands. Grows in soils with a strong shale influence on sandstone substrates.					development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, *Epacris purpurescens* var. *purpurescens* does not require any further consideration.
Eucalyptus benthamii Camden White Gum	V	CE	Species	The Camden White Gum is a large tree species which grows on deep alluvial sandy soils. This eucalypt is known from two major subpopulations; one in the Kedumba Valley of the Blue Mountains National Park, and the other in Bents Basin State Recreation Area.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land. However, this species has been previously recorded approximately 4 kilometres from the subject land in 2016. Therefore, due to the lack of suitable habitat and the absence of close records to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									Camden White Gum does not require any further consideration.
Genoplesium baueri Bauer's Midge Orchid	E	E	Species	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates	Moderate	Yes	Yes – Targeted surveys were undertaken in February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, Bauer's Midge Orchid does not require any further consideration.
Grevillea parviflora* subsp. *parviflora Small-flower Grevillea	V	V	Species	Low spreading to erect shrub sporadically distributed throughout the Sydney Basin, most notably in the Picton, Appin and Bargo regions, in the Cessnock - Kurri Kurri area and isolated populations from Putty to Wyong and Lake Macquarie. Grows in Shale Sandstone Transition Forest, Kurri Sand Swamp Woodland,	Moderate	Yes	Yes – Targeted surveys were undertaken in September 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Coymbia maculata - Angophora costata Open Forest in the Dooralong Area, Sydney Sandstone Ridgetop Woodland at Wedderburn and Cooks River/Castlereagh Ironbark Forest at Kemps Creek. Grows in sandy or light clay soils including tertiary alluviums over thin shales and lateritic ironstone gravels.					period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, Small-flower Grevillea does not require any further consideration.
Grevillea raybrownii	V	V	Species	All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. Generally occurs on ridgetops and, less often, slopes and benches of Hawkesbury Sandstone and Mittagong Formation. It occurs in Eucalyptus open forest and woodland with a shrubby understorey on sandy, gravelly loam soils derived from sandstone that are low in nutrients. Killed by fire and relies entirely on seed that is stored in the soil for regeneration.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of close records to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									Grevillea raybrownii does not require any further consideration.
Hakea dohertyi Kowmung Hakea	CE	E	Species	Erect shrub with a population of ~7000 restricted to a small, 18 km square area in the Kowmung Valley in Kanagra Boyd National Park. Grows in Central Gorge Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests and Western Slopes Grassy Woodlands.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Kowmung Hakea does not require any further consideration.
Haloragis exalata* subsp. *exalata Square Raspwort	V	V	Species	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not within the subject land and this species has not been previously recorded within 5 kilometres of the subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.					Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Square Raspwort does not require any further consideration.
Hibbertia fumana		CE	Species	This species is a low shrub which occurs in Greater Sydney, from Richmond to Mittagong. The species grows in sandy clay loam soils and is known to occur in the ecotone between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Potential habitat for this species within the subject land occurs within PCT 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within suitable habitat within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									the absence of nearby records, *Hibbertia fumana* does not require any further consideration.
Hibbertia puberula		E	Species	Shrublet with a distribution extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. Grows in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on sandy soils, occasionally on clay soils.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3262, 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, *Hibbertia puberula* does not require any further consideration.
Kunzea cambagei Cambage Kunzea	V	V	Species	Low shrub with four populations of between 20 to 150 individuals growing on the western and southern extents of the Blue Mountains including Yerranderie and the Mt Werong area. Populations also found growing west of Berrima , along the Wingecarribee River, Loombah	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Plateau east of Mount Werong, the Oberon-Colong Stock Route within Kanangra-Boyd National Park and Wanganderry Plateau within the Nattai National Park. Grows at high elevations on sandstone outcrops in South East Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Sydney Coastal Heaths and Sydney Montane Heaths. Grows in damp, sandy soils derived from silurian sediments.					surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Cambage Kunzea does not require any further consideration.
Leucopogon exolasius Woronora Beard-heath	V	V	Species	Erect shrub confined to the upper Georges River area and Heathcote National Park. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Eastern Riverine Forests, and Sydney Coastal Heaths. Grows on sandstone substrates.	Moderate	Yes	Yes – Targeted surveys were undertaken in September 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in September 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records,

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									Woronora Beard-heath does not require any further consideration.
Persicaria elatior Tall Knotweed	V	V	Species	Erect herb found growing in south-eastern NSW at Moutn Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Tall Knotweed does not require any further consideration.
Persoonia acerosa Needle Geebung	V	V	Species	Small, erect shrub found growing around the central coast and in the Blue Mountains from Mount Tomah to Hill Top. Grows in heathy or	Low	Yes	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				scrubby woodland including disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests and Sydney Montane Heaths. Grows on sandstone substrates in low fertility soils.					Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Needle Geebung does not require any further consideration.
Persoonia bargoensis Bargo Geebung	E	E	Species	Erect, bushy shrub restricted to a small area on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands south-west of Sydney. Grows in woodland, forest and disturbed areas in transitional soils in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy	Moderate	Yes	Yes – Targeted surveys were undertaken in February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Woodlands and North Coast Wet Sclerophyll Forests. Grows in heavy well drained, loamy or gravelly soils derived from Wianamatta Shales and Hawesbury Sandstone.					Based on the absence of this species within the development footprint and the absence of nearby records, the Bargo Geebung does not require any further consideration.
Persoonia glaucescens Mittagong Geebung	V	V	Species	Erect shrub with a historical distribution which extends from Couridjah (Thirlmere Lakes) to the north and east, Fitzroy Falls to the south and High Range to the west. Current distribution is reduced to Berrima to the south and Buxton to the north. Grows on ridge tops, plateaux, upper slopes and disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Southern Tableland Grassy Woodlands. Grows on sandstone substrates in clay or gravel laterites.	Moderate	Yes	Yes – Targeted surveys were undertaken in February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, the Mittagong Geebung does not require any further consideration.
Persoonia hirsuta Hairy Geebung	E	E	Species	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the	Moderate	Yes	Yes – Targeted surveys were undertaken in February 2024	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. The closest record for this species exists approximately 3.5 kilometres from

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				west. Grows at elevations between 350 - 600 metres in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.					the subject land and was recorded in 2001. Targeted surveys for this species were undertaken within the development footprint in February 2024 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of close records, the Hairy Geebung does not require any further consideration.
Pomaderris brunnea Brown Pomaderris	V	E	Species	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and Hawkesbury Rivers including the Bargo area and near Camden. Grows on floodplains and creeklines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests. Grows in clay and alluvial soils.	Moderate	Yes	Yes – Targeted surveys were undertaken in September 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in September 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									Brown Pomaderris does not require any further consideration.
Pterostylis saxicola Sydney Plains Greenhood	E	E	Species	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, the Sydney Plains Greenhood does not require any further consideration.
Pterostylis vernalis	CE	CE	Species	Deciduous terrestrial orchid restricted to five populations of ~500 plants located to the west and south-west of Nowra including Jerrawangala	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land, although this species has been recorded approximately 400 metres from the subject land in 2020.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				National Park and Triplarina Nature Reserve on the NSW south coast. Found growing on rock shelves in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps and Sydney Coastal Heaths. Grows in shallow soils over sandstone substrates.					Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the *Pterostylis vernalis* does not require any further consideration.
Pultenaea glabra Smooth Bush-Pea	V	V	Species	Small, erect shrub restricted to the Blue Mountains mainly recorded from the Hazelbrook and Mount Victoria areas with unconfirmed records from the Mount Wilson and Mount Irvine areas. Found growing near swamp margins, on hillslopes, gullies and creekbanks in Southern Tableland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Montane Dry	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Sclerophyll Forests, Coastal Heath Swamps, Sydney Montane Heaths and Southern Lowland Wet Sclerophyll Forests. Grows on sandstone substrates.					surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Smooth Bush-pea does not require any further consideration.
Rhizanthella slateri Eastern Australian Underground Orchid		E2	Species	Terrestrial orchid with a distribution spanning from south-east NSW to south-east Queensland. Recorded in ten populations in NSW including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wisemans Ferry Area, Agnes Banks and near Nowra. A cryptic species which grows beneath the soil surface with flowers being the only part of the plant to occur aboveground in Sydney Sand Flats Dry Sclerophyll Forests, Eastern Riverine Forests, Northern Warm Temperate Rainforests, North Coast Wet Sclerophyll Forests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows in deep loam soils.	Low	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3262 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. Based on the absence of this species within the development footprint and the absence of nearby records, Eastern Australian Underground Orchid does not require any further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Rhodamnia Scrub Turpentine	CE	CE	Species	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023		Potential habitat for this species within the subject land occurs within PCT 3262. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in October 2023 during the approved survey period for the species and no individuals were recorded. This species is also highly conspicuous and easily detectible. Based on the absence of this species within the development footprint and the absence of nearby records, Scrub Turpentine does not require any further consideration.
Tetratheca glandulosa		V	Species	Small, spreading shrub with 150 populations confined to the Baulkham Hills, Gosford, Hawkesbury, Ku-ring-gai, Pittwater, Ryde and Wyong Local Government Areas. Found growing in a variety of communities including Sydney Sandstone Ridgetop Woodland, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley	Moderate	Yes	Yes – Targeted surveys were undertaken in September 2023	No	Potential habitat for this species within the subject land occurs within PCTs 3321 and 3616. However, this species has not been previously recorded within 5 kilometres of the subject land. Targeted surveys for this species were undertaken within the development footprint in September 2023 during the approved survey period for the species and no individuals were recorded.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Grassy Woodlands, Sydney Montane Heaths and North Coast Wet Sclerophyll Forests. Grows in the shallow, yellow clay/sandy loams that are typical of shale/sandstone transition soils where shale caps occur over sandstone substrates such as the Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes.					Based on the absence of this species within the development footprint and the absence of nearby records, *Tetratheca glandulosa* does not require any further consideration.
Thelymitra kangaloonica Kangaloon Sun Orchid	CE	CE	Species	Terrestrial orchid confined to the southern tablelands in the Moss Vale, Kangaloon, Fitzroy Falls area with the majority growing on land managed by the Sydney Catchment Authority. Found growing in swamps and sedgelands at elevations between 550 and 700 metres in Temperate Highland Peat Swamps on Sandstone, Coastal Heath Swamps and Montane Bogs and Fens. A cryptic species which is most visible when flowering between late October and early November. Grows in grey silty or grey loam soils.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									Kangaloon Sun Orchid does not require any further consideration.
Thesium austral Austral Toadflax	V	V	Species	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass *Themeda triandra* in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.	Low	No	No – Targeted surveys were not required	No	Potential habitat for this species does not occur within the subject land and this species has not been previously recorded within 5 kilometres of the subject land. Therefore, due to the lack of suitable habitat and the absence of records close to the subject land, targeted surveys for this species were not required. Although targeted surveys were not undertaken for this species due to the absence of suitable habitat, initial surveys also did not incidentally record this species. Based on the absence of suitable habitat for this species within the development footprint and the absence of nearby records, the Austral Toadflax does not require any further consideration.

Table A 2: Threatened fauna species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Birds									
Actitis hypoleucos Common Sandpiper	Mi		No	Inhabits a wide range of coastal and inland wetlands, often with muddy or rocky margins. Also known to occur at estuaries, billabongs, dams, pools and lakes, often associated with mangroves.	Low	No	No – Targeted surveys not undertaken	No	Migratory species known to breed in Russia. When migrating to Australia, this species primarily remains on the coastlines. This species has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Aphelocephala leucopsis Southern Whiteface	V	V	No	Southern whitefaces occupy open acacia or eucalypt-dominated woodlands and shrublands on ranges, foothills, lowlands, and plains. This species favours open woodlands and shrublands with low tree densities and a herbaceous litter cover or grassy understory.	Low	No	No – Targeted surveys not undertaken	No	The Southern Whiteface is typically found west of the Great Dividing Range. This species has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Apus pacificus Fork-tailed Swift	Mi		No	Almost exclusively aerial (foraging). The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April. Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the	Low	No	No – Targeted surveys not undertaken	No	Migratory species known to breed in Asia. This species has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				ground and up to 300 metres high.					
Botaurus poiciloptilus Australasian Bittern	E	E	Ecosystem	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including *Typha* spp. and *Eleocharis* spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	Low	No	No – Targeted surveys not undertaken	Low	The subject land does not contain established wetlands, suitable habitat is therefore not present within the subject land. The Australasian Bittern has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Calidris acuminata Sharp-tailed Sandpiper	V, Mi		No	This species is a migratory visitor to Australia, and spends its breeding season in Siberia. In the non-breeding season, the Sharp-tailed Sandpiper is known to occur mostly in the south-east of Australia, but has been found on coastlines all throughout the country.	Low	No	No – Targeted surveys not undertaken	Low	Migratory species known to breed in Siberia. The Sharp-tailed Sandpiper has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Calidris ferruginea Curlew Sandpiper	CE, Mi	E	Species/Ecosystem	Inhabits sheltered intertidal mudflats. Also, non-tidal	Low	No	No – Targeted	Low	Suitable habitat not present in the subject land. The Curlew Sandpiper

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				swamps, lagoons and lakes near the coast. Infrequently recorded inland.			surveys not undertaken		has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Calidris melanotos Pectoral Sandpiper	Mi		No	Scarce, but regular visitor, usually recorded in summer from November to March. Widespread but scattered records in Australia. Usually found in fresh to saline wetlands, floodplains, swamps, estuaries and lagoons, sometimes with emergent or fringing vegetation such as grass.	Low	No	No – Targeted surveys not undertaken	No	Migratory species known to breed in Asia. Suitable habitat not present in the subject land. There are no records within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Callocephalon fimbriatum Gang-gang Cockatoo		E2	Species/Ecosystem	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It	Moderate	Yes	Yes – targeted surveys were undertaken in January and February 2024	No	The Gang-gang Cockatoo has several records within 1.5 kilometres of the subject land, with the most recent being in 2017. Suitable habitat in the form of tall woodlands and forests with large hollows occur within the subject land. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of individuals detected on site during targeted surveys, Gang-gang Cockatoo does

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				requires tree hollows in which to breed.					not require further consideration.
Calyptorhynchus lathami Glossy Black-Cockatoo		V	N/A	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	Moderate	Yes	Yes – targeted surveys were undertaken in January and February 2024	No	The Glossy Black-cockatoo has two records within 5.4 kilometres of the subject land, with the most recent being in 2019. Suitable habitat in the form of tall woodlands and forests with large hollows occur within the subject land, as well as Allocasuarina species which are strongly associated with this species. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of individuals detected on site during targeted surveys, Glossy Black-Cockatoo does not require further consideration.
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	V	V	Ecosystem	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.	Low	No	No – Targeted surveys were not required.	No	Potential habitat on site was too limited and disturbed. This species is known to inhabit the same location year-round. The Brown Treecreeper has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Cuculus optatus Oriental Cuckoo	Mi		No	The Oriental Cuckoo inhabits forests where it forages in trees and bushes, and occasionally on the ground. The species is a brood parasite, with a large breeding area covering most of northern Eurasia. This Cuckoo spends the winter in warmer regions of the Asia-Pacific, having been recorded along the east coast of Australia.	Low	No	No – Targeted surveys were not required.	No	Migratory species known to breed in northern Eurasia. The Oriental Cuckoo has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Falco hypoleucos Grey Falcon	V	V	Ecosystem	Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub.	Low	No	No – Targeted surveys were not required.	No	Suitable habitat for this species was not present within the subject land. The Grey Falcon has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Gallinago hardwickii Latham's Snipe	V, Mi		No	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams.	Low	No	No – Targeted surveys were not required.	No	Migratory species known to breed in Russia and Japan. Latham's Snipe has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Grantiella picta	V	V	Ecosystem	Found mainly in dry open woodlands and forests, where	Low	No	No – Targeted	No	The Painted Honeyeater has not been recorded within 5 kilometres of

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Painted Honeyeater				it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.			surveys were not required.		the subject land. In addition, no mistletoe was observed onsite. Therefore, this species does not require further consideration.
Haliaeetus leucogaster White-bellied Sea-Eagle		V	Species/Ecosystem	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	Yes	Yes – Targeted surveys were undertaken in September 2023	No	The White-bellied Sea-Eagle has suitable habitat such as tall trees for nesting and open woodland for foraging present within the subject land. However, large freshwater lakes, dams, lagoons or saltmarshes, of which are preferable, are not present within the subject land. There are three small – medium sized dams however this habitat is of poor quality. In addition, no stick nests were observed on site. This species also has not been recorded within 5 kilometres of the subject land. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of individuals detected on site during targeted surveys, lack of nearby records and the low-quality habitat, the White-bellied Sea-Eagle does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Hieraaetus morphnoides Little Eagle		V	Species/Ecosystem	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	Moderate	Yes	Yes – Targeted surveys were undertaken in September 2023	No	The Little Eagle has suitable habitat such as lightly timbered woodland with open grassy areas tall trees for foraging and tall living trees for nesting present within the subject land. However, this species has not been recorded within 5 kilometres of the subject land and no stick nests were observed on site. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of individuals detected on site during targeted surveys and the lack of nearby records, the White-bellied Sea-Eagle does not require further consideration.
Hirundapus caudacutus White-throated Needletail	V, Mi		Ecosystem	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. This species roosts in trees in forests and woodlands and feeds on insects. The White-throated Needletail breeds in forests and sparse hills in Asia.	Low	No	No – Targeted surveys were not required.	No	Migratory species known to breed in Asia. The White-throated Needletail was recorded approximately 750 metres from the subject land in 2013. No incidental sightings of this species were recorded on site during previous surveys. Ample high-quality vegetation available in neighbouring national park. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Lathamus discolor Swift Parrot	CE	E	Species/Ecosystem	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low	No	No – Targeted surveys were not required	No	No mapped important habitat for the Swift Parrot is present within the subject land. The closest area of mapped important habitat is approximately 16km northeast of the subject land. Therefore, this species does not require further consideration.
Lophoictinia isura Square-tailed Kite		V	Species/Ecosystem	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often	Moderate	Yes	Yes – Targeted surveys were undertaken	No	The Square-tailed Kite has suitable habitat on site and has been recorded approximately 750 metres away in 2013. However no stick nests

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.			in September 2023		were observed on site and vegetation is highly scattered in some areas. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of stick nests and individuals on site, the Square-tailed Kite does not require further consideration.
Motacilla flava Yellow Wagtail	Mi		No	Regular spring-summer visitor in north of Australia, rare vagrant or occasional visitor farther south. Found in marshes, damp paddocks, airfields, cultivated fields, lawns and estuaries.	Low	No	No – Targeted surveys were not required	No	Migratory species known to breed in Europe and Asia. Suitable habitat for this species was not present on site. No records for the Yellow Wagtail within 5 kilometres. Therefore, this species does not require further consideration.
Myiagra cyanoleuca Satin Flycatcher	Mi		No	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies.	Low	No	No – Targeted surveys were not required	No	Habitat not suitable quality for this species due to limited woodland patch. No records for the Satin Flycatcher within 5 kilometres. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Neophema chrysostoma Blue-winged Parrot	V	V	N/A	The Blue-winged Parrot is a small parrot found in Tasmania and southeast mainland Australia. Some populations are known to migrate to Tasmania from the mainland during summer months. The species feeds predominantly on the ground, and occurs in savannah woodlands and grasslands.		No	No – Targeted surveys were not required	No	This species typically is found further inland and often found near established wetlands. The Blue-winged Parrot has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Ninox connivens Barking Owl		V	Species/Ecosystem	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	Moderate	Yes	No – Targeted surveys not required as assuming presence	Yes	Large hollows are present outside the development footprint within the VMP area. The location of the hollows is disconnected from vegetation patches, therefore, not preferable for roosting. At this stage, presence is assumed but targeted surveys will be completed in winter.
Ninox strenua Powerful Owl		V	Species/Ecosystem	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees	Moderate	Yes	No – Targeted surveys not required as assuming presence	Yes	Large hollows are present outside the development footprint within the VMP area. The location of the hollows is disconnected from vegetation patches, therefore, not preferable for roosting. At this stage, presence is assumed but targeted surveys will be

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.					completed in winter.
Numenius madagascariensis Eastern Curlew	CE, Mi		Species/Ecosystem	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Low	No	No – Targeted surveys not required	No	The subject land does not have the habitat requirements for the Eastern Curlew. The subject land is not on the coast and does not have estuaries, embayments, harbours, inlets, coastal lagoons or intertidal flats. Furthermore. the Eastern Curlew has not been recorded within 5 kilometres of the subject land. Therefore, due to absence of suitable habitat, the Eastern Curlew does not require further consideration.
Pandion haliaetus Osprey	Mi		N/A	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for	Low	No	No – Targeted surveys not required	No	The Osprey has not been recorded within 5 kilometres of the subject land. This species is typically found on the coast, and often roosts in marine cliffs. Habitat for this species was not

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.					present within the subject land. Therefore, the Osprey does not require further consideration.
Pycnoptilus floccosus Pilotbird	V		N/A	The pilotbird is found from the Wollemi National Park and Blue Mountains National Park in New South Wales through to the Dandenong Ranges, near Melbourne in Victoria. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris.	Low	No	No – Targeted surveys not required	No	The Pilotbird has been recorded 6 times within 5 kilometres of the subject land, with the closest recording approximately 750 metres from the subject land and the most recent record being in 2003. Pilotbirds prefer dense forests with heavy undergrowth. Therefore, habitat for this species is not suitable within the subject land due to the disturbed nature of the site. Therefore, the Pilotbird does not require further consideration.
Rostratula australis Australian Painted Snipe	E	E	Ecosystem	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands,	Low	No	No – Targeted surveys not required	No	Suitable quality wetland is not present on the subject land due to the limited connectivity between dams and lack of emergent

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.					vegetation surrounding the farm dams. The Australian Painted Snipe has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Stagonopleura guttata Diamond Firetail	V	V	Ecosystem	The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses. Feeds exclusively on the ground on ripe grass and herb seeds, green leaves and insects.	Low	No	No – Targeted surveys not required	No	Suitable habitat not present on site due to lack of quality watercourse within the subject land. High-quality habitat located in neighbouring national parks. The Diamond firetail has not been recorded within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Tringa nebularia Common Greenshank	E, Mi		No	Widely distributed throughout a range of inland wetlands and sheltered coastal habitats. Occurs in habitats with varying salinity.	Low	No	No – Targeted surveys not required	No	Habitat not suitable within subject land. This species prefers established wetlands. The common Greenshank has not been recorded within 5 kilometres of the subject land.
Tyto novaehollandiae Masked Owl		V	Species/Ecosystem	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is	Moderate	Yes	No – Targeted surveys not required due to assuming presence	No	Large hollows are present outside the development footprint within the VMP area. The location of the hollows is disconnected from vegetation patches, therefore, not preferable for

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.					roosting. At this stage, presence is assumed but targeted surveys will be completed in winter.
Mammals									
Cercartetus nanus Eastern Pygmy-possum		V	Species	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest	Moderate	Yes	Yes – Targeted surveys were undertaken in January 2024	Low	Suitable potential habitat occurs within the subject land. This species was not recorded during targeted surveys in January, which is the middle of the suitable survey period for the species. There are no records of the Eastern Pygmy-Possum within 5 kilometres of the subject land. Due to the absence of individuals on site, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				sites within a 0.5 ha area over a 5 month period.					
Chalinolobus dwyeri Large-eared Pied Bat	E	V	Species	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	Moderate	No	Yes – Targeted survey was undertaken in January and February 2024.	Low	Targeted survey was undertaken in January and February, where this species was detected. Although this species was detected during targeted survey, it is unlikely that the proposed works will have a significant impact on this species as the subject land supports foraging habitat only, and these resources are available across the local landscape. There are no caves, overhangs, mines, culverts or other man-made structures to support roosting for this species within the subject land. Therefore, this species does not require further consideration.
Dasyurus maculatus Spotted-tailed Quoll		V	Ecosystem	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been	Moderate	No	No targeted surveys required	Low	The Spotted-tailed Quoll has been recorded 3 times with the closest record within 2 kilometres from the subject land and the most recent record occurring in 1999. The Spotted-tailed Quoll requires suitable den sites, including hollow

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.					logs, rock crevices and caves. This habitat is not present within the subject land. Therefore, the subject land may support foraging however it is unlikely that the proposed development will have significant impact on the species and these foraging resources are available across the local landscape. Therefore, this species does not require further consideration.
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern)	E	E	Species	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Moderate	Yes	Yes- targeted surveys were undertaken in January and February 2024.	Low	The Southern Brown Bandicoot has no records within 5 kilometres of the subject land. Targeted surveys were completed during the approved survey period and did not detect any individuals. Due to the absence of individuals detected on site during targeted surveys, the Southern Brow Bandicoot does not require further

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									consideration.
Miniopterus australis Little Bent-winged Bat		V	Species/Ecosystem	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.	Moderate	No	Yes- targeted surveys were undertaken in January and February 2024.	Low	Targeted surveys were completed during the approved survey period and did not detect any individuals. Previous records show that the Little Bent-winged Bat has been recorded once, approximately 700 metres from site. There are no caves, overhangs, mines, culverts or other man-made structures to support roosting for this species within the subject land. Therefore, it is unlikely that the proposed works will have a significant impact on this species as the subject land supports foraging habitat only, and these resources are available across the local landscape. Therefore, this species does not require further consideration.
Miniopterus orianae oceanensis Large Bent-winged Bat		V	Species/Ecosystem	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to	Moderate	No	Yes- targeted surveys were undertaken in January and February 2024.	Low	Targeted survey was undertaken in January and February, where this species was detected. Although this species was detected during targeted survey, it is unlikely that the proposed works will have a significant impact on this species as

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.					the subject land supports foraging habitat only, and these resources are available across the local landscape. There are no caves, overhangs, mines, culverts or other man-made structures to support roosting for this species within the subject land. Therefore, this species does not require further consideration.
Myotis macropus Southern Myotis		V	Species	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.	Moderate	Yes	Yes- targeted surveys were undertaken in January and February 2024.	High	Detected on site. There are waterbodies within the subject land and surrounds greater than 3m – which is their definition of suitable habitat and foraging. Therefore, it is likely that the proposed development will have impacts on foraging and habitat availability for this species however mitigation measures and retention of habitat trees and waterbodies will minimise overall habitat impact. Therefore, given these strategies, further considerations for this species will not be required.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Notamacropus parma Parma Wallaby	V	V	Species	Occurs in wet and dry sclerophyll forest with a thick, shrubby understorey associated with grassy patches. They may also occur in rainforest but prefer the wet sclerophyll forest (Strahan, 1995 134 /id). This species feed on grasses and herbs (Strahan, 1995 134 /id).	Low	No	No targeted surveys required	Low	This species requires a thick understorey in wet sclerophyll forests which is not present within the subject land. The Parma Wallaby has not been recorded within 5 kilometres of the subject land.
Petauroides volans Southern Greater Glider	E	E	Species	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	Moderate	Yes	Yes- targeted surveys were undertaken in January and February 2024.	Low	Targeted surveys were completed during the approved survey period and did not detect any individuals. Previous records show that the Southern Greater Glider has been recorded 30 times within 5 kilometres of the subject land. The suitable sized hollows within the subject land are in disconnected vegetation patches. All surrounding records of this species are within the neighbouring National Park. Lack of connectivity between the National Park and the subject land limit dispersal of this species. Therefore, it is unlikely that the proposed works will have a significant impact on this species.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Petaurus norfolcensis Squirrel Glider		E2	Species	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Moderate	Yes	Yes- targeted surveys were undertaken in January and February 2024.	Low	Targeted surveys were completed during the approved survey period and did not detect any individuals. Previous records show that the Squirrel Glider has been recorded once within 5 kilometres of the subject land. The suitable sized hollows within the subject land are in disconnected vegetation patches. Surrounding records of this species are within the neighbouring National Park. Lack of connectivity between the National Park and the subject land limit dispersal of this species. Therefore, it is unlikely that the proposed works will have a significant impact on this species.
Petrogale penicillata Brush-tailed Rock-wallaby	V	E	Species	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.	Low	No	No	Low	Habitat for this species includes caves, ledges and crevices which are all absent from the subject land. There are no records of the Brush-tailed Rock-wallaby within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Phascolarctos cinereus Koala		E	Species	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus robusta*, *E. tereticornis*, *E. punctata*, *E. haemastoma* and *E. signata*. They are solitary with varying home ranges.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023		Targeted surveys were completed during the approved survey period and did not detect any individuals or any evidence of scat. Potential habitat is present on site as the subject land contains primary feed trees. Due to the absence of individuals on site and the lack of connectivity between vegetation patches, this species does not require further consideration.
Pseudomys novaehollandiae New Holland Mouse	V		Ecosystem	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds,	Low	No	No targeted surveys required	Low	Suitable habitat is not present within the subject land. There are no records of the New Holland Mouse within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.					
Pteropus poliocephalus Grey-headed Flying-fox	V	V	Species/Ecosystem	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	Moderate	Yes	Yes – Targeted surveys were undertaken in October 2023	No	Targeted surveys were completed during the approved survey period and did not detect any individuals. Previous records show that the Grey-headed Flying-Fox have been recorded 4 times within 5 kilometres of the subject land. No camps were detected on site and the closest camp has been recorded approximately 13 kilometres southeast. Therefore, it is likely that this species may potentially use the subject land as foraging habitat however due to the availability of similar resources across the local landscape, it is unlikely that the proposed works will have a

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									significant impact on this species.
Amphibians									
Pseudophryne australis Red-crowned Toadlet		V	Species	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.	Low	Yes	No targeted surveys required	Low	Potential habitat for this species within the subject land was considered too degraded around the dams with no connectivity between the two dams on site. The dams had little to no fringing vegetation and overall condition of the water habitat was poor. The Red-crowned Toadlet has one record within 5 kilometres of the subject land. This record however is located within the neighbouring National Park which contains high-quality habitat. Therefore, the Red-crowned Toadlet does not require further consideration.
Heleioporus australiacus Giant Burrowing Frog	V	V	Species	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or	Low	No	No targeted surveys required	Low	Potential habitat for this species within the subject land was considered too degraded around the dams with no connectivity between the two dams on site. The dams had little to no fringing vegetation and overall condition of the water habitat was poor. The Giant Burrowing Frog has been

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.					recorded 1 time within 5 kilometres of the subject land. This record however is located within the neighbouring National Park which contains high-quality habitat. Therefore, the Giant Burrowing Frog does not require further consideration.
Litoria littlejohni Littlejohn's Tree Frog	E	E	Species	The species is distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern VIC. It is not known from coastal habitats. Occurs in wet and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m. Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species	Low	No	No targeted surveys required	Low	The Littlejohn's Tree Frog requires permanent or semi-permanent rock flowing streams which is not present within the subject land. Other potential habitat for this species around the dams within the subject land were considered too degraded with no connectivity between the two dams on site. The dams had little to no fringing vegetation and overall condition of the water habitat was poor. The Littlejohn's Tree Frog has been recorded 1 time within 5 kilometres of the subject land. This record however is located within the neighbouring National Park which contains high-quality habitat. Therefore, the Littlejohn's Tree Frog does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has been recorded calling in all seasons with variously reported peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.					
Mixophyes balbus Stuttering Frog	V	E	Species	This species is usually associated with mountain streams, wet mountain forests and rainforests. It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains.	Low	No	No targeted surveys required	Low	Suitable habitat is not present within the subject land as this species prefers rainforests or wet mountain forests. There are no records for this species within 5 kilometres of the subject land. Therefore, the Stuttering Frog does not require further consideration.
Reptiles									
Delma impar Striped Legless Lizard	V	V	Species	Generally occurs in lowland native grasslands occurring on gently undulating plains having soils of basaltic origin. Grasses are dominated by perennial,	Low	No	No targeted surveys required	Low	Suitable habitat for this species is not present within the subject land. This species is known only to occur in select known locations that are not

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				tussock-forming grasses such as Themeda triandra, Austrostipa spp. and Austrodanothonia spp. Inhabits secondary grasslands only when they occur within 2km of primary grassland.					within the locality of the subject Land. There are no records of this species within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Hoplocephalus bungaroides Broad-headed Snake	E	E	Species/Ecosystem	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	Low	No	No targeted surveys required	Low	Habitat requirements for this species include exposed sandstone outcrops, rock crevices and exfoliating rock. These habitat features are not present within the subject land and there are no records within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Fish									
Macquaria australasica Macquarie Perch	E		No	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats,	Low	No	No targeted surveys required	Low	Suitable habitat is not present within the subject land as there no rivers, tributaries, or connectivity between the dams to lake or river habitats. There are no records within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				especially the upper reaches of rivers and their tributaries					
Prototroctes maraena Australian Grayling	V		No	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the Otway Ranges in Victoria, and Tasmania. Australian grayling do not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species; migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and also in muddy-bottomed, heavily silted habitats.	Low	No	No targeted surveys required	Low	Suitable habitat is not present within the subject land as there no rivers, tributaries, or connectivity between the dams to lake or river habitats. There are no records within 5 kilometres of the subject land. Therefore, this species does not require further consideration.
Gastropods									
Meridolum corneovirens Cumberland Plain Land Snail		E	Species	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees.	Moderate	Yes	Yes – targeted surveys were undertaken in October 2023.	High	Targeted surveys were completed during the approved survey period and detected 4 individual snail shells at two locations. Species polygon has been created for the associated vegetation impacted within the development footprint and will be offset accordingly.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				May also use soil cracks for refuge.					
Pommerhelix duralensis Dural Land Snail	E	E	Species	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.		Yes	Yes – targeted surveys were undertaken in October 2023.		Targeted surveys were completed during the approved survey period and did not detect any individuals or shells. There are no records of this species within 5 kilometres of the subject land. Therefore, this species does not require further consideration.

Appendix 3 Flora

Appendix 3.1 BAM plot field data

Table A 3: BAM plot floristics (Plots 1 to 8)

Family	Scientific name	Common name	39765.B01		39765.B02		39765.B03		39765.B04		39765.B05		39765.B06		39765.B07		39765.B08	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Apiaceae	*Centella asiatica*	Indian Pennywort							0.1	20								
Apiaceae	*Hydrocotyle sibthorpioides*	None			0.1	30					0.1	30						
Apocynaceae	*Tylophora barbata*	Bearded Tylophora									5	100						
Apocynaceae	*Marsdenia rostrata*	Milk Vine									3	40						
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax															0.1	1
Araliaceae	*Polyscias sambucifolia subsp. sambucifolia*	None									0.1	5						
Asparagaceae	*Arthropodium milleflorum*	Pale Vanilla-lily									0.1	3						
Asparagaceae	*Arthropodium minus*	Small Vanilla Lily																
Asphodelaceae	*Dianella caerulea*	Blue Flax-lily	0.5	4					0.1	10							0.1	10
Asphodelaceae	*Dianella longifolia*	Blueberry Lily									0.1	2						
Asphodelaceae	*Dianella caerulea* var. *caerulea*	None			0.1	10												
Asphodelaceae	*Dianella caerulea* var. *producta*	None									0.1	5						
Asteraceae	*Lagenophora stipitata*	Common Lagenophora									0.1	1						
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting	0.1	1														
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed											0.1	1				
Asteraceae	*Euchiton japonicus*	None											0.1	10				
Asteraceae	*Lagenophora gracilis*	Slender Lagenophora							0.1	10								

Asteraceae	*Euchiton involucratus*	Star Cudweed											0.1	2	0.1	5		
Asteraceae	*Euchiton sphaericus*	Star Cudweed													0.1	1		
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood			0.1	1												
Asteraceae	*Vernonia cinerea*	little ironweed							0.1	1								
Bignoniaceae	*Pandorea pandorana* subsp. *pandorana*	Wonga Wonga Vine									0.1	1						
Blechnaceae	*Doodia australis*	Common Rasp Fern							0.2	20								
Blechnaceae	*Doodia spp.*	None									5	100						
Campanulaceae	*Wahlenbergia gracilis*	Sprawling Bluebell																
Campanulaceae	*Lobelia purpurascens*	whiteroot			0.1	40	0.1	1	3	300	0.2	40	2	100	0.1	5	5	500
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak									0.3	2						
Clusiaceae	*Hypericum gramineum*	Small St John's Wort			0.1	5							0.1	10				
Commelinaceae	*Commelina cyanea*	Native Wandering Jew			0.2	40											0.5	20
Convolvulaceae	*Dichondra repens*	Kidney Weed	1	30	0.1	20			2	300	1	100	1	400			3	4000
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge					0.1	10							0.1	1		
Cyperaceae	*Carex inversa*	Knob Sedge			0.1	10												
Cyperaceae	*Lepidosperma gunnii*	None							0.1	2								
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge																
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge			0.1	6												
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	0.1	2					0.2	10	0.5	10					0.1	5
Euphorbiaceae	*Homalanthus populifolius*	None																
Fabaceae (Faboideae)	*Indigofera australis*	Australian Indigo																
Fabaceae (Faboideae)	*Kennedia rubicunda*	Dusky Coral Pea							0.1	20								
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla			0.1	1			0.1	3	0.1	2					0.1	1
Fabaceae (Faboideae)	*Desmodium gunnii*	None									0.1	30						
Fabaceae (Faboideae)	*Desmodium varians*	None							0.1	20								

Fabaceae (Faboideae)	*Glycine microphylla*	Small-leaf Glycine	0.5	10							0.1	40						
Fabaceae (Faboideae)	*Desmodium spp.*	Tick-trefoil															0.1	40
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine	0.2	10	0.1	2			0.1	20	0.1	20	0.1	30			0.1	20
Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine					0.1	1			0.1	30	0.2	60			0.1	20
Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle			0.1	2												
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta Wattle	1	1					0.1	2	0.1	4	25	10			2	3
Geraniaceae	*Geranium solanderi*	Native Geranium	0.1	2														
Geraniaceae	*Geranium homeanum*	None			0.1	10												
Goodeniaceae	*Goodenia bellidifolia subsp. bellidifolia*	None																
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort			0.1	5											0.1	1
Hypoxidaceae	*Hypoxis hygrometrica var. hygrometrica*	None																
Lamiaceae	*Mentha satureioides*	Native Pennyroyal																
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush							0.1	10	0.1	2					0.1	1
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	None			0.1	1					0.1	1						
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush			0.1	1			0.5	10	0.1	2						
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry															0.1	1
Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree															1	3
Malvaceae	*Brachychiton populneus*	Kurrajong									0.1	1						
Meliaceae	*Melia azedarach*	White Cedar			0.1	1												
Myrtaceae	*Eucalyptus moluccana*	Grey Box	5	1														
Myrtaceae	*Eucalyptus punctata*	Grey Gum	5	1	5	1			10	1	10	10					10	2
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush																

Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	5	1												2	3
Myrtaceae	*Eucalyptus paniculata subsp. paniculata*	None									0.3	1				7	3
Myrtaceae	*Syncarpia glomulifera subsp. glomulifera*	None			7	8											
Myrtaceae	*Corymbia gummifera*	Red Bloodwood			0.5	1											
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint			15	5											
Myrtaceae	*Angophora costata*	Sydney Red Gum			5	2											
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark			3	1											
Myrtaceae	*Kunzea ambigua*	Tick Bush							0.5	10							
Myrtaceae	*Syncarpia glomulifera*	Turpentine							5	1	25	20				50	50
Myrtaceae	*Eucalyptus globoidea*	White Stringybark							40	8						5	4
Myrtaceae	*Eucalyptus quadrangulata*	White-topped Box														3	2
Myrtaceae	*Eucalyptus longifolia*	Woollybutt															
Oleaceae	*Notelaea longifolia f. longifolia*	None									0.1	1				0.1	1
Orchidaceae	*Pterostylis spp.*	Greenhood									0.1	1					
Oxalidaceae	*Oxalis chnoodes*	None									0.1	1					
Oxalidaceae	*Oxalis exilis*	None															
Oxalidaceae	*Oxalis perennans*	None											0.1	2		0.1	20
Phyllanthaceae	*Phyllanthus gunnii*	None									0.2	40					
Phyllanthaceae	*Poranthera microphylla*	Small Poranthera															
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry							0.1	2							
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn	2	10					0.1	1						1	20
Pittosporaceae	*Bursaria spinosa subsp. spinosa*	Native Blackthorn			0.1	1											
Pittosporaceae	*Pittosporum revolutum*	Rough Fruit Pittosporum									0.1	1				2	30
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum			0.1	5			0.5	1	5	10	0.1	1		1	5
Plantaginaceae	*Plantago debilis*	Shade Plantain															
Plantaginaceae	*Veronica plebeia*	Trailing Speedwell							0.1	5			0.1	1			

Poaceae	*Cymbopogon refractus*	Barbed Wire Grass					0.1	2	10	300			0.1	2				
Poaceae	*Imperata cylindrica*	Blady Grass															0.1	1
Poaceae	*Entolasia marginata*	Bordered Panic									0.1	10	0.1	40				
Poaceae	*Eragrostis brownii*	Brown's Lovegrass			0.1	20	0.5	50	0.5	100								
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass							0.5	30								
Poaceae	*Cynodon dactylon*	Common Couch					5	100										
Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass															0.1	5
Poaceae	*Digitaria ramularis*	Finger Panic Grass							0.1	20							0.3	50
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	5	30	0.1	20			0.5	20							0.1	20
Poaceae	*Austrostipa pubescens*	None							20	300	0.1	2						
Poaceae	*Austrostipa rudis*	None									0.2	20						
Poaceae	*Lachnagrostis filiformis*	None													0.1	1		
Poaceae	*Oplismenus aemulus*	None			0.1	5			2	300	0.1	30					10	2000
Poaceae	*Oplismenus imbecillis*	None	15	50														
Poaceae	*Poa affinis*	None									1	30						
Poaceae	*Themeda triandra*	None					0.1	10	3	100			0.1	5				
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass											1	500	0.1	40		
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass			0.1	6	0.1	10	1	20								
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass											0.1	10				
Poaceae	*Aristida vagans*	Threeawn Speargrass							5	300								
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass																
Poaceae	*Panicum simile*	Two-colour Panic							2	100								
Poaceae	*Rytidosperma racemosum*	Wallaby Grass							0.1	10								
Poaceae	*Rytidosperma racemosum* var. *racemosum*	Wallaby Grass			0.1	1												
Poaceae	*Microlaena stipoides*	Weeping Grass							30	2000							40	5000

Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass			10	100	0.3	60			1	100	95	5000	0.3	100		
Poaceae	*Entolasia stricta*	Wiry Panic	10	30	0.3	60			1	50	1	40					2	100
Polygonaceae	*Rumex brownii*	Swamp Dock			0.1	1												
Proteaceae	*Grevillea spp.*	None																
Proteaceae	*Grevillea robusta*	Silky Oak							0.1	1								
Pteridaceae	*Adiantum aethiopicum*	Common Maidenhair	0.2	5					0.5	50	0.5	60					2	100
Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Rock Fern																
Ranunculaceae	*Clematis glycinoides* var. *glycinoides*	None									0.1	10						
Ranunculaceae	*Clematis aristata*	Old Man's Beard	0.5	1	0.1	1					0.1	5					0.3	30
Rubiaceae	*Asperula conferta*	Common Woodruff	0.1	5														
Rubiaceae	*Galium leiocarpum*	None																
Rubiaceae	*Galium spp.*	None							0.1	5							0.1	30
Rubiaceae	*Opercularia diphylla*	Stinkweed							0.1	5							0.1	2
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart			1	1												
Selaginellaceae	*Selaginella uliginosa*	Swamp Selaginella	0.1	5														
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsparilla			0.1	1												
Solanaceae	*Solanum prinophyllum*	Forest Nightshade			0.1	4							0.1	1			0.2	4
Solanaceae	*Solanum spp.*	None			0.1	2												
Violaceae	*Viola hederacea*	Ivy-leaved Violet			0.1	1												
Polygonaceae	*Acetosa sagittata*	Rambling Dock																
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern			0.1	1											0.2	10
Asparagaceae	*Asparagus virgatus*	Asparagus Fern															0.1	2
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass			20	400	45	500							5	100		
Asteraceae	*Bidens pilosa*	Cobbler's Pegs											0.1	20	0.1	1		
Poaceae	*Briza subaristata*	None					0.1	10										
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass			5	50	35	500	0.1	4					10	100		

Gentianaceae	*Centaurium erythraea*	Common Centaury					0.1	1					0.1	2				
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed													0.1	3		
Asteraceae	*Cirsium vulgare*	Spear Thistle			0.1	1									0.1	1		
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane			0.1	10			0.1	20			0.1	10	0.1	7		
Apiaceae	*Cyclospermum leptophyllum*	Slender Celery			0.1	2												
Cyperaceae	*Cyperus brevifolius*	None			0.1	20	0.1	3							0.1	10		
Cyperaceae	*Cyperus sesquiflorus*	None					0.1	30							0.1	10		
Poaceae	*Dactylis glomerata*	Cocksfoot							0.1	5			0.1	2	0.1	10		
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	20	100	0.1	10											0.1	20
Asteraceae	*Euryops chrysanthemoides*	None																
Oleaceae	*Fraxinus excelsior*	European ash																
Asteraceae	*Gamochaeta calviceps*	Cudweed					0.1	10										
Asteraceae	*Gamochaeta* spp.	None											0.1	1	0.1	10		
Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush											0.1	1				
Asteraceae	*Hypochaeris radicata*	Catsear	0.2	5			0.1	20	0.1	50			0.1	10	0.1	20		
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda									0.1	1						
Juncaceae	*Juncus cognatus*	None			0.1	20									0.1	4		
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet			0.1	5											0.1	1
Oleaceae	*Ligustrum sinense*	Small-leaved Privet			0.1	5					0.1	1					0.2	5
Poaceae	*Lolium perenne*	Perennial Ryegrass			0.1	10												
Fabaceae (Faboideae)	*Lotus angustissimus*	Slender Birds-foot Trefoil											0.1	20				
Fabaceae (Faboideae)	*Lotus subbiflorus*	Hairy Birds-foot Trefoil			0.1	5							0.1	10	0.1	10		
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel			0.1	5							0.1	1	0.1	2		
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow			0.1	2												
Rutaceae	*Murraya paniculata*	None																
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant															0.1	1

Oleaceae	*Olea europaea subsp. cuspidata*	African Olive									0.1	1					0.1	1
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis					0.1	5							0.1	3		
Poaceae	*Paspalum dilatatum*	Paspalum	2	20			0.2	20					0.1	10	60	500		
Geraniaceae	*Pelargonium capitatum*	None																
Phytolaccaceae	*Phytolacca octandra*	Inkweed																
Pinaceae	*Pinus radiata*	Radiata Pine			3	1												
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues			0.2	40	0.1	30					0.1	30	0.2	50		
Poaceae	*Poa annua*	Winter Grass			0.1	2												
Fagaceae	*Quercus robur*	English Oak																
Rubiaceae	*Richardia brasiliensis*	Mexican Clover			0.2	50	0.2	40										
Rosaceae	*Rubus fruticosus* sp. agg.	Blackberry complex			0.1	2			0.1	1			0.1	10	0.1	5		
Asteraceae	*Senecio madagascariensis*	Fireweed			0.1	5	0.1	10	0.1	2			0.1	10	0.1	10		
Poaceae	*Setaria parviflora*	None					0.2	100							20	100		
Poaceae	*Setaria pumila*	Pale Pigeon Grass			0.2	50			0.1	20			0.3	100				
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne			0.1	1									0.1	20		
Iridaceae	*Sisyrinchium rosulatum*	Scourweed					0.2	10										
Solanaceae	*Solanum americanum*	Glossy Nightshade																
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush																
Solanaceae	*Solanum nigrum*	Black-berry Nightshade			0.1	5												
Solanaceae	*Solanum pseudocapsicum*	Madeira Winter Cherry									0.1	1						
Solanaceae	*Solanum seaforthianum*	Climbing Nightshade															0.1	1
Asteraceae	*Sonchus oleraceus*	Common Sowthistle			0.1	1							0.1	2				
Poaceae	*Sporobolus africanus*	Parramatta Grass					0.2	50	0.1	20					0.1	30		
Asteraceae	*Tagetes minuta*	Stinking Roger																
Asteraceae	*Taraxacum officinale*	Dandelion											0.1	1				
Melastomataceae	*Tibouchina urvilleana*	Lasiandra																
Euphorbiaceae	*Triadica sebifera*	Chinese Tallowood			0.1	10												

Fabaceae (Faboideae)	*Trifolium repens*	White Clover			0.1	1			0.1	10							
Fabaceae (Faboideae)	*Trifolium subterraneum*	Subterranean Clover													0.1	20	
Verbenaceae	*Verbena bonariensis*	Purpletop													0.1	1	
Verbenaceae	*Verbena officinalis*	Common Verbena			0.1	1											
Violaceae	*Viola odorata*	Sweet Violet			0.1	3											

Table A 4: BAM plot floristics (Plots 9 to 15)

Family	Scientific name	Common name	39765.B09		39765.B10		39765.B11		39765.B12		39765.B13		39765.B14		39765.B15		39765.B16	
			Cvr%	Abund	Cvr%	Abund	Cvr%	Abund	Cvr%	Abund	Cvr%	Abund	Cvr%	Abund	Cvr%	Abund	Cvr%	Abund
Native species																		
Apiaceae	*Centella asiatica*	Indian Pennywort	0.1	20					0.1	20	0.1	40	0.1	20				
Apiaceae	*Hydrocotyle sibthorpioides*	None							0.2	60	0.1	30			0.2	50	0.1	50
Apocynaceae	*Tylophora barbata*	Bearded Tylophora																
Apocynaceae	*Marsdenia rostrata*	Milk Vine																
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax															0.1	2
Araliaceae	*Polyscias sambucifolia subsp. sambucifolia*	None																
Asparagaceae	*Arthropodium milleflorum*	Pale Vanilla-lily																
Asparagaceae	*Arthropodium minus*	Small Vanilla Lily							0.1	20							0.1	10
Asphodelaceae	*Dianella caerulea*	Blue Flax-lily																
Asphodelaceae	*Dianella longifolia*	Blueberry Lily																
Asphodelaceae	*Dianella caerulea var. caerulea*	None							0.1	10								
Asphodelaceae	*Dianella caerulea var. producta*	None															0.3	20
Asteraceae	*Lagenophora stipitata*	Common Lagenophora																
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting	0.1	3											0.1	1		
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed	0.8	20					0.1	4					0.1	6		
Asteraceae	*Euchiton japonicus*	None															0.1	10
Asteraceae	*Lagenophora gracilis*	Slender Lagenophora															0.1	5
Asteraceae	*Euchiton involucratus*	Star Cudweed			0.1	10												

Asteraceae	*Euchiton sphaericus*	Star Cudweed															0.1	10
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood																
Asteraceae	*Vernonia cinerea*	little ironweed																
Asteraceae	*Brachyscome graminea*	None															0.5	10
Asteraceae	*Cassinia longifolia*	None															0.1	20
Bignoniaceae	*Pandorea pandorana subsp. pandorana*	Wonga Wonga Vine																
Blechnaceae	*Doodia australis*	Common Rasp Fern															0.3	40
Blechnaceae	*Doodia* spp.	None							0.2	40					0.2	40		
Campanulaceae	*Wahlenbergia gracilis*	Sprawling Bluebell	0.1	3														
Campanulaceae	*Lobelia purpurascens*	whiteroot	10	1000					0.2	30	0.1	10	0.1	20	0.8	2000	0.2	40
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak															0.1	1
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak																
Clusiaceae	*Hypericum gramineum*	Small St John's Wort					0.1	5			0.1	20	0.1	40				
Commelinaceae	*Commelina cyanea*	Native Wandering Jew																
Convolvulaceae	*Dichondra repens*	Kidney Weed	5	1000					0.2	100	0.1	30	0.2	50	0.8	1000	0.5	500
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge							0.1	1	0.1	10	0.1	40				
Cyperaceae	*Carex inversa*	Knob Sedge			0.1	20												
Cyperaceae	*Lepidosperma gunnii*	None																
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	0.1	10														
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge							0.1	1					0.1	20		
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	0.1	5									0.1	50			1	50
Ericaceae	*Acrotriche divaricata*	None															0.2	1
Euphorbiaceae	*Homalanthus populifolius*	None	0.1	3														

Fabaceae (Faboideae)	*Indigofera australis*	Australian Indigo													0.2	2	0.1	2
Fabaceae (Faboideae)	*Kennedia rubicunda*	Dusky Coral Pea							0.1	1					0.1	2	0.1	2
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla							0.1	1								
Fabaceae (Faboideae)	*Desmodium gunnii*	None							0.1	20								
Fabaceae (Faboideae)	*Desmodium varians*	None													0.1	10	0.1	10
Fabaceae (Faboideae)	*Grona varians*	None															0.1	20
Fabaceae (Faboideae)	*Glycine microphylla*	Small-leaf Glycine							0.1	10			0.1	10				
Fabaceae (Faboideae)	*Desmodium spp.*	Tick-trefoil	0.3	50														
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine							0.1	30	0.1	20			0.3	100		
Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine	0.1	50	0.1	5			0.1	20			0.1	20				
Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle									0.1	2					5	10
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta Wattle	50	4											1	10	0.1	2
Fabaceae (Mimosoideae)	*Acacia parvipinnula*	Silver-stemmed Wattle																
Geraniaceae	*Geranium solanderi*	Native Geranium	0.4	80														
Geraniaceae	*Geranium homeanum*	None							0.1	10								
Goodeniaceae	*Goodenia bellidifolia subsp. bellidifolia*	None							0.1	1							0.1	2
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort											0.2	40				
Hypoxidaceae	*Hypoxis hygrometrica var. hygrometrica*	None											0.1	1	0.1	2		
Lamiaceae	*Mentha satureioides*	Native Pennyroyal													0.1	5		

Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush															
Lomandraceae	*Lomandra filiformis subsp. filiformis*	None														0.1	5
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush							0.1	10							
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry															
Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree															
Malvaceae	*Brachychiton populneus*	Kurrajong															
Meliaceae	*Melia azedarach*	White Cedar							0.1	5							
Myrtaceae	*Eucalyptus moluccana*	Grey Box													8	10	5	1
Myrtaceae	*Eucalyptus punctata*	Grey Gum							3	1			15	1				
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush					2	1									2	5
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	20	3					2	1					7	1		
Myrtaceae	*Eucalyptus paniculata subsp. paniculata*	None							5	3								
Myrtaceae	*Syncarpia glomulifera subsp. glomulifera*	None							20	20								
Myrtaceae	*Corymbia gummifera*	Red Bloodwood																
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint																
Myrtaceae	*Angophora costata*	Sydney Red Gum																
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark							5	10	3	8					3	30
Myrtaceae	*Kunzea ambigua*	Tick Bush									40	100					0.3	1
Myrtaceae	*Syncarpia glomulifera*	Turpentine															10	10
Myrtaceae	*Eucalyptus globoidea*	White Stringybark											10	1			10	7
Myrtaceae	*Eucalyptus quadrangulata*	White-topped Box							3	1								
Myrtaceae	*Eucalyptus longifolia*	Woollybutt							0.2	1							0.2	2
Oleaceae	*Notelaea longifolia f. longifolia*	None																
Orchidaceae	*Pterostylis spp.*	Greenhood															0.1	2
Orchidaceae	*Chiloglottis diphylla*	None																

Oxalidaceae	*Oxalis chnoodes*	None															
Oxalidaceae	*Oxalis exilis*	None							0.1	5						0.1	5
Oxalidaceae	*Oxalis perennans*	None	0.5	200							0.1	5			0.1	20		
Phyllanthaceae	*Phyllanthus gunnii*	None																
Phyllanthaceae	*Poranthera microphylla*	Small Poranthera											0.1	2	0.1	10	0.1	2
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry																
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn													3	30	0.2	20
Pittosporaceae	*Bursaria spinosa subsp. spinosa*	Native Blackthorn							0.1	5			0.1	2				
Pittosporaceae	*Pittosporum revolutum*	Rough Fruit Pittosporum															2	10
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	1	10							0.1	2	0.1	1	0.3	3		
Plantaginaceae	*Plantago debilis*	Shade Plantain							0.1	3								
Plantaginaceae	*Veronica plebeia*	Trailing Speedwell																
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass																
Poaceae	*Imperata cylindrica*	Blady Grass															0.1	30
Poaceae	*Entolasia marginata*	Bordered Panic							0.2	50	0.2	50						
Poaceae	*Eragrostis brownii*	Brown's Lovegrass									0.2	40						
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass																
Poaceae	*Cynodon dactylon*	Common Couch									15	200						
Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass																
Poaceae	*Digitaria ramularis*	Finger Panic Grass	0.5	10													0.2	40
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	0.1	10					1	40	0.2	40			0.5	40	0.2	20
Poaceae	*Austrostipa pubescens*	None																
Poaceae	*Austrostipa rudis*	None													0.1	10		
Poaceae	*Lachnagrostis filiformis*	None																

Poaceae	*Oplismenus aemulus*	None							0.1	20							1	100
Poaceae	*Oplismenus imbecillis*	None	0.1	10											0.5	4		
Poaceae	*Poa affinis*	None																
Poaceae	*Themeda triandra*	None									0.1	10	0.1	20	0.5	40		
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	0.1	50							0.1	30			0.5	100		
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass																
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass							0.1	1								
Poaceae	*Aristida vagans*	Threeawn Speargrass															0.1	20
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted Hedgehog Grass							0.1	4	0.1	1						
Poaceae	*Panicum simile*	Two-colour Panic	0.5	100					0.1	30								
Poaceae	*Rytidosperma racemosum*	Wallaby Grass																
Poaceae	*Rytidosperma racemosum var. racemosum*	Wallaby Grass																
Poaceae	*Microlaena stipoides*	Weeping Grass	40	5000											35		25	3000
Poaceae	*Microlaena stipoides var. stipoides*	Weeping Grass			1	100			5	100	10	200	0.1	30			5	200
Poaceae	*Entolasia stricta*	Wiry Panic	0.5	100					2	50			0.1	10				
Polygonaceae	*Rumex brownii*	Swamp Dock																
Proteaceae	*Grevillea spp.*	None					0.1	1										
Proteaceae	*Grevillea robusta*	Silky Oak	0.2	1														
Pteridaceae	*Adiantum aethiopicum*	Common Maidenhair							2	80					0.2	20	0.1	1
Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Rock Fern									0.1	5					0.2	20
Ranunculaceae	*Clematis glycinoides var. glycinoides*	None																

Ranunculaceae	*Clematis aristata*	Old Man's Beard							0.1	10					0.1	1	0.2	10
Rubiaceae	*Asperula conferta*	Common Woodruff																
Rubiaceae	*Galium leiocarpum*	None							0.2	40					0.1	9		
Rubiaceae	*Galium spp.*	None																
Rubiaceae	*Opercularia diphylla*	Stinkweed									0.1	1						
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart	0.1	1													0.1	1
Selaginellaceae	*Selaginella uliginosa*	Swamp Selaginella																
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsparilla																
Solanaceae	*Solanum prinophyllum*	Forest Nightshade	0.1	2					0.1	10					0.1	4	0.1	1
Solanaceae	*Solanum spp.*	None							0.1	5								
Violaceae	*Viola hederacea*	Ivy-leaved Violet																
Introduced species																		
Polygonaceae	*Acetosa sagittata*	Rambling Dock	0.1	1														
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern																
Asparagaceae	*Asparagus virgatus*	Asparagus Fern																
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass			2	100	0.5	40			20	100	5	100				
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	0.1	5							0.1	1			0.1	10		
Poaceae	*Briza subaristata*	None																
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	0.5	10	95	##	95	##	0.1	20			95	##				
Gentianaceae	*Centaurium erythraea*	Common Centaury									0.1	1	0.1	1				
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed																
Asteraceae	*Cirsium vulgare*	Spear Thistle													0.1	1		
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	0.5	40	0.1	3			0.1	1	0.1	5	0.1	1	0.1	6		

Apiaceae	*Cyclospermum leptophyllum*	Slender Celery															
Cyperaceae	*Cyperus brevifolius*	None															
Cyperaceae	*Cyperus sesquiflorus*	None									0.1	20					
Poaceae	*Dactylis glomerata*	Cocksfoot													0.1	3		
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	3	50					0.1	1								
Asteraceae	*Euryops chrysanthemoides*	None									0.1	2						
Oleaceae	*Fraxinus excelsior*	European ash					2	1										
Asteraceae	*Gamochaeta calviceps*	Cudweed									0.1	2						
Asteraceae	*Gamochaeta spp.*	None			0.1	10			0.1	1								
Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush																
Asteraceae	*Hypochaeris radicata*	Catsear	0.5	20	0.1	2	0.1	10	0.1	5	0.1	40	0.1	10				
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda																
Juncaceae	*Juncus cognatus*	None																
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet															0.1	7
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	1	5											0.1	1	0.1	20
Poaceae	*Lolium perenne*	Perennial Ryegrass																
Fabaceae (Faboideae)	*Lotus angustissimus*	Slender Birds-foot Trefoil	0.1	50							0.1	2						
Fabaceae (Faboideae)	*Lotus subbiflorus*	Hairy Birds-foot Trefoil			0.1	3							0.1	10	0.2	50		
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	0.1	100									0.1	1	0.1	10		
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow																
Rutaceae	*Murraya paniculata*	None							0.1	2	0.1	1						
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant																
Oleaceae	*Olea europaea subsp. cuspidata*	African Olive	0.5	3														
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis			0.1	1	0.1	10					0.1	2				

Poaceae	*Paspalum dilatatum*	Paspalum	1	100	1	30			0.1	1	10	60	0.1	10	10	500		
Geraniaceae	*Pelargonium capitatum*	None					0.1	2										
Phytolaccaceae	*Phytolacca octandra*	Inkweed							0.1	1								
Pinaceae	*Pinus radiata*	Radiata Pine																
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	0.3	20	0.1	10	0.1	20	0.1	10			0.1	30	0.2	60		
Poaceae	*Poa annua*	Winter Grass																
Fagaceae	*Quercus robur*	English Oak					10	3										
Rubiaceae	*Richardia brasiliensis*	Mexican Clover									0.2	200						
Rosaceae	*Rubus fruticosus sp. agg.*	Blackberry complex	5	50					0.1	10	0.1	20			15	50	0.1	1
Asteraceae	*Senecio madagascariensis*	Fireweed	0.1	2	0.1	10			0.1	10	0.1	20			0.1	3		
Poaceae	*Setaria parviflora*	None									0.1	1	0.1	10	25	1000		
Poaceae	*Setaria pumila*	Pale Pigeon Grass	4	200	0.2	30			0.1	5	2	50						
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	0.1	20	0.1	1									0.4	20		
Iridaceae	*Sisyrinchium rosulatum*	Scourweed																
Solanaceae	*Solanum americanum*	Glossy Nightshade							0.1	2								
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	0.1	1													0.2	1
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	0.1	5					0.1	5					0.1	2	0.1	1
Solanaceae	*Solanum pseudocapsicum*	Madeira Winter Cherry																
Solanaceae	*Solanum seaforthianum*	Climbing Nightshade																
Asteraceae	*Sonchus oleraceus*	Common Sowthistle																
Poaceae	*Sporobolus africanus*	Parramatta Grass			0.1	2					0.1	1						
Asteraceae	*Tagetes minuta*	Stinking Roger													0.1	3		
Asteraceae	*Taraxacum officinale*	Dandelion													0.1	3		

Melastomataceae	*Tibouchina urvilleana*	Lasiandra					0.2	1										
Euphorbiaceae	*Triadica sebifera*	Chinese Tallowood																
Fabaceae (Faboideae)	*Trifolium repens*	White Clover	0.1	20	0.5	50												
Fabaceae (Faboideae)	*Trifolium subterraneum*	Subterranean Clover																
Verbenaceae	*Verbena bonariensis*	Purpletop	0.1	2	0.1	1					0.1	1						
Verbenaceae	*Verbena officinalis*	Common Verbena																
Violaceae	*Viola odorata*	Sweet Violet																

Table A 5: BAM plot summary

Category	39765.B01	39765.B02	39765.B03	39765.B04	39765.B05	39765.B06	39765.B07	39765.B08	39765.B09	39765.B10	39765.B11	39765.B12	39765.B13	39765.B14	39765.B15	39765.B16
PCT	3321	3616	-	3616	3262	3616	-	3321	3616	-	-	3262	3616	3616	3321	3321
Area (Ha)	3.97	5.02	8.56	5.02	2.34	5.02	8.56	1.05	5.02	8.56	0.44	0.34	5.02	0.25	3.97	1.05
Patch size	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Condition	Low	Low	Exotic	Low	High	Low	Exotic	High	Low	Exotic	UNE	Under scrubbed	Low	Scattered Trees	Low	High
Zone	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
Easting	270511	270661	270553	270651	270652	270596	270500	270345	270228	270267	270682	270608	270554	270746	270421	270618
Northing	6225898	6226380	6226239	6226194	6226059	6225897	6225756	6225975	6225958	6225835	6226276	6226138	6226142	6226366	6225895	6225968
Bearing	265	268	360	152	278	190	250	114	111	273	150	350	347	192	269	270
Composition																
Tree	4	8	0	5	7	1	0	9	3	0	0	8	2	2	3	8
Shrub	2	4	0	4	5	1	0	5	4	0	2	1	2	3	3	11
Grass	3	10	7	17	10	6	4	8	8	2	0	10	9	4	6	8
Forbs	5	12	1	9	10	9	3	9	9	1	1	16	7	7	11	13
Ferns	2	0	0	2	2	0	0	1	0	0	0	2	1	0	2	2
Other	3	4	1	5	9	2	0	6	2	1	0	6	1	2	4	5
Structure																
Tree	16.0	35.7	0.0	55.2	35.9	25.0	0.0	80.1	70.2	0.0	0.0	38.3	3.1	25.0	16.0	32.6
Shrub	2.1	1.3	0.0	1.3	5.9	0.1	0.0	4.2	1.3	0.0	2.1	0.1	40.1	0.3	3.5	7.4
Grass	30.0	11.1	6.2	76.4	3.8	96.4	0.6	52.7	41.9	1.1	0.0	8.8	26.0	0.4	37.1	31.7
Forbs	1.8	1.3	0.1	5.7	2.0	3.7	0.3	9.2	17.1	0.1	0.1	2.0	0.7	0.9	2.6	2.0
Ferns	0.3	0.0	0.0	0.7	5.5	0.0	0.0	2.0	0.0	0.0	0.0	2.2	0.1	0.0	0.4	0.4
Other	1.2	0.4	0.1	0.5	8.7	0.3	0.0	0.8	0.4	0.1	0.0	0.6	0.1	0.2	0.6	0.7
Function																
Large Trees	1	1	0	1	1	1	0	1	1	0	0	1	1	0	1	1

Hollow Trees	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Litter Cover	48	60	0.6	33	56	0.8	0.6	58	33	0.4	0.4	57	4.2	5	17	68
Len. Fallen Logs	8	3	0	0	53	0	0	10	0	0	0	8	0	0	0	10
Tree Stem 5to9	1	1	0	0	1	1	0	1	1	0	0	1	1	0	1	1
Tree Stem 10to19	1	1	0	1	1	1	0	1	1	0	0	1	1	0	1	1
Tree Stem 20to29	1	1	0	1	1	1	0	1	1	0	0	1	1	0	1	1
Tree Stem 30to49	1	9	0	10	19	0	0	1	1	0	0	22	0	0	0	8
Tree50to79	0	10	0	1	3	0	0	1	1	0	0	5	0	2	1	4
Tree Regen	1	1	0	0	1	0	0	1	1	0	0	1	1	1	1	1
High Threat Exotic	22.0	28.8	80.4	0.3	0.1	0.4	75.3	0.8	10.8	98.1	95.5	0.6	30.3	100.1	25.4	0.3

Appendix 3.2 BAM plot data sheets

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	22/09/2023	Oakdale BDAR		Low	RED JJN			
Zone 56	Datum GDA94	Plot ID	39765.B01	Plot dimensions	50x20	Orientation of middle	265	
Easting 270511	Northing 6225897	IBRA region	South Eastern Highlands	Photo #				
Plant Community Type		3321				EEC: Potentally	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	2
	Grasses etc.	3
	Forbs	5
	Ferns	2
	Other	3
Sum of Cover of native vascular plans by growth form group	Trees	16
	Shrubs	2.1
	Grasses etc.	30
	Forbs	1.8
	Ferns	0.3
	Other	1.2
High Threat Weed cover		22

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	2
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	8
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	60	60	30	40
Average of the 5 subplots	48				

Notes	Litter cover affected by the grubbing, some areas of bare earth and some areas of dense litter made from limbs bark and leaves from fallen trees/grubbed earth

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

Landform Pattern		Slope	Sloping south south east	Soil Surface Texture	Sandy loam,
Soil Colour	Light brown	Site Drainage	Watdrcourse to left of bam but not functional, dam also.	Distance to nearest water	80m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	R	Grubbing evidence
Cultivation (inc. pasture)			

Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness	2	R	Weed evidence lost due to grubbing
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/09/2023	Oakdale BDAR	39765.B01	RED JJN

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia parramattensis	N	1	1	Mid Storey
EG	Adiantum aethiopicum	N	0.2	5	Ground
FG	Asperula conferta	N	0.1	5	Ground
SG	Bursaria spinosa	N	2	10	Mid Storey
OG	Clematis aristata	N	0.5	1	Mid Storey
FG	Dianella caerulea	N	0.5	4	Ground
FG	Dichondra repens	N	1	30	Ground
GG	Echinopogon ovatus	N	5	30	Ground
	Ehrharta erecta	HTE	20	100	Ground
GG	Entolasia stricta	N	10	30	Ground
TG	Eucalyptus crebra	N	5	1	Canopy
TG	Eucalyptus moluccana	N	5	1	Canopy
TG	Eucalyptus punctata	N	5	1	Canopy
FG	Geranium solanderi	N	0.1	2	Ground
OG	Glycine clandestina	N	0.2	10	Ground
OG	Glycine microphylla	N	0.5	10	Ground
SG	Hibbertia aspera	N	0.1	2	Mid Storey
	Hypochaeris radicata	E	0.2	5	Ground
GG	Oplismenus imbecillis	N	15	50	Ground
	Paspalum dilatatum	HTE	2	20	Ground
EG	Selaginella uliginosa	N	0.1	5	Ground
FG	Xerochrysum bracteatum	N	0.1	1	Ground

Appendix 4 Fauna

Table A 6: Fauna species recorded at the subject land

Common name	Scientific name
Mammals	
Antechinus sp.	*Antechinus* sp.
Black Rats	*Rattus rattus*
Common Brushtail Possum	*Trichosurus vulpecula*
Eastern Grey Kangaroo	*Macropus giganteus*
Fox	*Vulpes vulpes*
Rabbit	*Oryctolagus cuniculus*
Ringtail Possum	*Pseudocheirus peregrinus*
Sugar Glider	*Petaurus breviceps*
Swamp Wallaby	*Wallabia bicolor*
Wombat	*Vombatidae* sp.
Birds	
Australasian Pipit	*Anthus novaeseelandiae*
Australian King-Parrot	*Alisterus scapularis*
Australian Magpie	*Cracticus tibicen*
Australian Wood Duck	*Chenonetta jubata*
Brown Goshawk	*Accipiter fasciatus*
Common Bronzewing	*Phaps chalcoptera*
Common Myna	*Acridotheres tristis*
Eastern Rosella	*Platycercus eximius*
Eurasian Blackbird	*Turdus merula*
Laughing Kookaburra	*Dacelo novaeguineae*
Magpie-lark	*Grallina cyanoleuca*
Noisy Miner	*Manorina melanocephala*
Pied Currawong	*Strepera graculina*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattlebird	*Anthochaera carunculata*
Red Wattlebird	*Anthochaera carunculata*
Spotted Pardalote	*Pardalotus punctatus*
Sulphur-crested Cockatoo	*Cacatua galerita*
Tawny Frogmouth	*Podargus strigoides*

Common name	Scientific name
White-throated Treecreeper	*Cormobates leucophaea*
White-winged Chough	*Corcorax melanorhamphos*
Reptiles	
Lace Monitor	*Varanus varius*
Frogs	
Common Eastern Froglet	*Crinia signifera*
Striped-marsh Frog	*Limnodynastes peronii*
Gastropods	
Cumberland Plain Land Snail	*Meridolum corneovirens*

Appendix 5 SAII

Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion

Community background

The *Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion* (PCT 3262) is listed under both the NSW BC Act and Commonwealth EPBC Act as a Critically Endangered Ecological Community (CEEC). The CEEC is listed in the BioNet Threatened Biodiversity Data Collection as an entity subject to Serious and Irreversible Impact (SAII) in NSW based on the following principles (DPIE 2019):

- Principle 1: an ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- Principle 2: an ecological community that is observed, inferred or reasonably suspected to be severely degraded or disturbed.

Occurrence in the subject land

There is approximately 2.69 ha of the CEEC within the subject land, including:

- Impacts to the CEEC include the removal of 0.05 ha of PCT 3262 underscrubbed condition.
- 2.34 ha of high condition PCT 3262 within the C2 (Environmental Management) zone.
- 0.29 ha of underscrubbed condition PCT 3262 within the C2 (Environmental Management) zone.

The BDAR has conservatively assumed for the purpose of assessment and calculation of impacts that all land within the development footprint, including road verges, and private spaces would be completely cleared of all native vegetation, with the exception of the proposed retention of approximately 443 trees within the subject land. It should be noted that this is an overestimation of the extent of impacts across 21.98 hectares of land. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further retention of trees and habitat features specifically in relation to *Sydney Turpentine-Ironbark Forest of the Sydney Basin Bioregion* (PCT 3262) within the development footprint. Of importance for assessment, the potential for underestimation of impacts is substantially less than the overestimation of impacts that has been incorporated into the assessment.

Given the absence of definitive impact thresholds stated for the community, the potential for a SAII will be determined by the consent authority, guided by the additional assessment provided below in Table A.7.

Table A.7 Assessment of SAII for Sydney Turpentine-Ironbark Forest

Information required (BAM Section 9.1.1)	Response
1. Impacts to the CEEC and the action and measures taken to avoid the direct and indirect impact on the CEEC at risk of an SAII.	
-	The project will directly impact 0.05 ha of underscrubbed condition PCT 3262 vegetation that meets the BC Act listing and EPBC Act requirements for Sydney Turpentine-Ironbark Forest CEEC. The vegetation to be removed occurs in the following conditions: • Underscrubbed: 0.05 ha – VI score of 48.5. Measures undertaken by the proponent to avoid and minimise impacts to the CEEC (3262) are provided in Section 5.1 of this BDAR. Specifically, substantial efforts have been made to ensure that impacts to the high condition Sydney Turpentine-Ironbark Forest have been avoided and minimised throughout the design phase of the project. Throughout the assessment process, ecological information collected by Biosis including vegetation mapping indicating locations of ground-truthed PCTs, TECs, and threatened flora and fauna habitat was provided following field investigation and used to influence alignment design options, construction options, and avoidance opportunities during the preparation of the Master Plan. Opportunities to avoid impacts to the high condition Sydney Turpentine-Ironbark Forest were a key focus, due to a desire to minimise impacts to the CEEC, minimise the potential need to refer the project to the Commonwealth, and to minimise the cost of offsets. Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and further avoidance will be undertaken at the detailed design stage. Avoidance and minimisation of impacts to Sydney Turpentine-Ironbark Forest were achieved through: • Avoidance of all PCT 3262 in high condition (2.34ha) within the northern portion of the subject land, under a C2 Environmental Management Zoning. • Redesign of subdivision to retain hollow-bearing trees where feasible. A site specific VMP will be prepared to: • Protect and manage the remaining 2.34 ha high condition Sydney Turpentine-Ironbark Forest CEEC (PCT 3262). • The VMP will be implemented and protected in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. This would avoid further degradation to the CEEC within the subject land, as a result of leaving it in situ. The VMP will maintain and restore the extent of occurrence of two CEECs including 2.58 ha of Shale Sandstone Transition Forest CEEC (PCT 3321), and 2.64 ha of Sydney Turpentine Ironbark Forest CEEC (PCT 3262). The project will result in the direct removal of 0.05 ha of Sydney Turpentine-Ironbark Forest CEEC. As such, this will result in a 1.19 % canopy loss of the Sydney Turpentine-Ironbark Forest CEEC within the subject land. The proposal would have resulted in impacts to 2.69 ha of Sydney Turpentine-Ironbark Forest CEEC prior to implementation of avoidance measures described above. In efforts to avoid and minimise impacts, the final development design was restricted to

Information required (BAM Section 9.1.1)	Response
	removal of 0.05 ha of underscrubbed condition PCT 3262 of the CEEC within the subject land. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest (PCT 3262) within the development footprint. Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, including Sydney Turpentine-Ironbark CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR.
2a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	
-	Species and ecological communities that have undergone large reductions or are likely to undergo large reductions in the future are considered to be at greater risk of extinction than those that have undergone or are likely to undergo smaller reductions (NSW TSSC 2018). To be considered under this principle, the ecological community should have been observed, estimated, inferred, or reasonably suspected to have undergone, or be projected to undergo, a very large reduction in distribution, being: • ≥80 % reduction where the reduction is over a 50-year period (i.e. since 1970), either in the past, future, or any part of the past, present and future (DPIE 2019). The Final Determination indicates the CEEC has undergone a very large reduction in its geographic distribution since European Settlement due to clearing for agricultural development. While the pre-European extent is regarded as uncertain, it has been estimated at 30,339 ha. The determination states the original extent has undergone a reduction exceeding 90%, and comprises approximately 2,940 ha. The current distribution of the CEEC is highly restricted, and mostly occur as small isolated remnants which are subject to ongoing disturbance (DECC NSW 2008, NSW Threatened Species Scientific Committee 2019). The Sydney Turpentine-Ironbark Forest occurs within the Sydney Basin Bioregion in the Cumberland Plain, Hornsby Plateau, and Woronora Plateau areas within the Baulkham Hills, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Hurstville local government areas (LGAs) (NSW Threatened Species Scientific Committee 2019). Whilst there is no confirmed proportion of geographic distribution reduction that has occurred over the last 50 years (i.e. since 1970) to date, the Final Determination estimates the extent of distribution at 2,940 as of 2019 (NSW Threatened Species Scientific Committee 2019). Given this, and the fact that the CEEC is noted in the SAII guidance document (DPIE 2019) as being subject to SAII Principle 1, infers that it has occurred in recent times, and therefore at a rapid rate. According to *Remnant vegetation of the western Cumberland subregion, 2013 Update VIS_ID 4207* (DPE 2015), *The Native Vegetation of the Sydney Metropolitan Area* (DPE 2016) and *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer et al. 2010), the current extent of Sydney Turpentine Forest (PCT 3262) within NSW is approximately 2,786 ha. This is a total reduction of approximately 9.2 % of the original geographic distribution.

Information required (BAM Section 9.1.1)	Response
2b. Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes. (SAII Principle 2)	
i. change in community structure, ii. change in species composition, iii. disruption of ecological processes	Reduction in ecological function relates to the IUCN principle of "very small population size" which for ecological communities means communities have very high levels of either environmental degradation or disruption of biotic processes, and interactions have an increased risk of failure to sustain their characteristic native species assemblages (Bland et al. 2016). Ecological communities that are considered to have a very large degree of environmental degradation or disruption of biotic processes or interactions are those with: • ≥90 % extent and severity where the disruption or impacts are measured since 1970. • ≥80 % extent and severity where the disruption or impacts are over a 50-year period, either in the past, future, or any part of the past, present and future (as per (Bland et al. 2016). (DPIE 2019). Clearing of Sydney Turpentine-Ironbark Forest for agricultural development commenced in the inner west of Sydney soon after European settlement (1788) and accelerated following the expansion of Sydney's suburbs in the nineteenth and early twentieth centuries. Today, remnants are typically small and fragmented and susceptible to continued attrition through clearing and land management practices (NSW Threatened Species Scientific Committee 2019). A range of anthropogenic disturbances including logging, grazing by domesticated livestock and burning at varying intensities have affected the structure and potentially composition of remnants. For example, the density and average basal diameter of trees in remnants sampled by Benson and Howell (1994) suggested that the removal of large older trees has led to higher densities of smaller trees such that remnants typically have the structure of regrowth forest. Increased fire frequencies associated with hazard reduction burning have led to declines in populations of slow maturing, fire sensitive species and effected a structural simplification in some remnants of Sydney Turpentine Forest. Conversely, remnants with a long-term history of fire-exclusion, particularly when coupled with increases in nutrient and moisture availability, are characterised by higher densities and cover of mesic species (such as Sweet Pittosporum *Pittosporum undulatum*, Cheese Tree *Glochidion ferdinandi* and Bleeding Heart *Homalanthus populifolius*), larger and more diverse populations of exotic species and lower diversity of understorey species (Rose & Fairweather 1997, McDonald, Wale, & Bear 2002, Howell 2003). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a key threatening process (KTP) to the CEEC (NSW Threatened Species Scientific Committee 2019). The condition of the native vegetation within the development footprint is relatively low, with a VI score of 48.5,. The vegetation within the development footprint contained an intact canopy, however the mid and understorey lacked structural and floristic diversity due to ongoing disturbance from grazing by livestock and pest fauna species.
iv. invasion and establishment of exotic	Remnants of Sydney Turpentine-Ironbark Forest are subject to ongoing invasion by an extensive range of naturalised plant species. Weed invasion is exacerbated by the

Information required (BAM Section 9.1.1)	Response
species **v. degradation of habitat** **vi. fragmentation of habitat.**	proximity of remnants to areas of rural and urban development and the associated influx of both weed propagules from gardens and nutrients contained in stormwater runoff, dumped garden refuse and animal droppings (Leishman 1990, Benson & Howell 1994, Leishman, Hughes, & Gore 2004, Smith & Smith 2010). Species such as Large-leaved Privet *Ligustrum lucidum* and *Ligustrum sinense* (Small-leafed Privet) are highly invasive under conditions of enhanced soil nutrients and have been recorded in at least half of all plots sampling Sydney Turpentine-Ironbark Forest by Tozer (2003). Other frequently recorded species include the shrubs Mickey Mouse Plant *Ochna serrulata*, Inkweed *Phytolacca octandra*, Paddy's Lucerne *Sida rhombifolia* and Bitou Bush *Chrysanthemoides* monilifera, the scandent shrubs Lantana, *Lantana camara* and Asparagus Fern *Asparagus* aethiopicus, the climbers Moth Vine Araujia sericifera, Bridal Creeper Asparagus asparagoides and English Ivy Hedera helix, and the grasses Paspalum *Paspalum* dilatatum, Panic Veldtgrass *Ehrhata erecta*, and *Setaria parviflora* (Tozer 2003). 'Invasion and establishment of exotic vines and scramblers', 'Invasion, establishment and spread of Lantana', 'Invasion of native plant communities by Chrysanthemoides monilifera', 'Invasion of native plant communities by exotic perennial grasses' and 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants are all listed as KTPs for the CEEC (NSW Threatened Species Scientific Committee 2019). Whilst there is no guidance as to the proportion of this degradation that has occurred in the last 50 years (i.e. since 1970) to date, the fact that the EEC is noted in the SAII guidance document (DPIE 2019) as being subject to Principle 2, infers that it has occurred in recent times. The condition of PCT 3262 underscrubbed within the development footprint is relatively low, with a VI score of 48.5, however High Threat Weed Cover was also quite low at 0.6 across the site. The proposed development proposes to protect and manage all high condition Sydney Turpentine-Ironbark Forest CEEC (2.34 ha) through the implementation of a VMP in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest of the Sydney Basin Bioregion (PCT 3262) within the development footprint.
2c. evidence of restricted geographic distribution (Principle 3, clause 6.7(2) BC Regulation), based on the TEC's geographic range in NSW according to the:	

i. extent of occurrence
ii. area of occurrence
	The geographic distribution of ecological communities is defined by the area of occupancy, sensu (Bland et al. 2016). Ecological communities with a very limited geographic distribution have an area of occupancy of less than or equal to two 10 x 10 km grid cells (200 km^2) or an extent of occurrence of ≤1,000 km^2, sensu (Bland et al. 2016), and one of the following:
	• An observed or inferred continuing decline in:
	  ○ A measure of spatial extent appropriate to the ecological community.
	  ○ A measure of environmental quality appropriate to characteristic biota of the ecological community.

Information required (BAM Section 9.1.1)	Response
	○ A measure of disruption to biotic interactions appropriate to the characteristic biota of the ecological community. • Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years. ○ An ecological community that exists at one location (DPIE 2019). According to the final determination for the CEEC, Sydney Turpentine-Ironbark Forest is estimated to occur within an extent of occurrence of 4,479 km2 and an area of occupancy of 12 10 x 10 km grid cells (NSW Threatened Species Scientific Committee 2019). As such, the CEEC is not noted in the SAII guidance document (DPIE 2019) as being subject to Principle 3. The proposed development will result in the complete removal of 0.05 ha of the CEEC in underscrubbed condition. A VMP will be implemented to protect and manage all of the high condition CEEC (2.34) ha. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest of the Sydney Basin Bioregion (PCT 3262) within the development footprint.
iii. number of threat-defined locations	There are no specific threat defined locations listed in the TBDC for the community. Of the threats listed in the TBDC for the CEEC, clearing and loss of vegetation for rural/residential/industrial development is listed as the highest threat to the CEEC. Remnants of the CEEC are poorly represented within the reserve network, with an estimated 280 ha of the CEEC (<1% of the pre-European extent) distributed among 15 reserves (with a minimum area of 0.5 ha) under the management of the NSW National Parks and Wildlife Service (NPWS). This puts unreserved areas at threat of vegetation clearing While land-clearing is likely to remain a threatening process contributing to the decline of this community into the future, the CEEC has an area of occupancy of more than two 10 x 10 km grid squares and has an extent of occurrence >1000 ha, and is therefore not considered under SAII principle 3 (DPIE 2019).
2d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	
-	This principle encompasses two components, firstly whether there are any particular traits of the community which limits its' response to management, and secondly whether there are any key threatening processes affecting the community which cannot be effectively managed (DPIE 2019). The final determination does not outline management success of the CEEC, however the *Best Practice Guidelines for Sydney Turpentine-Ironbark Forest* (DECC NSW 2008) lists bush regeneration and management principles including bush-fire management, which indicates the ability for the community to regenerate over time. The document does list some issues specific to bush regeneration including: • Small size of remnants: the small remnant size increases the effects of a large edge-to-core ratio (edge-effects). Weed encroachments, tracking, dumping, nutrient-laden stormwater and inappropriate fire regimes take on a greater significance in these small areas. • Wianamatta shale soil: This soil type has far more nutrients compared to Sydney sandstone-derived soils. This emphasises the need for long-term weed control as weeds can more easily establish themselves on high-nutrient soils; for example, by birds and wind spreading the weed seed. Contrast this with low-nutrient Sydney

Information required (BAM Section 9.1.1)	Response
	sandstone soils, where weeds usually require disturbance to become established (for example, from erosion by stormwater). In addition, several management measures are detailed within the TBDC for this community. These include: • Community and land-holder liaison/ awareness and/or education. • Habitat management: Fire. • Habitat management: Ongoing EIA – Advice to consent and planning authorities. • Habitat management: Promote regrowth by avoiding unnecessary mowing. • Habitat management: Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion. • Habitat management: Control weeds. • Habitat Rehabilitation/Restoration and/or Regeneration. Generally those entities which are listed as unlikely to respond to management (and thus are irreplaceable) tend to include species where the ability to control key threats is negligible and known reproductive characteristics that severely limit their ability to increase the existing population (DPIE 2019). Ecological communities as a whole do not typically align well with these criteria. Based on the existence of the best practice guidelines providing guidance as to the management of the CEEC, the community is not considered to be unlikely to respond to management and therefore it is does not meet SAII Principle 4.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC, the assessor must record this in the BDAR or BCAR.	
-	Not applicable.
4a. The impact on the geographic extent of the TEC, by estimating the total area of the TEC to be impacted by the proposal.	
i. in ha **ii. as a percentage of the current geographic extent of the TEC in NSW.**	As discussed above, the current extent of Sydney Turpentine-Ironbark Forest within NSW is approximately 30,339 ha. The CEEC is known to occur as small patches within the Sydney Basin Bioregion, namely within the LGAs of Baulkham Hills, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Hurstville (NSW Threatened Species Scientific Committee 2019). **Direct impacts** The proposed development will result in the removal of approximately 0.05 ha of the CEEC in underscrubbed condition within the development footprint. As such the total area of the CEEC to be directly impacted by the project equates to <0.001 % of the CEEC within NSW. The vegetation occurs in the following condition: Underscrubbed: 0.05 ha – VI score of 48.5. The structure of this conditional zones within the subject land occurs as a patch of grassy woodland with an intact canopy and a reduced structural and floristic diversity within the mid and groundstorey due to historic trampling and grazing by livestock. Invasion by exotic species is generally low. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Sydney Turpentine-Ironbark Forest of the Sydney Basin Bioregion (PCT 3262) within the development footprint.

Information required (BAM Section 9.1.1)	Response
	Indirect impacts Indirect impacts to Sydney Turpentine-Ironbark Forest associated with factors such as increased edge effects, fragmentation, altered fire regimes, altered hydrological patterns and transport of weeds and pathogens are not expected to be substantial or significant, largely due to the already degraded and edge effected nature of the CEEC within the development footprint / subject land and broader vicinity and the implementation of mitigation measures through a CEMP. Where Sydney Turpentine-Ironbark Forest will be retained (outside the development footprint, but within the subject land) it is most likely to be subject to indirect impacts associated with construction and operational activities. Within this area, the CEEC occurs in the following conditions: • High: 2.34 ha – VI score of 68.9. • Underscrubbed: 0.29 ha – VI score 48.5 Indirect impacts are not expected to occur as a result of the project, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental Consultants 2024) in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Therefore, offsets for indirect impacts are not anticipated to be required for the project.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:	
i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals.	Sydney Turpentine-Ironbark Forest present in the wider landscape surrounding the project area occurs in an already highly fragmented state. GIS was used to determine the range and average size of mapped (OEH 2013, OEH 2016, Biosis 2021) occurrences of Sydney Turpentine-Ironbark Forest within a 500 m buffer of the development footprint / subject land. The results of which are provided below both for those patches intersected by the development footprint / subject land (i.e. subject to vegetation removal) and those patches not intersected by the development footprint / subject land (i.e. not directly impact by the project). **Mapped areas within 500 m not directly impacted:** Size range: 3 ha to 5.19 ha Average size: 4.10 ha Total no. mapped polygons: 2 Total area: 8.20 ha **Mapped areas within 500 m directly impacted:** Size range: 0.05 ha to 0.05 ha Average size: 0.05 ha Total no. mapped polygons: 1 Total area: 0.05 ha The proposed development footprint will directly impact 0.05 ha of underscrubbed condition PCT 3262 of TEC vegetation within the subject land. 0.05 ha of CEEC vegetation within the subject land equates to a 0.61 % reduction of the local occurrence of Sydney Turpentine-Ironbark Forest and 1.86 % of all Sydney Turpentine-Ironbark Forest within the subject land.

Information required (BAM Section 9.1.1)	Response
	Impacts to the Sydney Turpentine-Ironbark Forest CEEC are restricted to underscrubbed condition vegetation with an absent midstorey, and all PCT 3262 in high condition (2.34 ha) will be protected and managed in perpetuity under a VMP under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.
ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: **distance between isolated areas of the TEC, presented as the average** **distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and** **estimated maximum dispersal distance for native flora species characteristic of the TEC, and** **other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development**	GIS was used to undertake a nearest neighbour analysis of mapped occurrences of Sydney Turpentine-Ironbark Forest prior to and post vegetation to determine the distance between impacted areas of the CEEC before and after the proposed vegetating removal. The average distance between mapped occurrences of Sydney Turpentine-Ironbark Forest within a 500 m buffer of the development footprint / subject land, include: • 161.97 m before development. • 124.85 m after development. Based on the above, there will be an average decrease of 37.12 m separation between retained patches of Sydney Turpentine-Ironbark Forest within 500 m of the development footprint / subject land, with no increase in maximum separation distance. This is largely due to the fact that the impacts associated with the proposed development will cause the existing patch of Sydney Turpentine-Ironbark Forest to be split in half, which then reduces the average distance between patches of this community post development and does not alter the maximum distance between remaining patches. Native flora species characteristic of the CEEC include a range trees, shrubs, grasses, forbs and other groundcover species, the majority of which are dispersed via wind or animal vectors, with some species primary method of dispersal likely to be via non-flying insects such as ants. The decrease in average separation distance by 37.12 m for mapped Sydney Turpentine-Ironbark Forest within 500 m of the development footprint / subject land, with no maximum increase in separation, is not expected to result in a significant or substantial impediment to the dispersal of native species between retained patches, in an already highly fragmented landscape. Furthermore, the project will not result in the creation of barrier to movement across the pipeline corridor post-construction and revegetation work will help promote connectivity across the future easement. It is noted in EPBC Act conservation advice documents that allowances can be made for "breaks" of up to 30 metres between areas of MNES habitat, and that such breaks, which may be the result of watercourses, tracks, paths, roads, etc., do not significantly alter the overall functionality of the ecological community, or habitat (CoA 2020). As such, breaks in connectivity caused by the development are not considered to be substantial in nature. The project will result in some vegetation removal that splits patches of Sydney Turpentine-Ironbark Forest vegetation into two patches, which is likely to increase the area to perimeter ratio for smaller patches, which may in turn increase edge effects for those smaller, now isolated patches. However, any increase in edge effects is unlikely to be significant or substantial to the vegetation immediately adjacent to the development footprint / subject land, along the majority of the project alignment, due to the already disturbed and edge effected nature of the vegetation. In addition, indirect impacts are not expected to occur as a result of the proposal, and

Information required (BAM Section 9.1.1)	Response
	will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental 2024) in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Therefore, offsets for indirect impacts are not anticipated to be required for the project.
iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	The CEEC occurs in one condition within the development footprint: • Underscrubbed: o Composition condition score: 72.6 o Structure condition score: 37.8 o Function condition score: 41.6 o Presence of hollow-bearing trees: No o VI score: 48.5 The project will result in the removal of 0.05 ha of the CEEC from the development footprint of the CEEC within the subject land. The project will avoid hollow-bearing trees within C2 zoned land and retain 2.34 ha of high condition CEEC and 0.29 ha of underscrubbed condition CEEC, which will be protected and managed under a VMP in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further retention of trees and habitat features specifically in relation to Sydney Turpentine-Ironbark Forest of the Sydney Basin Bioregion (PCT 3262) within the development footprint.

Shale Sandstone Transition Forest of the Sydney Basin Bioregion

Community background

The *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (PCT 3321) is listed under both the NSW BC Act and Commonwealth EPBC Act as a Critically Endangered Ecological Community (CEEC). The CEEC is listed in the BioNet Threatened Biodiversity Data Collection as an entity subject to Serious and Irreversible Impact (SAII) in NSW based on the following principles (DPIE 2019):

- Principle 2: an ecological community that is observed, inferred or reasonably suspected to be severely degraded or disturbed.
- Principle 3: The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.

Occurrence in the subject land

There is approximately 5.02 hectares of the CEEC mapped within the subject land, including:

- 0.97 ha of high condition PCT 3321 within the C2 (Environmental Management) zone.
- 1.61 ha of low condition PCT 3321 within the C2 (Environmental Management) zone.

- 0.09 ha of high condition PCT 3321 within the development footprint.
- 2.36 ha of low condition PCT 3321 within the development footprint.

Impacts to the CEEC include:

- The removal of 2.36 ha of PCT 3321 low condition within the development footprint.
- The removal of 0.09 ha of PCT 3321 high condition within the development footprint

The BDAR has conservatively assumed for the purpose of assessment and calculation of impacts that all land within the development footprint, including road verges, and private spaces would be completely cleared of all native vegetation, with the exception of the proposed retention of approximately 443 trees within the subject land. It should be noted that this is an overestimation of the extent of impacts across 14.89 hectares of land. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further retention of trees and habitat features specifically in relation to *Shale Sandstone Transition Forest of the Sydney Basin Bioregion* (PCT 3321) within the development footprint. Of importance for assessment, the potential for underestimation of impacts is substantially less than the overestimation of impacts that has been incorporated into the assessment.

Given the absence of definitive impact thresholds stated for the community, the potential for a SAII will be determined by the consent authority, guided by the additional assessment provided below in Table A.8.

Table A.8 Assessment of SAII for Shale Sandstone Transition Forest of the Sydney Basin Bioregion TEC

Information required (BAM Section 9.1.1)	Response
1. Impacts to the CEEC and the action and measures taken to avoid the direct and indirect impact on the CEEC at risk of an SAII.	
-	The project will directly impact 2.36 ha of low condition PCT 3321 and 0.09 ha of high condition PCT 3321 for a total impact of 2.45 ha of PCT 3321 vegetation that meets the BC Act listing and EPBC Act requirements for Shale Sandstone Transition Forest CEEC. The vegetation to be removed occurs in the following conditions: • Low: 2.36 ha – VI score of 53.8. • High: 0.09 – VI score of 75.4. Measures undertaken by the proponent to avoid and minimise impacts to the CEEC (3321) are provided in Section 5.1 of this BDAR. Specifically, substantial efforts have been made to ensure that impacts to the high condition Shale Sandstone Transition Forest have been avoided and further impacts to the low condition CEEC have been minimised throughout the design phase of the project. Throughout the assessment process, ecological information collected by Biosis including vegetation mapping indicating locations of ground-truthed PCTs, TECs, and threatened flora and fauna habitat was provided following field investigation and used to influence alignment design options, construction options, and avoidance opportunities during the preparation of the Master Plan. Opportunities to avoid impacts to the high condition Shale Sandstone Transition Forest were a key focus, due to a desire to minimise impacts to the CEEC, minimise the potential need to refer the project to the Commonwealth, and to minimise the cost of offsets. Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and further avoidance will be undertaken at the detailed design stage. Avoidance and minimisation of impacts to Shale Sandstone Transition Forest were achieved through: • Avoidance of PCT 3321 in high condition (0.96 ha) and 1.51 ha of low condition CEEC within the central-southern portion of the subject land, under a C2 Environmental Conservation Zoning. • Relocation of the roundabout further south, in southern portion of subject land, and reduction in number of lots (8) partially occurring within PCT 3321 within the southern portion of the subject land. • Redesign of subdivision to retain hollow-bearing trees where feasible. • The VMP will be implemented and protected in perpetuity under a under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. This would avoid further degradation to the CEEC within the subject land, as a result of leaving it in situ. The VMP will maintain and restore the extent of occurrence of two CEECs, including 2.58 ha of Shale Sandstone Transition Forest CEEC (PCT 3321) and 2.64 ha of Sydney Turpentine Ironbark Forest CEEC (PCT 3262). The proposed works will result in the direct removal of 2.45 ha of Shale Sandstone Transition Forest CEEC. As such, this will result in a 48.8% loss of the Shale Sandstone Transition Forest CEEC within the subject land. The proposal would have resulted in impacts to 5.02 ha of Shale Sandstone Forest CEEC prior to implementation of avoidance measures described above. In efforts to avoid and

Information required (BAM Section 9.1.1)	Response
	minimise impacts, the final development design was restricted to removal of 2.45 ha of the CEEC within the subject land. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest of the Sydney Basin Bioregion (PCT 3321) within the development footprint. Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, notably Shale Sandstone Transition Forest CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR.
2a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	
-	Species and ecological communities that have undergone large reductions or are likely to undergo large reductions in the future are considered to be at greater risk of extinction than those that have undergone or are likely to undergo smaller reductions (NSW TSSC 2018). To be considered under this principle, the ecological community should have been observed, estimated, inferred, or reasonably suspected to have undergone, or be projected to undergo, a very large reduction in distribution, being: • ≥80 % reduction where the reduction is over a 50-year period (i.e. since 1970), either in the past, future, or any part of the past, present and future (DPIE 2019). The Approved Conservation Advice for the EPBC listing of Shale Sandstone Transition Forest CEEC states that prior to European settlement, the CEEC was extensive across the Western Sydney and lower Blue Mountains areas, and is estimated to have covered between approximately 24,000 – 48,000 ha (DoE 2014). Whilst formerly extensive, the CEEC now mostly occurs as small fragmentated remnant patches (<10 ha), mainly occurring as linear stands. The Shale Sandstone Transition Forest occurs within the Sydney Basin IBRA Bioregion and has been recorded from the LGAs of Bankstown, Blue Mountains, Campbelltown, Hawkesbury, Hornsby, Liverpool, Parramatta, Penrith, The Hills Shire, Wingecarribee and Wollondilly, and may occur elsewhere in the Bioregion (NSW Scientific Committee 2014). The Final Determination indicates the CEEC has undergone a very large reduction in its geographic distribution since European Settlement. At the time of the determination (2014), the CEEC was estimated to comprise approximately 9,600 ha, representing a large reduction of approximately 60-80% of its original geographic distribution (NSW Scientific Committee 2014). Limited data is available on the community's reduction in geographic extent since 1970 (i.e. over the last 50 years). The approved conservation advice provides estimates of decline and extent from 2003 – 2010 based on vegetation units that correspond with the ecological community, indicating a reduction of approximately 360 ha (3.6%) within those years. The final determination also suggest ongoing rates of clearing of adjacent Shale Sandstone Transition Forest remnants (5.2±0.6% between 1998 and 2007) are indicative (NSW Scientific Committee 2014). Based on the available information the CEEC does not currently meet the thresholds for consideration under SAII Principle 1.

Information required (BAM Section 9.1.1)	Response
2b. Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes. (SAII Principle 2)	
i. change in community structure, ii. change in species composition, iii. disruption of ecological processes	Reduction in ecological function relates to the IUCN principle of "very small population size" which for ecological communities means communities have very high levels of either environmental degradation or disruption of biotic processes, and interactions have an increased risk of failure to sustain their characteristic native species assemblages (Bland et al. 2016). Ecological communities that are considered to have a very large degree of environmental degradation or disruption of biotic processes or interactions are those with: • ≥90 % extent and severity where the disruption or impacts are measured since 1970. • ≥80 % extent and severity where the disruption or impacts are over a 50-year period, either in the past, future, or any part of the past, present and future (as per (Bland et al. 2016). (DPIE 2019). Shale Sandstone Transition Forest has been historically cleared for agriculture and urban development since European settlement. The final determination for Shale Sandstone Transition Forest notes that changes in community structure, species composition, disruption of ecological processes, invasion by exotic species, degradation of habitat and fragmentation of habitat all contribute to a very large reduction in the overall ecological functioning of Shale Sandstone Transition Forest (NSW Scientific Committee 2014). Fragmentation and urban encroachment have led to changes to fire regimes. This is likely to lead to changes in community structure through increased shrub cover and reduced understorey diversity (fire exclusion) elimination of some non-sprouters (increased fire frequency). Invasion by weeds species such as African Olive and Bridal Creeper affects an estimated 20% and 25% of remnants respectively. These weeds have the potential to cause significant structural and compositional changes in Shale Sandstone Transition Forest, resulting in ecosystem collapse (NSW Scientific Committee 2014). Other structural changes include removal of dead wood and dead trees (NSW Scientific Committee 2014). The condition of the native vegetation within the development footprint is relatively low, with a VI score of 53.8 and High Threat Weed Cover of 23.7. The vegetation within the development footprint contained thinned canopy, lacked a mid-storey and a ground layer containing native and exotic species with patches of previously cleared weed Blackberry *Rubus fruticosus* returning. The long-term viability of the existing vegetation if left in situ, is considered significantly compromised due to its current condition and location of the subject land within a highly modified and urban landscape.
iv. invasion and establishment of exotic species v. degradation of habitat vi. fragmentation of habitat.	Invasion of remnant woodland by exotic species is listed as a Key Threatening Process (KTP) to Shale Sandstone Transition Forest, with various weed species invading many different areas of the community. For example, invasion by African Olive and Bridal Creeper affects and estimated 20 % and 25 % of remnant respectively and cause significant structural and compositional changes as outlined above. Apart from African Olive and Bridal Creeper, the most prevalent exotic species were herbs, with over half of the survey sites significantly affected by at least four species, most commonly Paspalum *Paspalum dilatatum*, Knotroot Bristlegrass *Setaria parviflora*, Spear Thistle *Cirsium vulgare*, Lamb's Tongues *Plantago lanceolata*, Mother of Millions *Bryophyllum delagoense*, Flatweed *Hypochaeris radicata*, Fireweed *Senecio madagascarensis* and Narrow-leafed Carpet Grass

Information required (BAM Section 9.1.1)	Response
	Axonopus affinis. Shale Sandstone Transition Forest is amount the most fragmented of vegetation types occurring within the Sydney region (NSW Scientific Committee 2014). Now, almost all (90%) of remnant patches are very small (<10 ha) and scattered, often adjoining cleared and/or degraded land. This fragmentation and urban encroachment promote changes to fire regimes which result in changes to community structure and composition as previously outlined. Whilst there is no guidance as to the proportion of this degradation has occurred in the last 50 years (i.e. since 1970), the fact that the CEEC is noted in the SAII guidance document (DPIE 2019) as being subject to Principle 2, infers that it has occurred in recent times. As discussed above the condition of PCT 3321 within the subject land is low, with a VI score of 53.8 and an average High Threat Weed Cover of 23.7 across the site. The proposed development proposes to protect and manage 0.97 ha of high condition Shale Sandstone Transition Forest CEEC and restore 1.61 ha of low condition CEEC within the subject land, through implementation of a VMP in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest of the Sydney Basin Bioregion (PCT 3321) within the development footprint.

i. extent of occurrence
ii. area of occurrence
	The geographic distribution of ecological communities is defined by the area of occupancy, sensu (Bland et al. 2016). Ecological communities with a very limited geographic distribution have an area of occupancy of less than or equal to two 10 x 10 km grid cells (200 km^2) or an extent of occurrence of ≤1,000 km^2, sensu (Bland et al. 2016), and one of the following:
	• An observed or inferred continuing decline in:
	  ○ A measure of spatial extent appropriate to the ecological community.
	  ○ A measure of environmental quality appropriate to characteristic biota of the ecological community.
	  ○ A measure of disruption to biotic interactions appropriate to the characteristic biota of the ecological community.
	• Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years.
	  ○ An ecological community that exists at one location (DPIE 2019).
	According to the final determination for the CEEC, Shale Sandstone Transition Forest has a mapped extent of 9600 ha (96 km^2) (NSW Scientific Committee 2014), which is ≤1,000 km^2. As such, the CEEC is noted in the SAII guidance document (DPIE 2019) as being subject to Principle 3.
	The proposed development will result in the complete removal of 2.36 ha of the CEEC in low condition and 0.09 ha of the CEEC in high condition for a total of 2.45 ha of CEEC within the subject land. A VMP will be implemented to protect and manage 0.97 ha of the high condition CEEC and restore 1.61 ha low condition CEEC within the subject land in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy.

Information required (BAM Section 9.1.1)	Response
	Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest of the Sydney Basin Bioregion (PCT 3321) within the development footprint.
iii. number of threat-defined locations	There are no specific threat defined locations listed in the TBDC for the community. Of the threats listed in the TBDC for the CEEC, clearing for residential, industrial and agricultural development resulting in habitat loss and fragmentation is listed as the highest threat to the CEEC. Whilst an estimate of 260 ha of the community is represented within conservation reserves, much of the remaining area occurs on private land or public land (98%) (DoE 2014), putting it at risk from cumulative small-scale clearing associated with housing, industrial development and transport infrastructure. Given the low mapped extent and the facts that land-clearing is likely to remain a threatening process contributing to the decline of this community into the future, the CEEC can be considered a highly geographically restricted community.
2d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	
-	This principle encompasses two components, firstly whether there are any particular traits of the community which limits its' response to management, and secondly whether there are any key threatening processes affecting the community which cannot be effectively managed (DPIE 2019). The final determination does not outline management success of the CEEC, however the Endangered Ecological Community Information (National Parks & Wildlife Service 2004) indicates that once threatening processes, such as grazing and mowing are removed, Shale Sandstone Transition Forest can regenerate strongly. For instance, Wattle and Pea species present within the community have seeds that can persist in the soil seedbank and, following fire, will colonise disturbed margins. Woody weeds should be controlled to prevent them dominating the understorey. While there is no specific national recovery plan for the CEEC, Management of the CEEC is covered under several other plans including the Cumberland Plain Recovery Plan (DECCW 2011). In addition, several management measures are detailed within the TBDC for this community. These include: • Community and land-holder liaison/ awareness and/or education. • Habitat management: Fire. • Habitat management: Ongoing EIA – Advice to consent and planning authorities. • Habitat management: Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion. • Habitat management: Weed Control. • Habitat Rehabilitation/Restoration and/or Regeneration. • Habitat Protection (inc vca/ jma/ critical habitat nomination etc). Generally those entities which are listed as unlikely to respond to management (and thus are irreplaceable) tend to include species where the ability to control key threats is negligible and known reproductive characteristics that severely limit their ability to increase the existing population (DPIE 2019). Ecological communities as a whole do not typically align well with these criteria. Based on the existence of the Cumberland Plain Recovery Plan and other management plans providing guidance as to the management of the CEEC, the community is not considered to be unlikely to respond to management and therefore

Information required (BAM Section 9.1.1)	Response
	it is does not meet SAII Principle 4.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC, the assessor must record this in the BDAR or BCAR.	
-	Not applicable.
4a. The impact on the geographic extent of the TEC, by estimating the total area of the TEC to be impacted by the proposal.	
ii. in hectares **ii. as a percentage of the current geographic extent of the TEC in NSW.**	As discussed above, the current extent of Shale Sandstone Transition Forest within NSW is approximately 9,600 ha. The CEEC is known to occur as small patches within the Sydney Basin Bioregion, within the LGAs of Bankstown, Blue Mountains, Campbelltown, Hawkesbury, Hornsby, Liverpool, Parramatta, Penrith, The Hills Shire, Wingecarribee and Wollondilly, and may occur elsewhere in the Bioregion (NSW Scientific Committee 2014). **Direct impacts** The proposed development will result in the complete removal of 2.36 ha of the CEEC in low condition and 0.09 ha of the CEEC in high condition for a total of 2.45 ha of CEEC within the subject land. As such the total area of the CEEC to be directly impacted by the project equates to 0.03 % of the CEEC within NSW. The vegetation occurs in the following condition: • Low: 2.36 ha – VI score of 53.8. • High 0.09 – VI score of 75.4. The structure of this conditional zones within the subject land occurs as a patch of grassy woodland with a reduced structural and floristic diversity across all stratums, including a thinned canopy, absence of a mid-storey and a high proportion of exotic species within the ground storey, including a moderate level of invasion by high threat weed species. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest of the Sydney Basin Bioregion (PCT 3321) within the development footprint. **Indirect impacts** Indirect impacts to Shale Sandstone Transition Forest associated with factors such as increased edge effects, fragmentation, altered fire regimes, altered hydrological patterns and transport of weeds and pathogens are not expected to be substantial or significant, largely due to the already degraded and edge effected nature of the low condition CEEC within the development footprint / subject land and broader vicinity and the implementation of mitigation measures through CEMP. Where Shale Sandstone Transition Forest will be retained (outside the development footprint, but within the subject land) it is most likely to be subject to indirect impacts associated with construction and operational activities. Within this area, the CEEC occurs in the following conditions: • Low: 1.61 ha – VI score of 53.8. • High: 0.97 ha – VI score of 75.4. Indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental Consultants 2024) in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with

Information required (BAM Section 9.1.1)		Response
		Council's Dedication of Land Policy. Therefore, offsets for indirect impacts are not anticipated to be required for the project.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:		
iii.	**estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of thedevelopment footprint or equivalent area for other types of proposals.**	Shale Sandstone Transition Forest present in the wider landscape surrounding the project area occurs in an already highly fragmented state. GIS was used to determine the range and average size of mapped (OEH 2013, OEH 2016, Biosis 2021) occurrences of Shale Sandstone Transition Forest within a 500 m buffer of the subject land. The results of which are provided below both for those patches intersected by the development footprint / subject land (i.e. subject to vegetation removal) and those patches not intersected by the development footprint / subject land (i.e. not directly impact by the project). **Mapped areas within 500 m not directly impacted:** Size range: <0.01ha to 2.77 ha Average size: 0.38 ha Total no. mapped polygons: 15 Total area: 5.66 ha **Mapped areas within 500 m directly impacted:** Size range: <0.01ha to 1.98 ha Average size: 0.13 ha Total no. mapped polygons: 19 Total area: 2.45 ha The proposed development footprint will directly impact 2.36 ha of low condition PCT 3321 and 0.09 ha of high condition PCT 3221 for a total impact of 2.45 ha of TEC vegetation within the subject land. 2.45 ha of TEC vegetation within the subject land equates to a 30.21 % reduction of the local occurrence of Shale Sandstone Transition Forest and 48.8 % of all Shale Sandstone Transition Forest within the subject land. Impacts to the Shale Sandstone CEEC are restricted to 0.09 ha of high condition and 2.36 ha of low condition vegetation with an absent midstorey, with 0.97 ha of high condition and 1.61 ha of low condition CEEC within the central-southern portion of the subject land to be avoided and protected in perpetuity under a VMP under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. However, impacts still equate to 30.21 % reduction of the local occurrence of the CEEC. Given the extent of impacts within the locality and the entity listed as a SAII, further retention of canopy trees is recommended within the detailed design to reduce the overall impacts to this CEEC within the locality.
iv.	**describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:**	GIS was used to undertake a nearest neighbour analysis of mapped occurrences of Shale Sandstone Transition Forest prior to and post vegetation to determine the distance between impacted areas of the CEEC before and after the proposed vegetating removal. The average distance between mapped occurrences of Shale Sandstone Transition Forest within a 500 m buffer of the development footprint / subject land, include: • 45.63 m before development. • 58.98 m after development. Based on the above there will be an average increase of 13.35m separation between

Information required (BAM Section 9.1.1)	Response
distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and estimated maximum dispersal distance for native flora species characteristic of the TEC, and other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development	retained patches of Shale Sandstone Transition Forest within 500 m of the subject land, with a maximum increase in separation distance of up to 695.76 m. Native flora species characteristic of the CEEC include a range of trees, shrubs, grasses, forbs and other groundcover species, the majority of which are dispersed via wind or animal vectors, with some species primary method of dispersal likely to be via non-flying insects such as ants. The increase in average separation distance by 13.35 m for mapped Shale Sandstone Transition Forest within 500 m of the development footprint / subject land, with a maximum increase of up to 695.76 m, is expected to result in a significant or substantial impediment to the dispersal of native species between retained patches, in an already highly fragmented landscape. Furthermore, the project will result in the creation of barrier to movement across the vegetation corridor post-construction. It is noted in EPBC Act conservation advice documents that allowances can be made for "breaks" of up to 30 metres between areas of MNES habitat, and that such breaks, which may be the result of watercourses, tracks, paths, roads, etc., do not significantly alter the overall functionality of the ecological community, or habitat (CoA 2020). As such, breaks in connectivity caused by the development are considered to be substantial in nature. The project will result in some vegetation removal that splits patches of Shale Sandstone Transition Forest vegetation into two (or more) patches, which is likely to increase the area to perimeter ratio for smaller patches, which may in turn increase edge effects for those smaller, now isolated patches. However, any increase in edge effects is unlikely to be significant or substantial to the vegetation immediately adjacent to the development footprint / subject land, along the majority of the project alignment, due to the already disturbed and edge effected nature of the vegetation. In addition, indirect impacts are not expected to occur as a result of the proposal, and will be avoided through the mitigation measures provided in Section 7 of this BDAR including implementation of a CEMP and VMP (Restore Environmental 2024) in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Therefore, offsets for indirect impacts are not anticipated to be required for the project.

iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	The TEC occurs in two conditions within the development footprint:
	• Low:
	  ○ Composition condition score: 58.8
	  ○ Structure condition score: 40.7
	  ○ Function condition score: 65
	  ○ Presence of hollow-bearing trees: Yes
	  ○ VI score: 53.8
	• High:
	  ○ Composition condition score: 84.5
	  ○ Structure condition score: 88
	  ○ Function condition score: 57.6
	  ○ Presence of hollow-bearing trees: Yes
	  ○ VI score: 75.4
	The proposed works will result in the complete removal of 2.45 ha of the CEEC from the development footprint. The proposed development will avoid hollow-bearing trees within the C2 zoned areas and retain 0.97 ha of high condition CEEC and restore 1.61 ha of low

Information required (BAM Section 9.1.1)	Response
	condition CEEC, which will be protected and managed under a VMP in perpetuity under a C2 Environmental Conservation zoning to be dedicated to Council following rehabilitation and an agreed developer-funded management period in accordance with Council's Dedication of Land Policy. Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further retention of trees and habitat features specifically in relation to Shale Sandstone Transition Forest of the Sydney Basin Bioregion (PCT 3321) within the development footprint.

Appendix 6 Significant Impact Criteria assessments

Threatened ecological communities

Turpentine-Ironbark Forest of the Sydney Basin Bioregion (Turpentine-Ironbark Forest)

Turpentine-Ironbark Forest is listed as a Critically Endangered Ecological Community (CEEC) under the EPBC Act. Turpentine-Ironbark Forest is an open forest, with dominant canopy trees including Turpentine, Grey Gum *Eucalyptus punctata*, Grey Ironbark *Eucalyptus paniculata* and Thin-leaved Stringybark *Eucalyptus eugenioides*. In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum is more dominant. The shrub stratum is usually sparse and may contain mesic species such as Sweet Pittosporum *Pittosporum undulatum* and Elderberry Panax *Polyscias sambucifolia*. The ecological community occurs in Sydney and is heavily fragmented, with only 0.5 % of its original extent remaining intact. Remnants mostly occur in the Baulkham Hills, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Hurstville local government areas. Good examples can be seen in small reserves such as Wallumatta Nature Reserve and Newington Nature Reserve.

Turpentine-Ironbark Forest within the subject land

Turpentine-Ironbark Forest aligns with PCT 3262 within the subject land. A total of 2.69 ha of Turpentine-Ironbark Forest occurs within subject land. The proposal will result in the removal of 0.05 hectares of this CEEC in an underscrubbed condition and as such, the proposal is subject to assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A 7: SIC assessment for Turpentine-Ironbark Forest of the Sydney Basin Bioregion

SIC assessment for a critically endangered ecological community
Reduce the extent of an ecological community.
When assessed at both the local and national scale the proposed impacts of the project will not result in a substantial reduction to the extent of Turpentine-Ironbark Forest. A total of approximately 2.69 ha of Turpentine-Ironbark Forest is present within the subject land. The planning proposal will result in the removal of 0.05 ha of under-scrubbed Turpentine-Ironbark Forest. The area to be impacted currently occurs in an under-scrubbed condition, with an intact canopy and modified understorey. Though removal of this small patch (0.05 ha) will reduce the extent of the community within the subject land, this equates to only 1.86 % of the Turpentine-Ironbark Forest within the subject land, which is not considered to be substantial considering a larger adjacent patch in high (2.34 ha) and underscrubbed (0.29 ha) condition will be fully retained and protected through the rezoning to C2 – Environmental Conservation and the implementation of a VMP to manage edge effects. In addition, the occurrence of Turpentine-Ironbark Forest within the 500m locality has been conservatively estimated at 8.25 ha, of which the removal of 0.05 ha would constitute only a 0.61% reduction. Given this, it is unlikely that a relatively localised impact will result in a significant reduction of the extent of Sydney Turpentine-Ironbark Forest.
Fragment or increase fragmentation of an ecological community.
The Listing Advice for Turpentine-Ironbark Forest states that it occurs in a highly fragmented state and generally occurs as small remnants. Whilst patches of Turpentine-Ironbark Forest within the subject land form part of a larger contiguous patch of intact vegetation, the vegetation to be impacted mostly occurs along an existing edge effected patch and as such, is already subject to disturbance and potential for invasion by exotic species. The planning proposal will result in the

SIC assessment for a critically endangered ecological community

removal of 0.05 ha to an under-scrubbed patch of the community. A larger adjacent patch in high (2.34 ha) and underscrubbed (0.29 ha) condition will be retained and rezoned as C2 – Environmental Conservation within the subject land. This will increase overall connectivity and reduce fragmentation of vegetation within the subject land. The project will not create a new barrier to the movement of genetic material. As such, the total reduction of approximately 1.86 % of Turpentine-Ironbark Forest within the subject land and 0.61 % decrease within the broader 500 m locality is unlikely to fragment or increase fragmentation of the ecological community.

Adversely affect habitat critical to the survival of an ecological community.

The Matters of National Environmental Significance Significant impact guidelines (Commonwealth of Australia 2013) state the 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators),
- To maintain genetic diversity and long-term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community.

No such habitat has been identified in a recovery plan for Turpentine-Ironbark Forest, nor is it listed on the Register of Critical Habitat maintained by the minister under the EPBC Act. Nonetheless, the proposal will result in the removal of 0.05 ha to an under-scrubbed patch of the community. Impacts are restricted to vegetation that is currently subjected to a moderate level of modification within the understorey, with potential for further weed ingress. A larger patch in high (2.34 ha) and underscrubbed (0.29 ha) condition will be retained, allowing for the continued connectivity of the CEEC. The retained patch will be managed as part of a VMP therefore, increasing the integrity of the patch and increasing its ability to survive by reducing current edge effects. Given that the proposed impacts are of a small and localised scale, and that larger contiguous patches will be retained, it is unlikely that the proposal will have an adverse effect on any habitat that is critical to the community's survival.

Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

While the planning proposal will result in some localised disturbance to soil, hydrology and topography during the construction stage, primarily resulting from earth-moving/landscaping, it is not expected to destroy abiotic factors necessary for the survival of Turpentine-Ironbark Forest, and no instream works are proposed. The vegetation to be removed occurs in an underscrubbed condition, currently subject to ongoing soil disturbance from grazing and trampling by livestock, and edge effects from adjacent cleared land and urban areas such as runoff and weed ingress. A substantial portion of the community is to be retained and will be protected and maintained in perpetuity under the VMP, including high (2.34 ha) and underscrubbed (0.29 ha) condition vegetation. Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, including Sydney Turpentine-Ironbark CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR. As such, the project is not expected to result in substantial changes to ground levels, hydrological patterns or the removal of other abiotic features within the patch. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the community.

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

Turpentine-Ironbark Forest to be impacted within the development footprint is currently subject to modification from historic land management including livestock grazing, which has led to an absence of much of the midstorey and changes to the composition of the groundstorey. The project will result in the removal of 0.05 ha to an under-scrubbed patch of the community. Some localised fragmentation will occur between the two patches of the community within the subject land. However, the distance will be small enough to facilitate the genetic flow between the two patches by means of

SIC assessment for a critically endangered ecological community
pollination or dispersal. The project will not result in changes to fire regimes or flora and fauna harvesting. As such, it is unlikely the planning proposal will further reduce species diversity, simplify community structure.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - ***Assisting invasive species establishment*** ***- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.***
All Turpentine-Ironbark Forest within the subject land is subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding land uses. Nonetheless, the proposal is not expected to increase weed or pest invasion, or cause mobilisation of fertilisers, herbicides or other chemicals within the community. Additionally, areas contiguous to this vegetation will be protected and managed in perpetuity under a VMP therefore, increasing the barrier around the southern edge of the high condition patch, and reducing the risk of invasion by exotic species. Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, including Turpentine-Ironbark Forest CEEC, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the community.
Interfere with the recovery of an ecological community.
A National Recovery Plan for Turpentine-Ironbark Forest has not been produced, however the Approved Conservation Advice (DoE 2014a) sufficiently outlines the priority actions needed for this ecological community. Some of the high priority conservation actions significant to the proposed works are: • Protect and conserve remaining areas of the ecological community, including protecting potential areas of natural or managed retreat (e.g., upslope and upstream of current occurrences). • Avoid further clearance and destruction of the ecological community. • Retain other native vegetation remnants, near patches of the ecological community, where they are important for connectivity, diversity of habitat and act as buffer zones between the ecological community and threats or development zones. The planning proposal will result in minor vegetation clearance (0.05 ha). However, interference with the recovery of the community will be minimised by the retention of the larger patch of high (2.34 ha) and underscrubbed (0.29 ha) condition vegetation. As such, the proposal is unlikely to interfere with the recovery of the ecological community.
Conclusion
Based on the assessment provided above, it is concluded that the Turpentine-Ironbark Forest is unlikely to be significantly impacted by the proposed works. This conclusion was made on the basis that the proposed works are: • Unlikely to contribute to substantial fragmentation of the community. • Unlikely to contribute to local scale reduction in the extent and functionality of the community. • Unlikely to adversely affect habitat critical to the community's survival. • Unlikely to interfere with the recovery of the ecological community. Therefore, no further assessment is required.

Shale Sandstone Transition Forest of the Sydney Basin Bioregion (Shale Sandstone Transition Forest)

The Shale Sandstone Transition Forest is listed as a CEEC under the EPBC Act. This community occupies the edges of the Cumberland Plain on the integrate of clay soils derived from shale and sandy soils from sandstone. Shale Sandstone Transition Forest occurs throughout the southern parts of western Sydney, where only 22.6 % of its original extent remains intact. The composition of species is dependent on the soil, but typically comprises a canopy of Forest Red Gum *Eucalyptus tereticornis*, Grey Box *Eucalyptus moluccana*, stringybarks and ironbarks. The canopy may contain many additional species other than those listed, and the species composition of the understorey resembles that of Cumberland Plain Woodland in areas on clay-loam soils. This community is well adapted to fire, and prior to European settlement, this community was extensive throughout western Sydney.

Shale Sandstone Transition Forest within the subject land

Shale Sandstone Transition Forest aligns with PCT 3321 in a low and high condition within the subject land. A total of 5.02 hectares of Shale Sandstone Transition Forest occurs within the subject land. The project will result in the removal of 2.36 hectares within of low condition and 0.09 ha within high condition and as such, the proposal is subject to assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A 8: SIC assessment for Shale Sandstone Forest of the Sydney Basin Bioregion

SIC assessment for a critically endangered ecological community
Reduce the extent of an ecological community.
The total extent of the Shale Sandstone Transition Forest in the Sydney Basin Bioregion was estimated to cover approximately 9,642 ha in 2010 (NSW Scientific Committee 2014). The local occurrence of Shale Sandstone Transition Forest includes the vegetation directly impacted by the proposed works, as well as the vegetation (PCT 3321) within a 500 m buffer of the subject land. The mapped local occurrence of the community is approximately 8.11 ha. The project would result in the removal of up to 2.45 ha of Shale Sandstone Transition Forest. This represents a removal of approximately 30.21% of the communities' local occurrence and 48.8% within the subject land. Impacts will occur in areas of low condition vegetation 2.36 ha and a small patch 0.09 ha of high condition, with 0.97 ha of high condition vegetation to be retained protected and managed in perpetuity under a VMP, along with the remaining 1.61 ha in low condition. As the project will result in the removal of 48.8% of the occurrence within the subject land, and 30.21% the occurrence within the 500 m locality, the project would result in the considerable removal of a CEEC. Given this, and based on the current area of impacts proposed, the project is likely to result in a significant reduction in the extent of Shale Sandstone Transition Forest.
Fragment or increase fragmentation of an ecological community.
The patch of the CEEC within the subject land is currently represented by a large area of low condition Shale Sandstone transition forest (3.97 ha) contiguous with a smaller corridor of high condition vegetation (1.05 ha). The project will result in the removal of 2.36 ha in low condition and 0.09 ha in high condition for a total of 2.45 ha to be removed. While the vegetation to be removed occurs predominantly in a low condition and is subject to some fragmentation, the project will result in the loss of a large percentage (48.8 %) of Shale Sandstone Transition Forest, leaving a small section along the edge of the low condition patch, adjacent to the high condition patch to be retained. The proposed removal of the low condition section will increase fragmentation by reducing the remaining high condition patch to a thin corridor exposed to edge effects and limiting the dispersal of the community. Due to the location and current percentage of clearing predicted to be undertaken, the proposal will likely result in further fragmentation of the critically endangered ecological community.
Adversely affect habitat critical to the survival of an ecological community.

SIC assessment for a critically endangered ecological community

No critical habitat has been declared within the Approved Conservation Advice and listing advice for Shale Sandstone Transition Forest in the Sydney Basin Bioregion (DoE 2014b).

The proposal would result in the removal of up to 2.45 ha of Shale Sandstone Transition Forest, which is approximately 48.8 % of this community within the subject land. The CEEC lacks any direct contiguous connection to Shale Sandstone Transition Forest outside the subject land and therefore, the proposed removal will reduce the remaining fragmented patch to only 2.57 ha. Taking this into consideration, and based on the current area of impacts proposed, the proposal is likely to cause serious or long-term impacts on habitat critical to the survival of the community.

Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

While the planning proposal will result in some localised disturbance to soil, hydrology and topography during the construction stage, primarily resulting from earth-moving/landscaping, it is not expected to destroy abiotic factors necessary for the survival of Shale Sandstone Transition Forest, and no instream works are proposed. The vegetation to be removed occurs in a low condition, currently subject to ongoing soil disturbance from grazing and trampling by livestock, and edge effects from adjacent cleared land and urban areas such as runoff and weed ingress. Mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land, including Shale Sandstone Transition Forest, from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR. As such, the project is not expected to result in substantial changes to ground levels, hydrological patterns or the removal of other abiotic features within the patch. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the community.

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

The project will result in the clearing of a large area (2.45 ha) of the CEEC. While the vegetation to be removed occurs predominantly in a low condition with a modified composition, the area to be removed is currently acting as barrier, protecting the high condition patch from invasive species and providing a larger area of habitat for native species diversity and transfer of genetic material. Removal of this area will expose the remaining corridor of high condition vegetation to invasion from exotics species and reduce the ability for gene flow and dispersal by native species reducing the long-term viability of the community.

The proposal will result in a 48.8 % reduction of the community within the subject land, which is likely to contribute to a high level of fragmentation. This will result in the removal of some functionally important species within this community and increase potential invasion by exotic species, leading to lower genetic diversity of native species.

Therefore, it is likely that the current proposal would cause substantial change in the species composition of an occurrence of an ecological community.

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

- ***Assisting invasive species establishment***

- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.

The Shale Sandstone Transition Forest in the subject land is currently subject to edge effects and potential effects from fertilizers and other pollutants from adjacent agricultural and urban development. The proposal is confined to a section within the centre of the subject land, which has been subject to previous disturbance. The proposal will result in the removal of a large section (2.45 ha) of Shale Sandstone Transition Forest. The remaining section of low condition vegetation (1.61 ha) and 0.97 ha of high condition vegetation will be protected and managed under a VMP in perpetuity, and therefore exotic species invasion will be managed. However, the project will result in a large area to be removed

SIC assessment for a critically endangered ecological community

which will ultimately fragment the remaining patch of the CEEC, increasing the potential of edge effects and assisting in potential invasion of exotic species and pollutants.

Therefore, based on the current area of impacts proposed, the project is likely to cause a substantial reduction in the quality or integrity of the CEEC.

Interfere with the recovery of an ecological community.

Currently, there is no Commonwealth Recovery Plan for this ecological community. However, the Approved Conservation Advice provides recovery strategies and management to combat threats to this CEEC (DEWHA 2010). Management actions with the highest priority include:

- Avoid further clearance and fragmentation of patches of the ecological community and surrounding native vegetation, including derived grasslands/shrublands.
- Minimise impacts from any developments and activities adjacent to patches that might result in further degradation (for example by applying buffer zones).
- Protect mature trees with hollows and plant native hollow producing species. Ensure that trees are always left to grow to maturity and if necessary, place artificial hollows (e.g. nest boxes) in or near to the ecological community and monitor outcomes.
- Retain fallen logs as habitat for fauna (and add logs to areas where they have been removed), noting different log requirements for different species e.g. logs embedded in the soil are necessary for some species and hollow logs are required by other species.
- Retain other native vegetation remnants, derived grasslands or shrublands and paddock trees near patches of the ecological community and create or restore wildlife corridors and linkages.
- Implement appropriate management regimes and best practice standards to maintain the biodiversity, including listed threatened species, of patches of the ecological community on private and public lands.
- Integrate fire and grazing management regimes (see also separate actions below regarding grazing and fire).
- Manage any changes to hydrology or disruptions to water flows that may result in changes to water table levels and/or increased run-off, salinity, sedimentation or pollution.
- Manage any other known, potential, or emerging threats such as rural tree dieback.

The proposal is considered likely to significantly interfere with the priority actions of the conservation advice. Namely, the project will result in the reduction of approximately 48.8 % of the CEEC extent within the subject land, and 30.21 % within the 500 m locality through clearing, which is likely to result in increased fragmentation and degradation through the loss of buffering vegetation. While the retained vegetation (1.61 ha of low condition and 0.97 ha of high condition) will be restored, protected and managed under a VMP in perpetuity, the loss of 2.45 ha is considered substantial in relation to the amount to be retained, which will remain at higher risk of fragmentation and degradation due to the loss of buzzer zones.

Conclusion.

Based on the assessment provided above, it is concluded the proposed works is likely to lead to a significant impact towards Shale Sandstone Transition Forest. This conclusion can be made on the basis that:

- The proposal is likely to cause fragmentation of the CEEC.
- The proposal is likely to cause a substantial change in the composition of the CEEC.
- The proposal is likely to significantly reduce the total extent of the CEEC.
- The proposal is likely to adversely affect habitat critical to the survival of an ecological community.

Considering the above, an EPBC referral to the minister is recommended.

However, it should be noted that, Lot sizing, and landscaping design for road verges and open spaces, in consultation with the Projects Bushfire Consultant, Arborist, and Engineer, will be reviewed at DA stage to facilitate the further avoidance of impacts to Shale Sandstone Transition Forest CEEC (PCT 3321) within the development footprint, and a revised SIC should be prepared to consider these avoidance measures once finalised.

Threatened species

Large-eared Pied Bat *Chalinolobus dwyeri*

Species background

The Large-eared Pied Bat is a medium-sized insectivorous bat measuring a total length of approximately 100 millimetres and weighing 7–12 grams (Hoye and Dwyer 1995). The species is listed as Vulnerable under the BC Act and the EPBC Act. The species' current distribution is poorly known. Records exist from Shoalwater Bay, north of Rockhampton, Queensland, through to the vicinity of Ulladulla, NSW in the south (Hoye 2005). Despite the large range, it has been suggested that the species occurrence within the range is more restricted than previously thought (DECC 2007). Much of the known distribution is within NSW. Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney basin and the north-west slopes (Coolah Tops, Mt Kaputar, Warrumbungle National Park and Pilliga Nature Reserve (DERM 2011).

Large-eared Pied Bat requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging (TSSC 2012). Almost all records have been found within several kilometres of cliff lines or rocky terrain (Hoye 2005). Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy Martin Hirundo ariel nests (Hoye and Dwyer 1995).

Only four maternity roosts have been discovered in NSW, with two of these since abandoned due to flood and disturbance by macropods (Pennay 2008). The structure of maternity roosts appears to be very specific (arch caves with dome roofs). Caves need to be high and deep enough to allow juvenile bats to learn to fly safely inside and have indentations in the roof. Roosting bats cluster in these indentations, presumably to allow the capture of heat. These physical characteristics are very uncommon in the landscape and their scarcity presumably poses an important limiting factor in the distribution of the Large-eared Pied Bat (Pennay 2008).

Occurrence in the subject land

There are four records of this species within 5 kilometres of the subject land, with the closest approximately 400 metres from the subject land. Targeted survey was undertaken for this species during October and November 2023, and this species was detected using ANABAT ultrasonic recorders. No rocky areas suitable for roosting and breeding occur within the development footprint, however, rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, occur within 10 km of the subject land in the neighbouring Nattai National Park, which represents potential roosting and breeding habitat for cave-dependant microbat species such as the Large-eared Pied Bat. The subject land contains 12.98 ha of potential foraging habitat in the form of PCT 3321, PCT 3262 and PCT 3616. The proposal will result in the removal of 5.83 hectares of potential foraging habitat. An assessment to determine whether the proposed development is likely to significantly affect the species is provided in the table below.

Table A 9: SIC assessment for Large-eared Pied Bat *Chalinolobus dwyeri*

SIC assessment for critically endangered or endangered species
Lead to a long-term decrease in the size of a population.
The proposed works will result in the clearing of up to 5.83 ha of native vegetation representing potential foraging resources for the Large-eared Pied Bat. While the proposal will result in the removal of potential foraging habitat, the total area of habitat being removed is small in relation to the amount of non-impacted habitat available in the broader

SIC assessment for critically endangered or endangered species
landscape. Given the expanse of native vegetation in the broader landscape, 5.83 ha of vegetation removal would constitute less than 1% of the Large-eared Pied Bats foraging range. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of the Large-eared Piet Bat population.
Reduce the area of occupancy of the species.
The total area of occupancy for Large-eared Pied Bat is approximately 9,120 km^2. The proposed works would remove 5.83 ha ha of potential foraging habitat which represents less than 1 % of the area of occupancy for the species as a whole. Therefore, the reduction in the area of available habitat to this species is negligible.
Fragment an existing population into two or more populations.
The proposed development will result in the removal of 5.83 ha, however, no impacts to roosting habitat will occur. The vegetation to be removed within the subject land occurs in close proximity to the main street of Oakdale, Burragorang Rd, where the area has undergone extensive clearing for past land use practices, as well as urban and residential development. As a result, vegetation is already fragmented with remnant patches experiencing moderate to high disturbance from several exotic species, including species of environmental and priority weeds. Marginal habitat connectivity is primarily located along the Turpentine-ironbark Forest and patches of Shale Sandstone Transition Forest within the subject land, of which the Turpentine-ironbark Forest has been largely retained, and some areas of Shale Sandstone Transition have been retained through the project design. While the proposed clearing may cause some minor fragmentation with the development footprint, it is unlikely that they will cause a substantial break in a canopy such that would have a detrimental impact on the Large-eared Pied Bat. Microbats are highly mobile in nature and are capable of moving through fragmented landscapes. Therefore, it is unlikely that the removal of 5.83 hectares of potential foraging habitat will significantly impact the connectivity of available habitat for this species such that the local population would become fragmented.
Adversely affect habitat critical to the survival of a species.
No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for the Large-eared Pied Bat. However, the National Recovery Plan for the *Large-eared* *Pied Bat* defines habitat critical to its survival as maternity roosts and sandstone cliffs in close proximity to fertile wooded valley habitat (DERM 2011). There are no identified sandstone cliffs within the development footprint, although such habitats are known within the neighbouring Nattai National Park. In addition, there are no cave-like roosting opportunities within the subject land in the form of culverts, tunnels, mines, bridges, etc. These habitats do occur within 10 kilometres of the subject land and therefore, the subject land is likely within the nightly foraging range for this species. In light of this, it is unlikely that the 5.83 ha of potential foraging habitat represents habitat critical to the survival of the species. Removal of this vegetation is therefore unlikely to adversely affect any habitat critical to the survival of the Large-eared Pied Bat.
Disrupt the breeding cycle of a population.
Little is known about the breeding patterns and biology of the Large-eared Pied Bat. Nursery colonies are thought to be established in September, with females giving birth in early December. The number of known breeding sites is limited, and the structure of maternity roosts is highly specific. Up to 100 individuals may be present in a roost at any one time, representing a substantial portion of a local population (DERM 2011). Destruction of roost sites is therefore likely to be the primary mechanism for disruption of the breeding cycle for this species.

SIC assessment for critically endangered or endangered species

The development footprint and subject land does not contain suitable roosting habitat for the species as there are no sandstone caves, cliffs or man-made cave-like structures. Due to the lack of roosting habitat, no maternity colonies are likely to be present.

Therefore, the proposed subdivision will not result in direct or indirect impacts to roosting habitat for the Large-eared Pied Bat and is therefore considered unlikely to disrupt the breeding cycle of the species. The subject land does contain 5.83 ha of potential foraging habitat for this species, however, given the distance from suitable roosting habitat, it is unlikely to be critical to their survival.

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

The proposed works will result in the loss of 5.83 ha of potential foraging habitat within the subject land. Large-eared Pied Bat likely forages along forest edges containing diverse vegetation types near water bodies, within 700 meters of roost sites (Williams & Thomson 2018). The potential foraging habitat within the subject land is considered unlikely to represent preferred foraging habitat due to the absence of known nearby roosting sites and the abundance of extensive bushland in the locality.

In addition, vegetation within the subject land is highly fragmented due to past land use practices, and is now moderately disturbed by weed ingress, agriculture and land clearing. Therefore, due to its disturbed nature, it is unlikely to represent key foraging habitat for this species. The extensive tracts of undisturbed native vegetation to the west and south of the subject land is considered more suitable habitat for the Large-eared Pied Bat. Therefore, removal of 5.83 hectares of vegetation is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

The majority of the vegetation and associated habitat to be removed or impacted as a result of the project is subject to at least low levels of weed cover as a result of past and current land use including livestock grazing, with some areas comprised of moderate to high levels of weed ingress. The proposed development occurs in an already fragmented landscape, and while works may result in the 'opening up' of new areas of habitat that were previously inaccessible to invasive species, a VMP will be implemented to restore, protect and manage retained vegetation within both C2, which will reduce the likelihood of spread of weeds. In addition, mitigation and management measures will also be put in place to adequately protect the biological diversity of native flora and fauna within the subject land from indirect impacts through the implementation of a CEMP and mitigation measures listed within Section 7 of the BDAR.

Therefore, it is unlikely that invasives species will pose a harmful impact on potential foraging habitat for the Large-eared Pied Bat.

Introduce disease that may cause the species to decline.

The IUCN Species Survival Commission released a statement on 19 June 2020 stating that there is a credible risk of human-to-bat transmission of SARS-Cov-2, a virus causing a pandemic of the illness Covid-19 (IUCN SSC 2020). However, introduction of this disease to Large-eared Pied Bats within the subject land as a result of the proposed development is unlikely for the following reasons:

- No contact or sharing of closed areas between humans and bats is expected as a result of the proposed subdivision.
- No roosting habitat is present within the development footprint, therefore, there will be no need for any human activity within maternity caves or areas with roosting microbats.

The transmission of SARS-Cov-2 is considered unlikely as a result of the proposed subdivision.

An emerging threat to Australian bats, particularly cave-roosting species, is the fungal disease white-nose syndrome. Currently, there have been no cases of white-nose syndrome recorded in Australia, however, a recent risk assessment considers it 'likely' that the pathogen causing the disease (Pseudogymnoascus destructans) will come into contact with Australian bats in the next decade (Holz et al. 2019). Cave-roosting bats are considered to be particularly at risk in the event the disease enters Australia (Turbill & Welbergen 2020).

SIC assessment for critically endangered or endangered species

Given that there are no recorded cases of this disease in Australian microbats, it is considered unlikely that the project would contribute to any increased risk in the introduction of white-nose syndrome.

Interfere with the recovery of the species.

A National Recovery Plan has been identified as a requirement for the Large-eared Pied Bat. This plan identifies the following recovery objectives for this species:

- Identify priority roost and maternity sites for protection.
- Implement conservation and management strategies for priority sites.
- Educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat.
- Research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management.
- Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat.

No roosting habitat occurs within the development footprint or subject land and the removal of 5.83 ha of potential foraging habitat for the Large-eared Pied Bat is unlikely to interfere substantially with the recovery of the species.

Conclusion.

Based on the assessment provided above, it is considered unlikely that the Large-eared Pied Bat will be significantly impacted by the proposed subdivision as:

- The project will not lead to a long-term decrease in the size of the population of the Large-eared Pied Bat.
- The project will not reduce the area of occupancy of the species or further fragment an existing population or habitat.
- The project will not adversely affect habitat critical to the survival of the species (i.e. breeding or roosting habitat) or disrupt the breeding cycle of a population.
- Given the surrounding suitable habitat, the proposed works will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
- The project will not result in invasive species or disease becoming established and should not further exacerbate current invasive species threat.
- A VMP will be implemented to protect and managed retained potential foraging habitat within both C2 zone.

As such, it is considered unlikely that the proposed subdivision will significantly impact the Large-eared Pied Bat and no further assessment is required.

Appendix 7 Koala SAT Survey Data

Table A 10: Koala SAT survey results

Tree Number	Scientific Name	Common Name	Scat Present? Y/N
SAT Site 1			
1	*Eucalyptus moluccana*	Grey Box	N
2	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
3	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
4	*Eucalyptus moluccana*	Grey Box	N
5	*Eucalyptus punctata*	Grey Gum	N
6	*Eucalyptus moluccana*	Grey Box	N
7	*Eucalyptus moluccana*	Grey Box	N
8	*Eucalyptus punctata*	Grey Gum	N
9	*Eucalyptus moluccana*	Grey Box	N
10	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
11	*Eucalyptus paniculata*	Grey Ironbark	N
12	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
13	*Eucalyptus punctata*	Grey Gum	N
14	*Eucalyptus punctata*	Grey Gum	N
15	*Eucalyptus punctata*	Grey Gum	N
16	*Eucalyptus moluccana*	Grey Box	N
17	*Eucalyptus moluccana*	Grey Box	N
18	*Eucalyptus sparsifolia*	Narrow-leaved Stringybark	N
19	*Eucalyptus punctata*	Grey Gum	N
20	*Eucalyptus moluccana*	Grey Box	N
21	*Eucalyptus moluccana*	Grey Box	N
22	*Eucalyptus moluccana*	Grey Box	N
23	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
24	*Eucalyptus punctata*	Grey Gum	N
25	*Eucalyptus moluccana*	Grey Box	N
26	*Eucalyptus moluccana*	Grey Box	N
27	*Eucalyptus moluccana*	Grey Box	N
28	*Eucalyptus paniculata*	Grey Ironbark	N
29	*Eucalyptus moluccana*	Grey Box	N
30	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
SAT Site 2			
1	*Eucalyptus punctata*	Grey Gum	N
2	*Eucalyptus moluccana*	Grey Box	N
3	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
4	*Eucalyptus punctata*	Grey Gum	N

5	*Eucalyptus moluccana*	Grey Box	N
6	*Eucalyptus moluccana*	Grey Box	N
7	*Eucalyptus moluccana*	Grey Box	N
8	*Eucalyptus moluccana*	Grey Box	N
9	*Eucalyptus moluccana*	Grey Box	N
10	*Eucalyptus punctata*	Grey Gum	N
11	*Eucalyptus moluccana*	Grey Box	N
12	*Eucalyptus moluccana*	Grey Box	N
13	*Eucalyptus punctata*	Grey Gum	N
14	*Eucalyptus punctata*	Grey Gum	N
15	*Eucalyptus moluccana*	Grey Box	N
16	*Eucalyptus moluccana*	Grey Box	N
17	*Eucalyptus punctata*	Grey Gum	N
18	*Eucalyptus moluccana*	Grey Box	N
19	*Eucalyptus punctata*	Grey Gum	N
20	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
21	Thin-leaved Ironbark	Narrow-leaved Ironbark	N
22	*Eucalyptus moluccana*	Grey Box	N
23	Thin-leaved Ironbark	Narrow-leaved Ironbark	N
24	*Eucalyptus punctata*	Grey Gum	N
25	*Eucalyptus moluccana*	Grey Box	N
26	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
27	*Eucalyptus punctata*	Grey Gum	N
28	*Eucalyptus moluccana*	Grey Box	N
29	*Eucalyptus punctata*	Grey Gum	N
30	*Eucalyptus moluccana*	Grey Box	N
SAT Site 3			
1	*Eucalyptus paniculata*	Grey Ironbark	N
2	*Eucalyptus quadrangulata*	White-topped Box	N
3	*Eucalyptus punctata*	Grey Gum	N
4	*Eucalyptus moluccana*	Grey Box	N
5	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
6	*Eucalyptus paniculata*	Grey Ironbark	N
7	*Eucalyptus moluccana*	Grey Box	N
8	*Eucalyptus quadrangulata*	White-topped Box	N
9	*Eucalyptus punctata*	Grey Gum	N
10	*Eucalyptus moluccana*	Grey Box	N
11	*Eucalyptus punctata*	*Grey Gum*	N
12	*Eucalyptus quadrangulata*	*White-topped Box*	N
13	*Eucalyptus globoidea*	*White Stringybark*	N
14	*Eucalyptus moluccana*	*Grey Box*	N
15	*Eucalyptus paniculata*	Grey Ironbark	N

16	*Eucalyptus punctata*	Grey Gum	N
17	*Eucalyptus paniculata*	Grey Ironbark	N
18	*Eucalyptus punctata*	Grey Gum	N
19	*Eucalyptus punctata*	Grey Gum	N
20	*Eucalyptus globoidea*	*White Stringybark*	N
21	*Eucalyptus quadrangulata*	White-topped Box	N
22	*Eucalyptus biturbinata*	Grey Gum	N
23	*Eucalyptus globoidea*	*White Stringybark*	N
24	*Eucalyptus punctata*	Grey Gum	N
25	*Eucalyptus paniculata*	Grey Ironbark	N
26	*Eucalyptus oblonga*	Stringybark	N
27	*Eucalyptus oblonga*	Stringybark	N
28	*Eucalyptus punctata*	Grey Gum	N
29	*Eucalyptus punctata*	Grey Gum	N
30	*Eucalyptus quadrangulata*	White-topped Box	N
SAT Site 4			
1	*Eucalyptus punctata*	Grey Gum	N
2	*Eucalyptus paniculata*	Grey Ironbark	N
3	*Eucalyptus punctata*	Grey Gum	N
4	*Corymbia gummifera*	Red Bloodwood	N
5	*Eucalyptus punctata*	Grey Gum	N
6	*Eucalyptus quadrangulata*	White-topped Box	N
7	*Corymbia gummifera*	Red Bloodwood	N
8	*Eucalyptus punctata*	Grey Gum	N
9	*Eucalyptus punctata*	Grey Gum	N
10	*Eucalyptus paniculata*	Grey Ironbark	N
11	*Corymbia gummifera*	Red Bloodwood	N
12	*Corymbia gummifera*	Red Bloodwood	N
13	*Eucalyptus punctata*	Grey Gum	N
14	*Eucalyptus quadrangulata*	White-topped Box	N
15	*Eucalyptus paniculata*	Grey Ironbark	N
16	*Corymbia gummifera*	Red Bloodwood	N
17	*Corymbia gummifera*	Red Bloodwood	N
18	*Eucalyptus punctata*	Grey Gum	N
19	*Corymbia gummifera*	Red Bloodwood	N
20	*Eucalyptus paniculata*	Grey Ironbark	N
21	*Eucalyptus punctata*	Grey Gum	N
22	*Eucalyptus paniculata*	Grey Ironbark	N
23	*Eucalyptus paniculata*	Grey Ironbark	N
24	*Eucalyptus punctata*	Grey Gum	N
25	*Eucalyptus paniculata*	Grey Ironbark	N
26	*Corymbia gummifera*	Red Bloodwood	N
27	*Eucalyptus crebra*	Narrow-leaved Ironbark	N

28	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
29	*Corymbia gummifera*	Red Bloodwood	N
30	*Eucalyptus paniculata*	Grey Ironbark	N
SAT Site 5			
1	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
2	*Eucalyptus punctata*	Grey Gum	N
3	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
4	*Eucalyptus paniculata*	Grey Ironbark	N
5	*Eucalyptus paniculata*	Grey Ironbark	N
6	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
7	*Eucalyptus punctata*	Grey Gum	N
8	*Eucalyptus paniculata*	Grey Ironbark	N
9	*Eucalyptus paniculata*	Grey Ironbark	N
10	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
11	*Eucalyptus paniculata*	Grey Ironbark	N
12	*Eucalyptus punctata*	Grey Gum	N
13	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
14	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
15	*Eucalyptus punctata*	Grey Gum	N
16	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
17	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
18	*Eucalyptus punctata*	Grey Gum	N
19	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
20	*Eucalyptus punctata*	Grey Gum	N
21	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
22	*Eucalyptus paniculata*	Grey Ironbark	N
23	*Eucalyptus biturbinata*	Grey Gum	N
24	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
25	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
26	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
27	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
28	*Eucalyptus punctata*	Grey Gum	N
29	*Eucalyptus punctata*	Grey Gum	N
30	*Eucalyptus eugenioides*	Narrow-leaved Stringybark	N
SAT Site 6			
1	*Eucalyptus paniculata*	Grey Ironbark	N
2	*Eucalyptus paniculata*	Grey Ironbark	N
3	*Eucalyptus punctata*	Grey Gum	N
4	*Eucalyptus paniculata*	Grey Ironbark	N
5	*Eucalyptus paniculata*	Grey Ironbark	N
6	*Eucalyptus paniculata*	Grey Ironbark	N
7	*Eucalyptus punctata*	Grey Gum	N
8	*Eucalyptus punctata*	Grey Gum	N

9	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
10	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
11	*Eucalyptus paniculata*	Grey Ironbark	N
12	*Eucalyptus paniculata*	Grey Ironbark	N
13	*Eucalyptus punctata*	Grey Gum	N
14	*Eucalyptus punctata*	Grey Gum	N
15	*Eucalyptus paniculata*	Grey Ironbark	N
16	*Eucalyptus paniculata*	Grey Ironbark	N
17	*Eucalyptus paniculata*	Grey Ironbark	N
18	*Eucalyptus paniculata*	Grey Ironbark	N
19	*Eucalyptus paniculata*	Grey Ironbark	N
20	*Eucalyptus paniculata*	Grey Ironbark	N
21	*Eucalyptus paniculata*	Grey Ironbark	N
22	*Eucalyptus punctata*	Grey Gum	N
23	*Eucalyptus crebra*	Narrow-leaved Ironbark	N
24	*Eucalyptus paniculata*	Grey Ironbark	N
25	*Eucalyptus paniculata*	Grey Ironbark	N
26	*Eucalyptus paniculata*	Grey Ironbark	N
27	*Eucalyptus punctata*	Grey Gum	N
28	*Eucalyptus paniculata*	Grey Ironbark	N
29	*Eucalyptus paniculata*	Grey Ironbark	N
30	*Eucalyptus paniculata*	Grey Ironbark	N

Photo 9 Koala SAT survey 1 Focal tree

Photo 10 Koala SAT survey 2 Focal Tree

Photo 11 Koala SAT survey 3 Focal Tree

Photo 12 Koala SAT survey 4 Focal Tree

Photo 13 Koala SAT survey 5 Focal Tree

Photo 14 Koala SAT survey 6 Focal Tree

Appendix 8 Oakdale Microbat Report

Oakdale BDAR
Bat call analysis results

FINAL

Prepared for Colliers International Engineering and Design Pty Ltd

28 February 2025

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1. Introduction

1.1. Project background

Biosis Pty Ltd was commissioned by Colliers International Engineering and Design Pty Ltd on behalf of Morehuman to undertake a biodiversity assessment of a planning Proposal at 1838 Barkers Lodge Road, 1455 and 1475 Burragorang Road, Oakdale, NSW (the subject land).

The purpose of this assessment was to undertake a microbat assessment to inform the BDAR to support the Planning Proposal for the project. The BDAR is to be submitted to Wollondilly Shire Council (Council) as part of a Planning Proposal under Part 4 of the EP&A Act, for the proposed development.

A detailed description of the ecological values of the site can be found in Stage 1 – Biodiverisity Assessment of the BDAR.

The scope of this microbat assessment is to identify the microbat fauna at the site and document compliance with targeted threatened species surveys under the Biodiversity Assessment Method (BAM).

1.2. Reporting standard

The content of this report follows the standards for the interpretation and reporting of bat call data described by the Australasian Bat Society, available on-line at http://www.ausbats.org.au/.

2. Methods

2.1. Survey method and effort

Survey was undertaken with reference to the following guidelines:

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

Data was collected over four nights from 15 – 19 January 2024. Calls were recorded from dusk until dawn using four Titley Scientific Anabat Swift ultrasonic bat detectors fitted with omnidirectional microphones and settings as shown in **Table 1**. Each time a bat flies past the detector, its call is recorded as a digital file (defined here as a 'pass') that is saved directly onto a memory card in the detector unit. Files were recorded in full spectrum format (.wav).

Table 1 Bat detector settings

	Anabat Swift Settings
Sample rate	320 ksps
Sensitivity	16
Max file length	10 sec
High Pass Filter	On
Trigger frequencies	10-250 kHz
Minimum event window	2 ms
Trigger window	2 sec
Mode	Night
Start time	19:42
End time	6:33

Units were located to allow space in front and around the microphone to minimise echoes from hard surfaces, call attenuation from surrounding vegetation, and ensure adequate flight space around the microphone. Representative images of detector deployments are shown Plate 1. All units were deployed at ground level (between 1-3 metres above the ground).

Plate 1 Example detector deployments

Unit 669187

Unit 669190

Unit 669191

Unit 669195

Survey was conducted during January, when bat activity is likely to be high, to maximise the chance of detection of threatened species. Weather details are provided in Table 1 below.

Table 2 Weather data (Station: Williamtown RAAF, Bureau of Meteorology)

Date	Maximum temperature (°C)	Minimum temperature (°C) (i)	Rainfall (mm)
15/01/2024	21.0	17.0	31.0*
16/01/2024	24.7	16.7	12.0
17/01/2024	27.5	20.0	1.4
18/01/2024	31.4	19.4	18.0
19/01/2024	31.1	14.4	0

(i) *minimum temperature in the 24 hours to 9am. *note heavy rainfall occurred in the early morning 15/0/2024, prior to detectors being deployed.*

2.2. Reference library

No reference calls were collected during the survey. Call identification was assisted by the following resources:

- *Bat calls of NSW* (Pennay, Law, & Reinhold 2004) including sample call files downloaded from https://www.environment.nsw.gov.au/topics/animals-and-plants/surveys-monitoring-and-records/bat-calls-of-nsw
- *Key to the bat calls of south-east Queensland and north-east New South Wales* (Reinhold et al. 2001)
- Unpublished course materials from the Advanced Bat Call Analysis Workshop (May 2023) – Titley Scientific and Balance! Environmental (Greg Ford and Julie Broken-Brow).

Species nomenclature used in this report follows the *Australian Faunal Directory* (ABRS 2022) unless otherwise stated.

2.3. Call identification

Data was viewed using Anabat Insight (version 2.0.9, licensed), Titley Scientific.

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

Files not containing bat calls (noise files) were filtered out using a standard “allbats” filter in Anabat Insight and not included in further analysis.

A custom decision tree was used to sort remaining files into likely species and species groups.

Calls were identified by visually comparing the spectrogram and call characteristics (e.g. characteristic frequency and call shape) with reference calls and descriptions from available reference materials (Reinhold et al. 2001, Pennay, Law, & Reinhold 2004).

A call (pass) was defined as a sequence of five or more consecutive pulses of similar frequency and shape. Identification was not attempted for sequences with less than five defined consecutive pulses (unless for

readily identifiable species such as the White-striped Freetail-bat *Austronomus australis*). Similarly, sequences containing multiple bats or pulses with irregular frequency and / or shape (non search-phase calls) were not identified to species.

The aim of call analysis was to generate a list of species present, with a focus on threatened species, rather than analyse species activity. Once a species was positively identified, it was recorded as present. Species identification was therefore not attempted for all files recorded. Where a threatened species was not recorded through the decision tree, additional checks were used to improve confidence that a false negative was not recorded including target frequency filters and manual review of additional files. Where data volume was too high or data quality was too poor to be confident in a true negative, the species was conservatively included as part of a species group.

Due to variability in the quality of calls and difficulty in distinguishing some species a conservative approach was taken when analyzing calls and assigning an identification. The identification of each call was assigned a confidence rating (Duffy et al. 2000) as summarized in Table 3.

Table 3 Call identification confidence ratings

Identification	Description
Almost certain	Diagnostic call characteristics present, consistent with descriptions in reference material and / or reference calls.
Probable	Highly likely the call represents a particular species, but call lacks enough detail (e.g. call quality) to be definite or similarities with other species of similar call type or frequency limits identification certainty and/or there is a limited number of sequences to be confident in species presence.
Species Group	Call characteristics (e.g frequency, shape) are indicative of a number of species and call lacks sufficient detail (e.g. call quality, diagnostic features) that would allow identification to species level.
Not Detected	Of the data analysed, no calls were attributable to this species.

2.4. Limitations and assumptions

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

A recorded call constitutes a measure of relative bat activity, but does not reflect species abundance. The number of calls provides a comparable index of activity to estimate the foraging selectivity of individual species between sampling sites.

Manual call analysis is also associated with limitations including the sometimes arbitrary selection of useable calls and subjectivity of the observer. Definitions as to which calls are assigned to each species have been provided to improve the consistency at which calls were attributed to a species.

2.5. Qualifications

Call analysis was undertaken by Felicity Williams. Felicity is experienced in ultrasonic call analysis having used it to complete her Honours thesis titled "The influence of fire on the foraging activity of insectivorous bats in the Victorian Mallee" in 2009 under the supervision of Lindy Lumsden (Arthur Rylah Institute for Environmental Research, Victorian Government Department of Land, Environment, Water and Planning). Felicity has eight years' experience using ultrasonic call detection and analysis for impact assessments on microbats in both Victoria, NSW and Tasmania.

Felicity has completed the following training courses with regard to ultrasonic call recording and analysis:

- Being SMART about bats at wind farms – Wildlife Acoustics (March 2024).
- Advanced Bat Call Analysis Workshop (May 2023) – Titley Scientific and Balance! Environmental (Greg Ford and Julie Broken-Brow).
- Anabat Insight Advanced Skills Workshop (March 2022) – Titley Scientific (Kristen Thompson).
- Micro-workshop: Deployment Techniques for Bat Detectors (March 2022) – Titley Scientific.
- Micro-workshop: Basics of Bat Calls (February 2022) – Titley Scientific.
- Bats of Gluepot Reserve (2011) – Survey techniques and identification (Terry Reardon, Dennis Matthews).
- Anabat system training course (December 2010) – Titley Scientific (Chris Corben).

3. Results

3.1. Data collection

A total of 26,864 files were recorded by the four detectors over 16 detector nights. Of these, 15,616 files were discarded by the allbats filter and not used for further analysis resulting in 11,248 files deemed to be bat passes. Of these, 1643 files contained less than five pulses and were not used for species identification. The large volume of noise files is likely due to the proximity of the detectors to water resulting in insect noise triggering the detector, and rainfall that occurred during the deployment which may also have produced false triggers. The volume of activity and species diversity overall, indicates the deployment was a success and suitable for detecting target species.

3.2. Overall bat activity

Bat activity was relatively high, averaging 600 calls per detector per night. Activity was highest at unit 669187, which recorded 4663 passes over the four nights, an average of 1166 passes per night. This site was located close to water, where insect abundance is likely to be high and bats are likely to concentrate their activity for foraging and socialising. Detector 669190 was also located close to water, but had slightly lower activity.

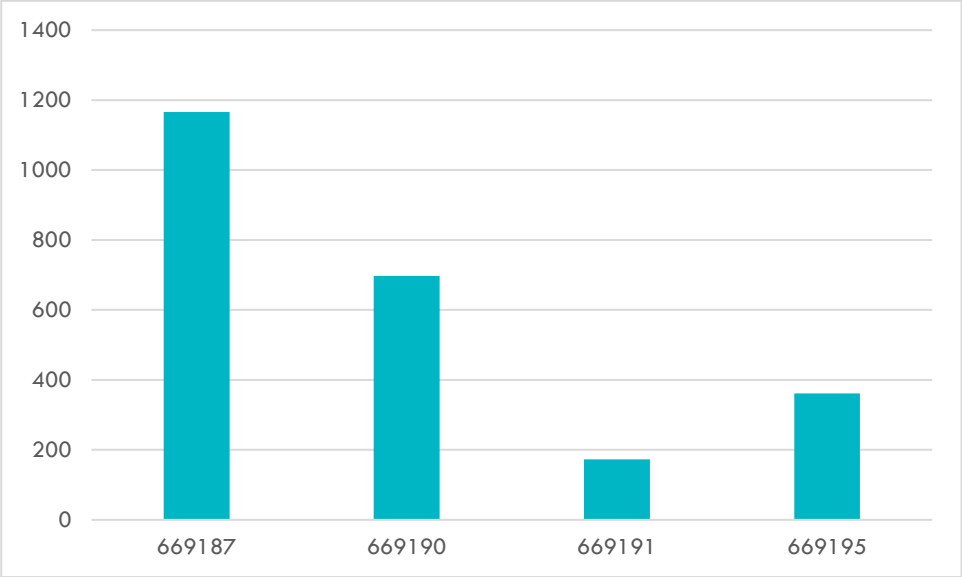

Figure 1 Average bat activity per detector per night

Due to the large volume of data preventing species level identification for all sequences, comparisons of activity for individual species was not within the scope of this assessment.

3.3. Species identification

3.4. Summary of results and survey effort

Fourteen species were positively identified (Almost Certain or Probable) of the 19 species that are known to occur within 10 km of Oakdale, NSW (Australasian Bat Society 2022). Up to four additional species may also have been recorded however reliable identification to species level was not possible due to poor data quality and/or similarity of call characteristics between species. One species known or predicted to occur in the locality was not detected by ultrasonic analysis.

Table 4 provides a list of all species known or predicted to occur in the study area, their conservation status, and identification following call analysis.

Table 4 Bat call analysis results

Species name	Common name	BC Act status	EPBC Act status	Identification
Austronomus australis	White-striped Free-tailed Bat	-	-	Almost certain
Chalinolobus dwyeri	Large-eared Pied Bat	V	CE	Almost certain
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Almost certain
Chalinolobus morio	Chocolate Wattled Bat	-	-	Almost certain
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Almost certain
Rhinolophus megaphyllus	Eastern Horseshoe Bat	-	-	Almost certain
Vespadelus darlingtoni	Large Forest Bat	-	-	Almost certain
Vespadelus regulus	Southern Forest Bat	-	-	Almost certain
Vespadelus vulturnus	Little Forest Bat	-	-	Almost certain
Miniopterus orianae oceanensis	Eastern Bent-winged Bat[ii]	V	-	Probable
Myotis macropus	Southern Myotis	V	-	Probable
Ozimops ridei	Ride's Free-tailed Bat	-	-	Probable
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Probable
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Probable
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Species group
Nyctophilus geoffroyi	Lesser Long-eared Bat	-	-	Species group
Nyctophilus gouldi	Gould's Long-eared Bat	-	-	Species group
Scotorepens orion	South-eastern Broad-nosed Bat	-	-	Species group
Phoniscus papuensis	Golden-tipped Bat	V	-	Not recorded

(ii) Formerly known as the Large Bent-winged Bat *Miniopterus schreibersii oceanensis*.

3.5. Threatened species summary

Threatened species identified to species level (probable or almost certain) included:

- Large-eared Pied Bat
- Southern Myotis
- Large Bent-winged Bat
- Yellow-bellied Sheathtail-bat
- Greater Broad-nosed Bat

Reliable identification to species level of Eastern False Pipistrelle was not possible due to the large volume of data and similarity of call characteristics between species. This species was identified as part of a species group and identification to species level was not confirmed from the ultrasonic analysis.

Cave-roosting species such as Large-eared Pied Bat and Eastern Bent-winged Bat are unlikely to roost within the subject land due to the absence of suitable cave or cave-like roosting opportunities (culverts, tunnels, mines, bridges etc). These habitats do occur within relatively close proximity to the subject land (less than 10 kilometres), and the subject land is therefore likely within the nightly foraging range for these species. Microbats are highly mobile, and it is likely that these species have been recorded in the study area because they are either commuting through it or using the site for foraging without necessarily roosting there. Presence within the subject land of cave-roosting species is therefore assumed to be associated with foraging activity only, not breeding.

In the case of Southern Myotis, which roosts in tree-hollows as well as artificial structures, the presence of hollow-bearing trees within the subject land and in close proximity to known foraging habitat (dams), is strongly suggestive that the species may be roosting within the subject land as well as foraging. Impacts to this species would therefore generate species credits in accordance with the BAM.

4. Conclusion and recommendations

Ultrasonic analysis confirmed the presence of the following threatened bat species within the subject land:

- Large-eared Pied Bat
- Southern Myotis
- Eastern Bent-winged Bat
- Yellow-bellied Sheathtail-bat
- Greater Broad-nosed Bat

An assessment of potential impacts to these species and recommended mitigation measures is provided in the BDAR.

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Appendices

Appendix A. Call characteristics used to differentiate overlapping species

The calls of Little Bent-winged Bat *Miniopterus australis* were distinguished from Eastern Forest Bat *Vespadelus pumilis* in good quality sequences by the presence of a down-sweeping tail.

Calls from *Vespadelus pumilis*, Eastern Cave Bat *Vespadelus troughtoni* and Little Forest Bat *Vespadelus vulturnus* could not be reliably separated based on call characteristics from potential calls recorded. These species were combined in a species group.

A small number of potential Eastern Bent-winged Bat *Miniopterus schreibersii oceanensis* calls were recorded. One sequence could be attributed to Eastern Bent-winged Bat due to the presence of a characteristic feeding buzz and variable pulse shape. This was given a 'probable' identification to reflect the uncertainty of the identification given the quality of pulses in the sequence, and the small number of sequences potentially attributable to this species.

Free-tailed Bat calls were identified by the presence of mostly flat pulses. Ride's Free-tailed Bat *Ozimops ridei* was differentiated from Eastern Coastal Free-tailed Bat *Micronmous norfolkensis* using long sequences with few alternating pulses as well as characteristic frequency less than 32kHz.

Gould's Wattled Bat *Chalinolobus gouldii* was differentiated from other species by the presence of curved pulses showing alternation in longer sequences.

Southern Myotis *Myotis macropus* was separated from Lesser Long-eared Bat and Gould's Long-eared Bat *Nyctophilus* spp due to the length of sequences recorded, visible interference to call data suggesting bats were recorded calling low over the water, pulse intervals of <75ms, initial slope of greater than 400 OPS on sequences where the initial section of the call was captured and calls of reduced slope scattered amongst steeper calls. All call sequences likely to be Large-footed Myotis were recorded on Unit 1, located in suitable foraging habitat next to Ironbark Creek, further suggesting these sequences are likely to be Large-footed Myotis rather than *Nyctophilus* spp.

Greater Broad-nosed Bat *Scoteanax rueppellii* was differentiated from Eastern Fale Pipiestrelle *Falsistrellus tasmanensis* and South-eastern Broad-nosed Bat *Scotorepens orion* in frequencies of 32-33kHz. For calls between 35 kHz and 37 kHz, where a drop in the pre-characteristic section was >3 kHz and the pre-characteristic section was long and gently curved, with a knee frequency of >37kHz, calls were attributed to Greater Broad-nosed Bat. Where these features were absent, calls were attributed to a species group.

Appendix B. Example time versus frequency graphs for species identification

All time versus frequency graphs are shown in F7 (10 ms), compressed mode, unless otherwise stated. Sequences are shown in both full spectrum and zero crossing formats, on a scale of 10 – 90 kHz. The oscillogram is also shown above each sequence to indicate amplitude.

Plate 2 White-striped Free-tailed Bat *Austronomus australis*

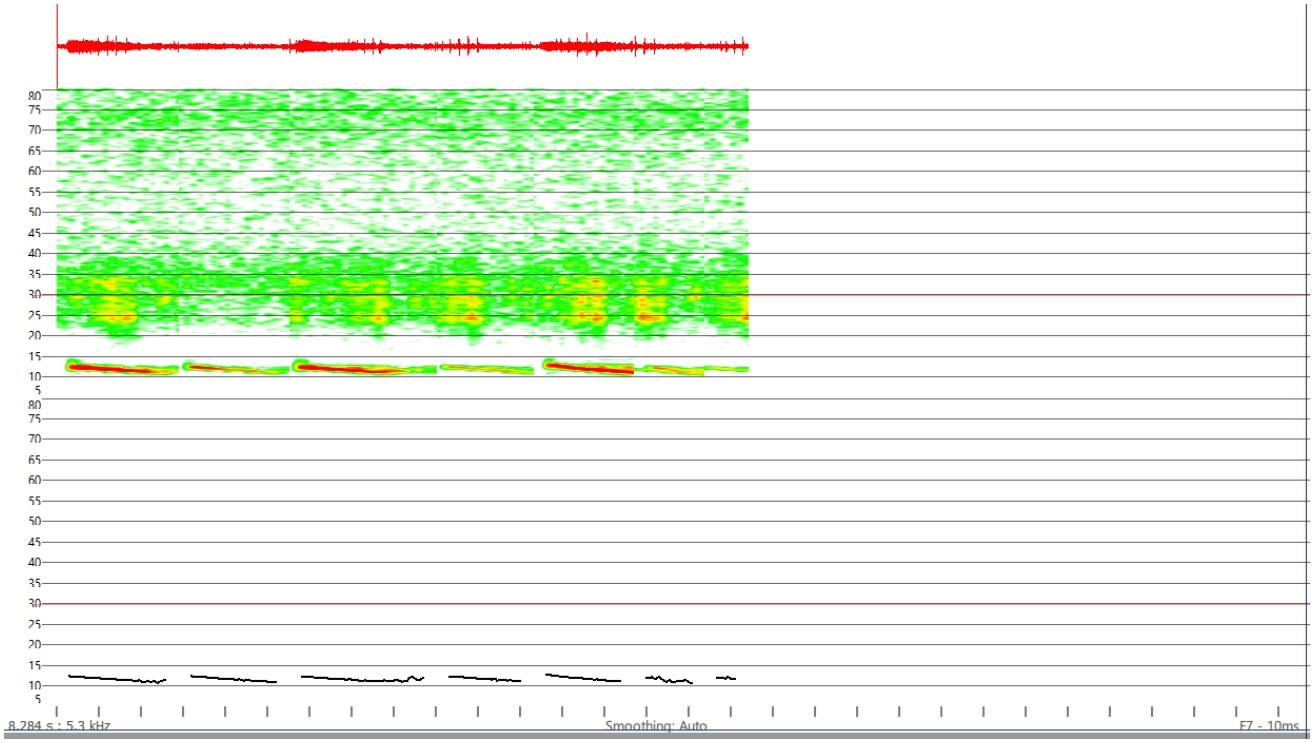

Plate 3 Large-eared Pied Bat *Chalinolobus dwyeri*

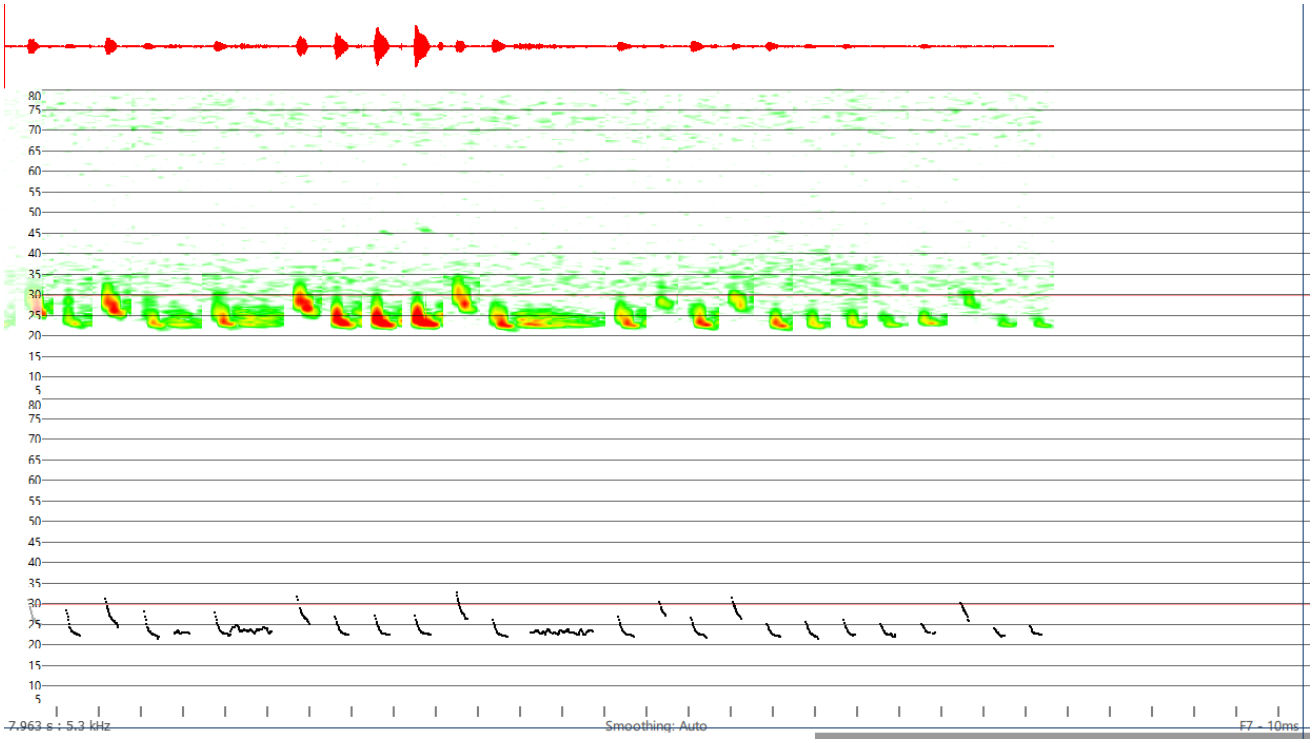

Plate 4 Gould's Wattled Bat *Chalinolobus gouldii*

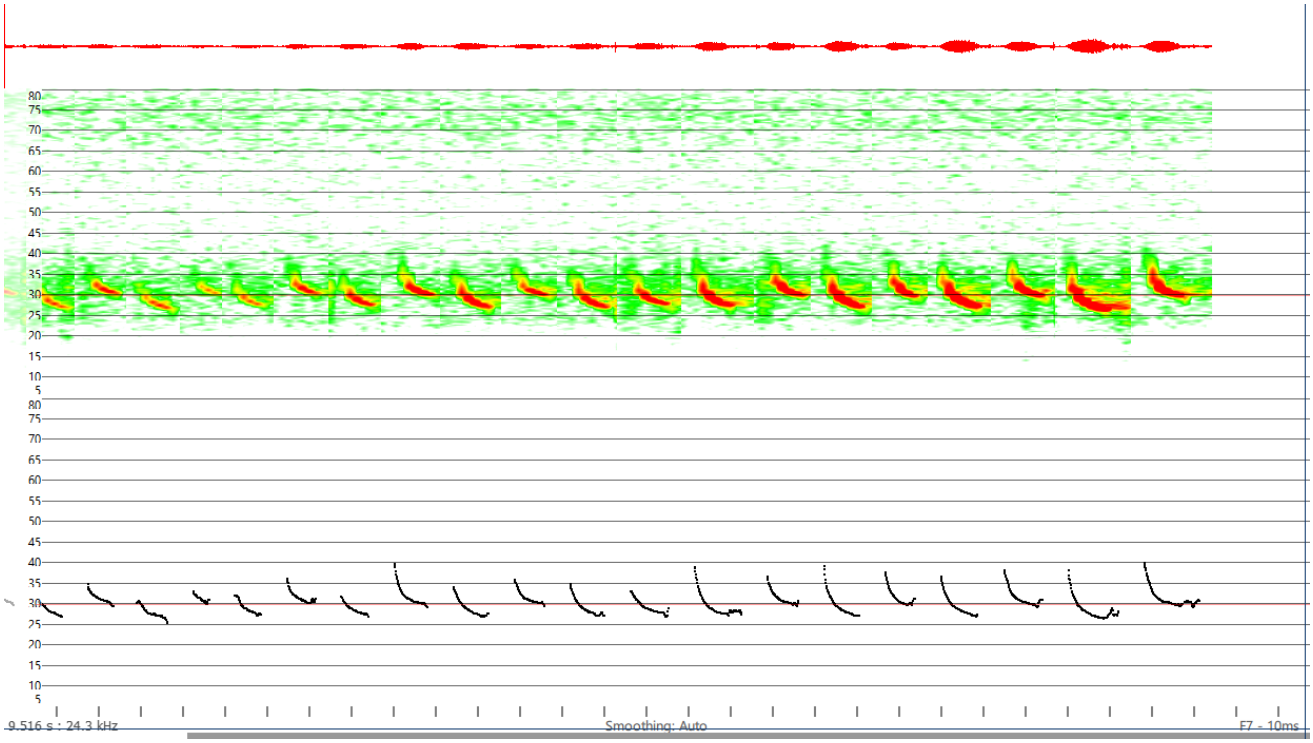

Plate 5 Chocolate Wattled Bat *Chalinolobus morio*

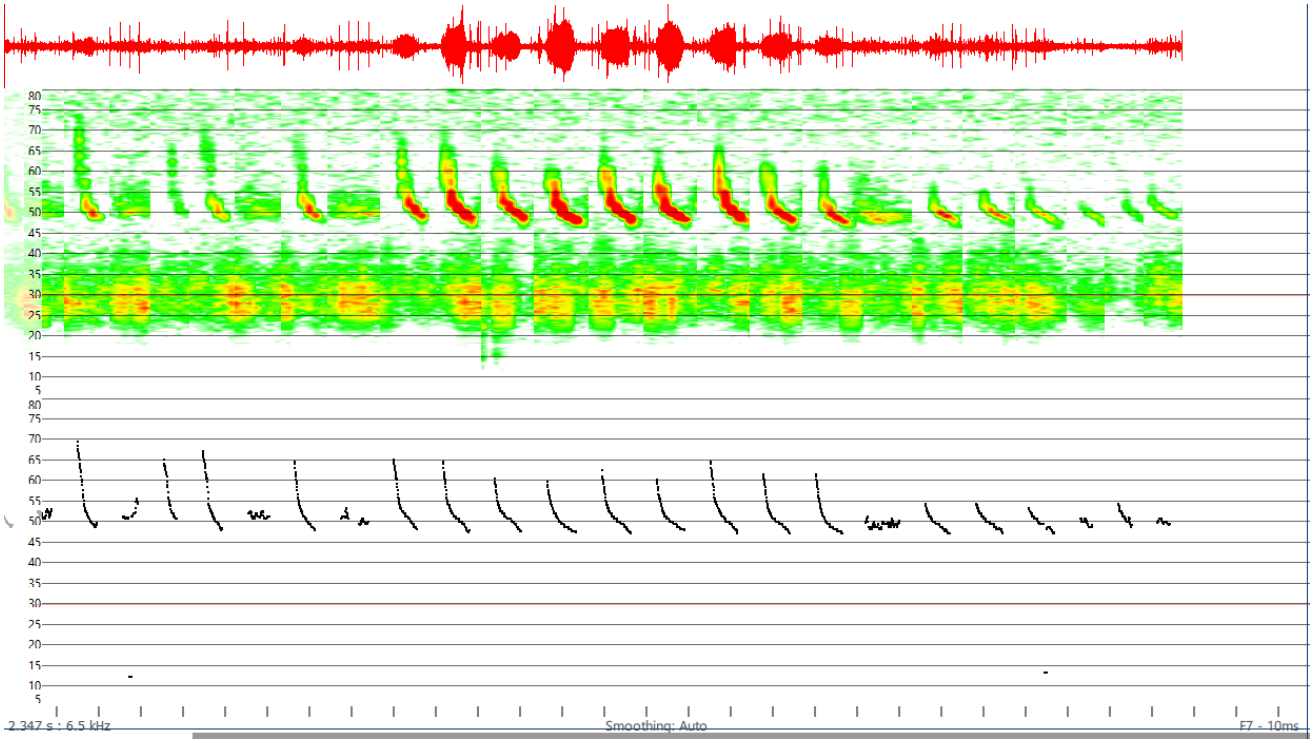

Plate 6 Eastern Coastal Free-tailed Bat *Micronomus norfolkensis*

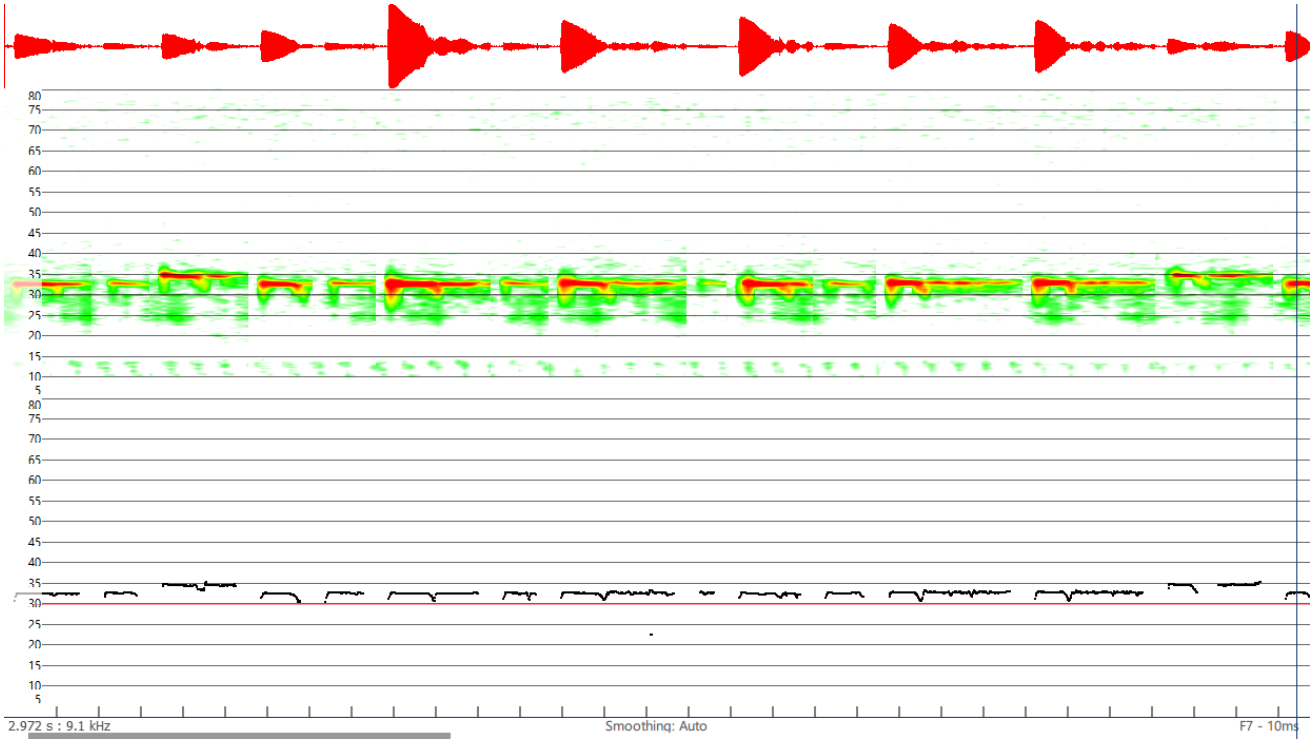

Plate 7 Eastern Bent-winged Bat *Miniopterus orianae oceanensis*

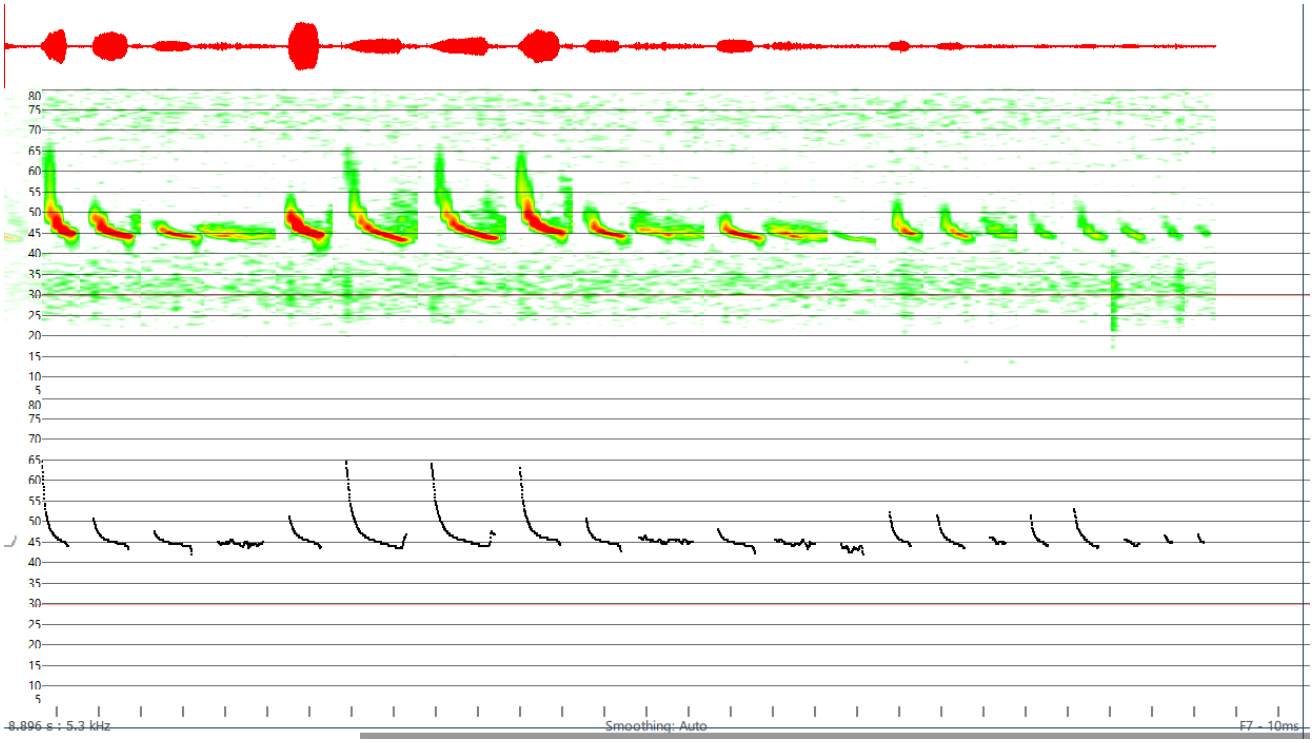

Plate 8 Southern Myotis *Myotis macropus* (top) and diagnostic feeding buzz (below) (uncompressed, F4 (0.01 sec))

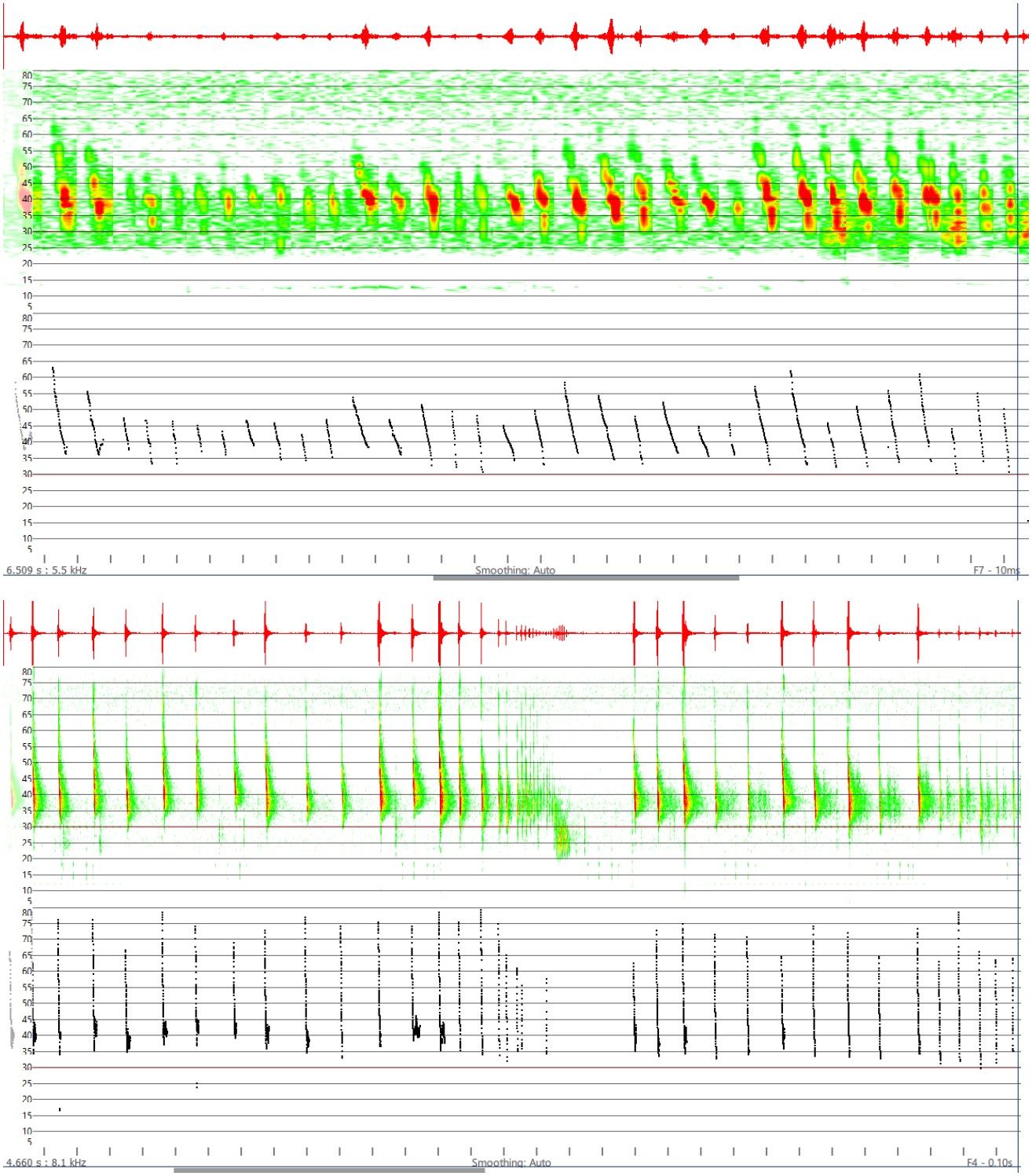

Plate 9 Ride's Free-tailed Bat *Ozimops ridei*

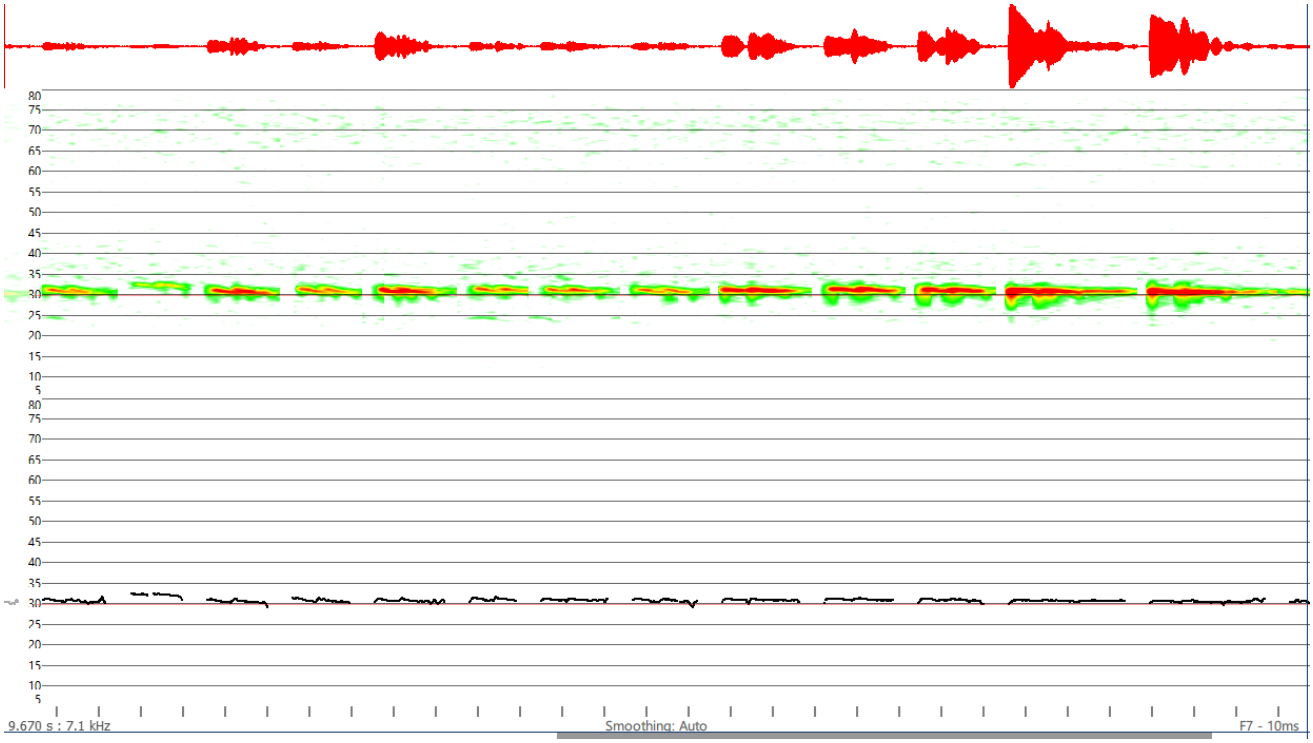

Plate 10 Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*

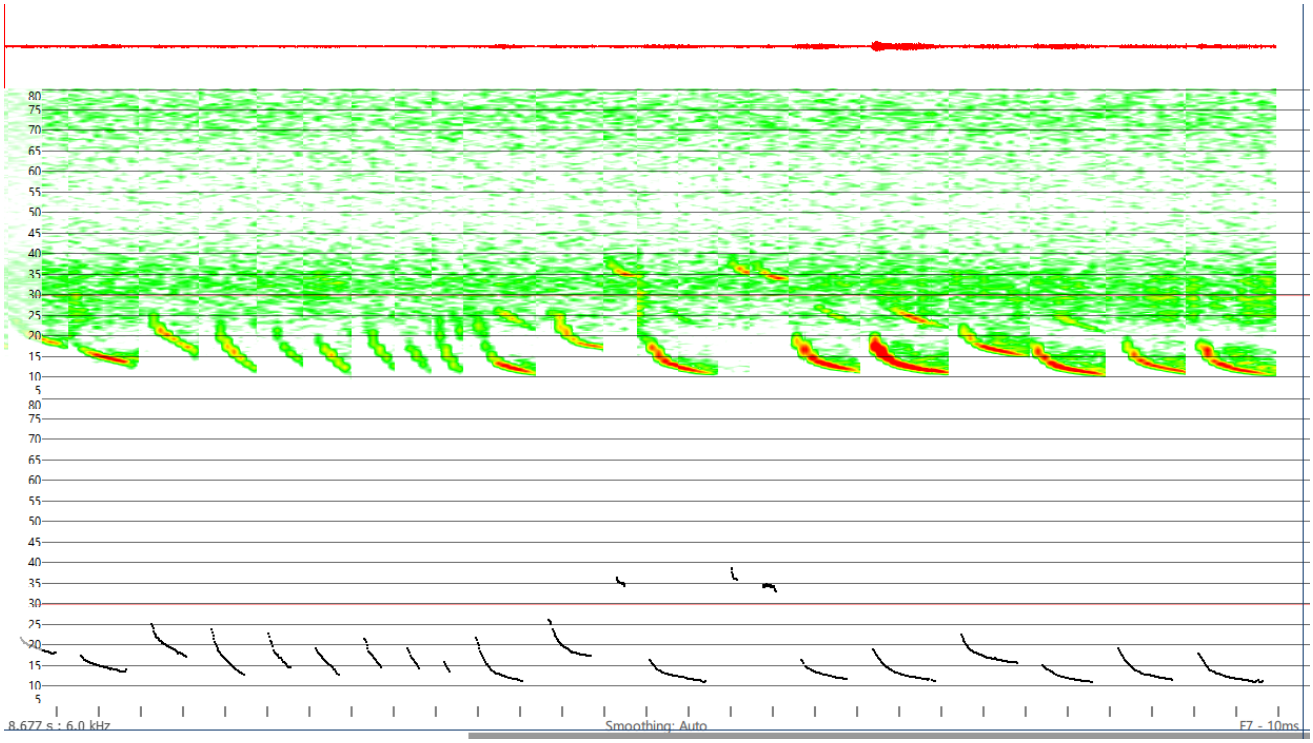

Plate 11 Greater Broad-nosed Bat *Scoteanax rueppellii*

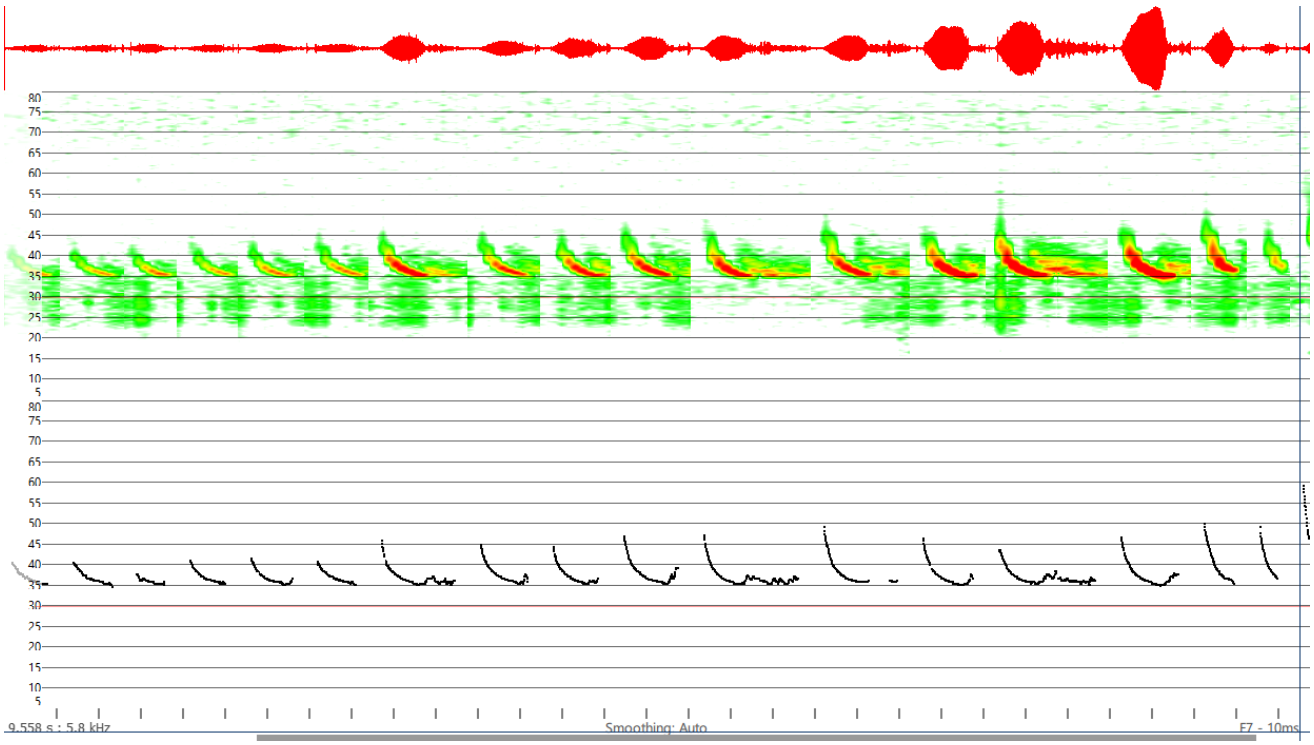

Plate 12 Large Forest Bat *Vespadelus darlingtoni*

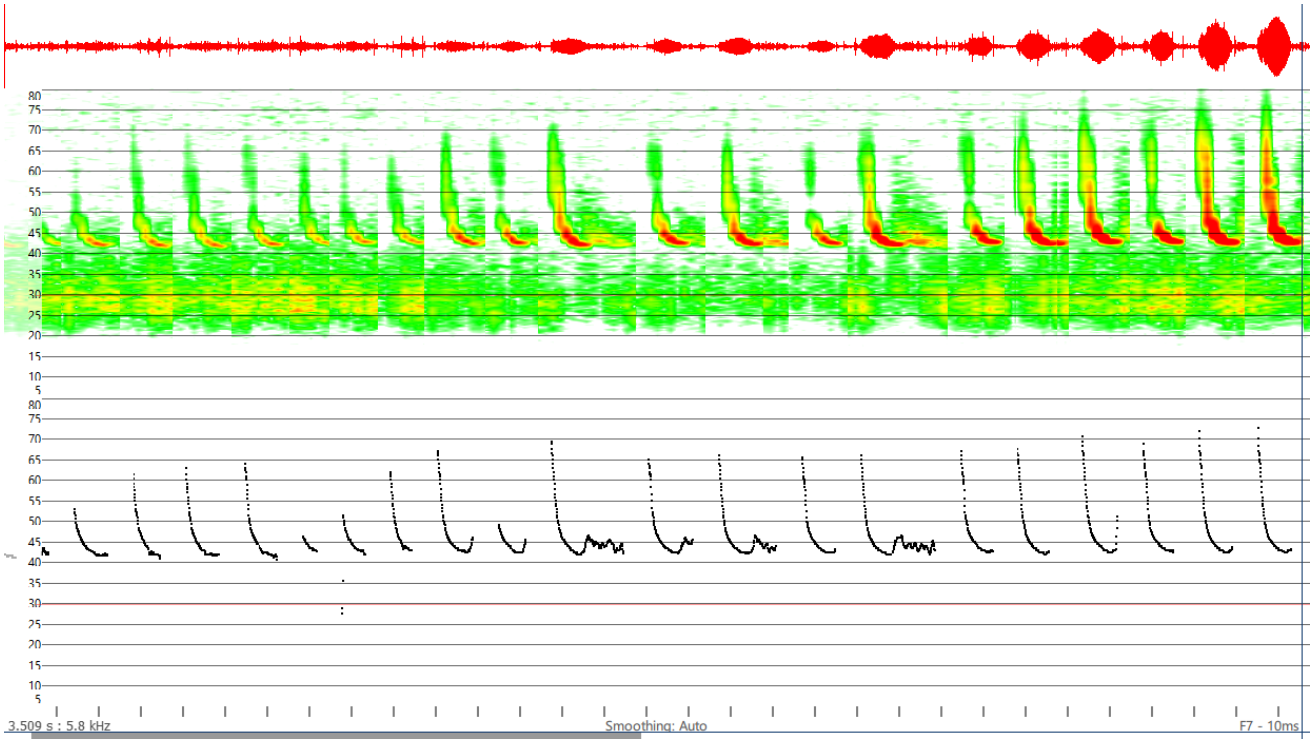

Plate 13 Southern Forest Bat *Vespadelus regulus*

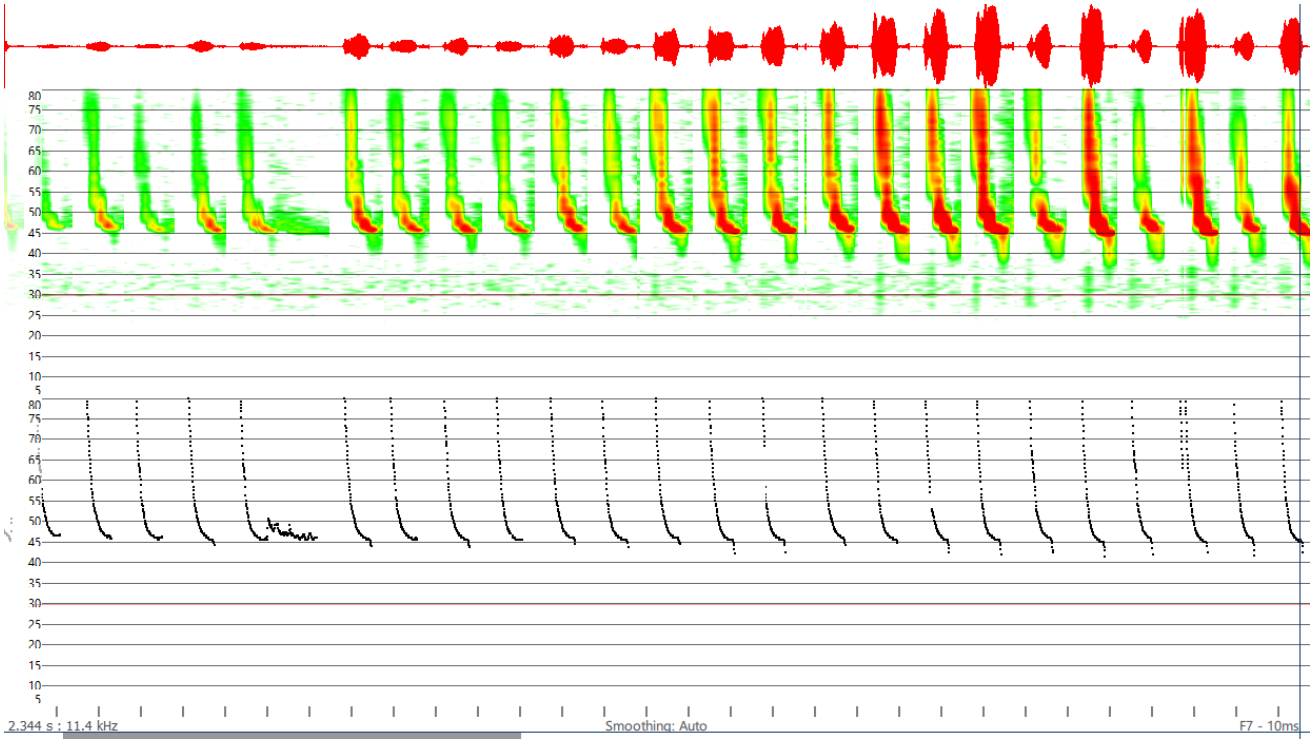

Plate 14 Little Forest Bat *Vespadelus vulturnus*