Catherine McAuley Catholic College – Modification 5

Biodiversity Development Assessment Report

FINAL REPORT

Prepared for The Trustees of the Roman Catholic Church for the Diocese of Maitland-Newcastle

11 April 2025

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- NSW Department of Climate Change, Energy, the Environment and Water for access to the BioNet Atlas of NSW Wildlife.
- BirdLife Australia for access to the New Atlas of Australian Birds 1998-2013.
- NSW Department of Primary Industries for access to indicative mapping of freshwater threatened species and fish populations.
- Biosis staff involved in this project were: Jenny Beckius, Henri Liswoyo (mapping).

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 1500 m of a site-based development
BAM	NSW Biodiversity Assessment Method
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*
CoC	Conditions of Consent
DA	Development Application
DC	Development Consent
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DCDB	Digital cadastral database
Development footprint	The area of land that is directly impacted by the proposal
Development site	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 within 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 5 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	New South Wales 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.
SSD	State Significant Development
Subject land	The areas within or the combined areas of the development site, and any indirect and prescribed impacts.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
TPZ	Tree Protection Zone
WM Act	*NSW Water Management Act 2000*
WHS	Work Health and Safety

Certification and Declarations

I certify that this report has been prepared on the basis of 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:	
Date:	11/04/2025
BAM Assessor Accreditation Number:	BAAS17051

Summary

The Trustees of the Roman Catholic Church for the Diocese of Maitland-Newcastle has approval to develop a site at 507 Medowie Road (Lot 1 DP1281466 and Lot 413 DP1063902) in Medowie New South Wales (NSW, hereafter referred to as the development site) (Figure 1) as a catholic college. The project is considered State Significant Development (SSD, #SSD-8989). A Biodiversity Development Assessment Report (BDAR) (Biosis 2018) was prepared in accordance with *NSW Biodiversity Assessment Method* (BAM) (OEH 2017) and reviewed by Accredited Assessor Sam Luccitti (BAAS17015) to accompany an Environmental Impact Statement (EIS) (de Witt Consulting 2018) under development case #00010084. The project was approved under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) on 26 July 2019 (SSD-8989), and has undergone four modifications, including SSD-8989-Mod-1 (approved 4 September 2020) and SSD-8989-Mod-2 (approved 14 January 2022).

The development involves the demolition of the existing dwelling, shed and outbuildings, the construction of a three-stream primary school, seven stream high school, chapel and childcare centre, and associated works including a carpark, retaining walls and landscaping. However, the development footprint required an update to account for:

- Inconsistencies with the approved EIS (de Witt Consulting 2018) footprint assessed in the approved BDAR (Biosis 2018).
- Updates to account for additional impacts outside of the approved areas resulting from the stockpiling of materials.

Consultation with NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) in June 2024 identified that a BDAR was required in accordance with the *NSW Biodiversity Assessment Method* (BAM) (DPIE 2020a) and the *Biodiversity Conservation Act 2016* (BC Act), to address these additional impacts. A BDAR to support SSD-8989-Mod-3 was prepared, in which nine threatened flora and ten threatened fauna species were assumed present as part of the BDAR. The modification instrument dated 25 October 2024 provided for the offset of 244 species credits (108 threatened flora species credits and 136 threatened fauna species credits), accordingly. Further survey has been undertaken within the subject land per agreement with NSW DCCEEW to rule out the presence of nine threatened flora species and seven of these threatened fauna species that were previously assumed present to reduce the credit offset liability.

This BDAR has been prepared by Dr Caragh Heenan and reviewed by Accredited Assessor Mitchell Palmer (BAAS17051), Callan Wharfe (BAAS18138) and Matthew Hyde to support SSD-8989-Mod-5. This BDAR describes the outcome of the development assessment case #00037496 conducted consistent with the BAM (DPIE 2020a).

Field investigation, undertaken in accordance with the BAM (DPIE 2020a), recorded 3.22 hectares of native vegetation within the subject land, representing one threatened ecological community, as well as 0.76 hectares of mapped Coastal Wetland and 1.42 hectares of Coastal Wetland Proximity Area.

Additional impacts from the modification have occurred to 0.50 hectares of native vegetation within the development footprint, including 0.26 hectares of Plant Community Types (PCT) 3544 *Coastal Sands Apple-Blackbutt Forest*, and 0.24 hectares of PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*. PCT 3395 is associated with an endangered ecological community (EEC); consistent with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed *Coastal Swamp Sclerophyll Forest of New South*

Wales and South East Queensland EEC and BC Act listed *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC.

During the field surveys for the original BDAR, no threatened flora species were recorded within the subject land. However, as the currency of the previous field survey is no longer valid, greater than five years old, and in accordance with the BAM, further survey is required to be undertaken. This is complicated further due the fact construction has commenced. Potential habitat for nine threatened flora species was previously considered present within the subject land, however targeted surveys have been undertaken and none of these nine threatened species were detected within the subject land.

Six threatened fauna species were recorded within the development site during field assessment for the approved BDAR (Biosis 2018) including; Koala *Phascolarctos cinereus*, Grey-headed Flying-fox *Pteropus poliocephalus*, Powerful Owl *Ninox strenua*, Masked Owl *Tyto novaehollandiae*, White-bellied Sea-eagle *Haliaeetus leucogaster* and Wallum Froglet *Crinia tinnula*. However, none of these observations listed above and no other threatened fauna were recorded within the subject land relevant to the current assessment. The subject land is therefore considered likely to provide only marginal foraging habitat for these highly mobile threatened species. No breeding habitat for Grey-headed Flying-fox, Powerful Owl, Masked Owl, or White-bellied Sea-eagle occurs within the subject land.

In addition, potential habitat for ten threatened fauna species was previously considered present within the subject land. Targeted surveys have been undertaken for seven of these threatened fauna species. No threatened fauna species that were subject to survey were recorded within the subject land.

Targeted survey was not undertaken for three threatened fauna species and as such, presence has been assumed for these species as part of the current assessment, including:

- Wallum Froglet *Crinia tinnula* (Vulnerable, BC Act).
- Koala *Phascolarctos cinereus* (Endangered, EPBC Act and BC Act).
- Common Planigale *Planigale maculata* (Vulnerable, BC Act).

Powerful Owl and Wallum Froglet were incidentally recorded within the subject land during field investigations for the current assessment. Wallum Froglet requires offset under the BAM (DPIE 2020a), however as no breeding habitat is present within the subject land for Powerful Owl, the subject land is considered to provide marginal foraging habitat for this species only and species credit offsets are not required. Koala are expected to forage occasionally on feed tree species within the subject land and may disperse across the subject land from Preferred Koala habitat immediately west of the subject land. The project will result in removal of approximately 0.50 hectares of Koala foraging habitat but will not impact habitat connectivity for Koala in the locality.

The vegetation integrity (VI) score of the vegetation to be impacted was calculated as 49.1 for PCT 3544 and 69.5 for PCT 3995. As such, in accordance with Section 10 of the BAM (DPIE 2020a), offsets are required to be secured for the project.

Consideration to avoiding and minimising impacts to biodiversity during the assessment has not been possible due to pre-existing impacts. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct, indirect and prescribed.

Given the minimisation of direct impacts to the mapped extent of the Coastal wetland and Preferred Koala Habitat and given a range of measures will be implemented to ensure indirect impacts are minimised, the

project is not considered to be in opposition to the aims and objectives of legislation. Moreover, the project is not expected to significantly impact any freshwater or marine aquatic values listed under the FM Act.

Impacts to native vegetation will require retirement of 13 ecosystem credits and 29 species credits in accordance with the Biodiversity Offsets Scheme (BOS), as outlined in Table 1 and Table 2.

Table 1 Summary of ecosystem credits

Vegetation zone	PCT	Credit requirement	
		SSD-8989-Mod-3	SSD-8989-Mod-5
3995_Moderate	PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	5	5
3544_Moderate	PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	8	8
Total		**13**	**13**

Table 2 Summary of species credits

Species name	Common name	Credit requirement	
		SSD-8989-Mod-3	SSD-8989-Mod-5
Flora			
Angophora inopina	Charmhaven Apple	14	0
Callistemon linearifolius	Netted Bottle Brush	4	0
Commersonia prostrata	Dwarf Kerrawang	14	0
Diuris arenaria	Sand Doubletail	23	0
Eucalyptus parramattensis subsp. decadens	Earp's Gum	5	0
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	14	0
Lindernia alsinoides	Noah's False Chickweed	14	0
Prostanthera densa	Villous Mint-bush	14	0
Rhodamnia rubescens	Scrub Turpentine	6	0
Fauna			
Crinia tinnula	Wallum Froglet	1	1
Hoplocephalus stephensii	Stephens' Banded Snake	14	0
Myotis macropus	Southern Myotis	5	0
Petalura gigantea	Giant Dragonfly	23	0
Petauroides volans	Greater Glider (southern and central)	14	0

Species name	Common name	Credit requirement	
		SSD-8989-Mod-3	SSD-8989-Mod-5
Petaurus norfolcensis	Squirrel Glider	14	0
Phascogale tapoatafa	Brush-tailed Phascogale	14	0
Phascolarctos cinereus	Koala	14	14
Planigale maculata	Common Planigale	14	14
Vespadelus troughtoni	Eastern Cave Bat	23	0
Total		**244**	**29**

None of the threatened species impacted by the project are Serious and Irreversible Impact (SAII) species and as such no assessment is required.

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 Water is not required.

STAGE 1 – BIODIVERSITY ASSESSMENT

1. Introduction

Biosis Pty Ltd was commissioned by The Trustees of the Roman Catholic Church for the Diocese of Maitland-Newcastle to undertake a biodiversity assessment of a development at 507 Medowie Road (Lot 1 DP1281466 and Lot 413 DP1063902), in Medowie NSW in 2018 (Figure 1). The project is considered SSD (#SSD-8989). A BDAR (Biosis 2018) was prepared in accordance with BAM (OEH 2017) and reviewed by Accredited Assessor Sam Luccitti (BAAS17015) to accompany an EIS (de Witt Consulting 2018) under development case #00010084. The project was approved under Part 4 of the EP&A Act on 26 July 2019 (SSD-8989), and has undergone four modifications, including SSD-8989-Mod-1 (approved 4 September 2020) and SSD-8989-Mod-2 (approved 14 January 2022).

The development footprint required an update to account for:

- Inconsistencies with the approved EIS (de Witt Consulting 2018) footprint assessed in the approved BDAR (Biosis 2018).
- Updates to account for additional impacts outside of the approved areas resulting from the stockpiling of materials.

Consultation with NSW DCCEEW in June 2024 identified that a BDAR was required in accordance with the BAM (DPIE 2020a) and the BC Act, to address these additional impacts. A BDAR to support SSD-8989-Mod-3 was prepared, in which nine threatened flora and ten threatened fauna species were assumed present as part of the BDAR. The modification instrument dated 25 October 2024 provided for the offset of 244 species credits (108 threatened flora species credits and 136 threatened fauna species credits), accordingly. Further survey has been undertaken within the subject land per agreement with NSW DCCEEW to rule out the presence of nine threatened flora species and seven threatened fauna species and hence reduce the credit offset liability.

The purpose of this assessment was to apply the NSW BAM (DPIE 2020a) to the project's additional impact areas, and provide The Trustees of the Roman Catholic Church for the Diocese of Maitland-Newcastle with a BDAR. The BDAR is to be submitted to the NSW DCCEEW as part of a modification to the EIS (de Witt Consulting 2018), under Part 4 of the EP&A Act, for the project.

1.1. Project description

The Trustees of the Roman Catholic Church for the Diocese of Maitland-Newcastle proposes to develop the site at 507 Medowie Road (Lot 1 DP1281466 and Lot 413 DP1063902) in Medowie NSW (Figure 1) as a catholic college. The development will involve the demolition of the existing dwelling, shed and outbuildings, the construction of a three-stream primary school, seven stream high school, chapel and childcare centre, and associated works including a car park, retaining walls and landscaping. Construction will be undertaken in a staged manner, to be conducted over five stages, as outlined in the site staging plan (Webber Architects 2018).

The additional development will include construction and operation of stormwater infrastructure designed to ensure post development stormwater volumes and water quality are not substantially different to pre-development values, as well as stockpiling of fill for reuse on site. Stormwater infrastructure includes discharge pipes, headwalls and a rock mattress.

Biosis was previously engaged by Webber Architects to prepare the BDAR (Biosis 2018) and associated plans, including; Vegetation Management Plan (VMP) (Biosis 2019a), Vegetation Management Sub Plan (VMSP) (Biosis 2019b), Biodiversity Management Sub Plan (BMSP) (Biosis 2019c), Fauna Management Plan (FMP) (Biosis 2019d) and Koala Management Sub Plan (KMSP) (Biosis 2019e).

Due to the scale of the project, the project will be assessed under Part 4 Division 4.1 Section 89C of the EP&A Act as SSD (#SSD-8989). The NSW BC Act requires that all SSD apply the BAM and the BOS to assess and offset the impacts of developments to biodiversity, 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 impacts resulting from the project.
- 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. This BDAR has been prepared by Dr Caragh Heenan and reviewed by Accredited Assessor Mitchell Palmer (BAAS17051), Callan Wharfe (BAAS18138) and Matthew Hyde. This BDAR describes the outcome of the development assessment case #00037496 conducted consistent with the BAM (DPIE 2020a).

The following revisions of BAM Calculator case 00048158 represents the following method undertaken:

- 00048158/Revision 0 – Development footprint (SSD-8989-Mod-3).
- 00048158/Revision 1 – Development footprint (current BDAR to support SSD-8989-Mod-5, for review).

1.1 The subject land, development footprint and assessment area

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

- The subject land is defined as the eastern extent of Lot 1 DP1281466 and Lot 413 DP1063902 (507 Medowie Road Medowie, NSW). The lot is located directly adjacent to Medowie Road, 4 km south-west of the township of Medowie, and approximately 32 km by road from the Newcastle Central Business District (CBD). The land is located in the Port Stephens Council Local Government Area (LGA) and the Hunter Local Land Services (LLS) Region and is zoned predominantly as Low Density Residential (R2), with occurrence of Large Lot Residential (R5) to the north of the subject land and Rural Landscape (RU2) located to the west of the subject land under the *Port Stephens Local Environmental Plan 2013* (LEP). The subject land includes the development footprint as well as all indirect impacts associated with the development, consisting of a 30 m buffer. The subject land covers a total area of 5.91 ha.
- The development footprint includes all direct impacts and is defined as the total area of disturbance; including both the construction and operational footprints; which in this case equates to the stormwater

infrastructure, stockpile area and impacts to Tree Protection Zones (TPZs), as per consultation with NSW DCCEEW. The development footprint is located within the subject land and is approximately 1.01 ha.

- The development site comprises Lot 1 DP1281466 and Lot 413 DP1063902 and is approximately 26.73 ha.
- The assessment area includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land and is approximately 942.01 ha.

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 5 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act (Cth DCCEEW 2025).
- NSW BioNet - the database for the Atlas of NSW Wildlife, NSW DCCEEW, for species, populations and ecological communities listed under the BC Act (NSW DCCEEW 2025a).
- NSW BAM Calculator.
- Biodiversity values map (NSW DCCEEW 2025b).
- Native vegetation regulatory map.
- BAM Important Areas maps (NSW DCCEEW 2024a).
- 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 2024b).
- Relevant vegetation mapping, such as *Lower Hunter Vegetation Mapping* (Cockerill, Harrington, & Bagel 2013) and NSW State Vegetation Type Map (SVTM C2.0M2.0) (NSW DCCEEW 2024i).
- *Port Stephens Council Comprehensive Koala Plan of Management* (CKPoM) (Port Stephens Council & Australian Koala Foundation 2002).

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

- *Catherine McAuley Catholic College, Medowie Biodiversity Development Assessment Report* (Biosis 2018) (BDAR).
- *Vegetation Management Plan for Catherine McAuley Catholic College, Medowie* (Biosis 2019a) (VMP).
- *Vegetation Management Sub Plan – Construction Phase for Catherine McAuley Catholic College, Medowie* (Biosis 2019b) (VMSP).
- *Biodiversity Management Sub Plan for Catherine McAuley Catholic College, Medowie* (Biosis 2019c) (BMP).
- *Fauna Management Plan for Catherine McAuley Catholic College, Medowie* (Biosis 2019d) (FMP).
- *Koala Management Sub Plan for Catherine McAuley Catholic College, Medowie* (Biosis 2019e) (KMSP).

- *Catherine McAuley Catholic College Landscape Master Plan Report* (Moir Landscape Architecture 2018).
- *Site Staging Plan - Catherine McAuley Catholic College 507 Medowie Road, Medowie* (Webber Architects 2018)
- *Bushfire Assessment Report - Proposed School Alternate Solution for Lot 412 and 413 DP 1063902 507 Medowie Road, Medowie* (Newcastle Bushfire Consulting 2018).
- *Arboricultural Impact Assessment Report for Catherine McAuley Catholic College, 507 Medowie Road* (Pidutti 2017).

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:

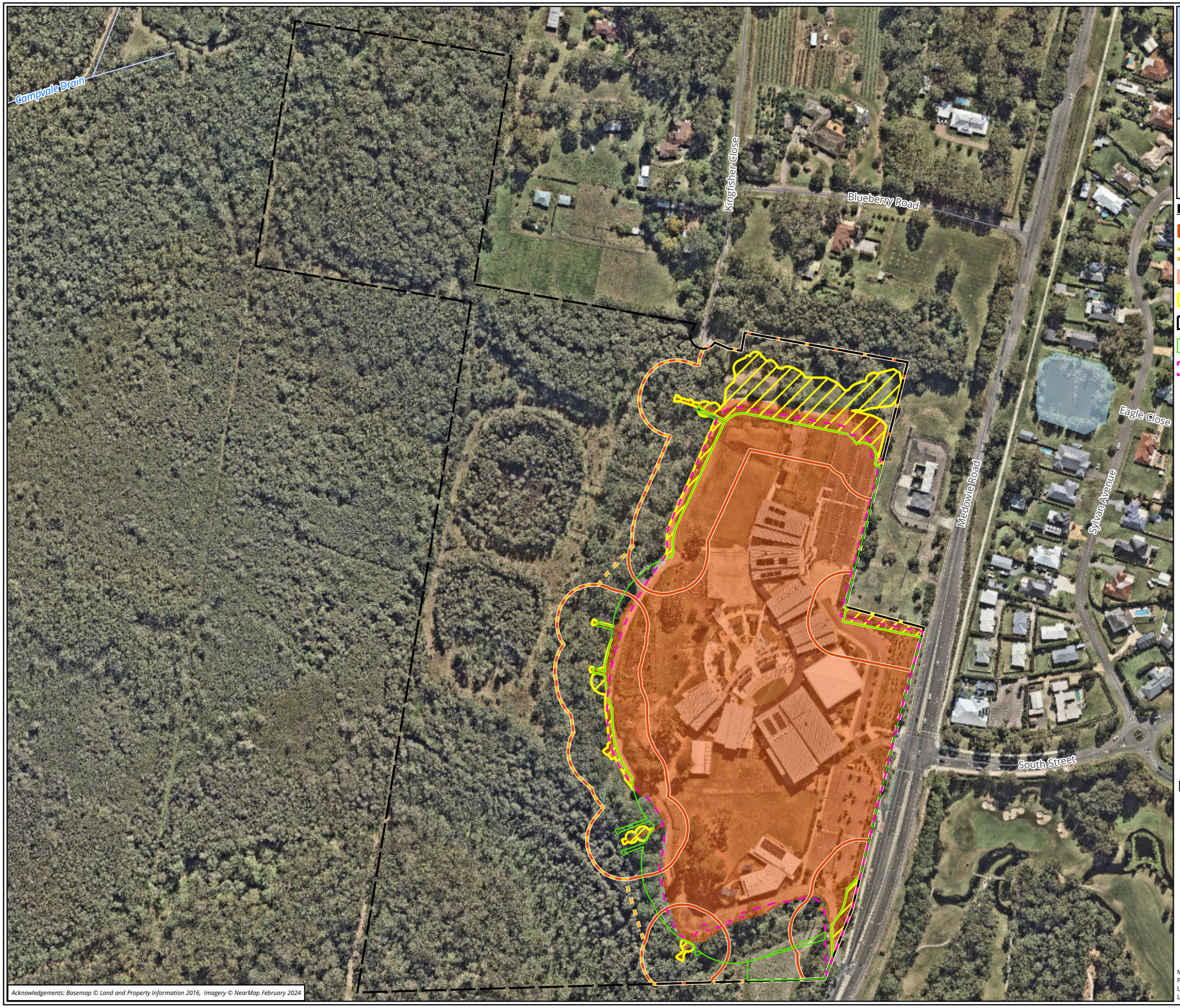
- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP).
- Spatial data associated with regional native vegetation mapping (OEH 2016).
- 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 1500 metre buffer, as described in section 3.1.3 of the BAM (DPIE 2020a).

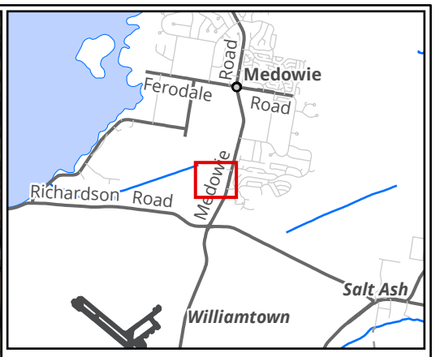
1.4. Legislative requirements

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 (Biodiversity and Conservation) 2021.
- *Port Stephens Comprehensive Koala Plan of Management 2002* (CKPoM) (Port Stephens Council & Australian Koala Foundation 2002).
- *Medowie Planning Strategy* (Port Stephens Council 2016).
- *Port Stephens Local Environmental Plan 2013* (LEP).

- *Port Stephens Development Control Plan 2014* (DCP).





Legend

- Subject land
- Study area
- Site layout
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area

Figure 1 Subject land

0 25 50 75 100 125

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F1_SubjectLand

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 located 4 kilometres south-west of the township of Medowie, and approximately 32 kilometres by road from the Newcastle CBD. The subject land contained a single story residential dwelling, shed, tennis court, lawns and scattered landscape plantings as well as native and exotic vegetation (Figure 1) prior to construction under the approved EIS (de Witt Consulting 2018). There is a mapped watercourse running east to west 400 metres from the western boundary of the development site. The subject land has a gentle slope with a western aspect that leads to the flat swampy vegetation along the western boundary of the development site.

The subject land is within the Medowie and Tea Gardens Newcastle 1:100k (Matthei 1995, NSW DCCEEW 2024c). The subject land is largely mapped as the Tea Gardens Aeolian soil landscape, consisting of Pleistocene sandsheets of marine and Aeolian quartz sands, wet heath forest (in the south of the subject land, variant 'a'), and wet heath and sedgeland (in the north-west of the site, variant 'b'). Dominant soil materials are mapped as sandy peat, loose loamy sand, bleached loose sand, massive organic pan, coarse smelly saturated mottled sand, and saturated brownish black massive coarse light sandy clay loam. A section in the north-east of the site is mapped as the Medowie Residual soil landscape, consisting of deep and well drained red and yellow structured loams on deeply weathered clay deposits, moderately deep and well drained Red Podzolic soils, and some shallow well drained Lithosols on sandy/pebbly deposits with clay lenses.

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. Table 3 provides a list of PCTs identified from existing vegetation mapping, and the current assessment, as occurring within the development site and within the 1500 metre assessment area.

Table 3 PCTs mapped within the development site and buffer

PCT	Subject land	Assessment area
3244 *Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest*	No	Yes
3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	No	Yes
3436 *Hunter Coast Sandy Creekflat Low Paperbark Scrub*	No	Yes
3544 *Coastal Sands Apple-Blackbutt Forest*	Yes	Yes
3549 *Lower North Sandplain Heathy Forest*	No	Yes
3581 *Hunter Coast Foothills Apple Forest*	No	Yes
3582 *Hunter Coast Lowland Apple-Bloodwood Forest*	No	Yes

PCT	Subject land	Assessment area
3802 *Lower North Sandplain Wallum Heath*	No	Yes
3906 *Northern Lowland Clay Wet Heath*	No	Yes
3959 *Coast Sands Baumea articulata Sedgeland*	No	Yes
3975 *Southern Lower Floodplain Freshwater Wetland*	No	Yes
3986 *Coastal Sands Swamp Mahogany Rush Forest*	No	Yes
3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	Yes	Yes
4006 *Northern Paperbark-Swamp Mahogany Saw-sedge Forest*	No	Yes
4007 *Northern Sands Paperbark Sedge Low Forest*	No	Yes
4012 *Tomago Drooping Red Gum Swamp Woodland*	No	Yes
4020 *Coastal Creekflat Layered Grass-Sedge Swamp Forest*	No	Yes

The total area of the assessment area (1500 metre buffer around the subject land) is 942.01 hectares, with the area of native vegetation mapped within the buffer being 571.71 hectares. This is a native vegetation cover of 61 % (30-70 % class as defined in Section 3.2.3 of the BAM (DPIE 2020a)) and this value was entered into the BAM calculator.

Cleared areas within the assessment area include 370.30 hectares, and include roads, car parks, a golf course, existing residential and other development, waterbodies (natural and man-made) and vacant land lots.

2.1.2. IBRA Bioregions and subregions

The assessment area occurs within the NSW North Coast IBRA bioregion and the Karuah Manning IBRA subregion. The North Coast Bioregion runs along the east coast of NSW from just north of Newcastle to just inside the Qld border. The total area of the bioregion is 5,924,130 hectares and the NSW portion accounts for 96.1 % of the bioregion (OEH 2016). The Sydney Basin Bioregion bounds the North Coast Bioregion in the south and the Nandewar and New England Tablelands bioregions lie against its western boundary.

2.1.3. Rivers and streams

The development site is located within the Hunter Local Land Services Region and Hunter River catchment. The Williams River is located approximately 10 kilometres west of the development site while the closest major waterbody is Grahamstown Reserve, located approximately 2.8 kilometres to the west.

There is one mapped second order stream, located 400 metres from the western boundary of the development site. The stream runs away from the development site from east to west, where it enters the Grahamstown Reserve (Figure 1).

An unmapped watercourse is located in the south of the subject land and appears to connect constructed waterbodies of the golf course east of Medowie Road (Figure 1). The waterway is moderately modified due to its location within a routinely mown landscape, past canopy clearing and weed infestation. There is an existing culvert structure connecting the subject land with the southern section of the development site. A number of additional small culvert sections provide access across the waterway within the south-western sections of the development site and existing vehicle track crosses near the western boundary of the development site.

The waterway appears to feed the mapped wetlands located across Medowie Road, southeast of the development site. Fringing, or submerged native aquatic plants and instream habitat structures such as logs or rocks were observed within some sections of the stream (Photo 1 and Photo 2). Isolated pools occurring within the waterway are considered to provide limited refuge habitat for aquatic fauna. Several drainage pipes and other infrastructure were found along the waterway.

The stream is not linked to the Strahler stream order system as it is downstream of the waterways on the Pacific Dunes golf course to the east (Personal comm. Ryan Shepherd, Water Regulations Officer, DPI). However, following advice from DPI, the stream is considered to be a first order stream for the purposes of assessment against relevant provision of the *NSW Water Management Act* 2000 (WM Act) and FM Act (Personal comm. Ryan Shepherd, Water Regulations Officer, DPI).

There are no mapped Key Fish Habitat as defined by the NSW Department of Primary Industry (DPI) (DPI 2013) within the subject land. The unnamed stream is not Key Fish Habitat (DPI 2013) as it is considered to be a first order gaining stream. The stream experiences intermittent flows and offers sporadic refuge, breeding and/or feeding areas for aquatic fauna within semi-permanent pools. The stream is therefore classified as a Class 3 – Minimal key fish habitat for fish passage.

Photo 1 Dry sections of unnamed waterway traversing the southern section of the subject land

Photo 2 Isolated pools of unnamed waterway traversing the southern section of the subject land

2.1.4. Wetlands

There are no wetlands within the subject land which are included in the DoIW of Australia (Cth DCCEEW 2019) (Figure 1 and Figure 2), however there is a Coastal Wetland and proximity area for a Coastal Wetland, as defined under Chapter 2 of the State Environmental Planning Policy (Resilience and Hazards) 2021, located to the west of the subject land (Figure 1). Under the objectives of the Resilience and Hazards SEPP, impacts to areas of coastal wetlands should be avoided. There are three additional wetlands located to the south-east of the development site, within the 1500 metre buffer area. These are not listed as important wetlands and are located at a distance of 230, 775 and 1,080 metres from the development site respectively. The furthest wetland is named Moffat's Lagoon.

The nearest Important Wetland, Port Stephens Estuary, is located approximately 4.3 kilometres to the north-east of the subject land (Cth DCCEEW 2019).

The development site lies 7.7 kilometres to the north-east of the Ramsar wetland Hunter Estuary Wetlands (Kooragang Nature Reserve). Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity. They are included on the List of Wetlands of International Importance developed under the Ramsar convention.

2.1.5. Connectivity

Habitats within the development site are primarily those associated with coastal sclerophyll forests. For highly mobile fauna species and seed/pollen dispersal of some flora species, habitats within the development site are well connected to the vegetation of Tilligerry State Conservation Area to the south and Campvale Swamp to the west (Figure 2 and Figure 3). The higher quality habitat connectivity links for fauna and flora occur to the west and south of the subject land, where most of the moderate and good condition vegetation remnant are located and barriers to dispersal are minor.

The subject land is well connected to the larger development site with only minimal disturbances such as vehicle tracks along the western boundary of the subject land, these are not considered to be barriers to species movement within the area. A power easement running from east to west divides vegetation within the development site but is not considered to provide a significant barrier for fauna species.

To the east of the subject land Medowie Road provides a barrier approximately 25 metres wide, this may be significant for less mobile and/or ground-dwelling species. The subject land is moderately well connected to vegetation in the north of the development site; a smaller strip of vegetation at the northern boundary is connected to the wider landscape through vegetation remnants surrounding rural residential buildings and cleared paddocks (Figure 2 and Figure 3). The subject land and wider development site are highly connected to extensive areas of swamp bushland to the west.

At the site scale and for species more restricted in mobility and dispersal ability, vegetation and habitats located along the eastern boundary are fragmented, with canopy species being separated by at least 25 metres. To the south there is potential for connectivity through the freehold land to vegetation within Tilligerry State Conservation Area (Figure 2 and Figure 3), however, Campvale Road lies between the Conservation area and freehold land and may provide a barrier to dispersal of less mobile and terrestrial species into and from Tilligerry State Conservation Area.

Potential habitat for frogs and other species reliant on waterbodies and watercourses occurs west of the development site within the swamp forest vegetation outside the subject land. Vegetation to the south and west of the development site may provide habitat for dispersal and shelter between potential breeding habitats within the local area. An unmapped waterway to the south of the development site provides potential for dispersal of threatened frog species between habitat to the west and south of the development site to habitat east of Medowie Road including Moffats Swamp Nature Reserve.

2.1.6. Geological features of significance

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the development site or within the assessment area.

2.1.7. Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value mapped within the development site.

Parts of the subject land are mapped as containing high biodiversity value on the Biodiversity Values map (BV map) (NSW DCCEEW 2025c). Information gathered during field investigations of the current study provided for further refinement of areas mapped as having high biodiversity value. The mapped areas relate to 'Core Habitat within an approved Koala Plan of Management' across the majority of the development site to the west of the subject land and in relation to 'Coastal Management Act – Wetlands' to the south-west of the subject land.

2.1.8. NSW (Mitchell) Landscape

The development site occurs within both the Sydney Basin Coastal Barriers Sydney-Newcastle Barriers and Beaches Mitchell Landscape (west and south side of the site), and the Sydney Basin Hunter Newcastle Coastal Ramp Mitchell Landscape (north east corner of the site) (Department of Environment & Climate Change NSW 2002).

Sydney-Newcastle Barriers and Beaches

The Sydney-Newcastle Barriers and Beaches Mitchell Landscape occurs as quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. It has a general elevation of between zero to 30 meters with local relief of 10 meters. Cliff top dunes may be found as high as 90 meters above sea level.

There is a distinct zonation of vegetation and increasing soil development from the beach to the inland dunes. At the beach Spinifex *Spinifex hirsutus*, Spiky Mat-rush *Lomandra longifolia*, Coast Wattle *Acacia longifolia* ssp. *sophorae* and Coast Tea-tree *Leptospermum laevigatum* colonise the frontal dune. Coast Banksia *Banksia integrifolia* and Old Man Banksia *Banksia serrata* are found on the second dunes and these merge with more complex forest containing Blackbutt *Eucalyptus pilularis*, Red Bloodwood *Corymbia gummifera*, Grass trees *Xanthorrhoea* sp. and numerous understorey shrubs on deep sands that have an organic rich A horizon, a bleached A2 horizon and the initial development of weak iron or organic pans in the sandy subsoil.

Freshwater sedge swamps are found in larger areas of sand. In the lagoons salinity varies depending on tidal flushing and they are often surrounded by Broad-leaved Tea-tree *Melaleuca quinquenervia* and Swamp Oak *Casuarina glauca*. Water margins are occupied by *Juncus* sp. and Common Reed *Phragmites australis* in freshwater areas. Grey Mangrove *Avicennia marina* may occur in some tidal inlets.

Newcastle Coastal Ramp

The Newcastle Coastal Ramp Mitchell Landscape occurs as undulating lowlands and low to steep hills on complex patterns of faulted and gently folded carboniferous conglomerate, lithic sandstone, felspathic sandstone and mudstone. It has a general elevation between 50 to 275 metres with local relief of 40 to 150 metres.

The landscape features a woodland of Spotted Gum *Corymbia maculata*, Forest Red Gum *Eucalyptus tereticornis*, Red Ironbark *Eucalyptus sideroxylon*, White Mahogany *Eucalyptus acmenoides*, Large-fruited Grey Gum *Eucalyptus canaliculata*, with sub-tropical rainforest elements in sheltered gullies.

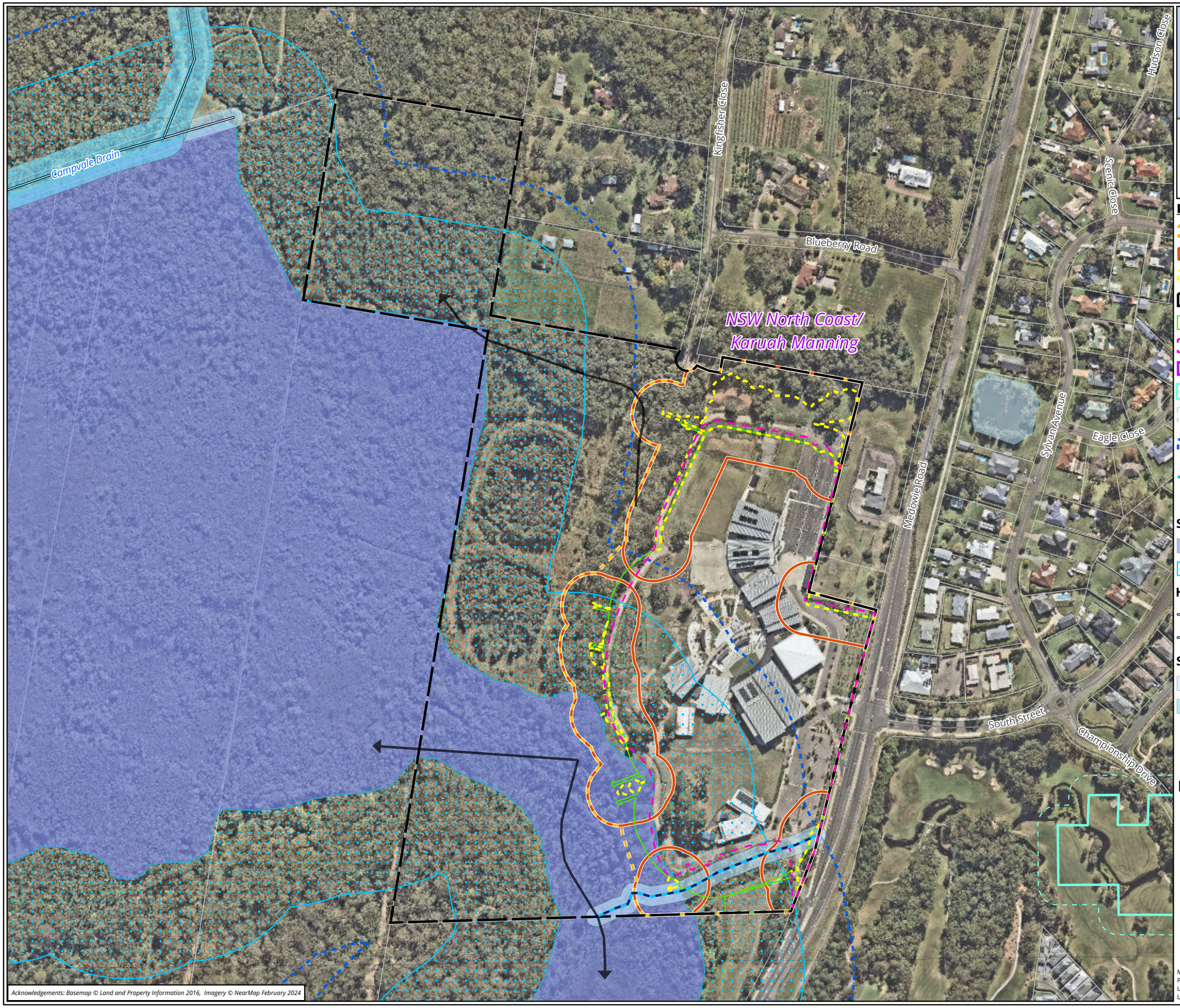
On lower slopes there are similar eucalypts, with Forest Oak *Allocasuarina torulosa* and grasses, merging to a forest of Smooth-barked Apple *Angophora costata*, Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis*, with Bracken *Pteridium esculentum* and grasses nearer the coast.

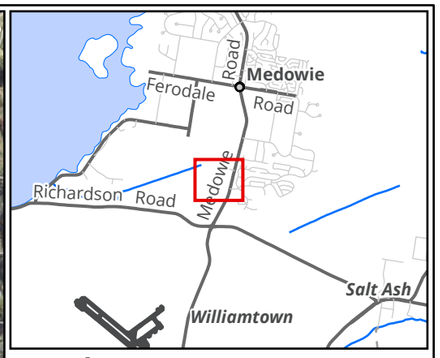
2.1.9. Additional landscape features

Vegetated parts of the development site are mapped as being Class 3, Class 4 and Class 5 Acid Sulfate Soils (Naylor et al. 1998, NSW DCCEEW 2024d). Within the broader landscape and within the 1500 metre buffer Acid Sulfate Soils have been mapped within all Classes.

2.1.10. Hydrology

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





Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- IBRA Region/Sub-region
- Local wetlands
- Riparian buffers - Local wetlands
- Riparian buffers - Important wetlands
- Hydro line (Biosis 2018)
- Habitat connectivity

SEPP (Resilience and Hazards) 2021

- Coastal Wetlands
- Coastal Wetlands Proximity Area

Hydro line stream order

- 1
- 2

Strahler stream order buffers

- 1
- 2

Figure 2 Site map

0 25 50 75 100 125

Metres

Scale: 1:3,500 @ A3

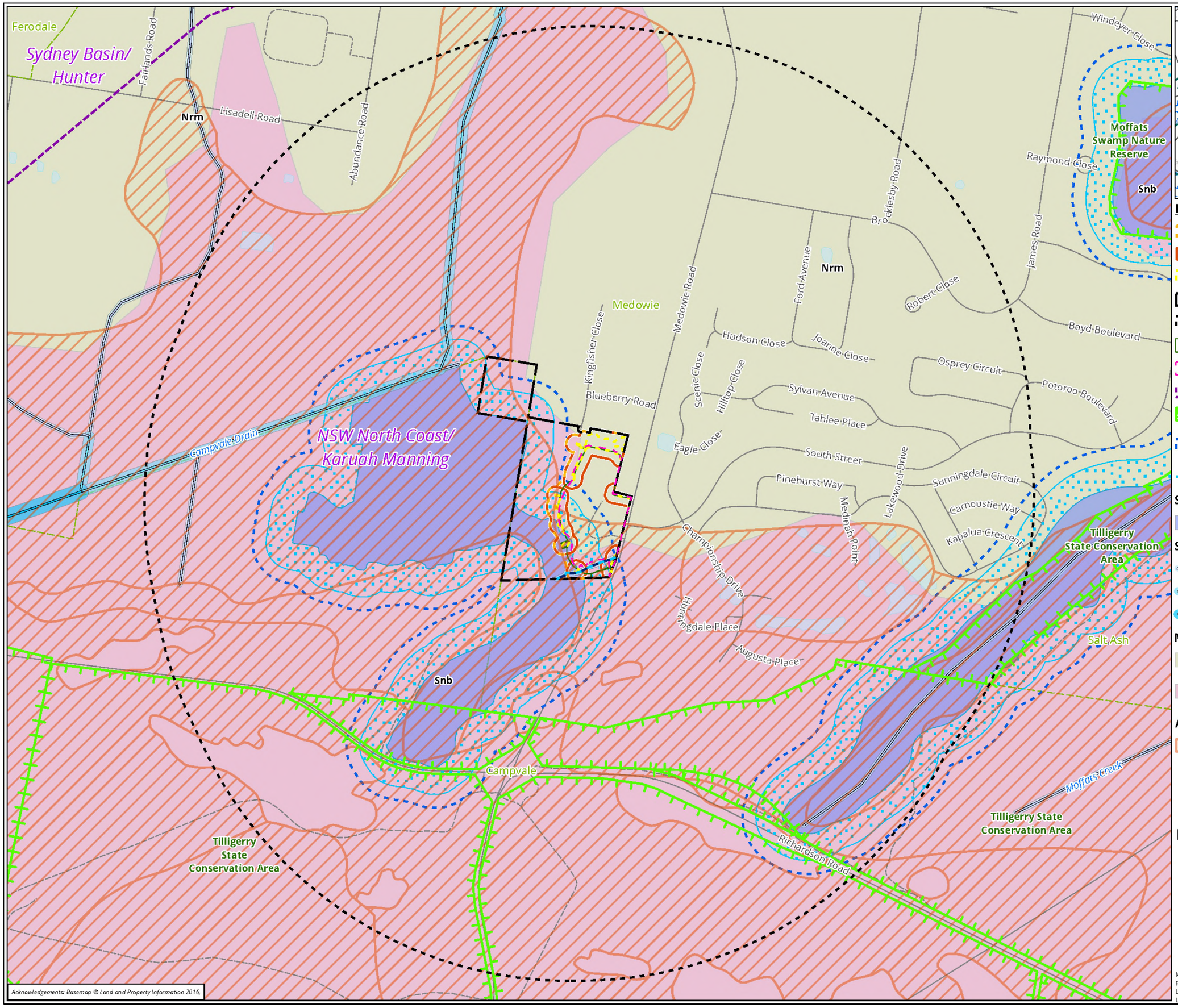
Coordinate System:
GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB, Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F2_Sitemap



Legend

- Study area
- Subject land
- Development footprint
- Development site
- Assessment area
- Approved BDAR area
- Approved EIS area
- IBRA Region/Sub-region
- National Park/Reserve
- Riparian buffers - Important wetlands
- Hydro line (Biosis 2018)

SEPP (Resilience and Hazards) 2021

- Coastal Wetlands

Strahler stream order / buffers

- 1
- 2
- 3

Mitchell landscapes

- Nrm,Newcastle Coastal Ramp
- Snb,Sydney - Newcastle Barriers and Beaches

Acid sulfate soil hazard

- Low probability of occurrence

Figure 3 Location map

0 100 200 300 400 500

Metres

Scale: 1:13,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

biosis

APEM Group

Matter: 40623, 38594, Date: 20 February 2025,
Prepared for CH, Prepared by HL, JB, Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F3_Location

3. Native vegetation

The subject land supports 3.22 hectares of native vegetation with varying levels of disturbance. Native vegetation within the subject land varied in composition and condition as a result of previous land uses. The western boundary of the subject land consists mostly of native vegetation, whilst the eastern portion is largely cleared, with scattered remnants.

The subject land is predominately covered by exotic pasture or non-native Slash Pine *Pinus elliottii* over exotic pasture, with native vegetation restricted to small patches of remnant canopy trees over exotic pasture and the fringing areas of larger remnant patches (Figure 5). Shrub and mid layer vegetation strata are mostly absent in the subject land except where the subject land intersects the edge of larger, more intact remnant vegetation patches.

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

Figure 4 provides a map of the native vegetation extent recorded within the development site and development footprint, as assessed during field investigations undertaken in June 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, and are addressed further below.

3.1.2. Review of existing information

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

- Regional vegetation mapping (Cockerill, Harrington, & Bagel 2013).
- Database searches.

Based on the results of the background review and the requirements of the BAM (DPIE 2020a) 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 on 31 May 2024 by qualified and experienced Biosis ecologists Brooke Corrigan (Senior Botanist – Offset Coordinator) and Liarni Rayment (Ecologist) under the terms of Biosis' Scientific Licence issued by NSW DCCEEW under the BC Act (SL100758, expiry date 30 June 2026). Wildlife surveys were conducted under the Secretary's Animal Care & Ethics Committee Approval (TRIM 17.892, expiry date 31 January 2028). Additional targeted survey was undertaken 23 August 2024 to 21 January 2025.

Assessment in accordance with the BAM (DPIE 2020a) was overseen by Accredited Assessor Mitchell Palmer (BAAS17051) and Callan Wharfe (BAAS18138).

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 Lower Hunter Vegetation Mapping (Cockerill, Harrington, & Bagel 2013).
- 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 development site.
- 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).

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 3) running the ArcGIS Collector 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 BioNet Vegetation Classification database (NSW DCCEEW 2024b). Locations of floristic plots surveyed are shown on Figure 3.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.2.1 below.

3.1.4. Local data

No additional local data was used for this assessment.

3.1.5. Non-native vegetation

The subject land is predominately covered by exotic pasture or non-native Slash Pine over exotic pasture, with native vegetation restricted to small patches of remnant canopy trees over exotic pasture and the edges of larger remnant patches. Parts of the subject land are composed of exotic grass areas under a continual mowing regime, mapped as Exotic vegetation with no native over-storey or mid-storey cover, which meets the definition of non-native vegetation and were not mapped as native vegetation (Figure 3).

Areas not shown as native vegetation cover within Figure 3, 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 has been assessed for threatened species, but is not considered to provide suitable habitat for threatened species.

3.1.6. Plant community types

PCTs represent the finest level of a hierarchy applied to the classification and description of native vegetation across NSW. A recent major revision to the classification of native plant assemblages of eastern NSW (DPE 2022a) and the Revised PCT Classification released to the BAM Calculator (BAM-C) in April 2023. PCTs within the east coast release area which pre-date the revised classification are known as 'Legacy PCTs' and could be applied to active development assessments under transitional arrangements until April 2024. All assessments under the BAM (DPIE 2020a) are now required to apply the revised PCTs within the report and BAM-C to determine impacts to biodiversity values.

The following Legacy PCTs were previously assessed as present within the subject land (Biosis 2018):

- PCT 1564 *Blackbutt - Rough-barked Apple - Turpentine - ferny tall open forest of the Central Coast*.
- PCT 1598 *Forest Red Gum grassy open forest on floodplains of the lower Hunter*.
- PCT 1619 *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands*.
- PCT 1718 *Swamp Mahogany – Flax leaved Paperbark swamp forest on coastal lowlands of the Central Coast*.

A review of PCT lineage (NSW DCCEEW 2024e) and PCTs modelled to occur in the study area and surrounds (NSW DCCEEW 2024i) determined two Revised PCTs represent vegetation present in the subject land:

- PCT 3544 *Coastal Sands Apple-Blackbutt Forest*.
- PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*.

Detailed descriptions of revised PCTs and their associations with vegetation previously assess under Legacy PCTs is provided in Table 4 to Table 5. PCTs recorded within the subject land are shown in Figure 5.

Table 4 PCT 3544 *Coastal Sands Apple-Blackbutt Forest*

PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	
Common name	*Coastal Sands Apple-Blackbutt Forest*
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Coastal Dune Dry Sclerophyll Forests
Extent within subject land	Approximately 0.74 ha, with 0.26 ha proposed for removal
Community description	A tall to very tall sclerophyll open forest with a dry shrubby understorey and ferny ground cover found on coastal sand plains from Jervis Bay to Port Macquarie. The tree canopy very frequently includes a high cover of Blackbutt *Eucalyptus pilularis* and Smooth-barked Apple *Angophora costata*, occasionally with Red Bloodwood *Corymbia gummifera*. The mid-stratum is characterised by a sparse to mid-dense shrub and small tree cover with Old-man Banksia *Banksia serrata* very frequently forming a sparse cover beneath the eucalypts. The lower shrub layer very frequently includes a sparse cover of Tree Broom-heath *Monotoca elliptica*, Prickly Moses *Acacia ulicifolia*, Sweet Wattle *Acacia suaveolens*, *Leucopogon lanceolatus* and Broad-leaved Geebung *Persoonia levis*, with *Acacia longifolia* and Wedding Bush *Ricinocarpos pinifolius* also common. The ground layer almost always includes a sparse to mid-dense cover of Bracken *Pteridium esculentum* and very frequently Spiny Matt-rush *Lomandra longifolia* and Blady Grass *Imperata cylindrica*. This PCT occurs mainly on low elevation coastal dune systems, which are commonly below 40 metres asl but in some cases up to 150 metres asl. The highest densities of plots are on the sand plains of the Tomago peninsula near Port Stephens and in Myall Lakes National Park. This community grades into northern sand plain forest PCT 3552 around Port Macquarie and into PCT 3545 or PCT 3549 on older podsolised dunes. It is patchy and restricted to larger coastal dune systems on the south coast where it intergrades with PCT 3638 near Jervis Bay (NSW DCCEEW 2024e).
Condition	Moderate: This PCT is in a moderate condition due to the low abundance of native canopy, lack of midstorey/shrub species and dominance of exotic grasses. Within the subject land the extent of this PCT is regularly mown (Figure 5).
Vegetation zones	3544_Moderate
Description within subject land	Vegetation at in the subject land is influenced by a north-south soil transition from Tea Gardens Aeolian soil landscape in the south of the site to Medowie Residual soils in the north. There is also an east-west transition from low lying lands influenced by coastal wetland hydrology to drier habitat upslope. PCT 3544 is present on land with increased elevation which is not routinely subjected to periodic inundation. Vegetation in the south contains Smooth-barked Apple and Swamp Mahogany *Eucalyptus robusta* in the canopy. Mid storey includes Coastal Wattle *Acacia longifolia* subsp. *sophorae*. Blady Grass and Spiny Matt-rush are dominant in the ground layer. Moving north in the site Blackbutt is frequent in the canopy with Forest Red Gum *E. tereticornis* and Rough-barked Apple *Angophora floribunda* also present.
Survey effort	Two BAM plots (40623.03 and 40623.04) were completed within the PCT (Figure 6) which informed the finalised mapping.
Legacy PCT associations	**PCT 1564 *Blackbutt - Rough-barked Apple - Turpentine - ferny tall open forest of the Central Coast***. Vegetation Formation: KF_CH2A Wet Sclerophyll Forests (Grassy sub-formation). Vegetation Class: Northern Hinterland Wet Sclerophyll Forest

PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	
	This PCT was characterised by an open canopy of Blackbutt *Eucalyptus pilularis* and Rough-barked Apple *Angophora floribunda.* The understory was dominated by exotic grasses such as Buffalo Grass *Stenotaphrum secundatum*, Whisky Grass Andropogon virginicus and Kikuyu Grass *Cenchrus clandestinus*. A low abundance of native groundcover species such as Brown's Lovegrass *Eragrostis brownii*, Blady Grass *Imperata cylindrica* and Common Couch *Cynodon dactylon* were recorded amongst exotic grass sward. **PCT 1619 *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands*.** Vegetation Formation: KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation. Vegetation Class: Sydney Coastal Dry Sclerophyll Forests. This PCT is located in the south-eastern portion of the subject land. Native canopy species recorded within the vegetation include Smooth-barked Apple, Swamp Mahogany, Coastal Wattle, Lance Leaf Geebung *Persoonia lanceolata* dominated the mid storey. The ground storey recorded a variety of native sedges and herbs for which included *Common Couch, Blue Flax-lily Dianella caerulea, Bushy Hedgehog-grass Echinopogon caespitosus, Tall Saw-sedge Gahnia clarkei,* Spiny-headed Mat-rush *Lomandra longifolia,* Pomax *Pomax umbellata,* Bracken Fern *Pteridium esculentum and* Trachymene *Trachymene incisa*. Exotic species were recorded in low densities. Weed species recorded included Whisky grass, Narrow-leafed Carpet grass, Fleabane *Conyza bonariensis* and African Lovegrass *Eragrostis curvula*.
Justification of PCT	Floristic composition soil type and landscape position aligns with Blackbutt - Rough-barked Apple - Turpentine - ferny tall open forest BioNet conditional benchmarks.
TEC Status	Commonwealth EPBC Act: Not listed NSW BC Act: Not listed Legacy PCT 1564 and PCT 1619 were not associated with a TEC.
PCT percent cleared value	21.67 % (NSW DCCEEW 2024b)
Photo 3 PCT 3544 in moderate condition on sandy soils	

PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	
Photo 4 PCT 3544 disturbed remnant with clay influence	

Table 5 PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*

PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	
Common name	*Hunter Coast Paperbark-Swamp Mahogany Forest*
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Swamp Forests
Extent within subject land	Approximately 2.48 ha, with 0.24 ha proposed for removal
Community description	A mid-high to tall, occasionally very tall, mixed Melaleuca-eucalypt open or closed forest, found in coastal lowland inundated freshwater swamps between Gosford and Port Stephens, Hunter coast. The tree canopy is almost always dominated by a high cover of Broad-leaved Paperbark *Melaleuca quinquenervia*, and very frequently with a sparse or patchy cover of Swamp Mahogany. The mid-stratum occasionally includes a sparse cover of small trees, including Broad-leaved Paperbark, rarely Flax-leaved Paperbark *Melaleuca linariifolia* or *Melaleuca sieberi*. Species in the lower mid-stratum almost always include a sparse cover of *Acacia longifolia* or occasionally Cheese Tree *Glochidion ferdinandi*. The ground layer is typically a dense cover of sedges, aquatic forbs, hardy graminoids, ferns and grasses, the composition of which is likely to vary with seasonal conditions and the depth and coverage of standing water. Species commonly include a patchy cover of Tall Saw-sedge *Gahnia clarkei*, Blue Flax-lily *Dianella caerulea* and an often high cover of Slender Mud-grass *Pseudoraphis paradoxa*. Other occasionally occurring species include Swamp Water Fern *Telmatoblechnum indicum*, *Liparophyllum exaltatum* and a range of sedges including Jointed Twig-rush *Machaerina articulata*, Bare Twig-rush *Machaerina juncea* and rarely, *Baloskion pallens*. On the drier margins of the swamp, other occasional species with a sparse cover include Bordered Panic *Entolasia marginata*, Blady Grass, Bracken and Spiny-headed Matt-rush. This PCT is mainly situated in sand swales and depressions along low-lying Quaternary sand plains below 10 m asl across the Tomago Peninsula. It is also found on sandy alluvial embayments that fringe the large lake systems of the Central Coast, including Wamberal, Tuggerah and Colongra. An elevation outlier (c. 80 m asl) occurs on a headland sand dune swamp in Awabakal Nature Reserve, south of Newcastle. This community overlaps spatially

PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	
	with swamp forest PCTs 4006 and 3996, both with similar canopy dominants, however the former has a mid-stratum of mesophyll shrubs and palms, and the latter a dry shrubby understorey and is only rarely inundated (NSW DCCEEW 2024e).
Condition	Moderate: Despite the low abundance of a midstorey and shrub layer, the Hunter Lowland Redgum forest in the subject land was considered to be in moderate condition, given the moderate native species diversity, abundance and relatively low weed cover.
Vegetation zones	3995_Moderate
Description within subject land	Vegetation at in the subject land is influenced by a north-south soil transition from Tea Gardens Aeolian soil landscape in the south of the site to Medowie Residual soils in the north. There is also an east-west transition from low lying lands influenced by coastal wetland hydrology to drier habitat upslope. PCT 3995 is present on land with lower elevation that may be subjected to periodic inundation. Vegetation contains Broad-leaved Paperbark *Melaleuca quinquenervia, Swamp Oak Casuarina glauca* and Swamp Mahogany *Eucalyptus robusta* in the canopy. Mid storey includes Coastal Wattle *Acacia longifolia* subsp. *sophorae*. Blady Grass and Bracken *Pteridium esculentum* are dominant in the ground layer.
Survey effort	Two BAM plots (40623.01 and 40623.02) were undertaken within the PCT (Figure 6).
Legacy PCT associations	**PCT 1598 *Forest Red Gum grassy open forest on floodplains of the lower Hunter***. Vegetation formation: KF_CH9 Forested Wetlands. Vegetation class: Coastal Floodplain Wetlands. This PCT is located along the western boundary of the subject land, draining into the swamps on the development site's western section (Figure 5). The canopy is dominated by Red Mahogany *Eucalyptus resinifera* and Forest Red Gum *Eucalyptus tereticornis.* The shrub layer is very sparse consisting of Notched Bush-pea *Pultenaea retusa* and Coffee Bush *Breynia oblongifolia.* The ground cover is dominated by native grasses including Blady Grass *Imperata cylindrica*, Silvertop Wallaby Grass *Rytidosperma pallidum,* Smallflower Wallaby Grass *Rytidosperma setaceum* Common Couch *Cynodon dactylon.* The most abundant weeds included Buffalo grass, Whisky Grass and Paspalum. **PCT 1718 *Swamp Mahogany – Flax leaved Paperbark swamp forest on coastal lowlands of the Central Coast***. Vegetation formation: KF_CH9 Forested Wetlands. Vegetation class: Coastal Swamp Forests. This PCT is located along the south-west boundary of the subject land and dominates the wetter habitat within the development site (Figure 5). Native species recorded within the vegetation include Swamp Mahogany, Swamp *oak Casuarina glauca* and Broad-leaved Paperbark *Melaleuca quinquenervia.* Tall Saw-sedge *Gahnia clarkei* dominated the mid storey in moist portions of the community and was supported by native shrub species such as Coastal Wattle and Flax-leaved Paperbark *Melaleuca linariifolia* and climbers such as Dusky Coral Pea *Kennedia rubicunda.* The ground storey included a variety of native ferns, grasses, rush and forbs such as Gristle Fern *Blechnum cartilagineum,* Rainbow Fern *Calochlaena dubia,* Wiry Panic *Entolasia stricta, Juncus prismatocarpus* and Slender Knotweed *Persicaria decipiens*. Weed species recorded included Blackberry complex *Rubus fruticosus, Narrow-leafed Carpet Grass* and Crofton Weed *Ageratina adenophora*.
Justification of PCT	Floristic composition soil type and landscape position align with the PCT BioNet conditional benchmarks and the Hunter lowland redgum forest in the Sydney Basin and NSW North Coast bioregions final determination (NSW Scientific Committee 2011) based on the following:

PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	
	• Landscape position in gentle slopes arising from depressions and drainage flats on Permian sediments of the Hunter Valley floor in NSW North Coast Bioregion. • Location within the Post Stephens LGA. • The canopy is dominated by Forest Red Gum. • Presence of Coffee Bush, Bushy Hedgehog-grass *Echinopogon caespitosus and* Wiry Panic *Entolasia stricta.*
TEC Status	Commonwealth EPBC Act: Endangered – *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.* NSW BC Act: Endangered – *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* Legacy PCT 1598 and PCT 1718 are associated with BC Act listed *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*.
PCT percent cleared value	61.21% (NSW DCCEEW 2024b)
Photo 5 PCT 3995 Broad-leaved Paperbark dominant with Swamp Oak over ferny ground layer	
Photo 6 PCT 3995 Eucalypt dominant over grass-sedge ground layer	

3.1.7. Threatened ecological communities

Vegetation within the subject land was found to represent one TEC listed under the Commonwealth EPBC Act and one TEC listed under the NSW BC Act, as outlined in Table 6 and Table 7 and below and illustrated on Figure 9.

Table 6 Summary of EPBC Act TECs within the subject land

EPBC Act TEC	Listing status	Subject land (ha)	Development footprint (Ha)
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	2.48	0.24

Table 7 Summary of BC Act TECs within the subject land

BC Act TEC	Listing status	Subject land (ha)	Development footprint (Ha)
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	2.48	0.24

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 (DPIE 2020a), and as described in Table 4 to Table 5 above. This resulted in two vegetation zones identified within the development footprint. Table 8 describes each of the zones, and provides details on the numbers of BAM floristic plots undertaken within (or associated with) each zone.

Patch size classes for each vegetation zone present within the subject land (Figure 7) 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 relatively large patch of connecting vegetation with an area of greater than 100 hectares. The connected vegetation comprises Tilligerry State Conservation Area to the south and Campvale Swamp to the west.

Patch size classes for each vegetation zone are also outlined in Table 8 below.

Table 8 Vegetation zones within the subject land

Vegetation zone	Plant Community Type	BAM plots completed	Subject land (ha)	Max. patch size development footprint
3544_Moderate	PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	2	0.74	>100 ha

Vegetation zone	Plant Community Type	BAM plots completed	Subject land (ha)	Max. patch size development footprint
3995_Moderate	PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	2	2.48	>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 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes and function.
- A 20 metre x 20 metre 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, four BAM plots have been completed, one of which occurs within the vegetation zones present development footprint and three occur adjacent to the footprint to enable collection of relevant vegetation data. These three plots have been retained for use in the assessment they are still considered to be representative of the vegetation present within the development footprint. Details are provided in Table 9 and shown on Table 10.

Vegetation integrity plots were undertaken in each vegetation zone.

Table 9 BAM plots completed within the subject land and study area

BAM plot reference	Vegetation zone
40623.01	3995_Moderate
40623.02	3995_Moderate
40623.03	3544_Moderate
40623.04	3544_Moderate

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM (DPIE 2020a) 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 NSW DCCEEW 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 are presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 10.

Table 10 Vegetation zone integrity scores

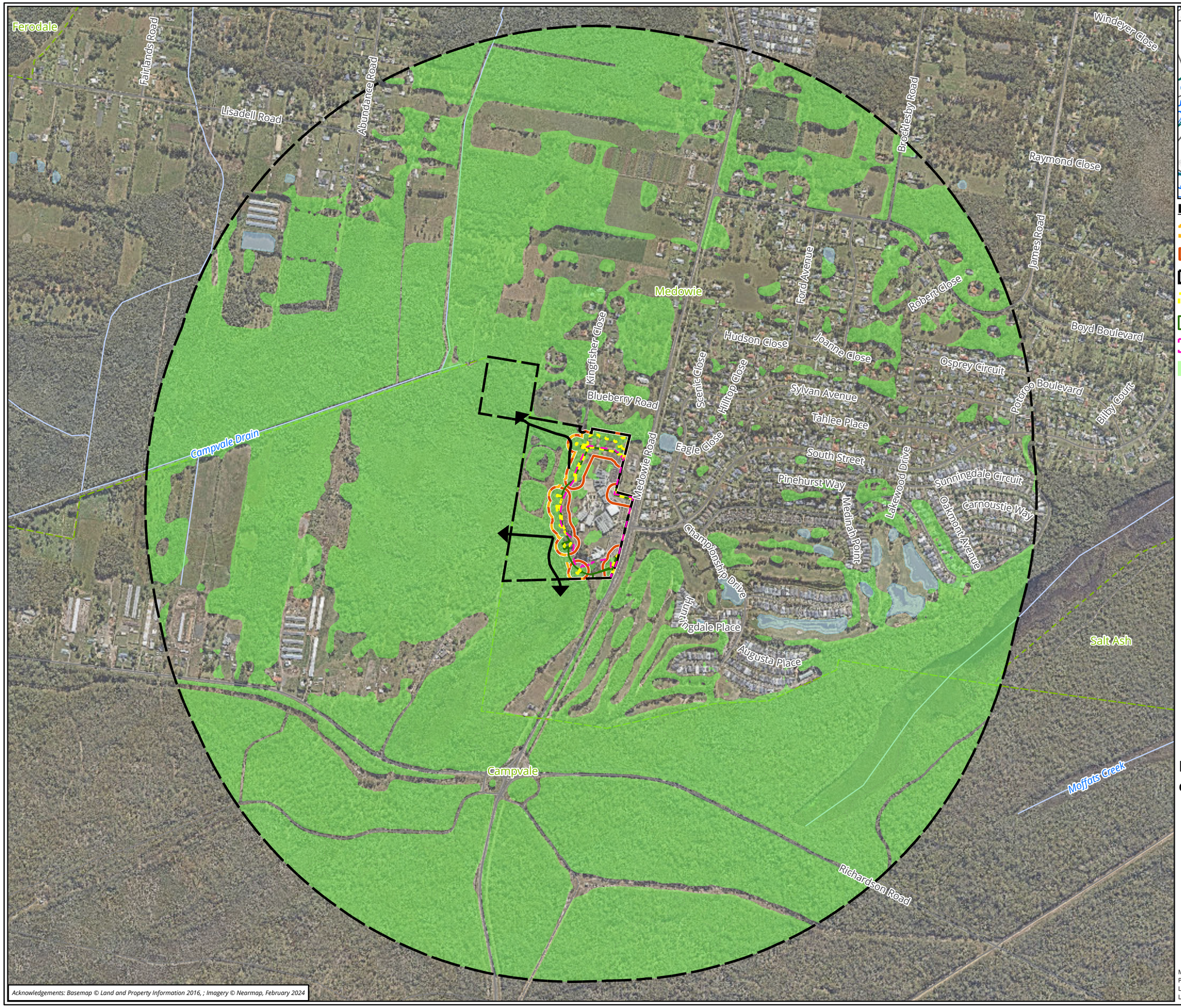
Vegetation zone	Composition score	Structure score	Function score	VI score*	Hollow-bearing trees present
3544_Moderate	45.0	36.0	72.9	49.1	Yes
3995_Moderate	89.6	41.1	91.1	69.5	Yes

**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.

The vegetation integrity score is above 20 for all vegetation zones. As such, ecosystem credit offsets are required for all impacts to mapped native vegetation within the subject land.



Legend

- Study area
- Subject land
- Development site
- Development footprint
- Approved BDAR area
- Approved EIS area
- Native vegetation
- Habitat connectivity

Figure 4 Native vegetation extent

0 100 200 300 400 500

Metres

Scale: 1:13,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

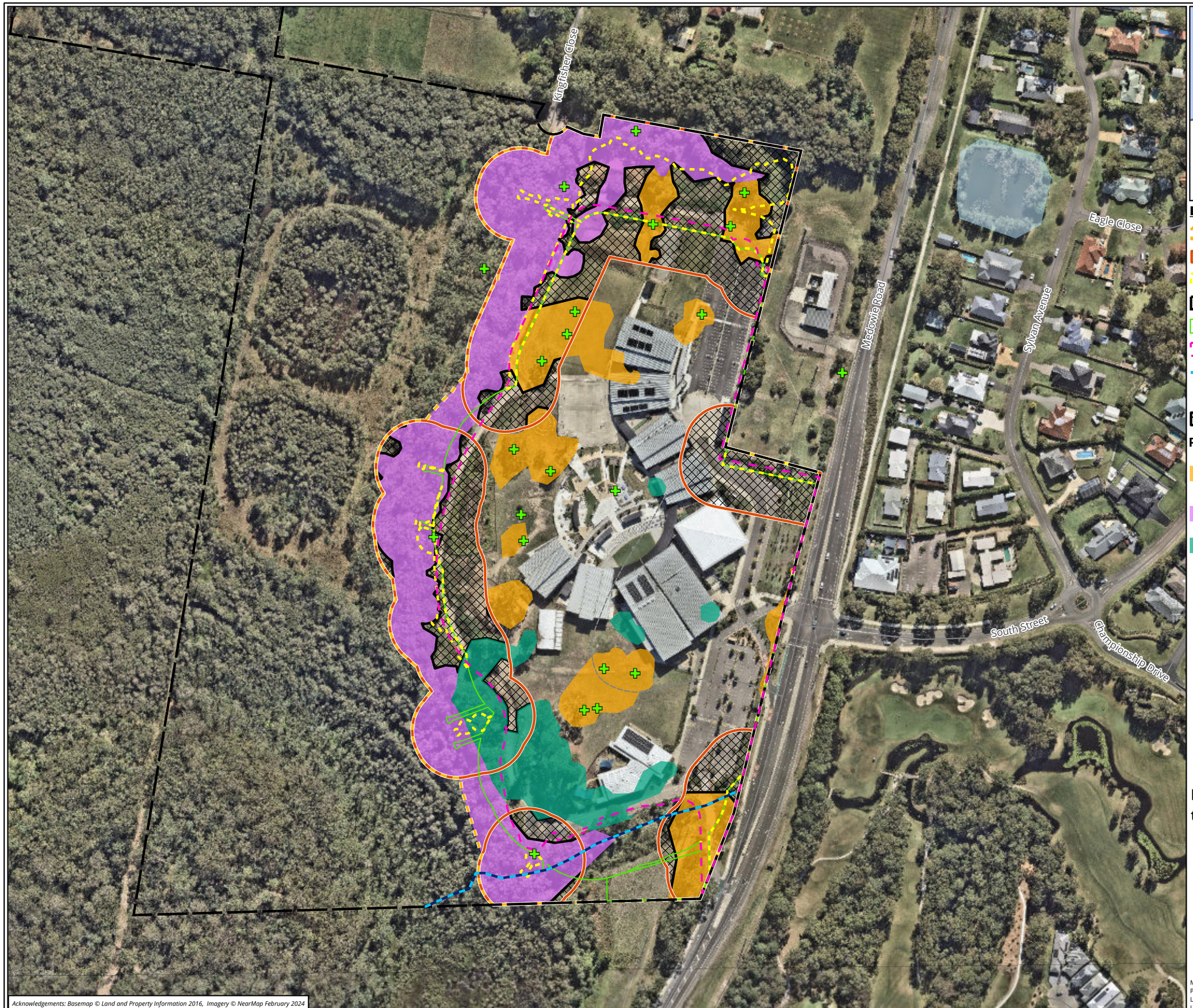
N

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB, Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F4_NativeVeg

Acknowledgements: Basemap © Land and Property Information 2016, ; Imagery © Nearmap, February 2024



Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- Hydro line (Biosis 2018)
- Hollow-bearing Tree
- Cleared

Plant Community Types

- PCT 3544 Coastal Sands Apple-Blackbutt Forest
- PCT 3995 Hunter Coast Paperbark-Swamp Mahogany Forest
- Exotic vegetation (Slash Pine)

Figure 5 Vegetation within the subject land

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, Date: 20 February 2025,
Prepared for CH, Prepared by HL, JB, Last edited by: hliswoyo
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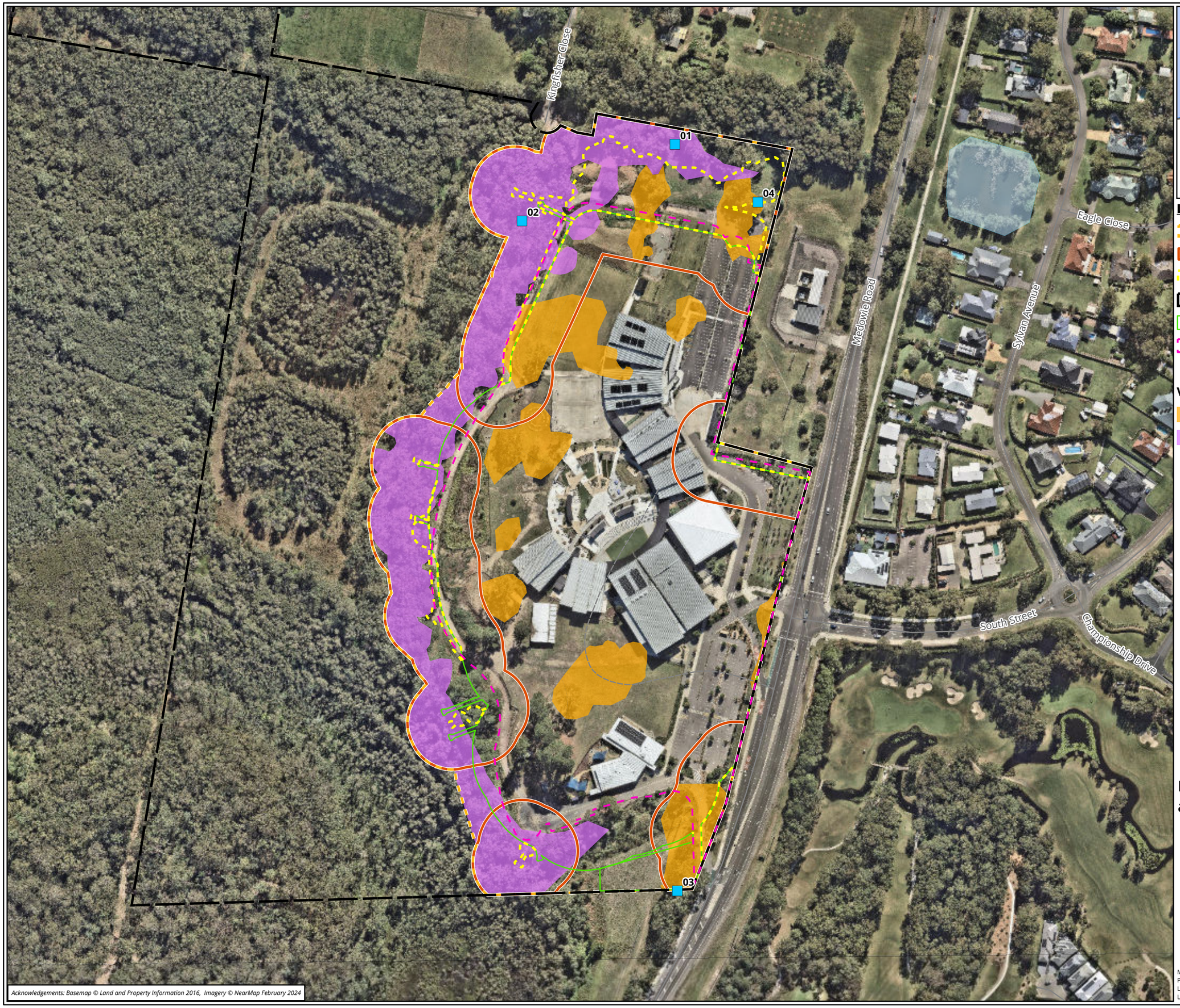
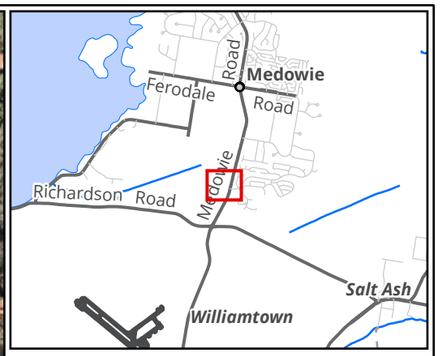
Layout: 40623_F5_BiosisVeg





Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- BAM Plot

Vegetation zones

- 3544_Mod
- 3995_Mod

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

Figure 6 Vegetation zones and plot locations

0 25 50 75 100 125

Metres

N

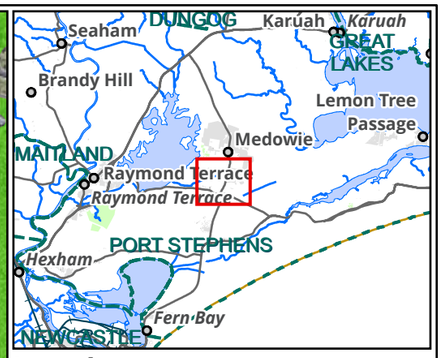
Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F6_VZ_Plots



Legend

- Study area
- Subject land
- Development site
- Development footprint
- Approved BDAR area
- Approved EIS area
- Assessment area
- Hydro line (Biosis 2018)

Patch size

- ≥100ha (3544_Mod, 3995_Mod)

Figure 7 Patch size

0 100 200 300 400 500

Metres

Scale: 1:13,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F7_PatchSize

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

Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved EIS area
- Hydro line (Biosis 2018)

Threatened Ecological Communities

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (EEC, EPBC Act) and
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC, BC Act)

Figure 8 Threatened Ecological Communities

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: , Date: 16 August 2024,
, Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F8_TEC

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 11 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.

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 11 Ecosystem credit species (predicted species)

Species name	Common name	Sensitivity to gain class	Biodiversity risk weighting	EPBC Act	BC Act
Anthochaera phrygia	Regent Honeyeater	High	3.00	CE	CE
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	1.50	-	VU
Botaurus poiciloptilus	Australasian Bittern	Moderate	2.00	EN	EN
Calidris alba	Sanderling	High	2.00	-	VU
Calidris canutus	Red Knot	High	2.00	VU	-
Calidris ferruginea	Curlew Sandpiper	High	3.00	CE	CE
Calidris tenuirostris	Great Knot	High	3.00	VU	VU
Callocephalon fimbriatum	Gang-gang Cockatoo	Moderate	2.00	EN	EN, E2
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	High	2.00	VU	VU, E2
Charadrius leschenaultii	Greater Sand-plover	High	2.00	VU	VU
Charadrius mongolus	Lesser Sand-plover	High	2.00	EN	VU
Circus assimilis	Spotted Harrier	Moderate	1.50	-	VU
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	2.00	VU	VU
Daphoenositta chrysoptera	Varied Sittella	Moderate	1.50	-	VU
Dasyurus maculatus	Spotted-tailed Quoll	High	2.00	EN	VU
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	2.00	-	EN
Esacus magnirostris	Beach Stone-curlew	High	3.00	-	CE

Species name	Common name	Sensitivity to gain class	Biodiversity risk weighting	EPBC Act	BC Act
Falsistrellus tasmaniensis	Eastern False Pipistrelle	High	2.00	-	VU
Glossopsitta pusilla	Little Lorikeet	High	2.00	-	VU
Haliaeetus leucogaster	White-bellied Sea-Eagle	High	2.00	-	VU
Hieraaetus morphnoides	Little Eagle	Moderate	1.50	-	VU
Hirundapus caudacutus	White-throated Needletail	High	2.00	VU	VU
Ixobrychus flavicollis	Black Bittern	Moderate	1.50	-	VU
Lathamus discolor	Swift Parrot	Moderate	3.00	CE	EN
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	High	2.00	VU	-
Lophoictinia isura	Square-tailed Kite	Moderate	1.50	-	VU
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Moderate	1.50	EN	EN
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	1.50	-	VU
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	2.00	-	VU
Miniopterus australis	Little Bent-winged Bat	High	3.00	-	VU
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	3.00	-	VU
Neophema pulchella	Turquoise Parrot	High	2.00	-	VU
Numenius madagascariensis	Eastern Curlew	High	3.00	CE	-
Pandion cristatus	Eastern Osprey	Moderate	1.50	-	VU
Petaurus australis	Yellow-bellied Glider	High	2.00	VU	VU, E2
Petroica boodang	Scarlet Robin	Moderate	1.50	-	VU
Phoniscus papuensis	Golden-tipped Bat	High	2.00	-	VU
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	1.50	-	VU
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	High	2.00	-	VU
Pseudomys novaehollandiae	New Holland Mouse	High	2.00	VU	-
Pteropus poliocephalus	Grey-headed Flying-fox	High	2.00	VU	VU
Ptilinopus superbus	Superb Fruit-Dove	Moderate	1.50	-	VU
Pyrrholaemus sagittatus	Speckled Warbler	High	2.00	-	VU

Species name	Common name	Sensitivity to gain class	Biodiversity risk weighting	EPBC Act	BC Act
Rostratula australis	Australian Painted Snipe	Moderate	2.00	EN	EN
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	2.00	-	VU
Scoteanax rueppellii	Greater Broad-nosed Bat	High	2.00	-	VU
Stagonopleura guttata	Diamond Firetail	Moderate	1.50	VU	VU
Syconycteris australis	Common Blossom-bat	High	2.00	-	VU
Xenus cinereus	Terek Sandpiper	High	2.00	VU	VU

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 assessment area, the PCTs present within subject land, and patch sizes listed in Table 8.

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. A total of 46 predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, geographic limitations and substantial degradation of existing potential habitat.

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 the subject of further assessment. In this case, no targeted survey was undertaken and assumption of presence for all candidate species credit species has been applied.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 12 (flora species) and Table 13 (fauna species).

Threatened flora

Habitat for threatened flora species within the subject land is considered to be very limited. Historical and ongoing disturbance in the form of vegetation removal, periodical grass mowing and invasion of dense and smothering exotic plant species has significantly degraded the habitats present. However, marginal habitat can be found along the west and south boundaries adjacent to moderate and good condition vegetation. Candidate species (as listed in Table 12) are largely low growing ground-cover species, highly sensitive to this form of disturbance.

Table 12 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 12 Candidate flora species credit species

Species name	Common name	Survey period	Method of assessment
Angophora inopina	Charmhaven Apple	Year-round	Targeted survey
Callistemon linearifolius	Netted Bottle Brush	October-January	Targeted survey
Commersonia prostrata	Dwarf Kerrawang	Year-round	Targeted survey
Diuris arenaria	Sand Doubletail	September	Targeted survey
Eucalyptus parramattensis* subsp. *decadens	Earp's Gum	Year-round	Targeted survey
Grevillea parviflora* subsp. *parviflora	Small-flower Grevillea	August-November	Targeted survey
Lindernia alsinoides	Noah's False Chickweed	November-February	Targeted survey
Prostanthera densa	Villous Mint-bush	Year-round	Targeted survey
Rhodamnia rubescens	Scrub Turpentine	Year-round	Targeted survey

Threatened fauna

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

Fauna habitat within the subject land mostly consists of isolated native canopy trees over a low understorey or ground cover (consisting of primarily exotic grasses) (Figure 5). Large areas of the subject land have been used to stockpile material removed from the approved EIS area.

Native vegetation within the subject land is considered to be of marginal or low value to threatened species due to the effects of current and historic disturbance such as clearing and edge effects. These practices have resulted in substantially modified vegetation composition and structure within the subject land and have likely lead to an increase in introduced predator (e.g. European Fox *Vulpes vulpes* and Cat *Felis catus*) pressure.

One ephemeral creek crosses a portion the subject land in the south-east. This creekline may provide some marginal dispersal habitat for threatened frogs and provides connectivity between habitat to the east of the subject land, across Medowie Road and to the west of the subject land. The aquatic habitats associated with this watercourse are further discussed in Section 2.1.3.

Within the subject land there are three hollow-bearing trees, and their TPZ may be impacted by the development as a result of compression from stockpiles. These trees provide hollows potentially suitable for roosting for threatened microbats but are considered to be unsuitable for breeding by other threatened species due to a variety of factors including aspect, size, position within the tree and position within the landscape.

Habitat within the subject land may provide foraging resources for some threatened species in the form of large flowering eucalypts including Swamp Mahogany, Blackbutt and Forest Red Gum (Figure 5). Swamp Mahogany and Forest Red Gum are winter-flowering species and therefore individuals within the subject land

likely provide marginal nectar resources for nectivorous birds, including threatened species such as Swift Parrot *Lathamus discolor* and Regent Honeyeater *Anthochaera phrygia*. The subject land and broader development site are not, however, considered 'important habitat' (as per the BAM) for either the Swift Parrot or Regent Honeyeater.

Native vegetation adjoining the subject land to the west is well connected to surrounding larger areas of bushland considered to provide higher quality habitat for all threatened species with potential to occur within the subject land.

The development site and surrounding bushland were observed to provide foraging resources for several threatened species during field assessment for the approved BDAR (Biosis 2018). Six threatened fauna species were recorded within the development site during field assessment for the approved BDAR (Biosis 2018) including; Koala, Grey-headed Flying-fox, Powerful Owl, Masked Owl, White-bellied Sea-eagle and Wallum Froglet. Wallum Froglet, Powerful Owl and Grey-headed Flying-fox were incidentally recorded within the subject land during field investigations for the current assessment. Koala and Wallum Froglet require offset under the BAM (DPIE 2020a) for impacts to breeding habitat, however the subject land is considered likely to provide only marginal foraging habitat for the remaining highly mobile threatened species. No breeding habitat for Grey-headed Flying-fox, Powerful Owl, Masked Owl or White-bellied Sea-eagle occurs within the subject land. Koala are expected to forage occasionally on feed tree species within the subject land and may disperse across the subject land from Preferred Koala habitat immediately west of the subject land. The project will result in removal of Koala foraging habitat but will not impact habitat connectivity for Koala in the locality.

Table 13 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 13 Candidate fauna species credit species

Species name	Common name	Survey period	Method of assessment
Crinia tinnula	Wallum Froglet	Year-round	Presence assumed
Hoplocephalus stephensii	Stephens' Banded Snake	October-March	Targeted survey
Myotis macropus	Southern Myotis	October-March	Targeted survey
Petalura gigantea	Giant Dragonfly	December-January	Targeted survey
Petauroides volans	Greater Glider (southern and central)	Year-round	Targeted survey
Petaurus norfolcensis	Squirrel Glider	Year-round	Targeted survey
Phascogale tapoatafa	Brush-tailed Phascogale	December-June	Targeted survey
Phascolarctos cinereus	Koala	Year-round	Presence assumed
Planigale maculata	Common Planigale	Year-round	Presence assumed
Vespadelus troughtoni	Eastern Cave Bat	November-January	Targeted survey

4.2.1. Threatened species survey details

As determined through consultation with NSW DCCEEW, targeted threatened species surveys were undertaken within the subject land where feasible, as a suitable representation of the development footprint prior to impact. Assumption of presence for candidate species credit species has been applied for one species

(Koala) considered present for the approved BDAR (Biosis 2018) and an additional two species (Wallum Froglet and Common Planigale) that were not subject to targeted survey.

Targeted threatened species surveys of the subject land were undertaken 23 August 2024 to 21 January 2025. Weather observations for each survey date are shown in Table 14.

Table 14 Weather observations during targeted flora and fauna surveys (Williamtown, NSW)

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)
		Min.	Max.	
Threatened flora	23/08/2024	9.1	21.9	0
Threatened flora	16/09/2024	6	21.3	6.4
Mammals (Camera trapping) **Microbats (Harp trapping)**	2/12/2024	16.9	35.5	0.4
Mammals (Camera trapping) **Microbats (Harp trapping)**	3/12/2024	21.3	33.1	0
Reptiles (Spotlighting) **Mammals (Spotlighting)** **Mammals (Camera trapping)** **Microbats (Harp trapping)**	4/12/2024	22.7	25.7	0
Reptiles (Spotlighting) **Mammals (Spotlighting)** **Mammals (Camera trapping)** **Microbats (Harp trapping)**	5/12/2024	19.9	26.3	0
Mammals (Camera trapping) **Microbats (Harp trapping)**	6/12/2024	20.2	33.9	0
Mammals (Camera trapping) **Microbats (Harp trapping)**	7/12/2024	22.7	34.2	0
Mammals (Camera trapping) **Microbats (Harp trapping)**	8/12/2024	22.2	29.9	0.8
Mammals (Camera trapping)	9/12/2024	19.7	24.3	1.6
Mammals (Camera trapping)	10/12/2024	21.1	25.8	0.2
Mammals (Camera trapping)	11/12/2024	15.9	26	0.2
Mammals (Camera trapping)	12/12/2024	16.2	30.3	0
Mammals (Camera trapping)	13/12/2024	18.3	34.8	0
Mammals (Camera trapping)	14/12/2024	22	28.7	0
Mammals (Camera trapping)	15/12/2024	20.3	27.1	0
Reptiles (Spotlighting) **Mammals (Spotlighting)** **Mammals (Camera trapping)**	16/12/2024	20.4	32.2	0
Reptiles (Spotlighting) **Invertebrates (Area search)**	17/12/2024	18.2	37.6	0

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)
		Min.	Max.	
Mammals (Spotlighting) **Mammals (Camera trapping)**				
Threatened flora **Mammals (Camera trapping)**	18/12/2024	17.9	22.9	0.2
Mammals (Camera trapping)	19/12/2024	17.4	24.9	1.2
Mammals (Camera trapping)	20/12/2024	13.4	25.2	0
Mammals (Camera trapping)	21/12/2024	12.9	33.8	0
Mammals (Camera trapping)	22/12/2024	21.4	28.4	0
Mammals (Camera trapping)	23/12/2024	20.5	35	0
Mammals (Camera trapping)	24/12/2024	13.8	24.6	0
Mammals (Camera trapping)	25/12/2024	15.4	28.4	0
Mammals (Camera trapping)	26/12/2024	14.9	30.9	0
Mammals (Camera trapping)	27/12/2024	21.3	35.8	0
Mammals (Camera trapping)	28/12/2024	19.9	26.6	2
Mammals (Camera trapping)	29/12/2024	16.1	29.1	0
Mammals (Camera trapping)	30/12/2024	20.3	27.8	0
Mammals (Camera trapping)	31/12/2024	15.9	29.1	0
Mammals (Camera trapping)	1/01/2025	16.7	33	0
Mammals (Camera trapping)	2/01/2025	19.9	25.3	0
Mammals (Camera trapping)	3/01/2025	20.2	26.2	1.8
Mammals (Camera trapping)	4/01/2025	15.9	29.7	0
Mammals (Camera trapping)	5/01/2025	16.1	34.3	0
Mammals (Camera trapping)	6/01/2025	17.4	35	0
Mammals (Camera trapping)	7/01/2025	21.1	22.3	9.6
Mammals (Camera trapping)	8/01/2025	18.7	20.3	29.8
Mammals (Camera trapping)	9/01/2025	17.5	24.5	52.2
Invertebrates (Area search)	21/01/2025	13.8	27.5	0

Information from the Australia Government Bureau of Meteorology website.

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

Threatened flora

Targeted survey was undertaken for; Charmhaven Apple, Netted Bottle Brush, Dwarf Kerrawang, Sand Doubletail, Earp's Gum, Small-flower Grevillea, Noah's False Chickweed, Villous Mint-bush and Scrub Turpentine.

Survey method and effort

Survey methods included 10–40 metre separated transect searches of areas of potential habitat in August, September and December 2024 (DPIE 2020b).

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).

Timing of survey

Survey was conducted on 23 August, 16 September and 18 December 2024, within the allowable survey periods prescribed by the TBDC survey guides (as per Table 12).

Survey personnel and relevant experience

Targeted flora surveys were undertaken by the Biosis ecologists listed in Table 15.

Table 15 Targeted flora survey personnel and relevant experience

Staff member	Role	Relevant experience
Brendon True	Senior Botanist - Major Projects	Brendon has over 12 years' experience and key expertise in the identification of native flora and vegetation communities throughout NSW including within the Sydney Basin, Hunter Valley, Central and New England Tablelands, and NSW North Coast.
Brooke Corrigan	Senior Botanist - Offset Coordinator	Brooke has over 17 years' experience assisting Industry, government and private landholders to assess and manage biodiversity assets and undertake flora surveys within NSW.

Results

Table 16 provides a summary of the results of the targeted flora surveys completed.

Table 16 Summary of targeted flora survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Angophora inopina	Charmhaven Apple	40 m separated transect searches of areas of potential habitat in August, September and December 2024.	Not recorded during surveys	NA
Callistemon linearifolius	Netted Bottle Brush	15 m separated transect searches of	Not recorded during surveys	NA

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		areas of potential habitat in December 2024.		
Commersonia prostrata	Dwarf Kerrawang	15 m separated transect searches of areas of potential habitat in August, September and December 2024.	Not recorded during surveys	NA
Diuris arenaria	Sand Doubletail	10 m separated transect searches of areas of potential habitat in September 2024.	Not recorded during surveys	NA
Eucalyptus parramattensis* subsp. *decadens	Earp's Gum	40 m separated transect searches of areas of potential habitat in August, September and December 2024.	Not recorded during surveys	NA
Grevillea parviflora* subsp. *parviflora	Small-flower Grevillea	15 m separated transect searches of areas of potential habitat in August and September 2024.	Not recorded during surveys	NA
Lindernia alsinoides	Noah's False Chickweed	10 m separated transect searches of areas of potential habitat in December 2024.	Not recorded during surveys	NA
Prostanthera densa	Villous Mint-bush	15 m separated transect searches of areas of potential habitat in August, September and December 2024.	Not recorded during surveys	NA
Rhodamnia rubescens	Scrub Turpentine	20 m separated transect searches of areas of potential habitat in August, September and December 2024.	Not recorded during surveys	NA

Limitations

There were no limitations to these 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 13 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.

Fauna habitat within the subject land was found to be significantly degraded due to previous disturbance and the lack of understorey and native ground cover for foraging and shelter. As such, the potential presence of the majority of the listed fauna species outlined above is considered to be on a transient basis only, as they fly over the site, or move through the site, foraging as part of their larger home range.

Habitat values typically increase with improved vegetation condition in the retained vegetation of the wider development site to the west, south and north. These areas have been assessed as holding a higher potential to support threatened fauna. The remainder of the subject land supports no fauna habitat of significance. The site has been subject to disturbance, and currently exists as native vegetation sparsely covering the site with cleared areas between, however, this is not considered to support habitat of any significance to species other than those common to urban/disturbed environments.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 17.

Table 17 Habitat features with potential to support threatened species credit species

Habitat feature	Presence within the development footprint
Hollow-bearing trees	Habitat trees supporting hollows limited to small (<50 mm diameter) hollows were present in the subject land. These trees have the potential to provide breeding resources for a range of native fauna species including microbats, but are unlikely to provide habitat for threatened cockatoos (Gang-gang Cockatoo) or owls (Barking Owl, Masked Owl and Powerful Owl) due to the small size and low height of the hollows.
Feed tree species	A variety of tree species identified as Koala use trees within the North Coast Koala management area, which includes the subject land, were detected during the assessment. These trees were identified in areas where there are known Koala records. Trees and shrubs providing food resources for smaller mammals such as Squirrel Glider were also recorded, but in low abundance and subjected to disturbance within the development footprint.

Habitat feature	Presence within the development footprint
Caves and rocky overhangs	There are no caves or rocky overhangs within the subject land or assessment area.
Rocky outcrops and sandstone crevices	There are no rocky outcrops or sandstone crevices within the subject land.
Major and minor watercourses and waterbodies (i.e., dams)	An unmapped waterway in the south-eastern section of the subject land and the supporting vegetation along these systems provide potential habitat for amphibians including Wallum Froglet. Riparian areas also have the potential to support threatened fauna species in a fragmented landscape such as the one relevant to the current project.
Woody debris and leaf litter	There is minimal woody debris or leaf litter within the subject land, due to the ongoing management and disturbance to the groundcover.

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.

Reptiles

Targeted reptile surveys were undertaken for Stephens' Banded Snake.

Survey method and effort

Surveys included spotlighting surveys, with ecologists undertaking 120 person-minutes of survey per replicate over four replicate nights. All native vegetation and access tracks within the subject land were surveyed, searching for the species via movement or eyeshine.

Justification of survey method and effort

Survey guidelines followed included:

- *Threatened Reptiles – Biodiversity Assessment Method Survey Guide* (DPE 2022b).
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
- *Survey Guidelines for Australia's Threatened Reptiles* (DSEWPC 2011).

Timing of survey

Survey was conducted on 4–5 and 16-17 December 2024, within the allowable survey periods prescribed by the TBDC survey guides (October–March) and *Threatened Reptiles – Biodiversity Assessment Method Survey Guide* (DPE 2022b) (as per Table 13).

Survey personnel and relevant experience

Reptile surveys were undertaken by the Biosis ecologists outlined in Table 18.

Table 18 Targeted reptile survey personnel and relevant experience

Staff member	Role	Relevant experience
Dr Caragh Heenan	Senior Zoologist – Major Projects	Caragh has over nine years' experience in the environmental sector working in ecology and threatened species management, including undertaking fauna surveys in NSW, SA and NT.
Liarni Rayment	Graduate Ecologist	Liarni has over two years' experience undertaking flora and fauna surveys in NSW.

Results

Table 19 provides a summary of the results of the reptile surveys completed.

Table 19 Summary of reptile survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Hoplocephalus stephensii	Stephens' Banded Snake	Spotlighting in suitable habitat for 120 person-minutes per four replicate nights in December 2024.	Not recorded during surveys	NA

Limitations

There were no limitations to these surveys.

Invertebrates

Targeted invertebrate surveys were undertaken for Giant Dragonfly.

Survey method and effort

No survey method is described for this species, however it is understood, based on previous field experience and working with NSW DCCEEW that area searches should be repeated over two days in suitable habitat. As such, surveys included active area searches, with ecologists undertaking up to 120 person-minutes of survey per two replicate days. All associated native vegetation within the subject land were surveyed, searching for the adults and exuviae.

Justification of survey method and effort

No survey method is described for this species, however it is known that adults emerge October to November and fly until late January (NSW Scientific Committee 1998). Once emerged, adults spend most of their time settled on low vegetation on or adjacent to swamps, or hunting for flying insects over and along swamp margins (NSW DCCEEW 2024h). As such, perched or flying adults can be identified via area searches. Exuviae can be identified on vegetation fringing wet areas.

Timing of survey

Survey was conducted on 17 December 2024 and 21 January 2025, within the allowable survey periods prescribed by the TBDC survey guides (December–January, as per Table 13).

Survey personnel and relevant experience

Invertebrate surveys were undertaken by the Biosis ecologists outlined in Table 20.

Table 20 Targeted invertebrate survey personnel and relevant experience

Staff member	Role	Relevant experience
Dr Caragh Heenan	Senior Zoologist – Major Projects	Caragh has over nine years' experience in the environmental sector working in ecology and threatened species management, including undertaking fauna surveys in NSW, SA and NT.

Results

Table 21 provides a summary of the results of the invertebrate surveys completed.

Table 21 Summary of invertebrate survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Petalura gigantea	Giant Dragonfly	Area searches in suitable habitat over two replicate days in December and January 2025.	Not recorded during surveys	NA

Limitations

There were no limitations to these surveys.

Mammals

Targeted mammal surveys were undertaken for Greater Glider, Squirrel Glider and Brush-tailed Phascogale.

Survey method and effort

Camera trapping was undertaken for arboreal mammals and included four baited cameras per hectare up to 1 hectare then an additional two cameras per hectare of potential habitat to satisfy the requirements for Brush-tailed Phascogale. Cameras were deployed for a minimum of four weeks (28 days), with rebaiting after two weeks. Up to 2.60 hectares of suitable habitat has been identified within the subject land, requiring a total of eight camera traps under the TBDC survey guides. A total of eight traps were deployed over 38 day / nights (minimum 224 trap nights undertaken plus an additional 80 trap nights) within the subject land and wider study area to target optimal habitat.

Spotlight surveys were conducted for two hours on four separate nights (minimum requirement is two nights), at least one week apart to determine the presence of arboreal fauna within hollows or associated habitat located in the subject land. Effort for spotlighting was determined by Greater Glider and Squirrel Glider survey requirements, which prescribe one hour over 1 kilometre of spotlighting to be conducted per stratification unit (in this case, per PCT) at a rate of 10 metres per minute.

Justification of survey method and effort

Survey guidelines followed include:

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

Timing of survey

Camera trapping survey was conducted 2 December 2024 to 9 January 2025. Spotlighting survey was conducted on 4–5 and 16–17 December 2024. Both survey methods were conducted within the allowable survey periods prescribed by the TBDC survey guides (December–June for Brush-tailed Phascogale and year-round for Greater Glider and Squirrel Glider, as per Table 13).

Survey personnel and relevant experience

Arboreal mammal surveys were undertaken by the Biosis ecologists outlined in Table 22.

Table 22 Targeted mammal survey personnel and relevant experience

Staff member	Role	Relevant experience
Dr Caragh Heenan	Senior Zoologist – Major Projects	Caragh has over nine years' experience in the environmental sector working in ecology and threatened species management, including undertaking fauna surveys in NSW, SA and NT.
Liarni Rayment	Graduate Ecologist	Liarni has over two years' experience undertaking flora and fauna surveys in NSW.

Results

Table 23 provides a summary of the results of the mammal surveys completed.

Table 23 Summary of mammal survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Petauroides volans	Greater Glider (southern and central)	Camera trapping for 14 consecutive days / nights (minimum). Units were deployed for 38 days / nights. Spotlighting through suitable habitat for one hour, repeated on two occasions (minimum). Spotlighting was undertaken over four nights.	Not recorded during surveys	NA
Petaurus norfolcensis	Squirrel Glider	Camera trapping for 14 consecutive days / nights (minimum). Units were deployed for 38 days / nights. Spotlighting through suitable habitat for one hour, repeated	Not recorded during surveys	NA

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		on two occasions (minimum). Spotlighting was undertaken over four nights.		
Phascogale tapoatafa	Brush-tailed Phascogale	Camera trapping for 28 consecutive days / nights, with a minimum of eight units required. Units were deployed for 38 days / nights. Spotlighting through suitable habitat for one hour, repeated on two occasions (minimum). Spotlighting was undertaken over four nights.	Not recorded during surveys	NA

Limitations

Identification of arboreal mammals is often limited by visibility, to overcome this photographs were taken with a zoom lens to pick up identifying characteristics that may be ambiguous at times, particularly if vegetation comes in the way of the observer and the animal.

Inclement weather can affect the emergence of fauna and surveys were timed to avoid rain, high wind and extreme temperature variations. As such survey was conducted over two separate weeks rather than multiple nights in a row.

The survey undertaken was considered adequate for the size and overall condition of the subject land given high visibility of the canopy of trees due to limited understory.

Microbats

Targeted microbat surveys were undertaken for Southern Myotis and Eastern Cave Bat.

Survey method and effort

'*Species credit' threatened bats and their habitats* (OEH 2018) recommend harp trapping to confirm that these species are breeding within a locality. Neither of these species are readily identifiable via acoustic means and therefore harp trapping is a reliable survey method for establishing species presence. The survey effort detailed in *'Species credit' threatened bats and their habitats* (OEH 2018) requires four harp traps to be deployed over a period of four nights (a minimum of 16 trap nights) for establishing presence within a subject land of up to 50 ha. As only three traps were available, survey was undertaken over six nights to ensure that sufficient trap nights were obtained (a total of 18 trap nights undertaken). Traps should be deployed within suitable habitat, which consists of associated PCTs within 100 metres of potential breeding habitat. As no breeding habitat was identified, traps were located as close as possible to waterbodies that may be used for

foraging, and associated flyways within PCTs present in the subject land. Traps were checked twice daily for the presence of captured microbats, including prior to sunrise and following sunset each evening.

Justification of survey method and effort

Survey guidelines followed include:

- *'Species Credit' Threatened Bats and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE 2021).
- *Survey Guidelines for Australia's Threatened Bats* (DEWHA 2010c).

Timing of survey

Survey was conducted on 2–8 December 2024, within the allowable survey periods prescribed by the TBDC survey guides (October–March for Southern Myotis and November–January for Eastern Cave Bat, as per Table 13).

Survey personnel and relevant experience

Microbat surveys were undertaken by the Biosis ecologists outlined in Table 24.

Table 24 Targeted microbat survey personnel and relevant experience

Staff member	Role	Relevant experience
Dr Caragh Heenan	Senior Zoologist – Major Projects	Caragh has over nine years' experience in the environmental sector working in ecology and threatened species management, including undertaking fauna surveys in NSW, SA and NT.
Emma Heath	Graduate Ecologist	Emma has over two years' experience undertaking flora and fauna surveys in NSW.

Results

Table 25 provides a summary of the results of the microbat surveys completed.

Table 25 Summary of microbat survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Myotis macropus	Southern Myotis	A total of 16 trap nights across four traps required. Harp trapping was undertaken for six nights across three traps (18 trap nights). Traps were checked twice daily for the presence of captured microbats, including prior to sunrise and following sunset each evening.	Not recorded during surveys	NA

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Vespadelus troughtoni	Eastern Cave Bat	A total of 16 trap nights across four traps required. Harp trapping was undertaken for six nights across three traps (18 trap nights). Traps were checked twice daily for the presence of captured microbats, including prior to sunrise and following sunset each evening.	Not recorded during surveys	NA

Limitations

There were no limitations to these surveys.

4.2.2. Incidental flora and fauna surveys

Six threatened fauna species were recorded outside of the subject land but within the development site during field assessment for the approved BDAR (Biosis 2018), as described in Section 4.2.1 above.

Wallum Froglet, Powerful Owl and Grey-headed Flying-fox were incidentally recorded within the subject land during field investigations for the current assessment. No Grey-headed Flying-fox breeding camps are present. Species credit species offsets under the BAM (DPIE 2020a) and required for Wallum Froglet and Koala, however as no breeding habitat is present within the subject land for Powerful Owl or Grey-headed Flying-fox, the subject land is considered to provide marginal foraging habitat for these species only.

Table 26 Summary of incidental flora and fauna survey results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
Crinia tinnula	Wallum Froglet	Incidental survey	One individual was recorded within the subject land during spotlighting surveys for mammals and reptiles. Breeding habitat is considered to be present within the subject land.	0.04
Ninox strenua	Powerful Owl	Incidental survey	One individual recorded within the subject land. No breeding habitat is present. The subject land is considered to	NA

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
			represent marginal foraging habitat only.	
Phascolarctos cinereus	Koala	Incidental survey (Biosis 2018)	Recorded during field investigations for the approved BDAR (Biosis 2018). Not recorded during current surveys. Assumed present.	0.50
Pteropus poliocephalus	Grey-headed Flying-fox	Incidental survey	Several individuals recorded within the subject land during spotlighting surveys for mammals and reptiles. No breeding camps are present.	NA

4.2.3. Local data

No local data was used for the current assessment.

4.2.4. Expert reports

Sections 5.2 and 5.3 of the BAM (DPIE 2020a) 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.

No expert reports were utilised for the current assessment.

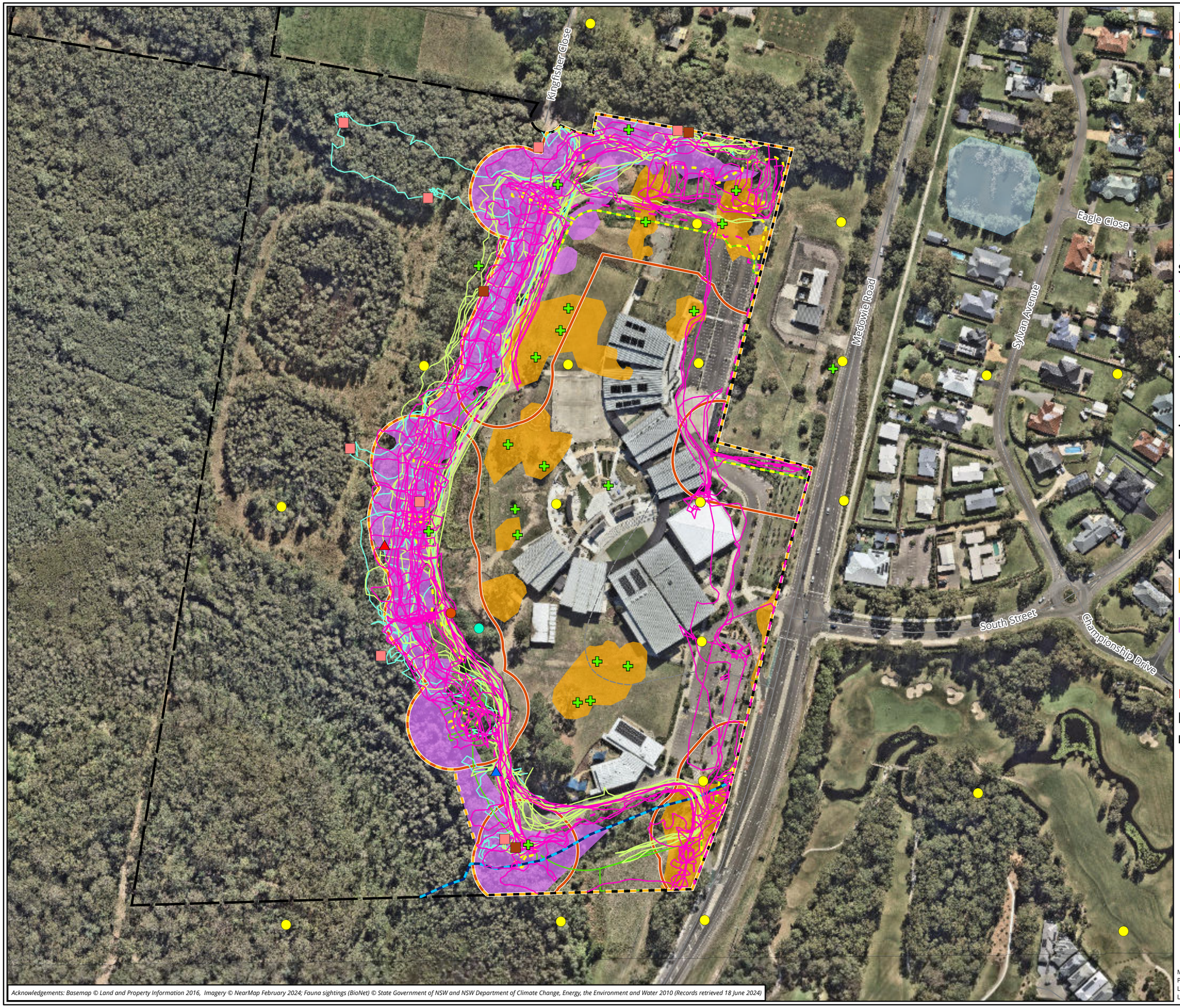
4.2.5. Threatened species summary and polygons

Table 27 provides details of threatened species potentially impacted by the project and outlines the attributes that comprise the threatened species polygons. The assumed presence of threatened species impacted by the project is illustrated in Figure 10.

Table 27 Threatened species polygons within the development footprint

Species name	Common name	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes
Fauna					
Crinia tinnula	Wallum Froglet	0.04	Area	1.50	All native vegetation and microhabitats mapped within the development footprint, located within 50 m of a waterway or Coastal Wetland.

Species name	Common name	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes
Phascolarctos cinereus	Koala	0.50	Area	2.00	The calculated extent of affected Koala habitat includes all patches of vegetation which contain Koala feed trees and which will be removed as a result of the development.
Planigale maculata	Common Planigale	0.50	Area	2.00	All native vegetation mapped within the development footprint.



Legend

- Subject land
- Study area
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- Hollow-bearing Tree
- Camera trap
- Harp trap
- Hydro line (Biosis 2018)

Survey tracks

- Flora survey
- Giant Dragonfly area search
- Spotlighting (mammals, reptiles)

Threatened fauna sightings (Biosis)

- Wallum Froglet - *Crinia tinnula*
- Powerful Owl - *Ninox strenua*

Threatened fauna sightings (BioNet)

- Greater Broad-nosed Bat - *Scoteanax rueppellii*
- Koala - *Phascolarctos cinereus*
- White-bellied Sea-Eagle - *Haliaeetus leucogaster*

Plant Community Types

- PCT 3544 Coastal Sands Apple-Blackbutt Forest
- PCT 3995 Hunter Coast Paperbark-Swamp Mahogany Forest

NOT TO BE MADE PUBLIC

Figure 9 Targeted species mapping

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

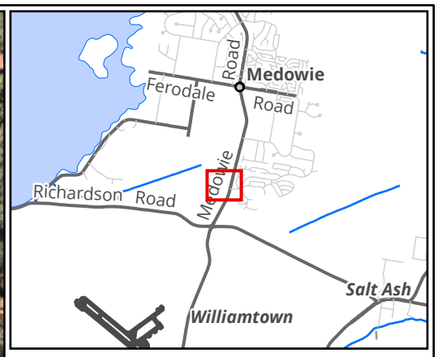
Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 27 February 2025,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F9_TargetedSpec



Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- Hydro line (Biosis 2018)

Threatened species polygons

- Wallum Froglet - *Crinia tinnula*
- Koala - *Phascolarctos cinereus* and Common Planigale - *Planigale maculata*

Vegetation zones

- 3544_Mod
- 3995_Mod

SEPP (Resilience and Hazards) 2021

- Coastal Wetlands

Waterbodies

- Dam

Figure 10 Threatened species polygon

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEMGroup

Matter: 40623, 38594, Date: 21 February 2025,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F10_ThrSpecPoly_2

STAGE 2 — IMPACT ASSESSMENT (BIODIVERSITY VALUES)

5. Avoid and minimise impacts

This section demonstrates the efforts to minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with BAM:

- Modes or technologies that would minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.
- Efforts to minimise impacts (including prescribed impacts) to biodiversity values.
- Other site constraints that the proponent has considered.

Avoidance and an analysis of alternatives was not possible to be undertaken as impacts had already occurred at the time of the assessment.

5.1. Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the development site is to avoid and/or minimise the removal of native vegetation and fauna habitat. Avoidance and an analysis of alternatives was not possible to be undertaken as impacts had already occurred at the time of the assessment. Additional recommendations include measures to mitigate residual impacts in Table 28.

Figure 11 shows the final development footprint, while Figure 12 shows areas of avoidance to minimise impacts on biodiversity values. The final proposal footprint (including construction and operation) as well as demonstrating indirect impact zones where applicable is shown in Figure 13.

Table 28 Minimisation of impact

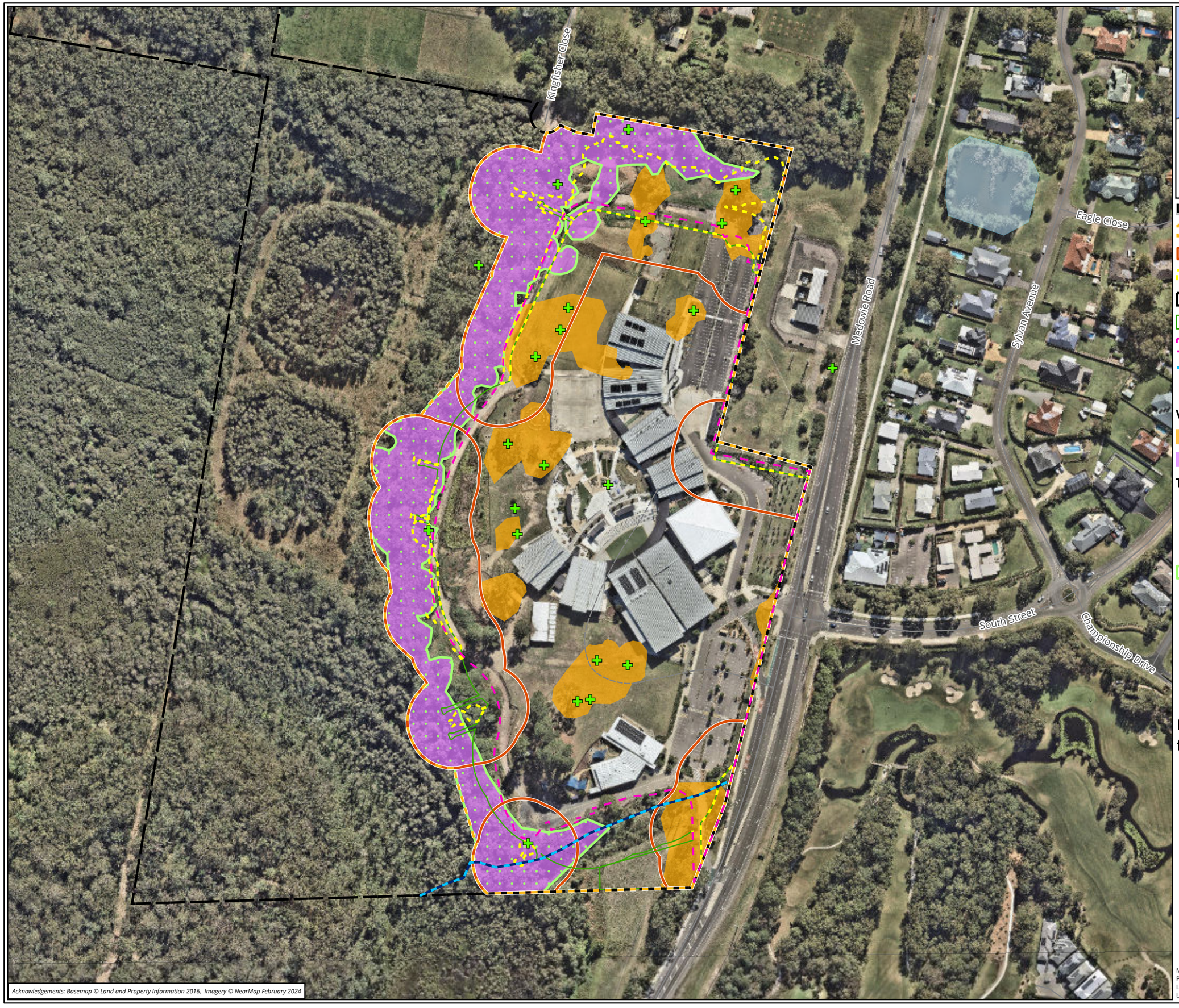
Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.	Removal of trees containing habitat features (Nests, hollows) undertaken by two-stage removal including supervision by an ecologist.	Avoid impacts to fauna utilising habitat features during clearing.	Prior to clearing of vegetation	Proponent and project ecologist
Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.	Not applicable to this assessment.			
Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Not applicable to this assessment.			
Alternative sites within a property on which the	Not applicable to this assessment.			

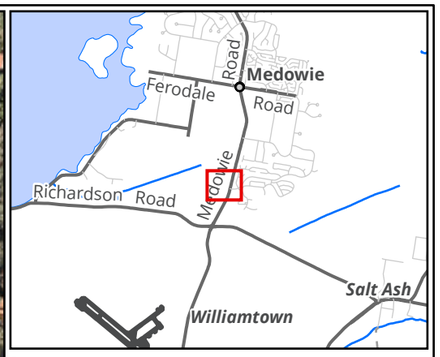
Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.				
Efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.	The subject land has been subjected to extensive prior disturbance. Situating the development in a previously disturbed site was selected rather than creation of a new site at another location.	Reduced impacts to biodiversity as a whole by utilising areas already subject to edge effects and noise/light pollution.	Prior to work commencement	Landowner
Other site constraints that the proponent has considered in determining the location and design of the proposal.	Removal of trees containing habitat features (hollows) undertaken by two-stage removal including supervision by an ecologist.	Avoid impacts to fauna utilising habitat features during clearing.	Prior to clearing of vegetation	Landowner and project ecologist

Following the *Controlled activities on waterfront land – guidelines for riparian corridors on waterfront land* (DPE 2022c) a 10 metre vegetated riparian zone (VRZ) should be maintained along either side of the waterway traversing the southern section of the subject land from the top of both banks. Wherever possible works within the VRZ should be avoided so that the existing riparian vegetation is maintained. This recommendation is made in line with the overarching objective of the controlled activity provisions of the WM Act, which is to establish and preserve the integrity of riparian corridors. Further specific recommendations relevant to the project are made, with regards to the specific objectives listed in *Controlled activities on waterfront land – guidelines for riparian corridors on waterfront land* (DPE 2022c) below:

- Road crossings are permitted within the 10 m VRZ according to the riparian corridor matrix, however the number of access road crossings should be minimised as far as practicable.
- Treat any stormwater run-off prior to discharge into the waterway.
- Locate services and infrastructure outside the VRZ or utilise road crossings wherever practicable.

A range of practical measures to mitigate and manage potential direct and indirect impacts to biodiversity values during the construction and operational phases of the project are described in detail in the following report sections.





Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- Hydro line (Biosis 2018)
- Hollow-bearing Tree

Vegetation zones

- 3544_Mod
- 3995_Mod

Threatened Ecological Communities

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (EEC, EPBC Act) and
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC, BC Act)

Figure 11 Final development footprint

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

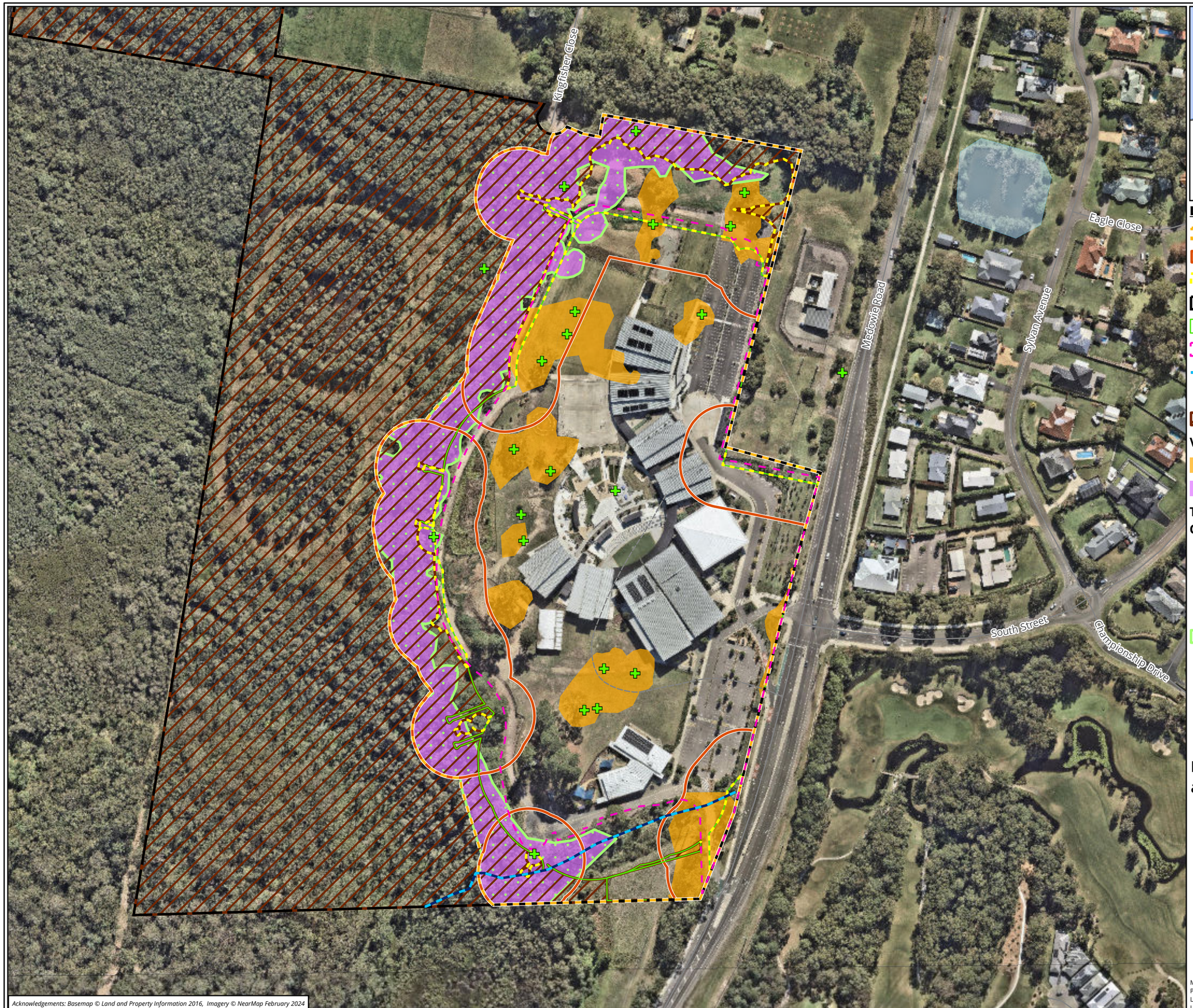
Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 16 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F11_Final_DF



Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area
- Hydro line (Biosis 2018)
- Hollow-bearing Tree
- Areas of avoidance

Vegetation zones

- 3544_Mod
- 3995_Mod

Threatened Ecological Communities

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (EEC, EPBC Act)
  and
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC, BC Act)

Figure 12 Alternate options and avoidance

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 20 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F12_AltOptions

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). The following direct and indirect impacts are unable to be avoided in progressing 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 or disturbance of 0.50 ha of native vegetation, providing limited foraging resources for threatened fauna, including:
  - Up to 0.26 ha of PCT 3544 Coastal Sands Apple-Blackbutt Forest.
  - Up to 0.24 ha of PCT 3995 Hunter Coast Paperbark-Swamp Mahogany Forest consistent with EEC *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* (Endangered, EPBC Act) and *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- Removal or disturbance of 0.50 ha of native vegetation forming potential habitat for species assumed present as part of the current assessment, including Koala and Common Planigale.
- Removal or disturbance of 0.04 ha of native vegetation forming potential habitat for Wallum Froglet assumed present as part of the current assessment.
- Disturbance of 0.03 ha of land within the mapped boundary of a Coastal Wetland and 0.07 ha of land within the buffer to the Coastal Wetland.
- Removal or disturbance to three hollow-bearing trees providing potential roosting for threatened ecosystem credit microbats.
- Removal or modification of 0.50 ha of Koala habitat predominately within the area mapped within the Port Stephens CKPoM (Port Stephens Council & Australian Koala Foundation 2002) as 100 m Koala habitat buffer and which provides dispersal and shelter habitat.
- Removal or disturbance of 0.50 ha of native vegetation providing foraging and dispersal habitat for EPBC Act and/or BC Act listed BAM ecosystem credit species, including; Regent Honeyeater, Dusky Woodswallow, Australasian Bittern, Sanderling, Red Knot, Curlew Sandpiper, Great Knot, Gang-gang Cockatoo, Glossy Black-Cockatoo, Greater Sand-plover, Lesser Sand-plover, Spotted Harrier, Brown Treecreeper (eastern subspecies), Varied Sittella, Spotted-tailed Quoll, Black-necked Stork, Beach Stone-curlew, Eastern False Pipistrelle, Little Lorikeet, White-bellied Sea-Eagle, Little Eagle, White-throated Needletail, Black Bittern, Swift Parrot, Bar-tailed Godwit (baueri), Square-tailed Kite, Hooded Robin (south-eastern form), Black-chinned Honeyeater (eastern subspecies), Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Turquoise Parrot, Eastern Curlew, Eastern Osprey, Yellow-bellied Glider, Scarlet Robin, Golden-tipped Bat, Grey-crowned Babbler (eastern subspecies), Eastern Chestnut Mouse, New Holland Mouse, Grey-headed Flying-fox, Superb Fruit-Dove, Speckled Warbler, Australian Painted Snipe, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat, Diamond Firetail, Common Blossom-bat, and Terek Sandpiper.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 5.1 above will help to 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 29.

Table 29 Summary of direct impacts to vegetation

Zone	PCT	TEC	Area within subject land (ha)	Area impacted (ha)	Current VI Score
3544_Moderate	PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	-	0.74	0.26	49.1
3995_Moderate	PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	Yes	2.48	0.24	69.5

Table 30 Summary of direct impacts species credit habitat or individuals

Species name	Common name	Sensitivity	Area (ha) or individuals
Fauna			
Crinia tinnula	Wallum Froglet	Moderate	0.04
Phascolarctos cinereus	Koala	High	0.50
Planigale maculata	Common Planigale	High	0.50

6.1.1. Loss of hollow bearing trees

The subject land contains a total of three hollow-bearing trees in various condition states. Of the hollow-bearing trees within the subject land, no hollow-bearing trees have been removed, however three may be impacted indirectly from compaction of TPZ due to stockpiles or excavation for stormwater infrastructure.

Of the hollow-bearing trees proposed to be indirectly impacted, all contain small hollows that have the potential to provide suboptimal roosting and/or nesting habitat for Southern Myotis and other microbats species. There are no hollow-bearing trees containing medium (50-150 millimetres diameter), large (150-400 millimetres diameter) or extra large (>400 millimetres diameter) hollows. These hollow-bearing trees do not provide suitable roosting habitat for large birds or owls due to their size and degraded nature. This habitat is subject to significant edge effects and ongoing disturbance from prior land use. No white wash, pellets or feathers for large forest owls were recorded in the subject land during field investigations.

6.2. Indirect impacts

Potential indirect impacts arising from the project are outlined and addressed in Table 31. Threatened and non-threatened entities with potential to be indirectly impacted include:

- Up to 2.71 ha of retained native vegetation within 30 m of the development footprint, including:
  - Up to 0.48 ha of PCT 3544 *Coastal Sands Apple-Blackbutt Forest*.
  - Up to 2.23 ha of PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest* consistent with EEC *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* (Endangered, EPBC

Act) and *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).

- Up to 2.71 ha of retained foraging and dispersal habitat for species assumed present as part of the current assessment, including Koala and Common Planigale.
- Up to 0.87 ha of retained foraging and dispersal habitat for Wallum Froglet assumed present as part of the current assessment.
- Up to 2.71 ha of retained foraging and dispersal habitat for EPBC Act and/or BC Act listed BAM ecosystem credit species, including; Regent Honeyeater, Dusky Woodswallow, Australasian Bittern, Sanderling, Red Knot, Curlew Sandpiper, Great Knot, Gang-gang Cockatoo, Glossy Black-Cockatoo, Greater Sand-plover, Lesser Sand-plover, Spotted Harrier, Brown Treecreeper (eastern subspecies), Varied Sittella, Spotted-tailed Quoll, Black-necked Stork, Beach Stone-curlew, Eastern False Pipistrelle, Little Lorikeet, White-bellied Sea-Eagle, Little Eagle, White-throated Needletail, Black Bittern, Swift Parrot, Bar-tailed Godwit (baueri), Square-tailed Kite, Hooded Robin (south-eastern form), Black-chinned Honeyeater (eastern subspecies), Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Turquoise Parrot, Eastern Curlew, Eastern Osprey, Yellow-bellied Glider, Scarlet Robin, Golden-tipped Bat, Grey-crowned Babbler (eastern subspecies), Eastern Chestnut Mouse, New Holland Mouse, Grey-headed Flying-fox, Superb Fruit-Dove, Speckled Warbler, Australian Painted Snipe, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat, Diamond Firetail, Common Blossom-bat, and Terek Sandpiper.

Table 31 Assessment of indirect impacts

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Temporary and permanent	Construction and operation	The project is unlikely to result in inadvertent impacts on adjacent retained habitat or vegetation. Impacts to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of the project Construction Environmental Management Plan (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. Mitigation measures implemented during the construction and operations phases of the project will ensure no encroachment to adjacent vegetation and habitat by construction workers or students/staff, during operation of the college.
Reduced viability of adjacent habitat due to edge effects	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Long-term	Construction and operation	The project will not result in a significant increase in edge effects impacting upon the retained vegetation. The majority of the site has been historically cleared and as such edge effects have been an ongoing impact to the vegetation that is to be retained within the development site. The project will increase edge effects to a small portion of the vegetation present in the southern and western corners of the development site. This vegetation is currently in moderate to good condition and will remain connected to other areas of higher condition vegetation and as such any increased edge effects are expected to result in negligible impacts. The potential for edge effects will be mitigated through implementation of a Vegetation Management Sub-plan (VMSP) which will

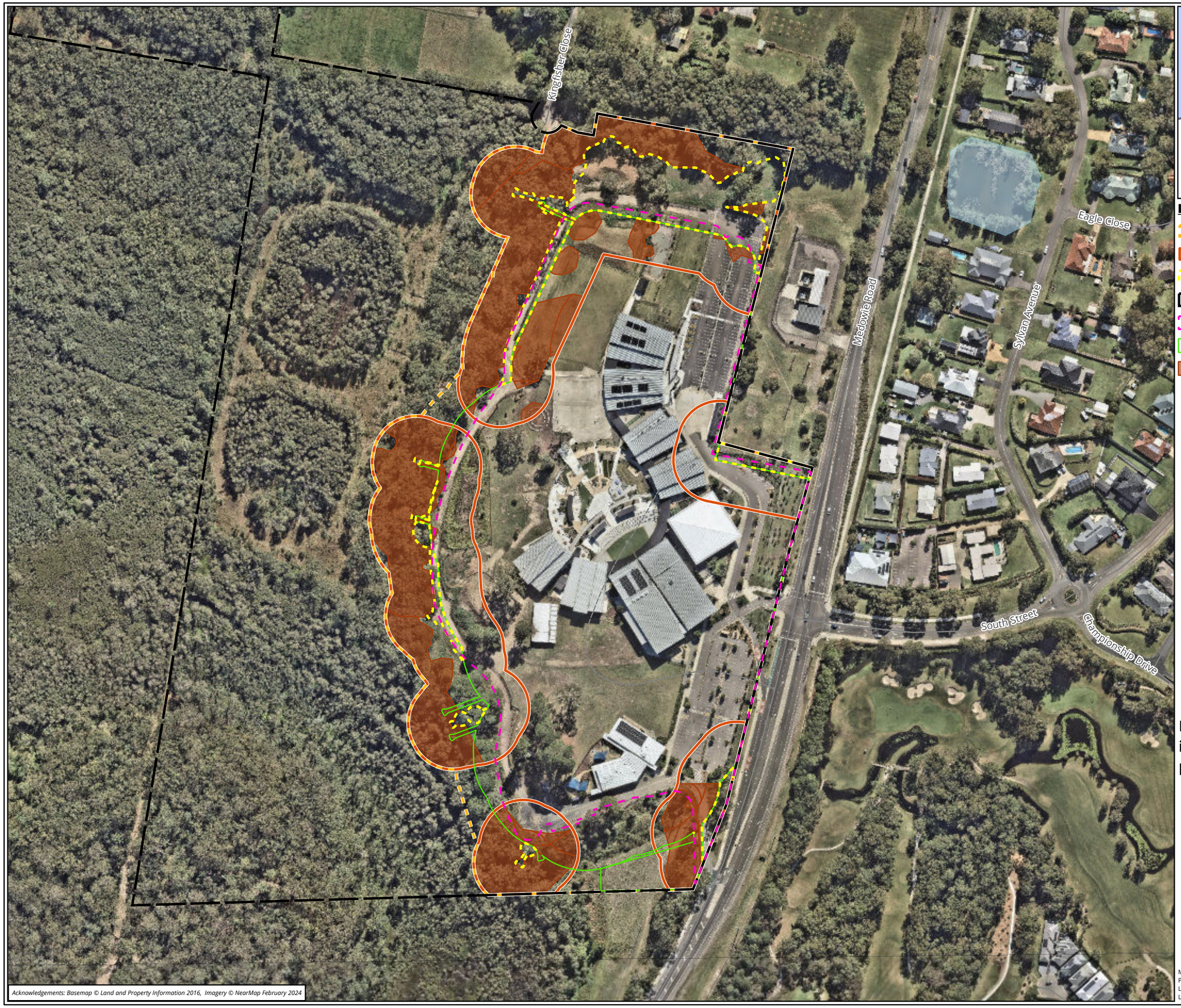
Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						include measures to minimise weed encroachment within adjacent habitat.
Reduced viability of adjacent habitat due to noise, dust or light spill	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Long-term	Operation	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 development of the subject land. However, this will be managed via best practices outlined in the project CEMP. The subject land occurs close by a residential area, and light and noise pollution is most likely moderate. This will likely not substantially increase due to the proposed future development. Light spill from the electrical substation currently occurs within the development site. Security lighting of the construction site and completed college will be designed so as to minimize light spill to adjacent habitat.
Transport of weeds and pathogens from the site to adjacent vegetation	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project and potentially along watercourses	Ongoing	Long-term	Construction and operation	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. The potential introduction and spread of weeds and pathogens will be managed through implementation of weed hygiene controls as part of the project CEMP during construction. A VMSP will be implemented during the operational phase to minimise the risk of weed introduction and spread from the subject land to adjacent habitat.
Increased risk of starvation, exposure and loss of shade or shelter	EPBC Act and BC Act listed threatened species, and non-	Up to a 30 m wide edge may be created as a	Ongoing	Long-term	Construction and operation	The habitat present in the subject land considered marginal for most fauna species given the disturbed condition, however, is potential habitat for Wallum Froglet, Koala and Common Planigale. The proposed future development will not result in an increased risk of

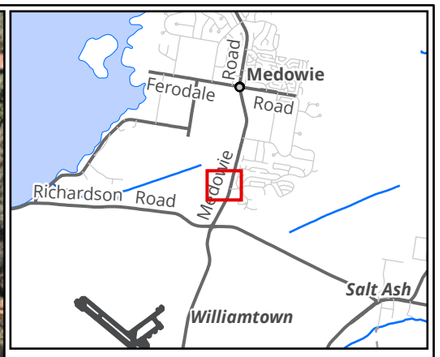
Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	threatened entities	result of the project				starvation, exposure and loss of shade or shelter to native species due to the small total area of vegetation being removed, and the very small proportion of commensurate habitats available in the immediate vicinity. The project has been positioned away from adjacent habitats and is therefore unlikely to increase the risk of starvation, exposure and loss of shade or shelter.
Loss of breeding habitats	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project and one hollow-bearing trees retained within the subject land	Ongoing	Long-term	Construction and operation	No specialist breeding habitat will be impacted by the development. Retained vegetation in adjacent lots provides higher quality habitat and will not be reduced by the proposed works. Koala and Common Planigale have been assumed present, however are considered unlikely to utilise the subject land for breeding. The project may indirectly impact up to three hollow-bearing trees. These trees have been assessed as unlikely to be suitable for breeding and as providing only marginal roosting habitat for some threatened species. Potential breeding habitat for the Wallum Froglet occurs within the unnamed stream to the south of the subject land. This habitat will be retained and measures to minimise impacts to the quantity and quality of water within the stream have been outlined in Section 5.1.
Trampling of threatened flora species	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	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.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Inhibition of nitrogen fixation and increased soil salinity	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Long-term	Construction and operation	The development will not result in the removal of a substantial area of native vegetation and large patches of vegetation, both within and adjacent to the development site, will not be impacted. Any excavations or soil disturbance resulting from the development of the subject land would be largely restricted to areas having undergone significant previous disturbance. As such it is not considered likely that the development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Long-term	Construction and operation	Fertilisers and herbicides are likely to be used during the operational phase of the associated college to manage landscaped and other open space areas within the college. An operational VMSP is to be implemented which prescribes the types of fertilisers and herbicides permitted for use and the circumstances under which their use is allowed. A key objective of the VMSP will be to avoid and minimise the risk of fertilizer and herbicide run-off and drift from the subject land to adjacent vegetation and habitats.
Rubbish dumping	EPBC Act and BC Act listed threatened species, and non-threatened entities	Up to a 30 m wide edge may be created as a result of the project	Ongoing	Long-term	Construction and operation	Standard environmental controls for the development would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan within the project CEMP. During the operational phase, the VMSP will include measures to monitor and respond to rubbish dumping within the subject land and interface with adjacent retained vegetation. Construction and operation of the associated college will increase the security of the

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						development site and likely reduce the potential for rubbish dumping.
Wood collection	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Development within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future educational use of the subject land, future landholders are not expected to be likely to undertake wood collection within the retained vegetation. Unauthorised access and collection of wood by the public is expected to be negligible. The heightened security during the construction and operation of the associated college is likely to deter wood collection activities.
Removal and disturbance of rocks, including bush rock	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	The subject land does not support bush rock.
Increase in predators	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Waste management measures implemented as part of the project CEMP and during operation of the associated college (refer Section 5.1) will mitigate the potential increase in predator species populations.
Increase in pest animal populations	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	The proposal occurs in a semi-urbanised area with impacts including introduced domestic pets such as Cats *Felis catus* 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.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Changed fire regimes	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	The development of the subject land is unlikely to lead to a substantial change in the fire regime of adjacent vegetation and habitats.
Disturbance to specialist breeding and foraging habitat, e.g., Beach nesting for shorebirds	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	Unlikely to occur	No specialist breeding or foraging habitat occurs within the development site. Foraging habitat exists for Wallum Froglet, Koala and Common Planigale, however larger areas of foraging habitat for these species exists outside of the subject land.
Fragmentation of movement corridors	EPBC Act and BC Act listed threatened species, and non-threatened entities	Removal or modification of 1.62 ha of vegetation and habitats from within landscape-scale wildlife habitat corridor	Ongoing	Long-term	Construction and operation	Vegetation within the subject land consist of a highly disturbed edge of a fragmented movement corridor linking habitats surrounding the development site to native vegetation to the north and with Tilligerry State Conservation Area to the south. Removal or modification of disturbed vegetation (see Section 6.1) is not considered likely to result in substantial or significant adverse impedance to fauna species that may use the corridor for dispersal. Large areas of better condition vegetation will be retained maintaining the corridor at, or just below, its current width with no expected decrease in overall corridor functionality. All fencing is to be of a fauna-friendly construction such that the risk of entanglement by fauna is minimised.





Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved EIS area
- Approved BDAR area
- Indirect impacts

Figure 13 Estimated zones of indirect impact for the proposal

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, 38594, Date: 20 August 2024,
Prepared for CH, Prepared by HL, JB., Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F13_IndirectImpact

6.3. Prescribed impacts

Identification and assessment of prescribed biodiversity impacts are outlined and addressed in Table 32. There are no threatened entities with potential to be impacted by prescribed impacts.

Table 32 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 karst, caves, crevices, cliffs and other features of geological significance will be impacted by the proposed works and no threatened species associated with these features were recorded during the assessment. No bush rock will be Impacted by the proposed works and no threatened species associated with this habitat feature were recorded during the assessment.	NA	NA
Occurrences of human-made structures and non-native vegetation	No human made structures will be impacted by the proposed works and no threatened species associated with this habitat feature were recorded during the assessment. Up to 2.69 ha of cleared areas or exotic vegetation will be removed or maintained as a result of the proposed works.	This non-native vegetation within the subject land and broader development site is not associated with habitat of any threatened species known or likely to occur in the locality. It is possible some highly mobile threatened species including threatened raptors and large forest owls forage in areas of non-native vegetation from time to time however similar habitat is extensive in the locality and subregion.	The loss of this non-native vegetation is expected to result in negligible impact to threatened species.
Corridors or other areas of connectivity linking habitat for threatened entities	An existing movement corridor that provides connectivity of habitats occurs within the development site and west of the subject land.	This corridor is identified as Key Corridor 1 (North – South) (Port Stephens Council 2016) and incorporates a majority of connective patches of preferred Koala habitat in the Medowie area. In addition to its importance to Koala (Port Stephens Council 2016), the majority of threatened species listed in Table 11, Table 12 and Table 13 likely derive some benefit from this key north to south corridor as it links remnant vegetation north of the development site to bushland within the Tilligerry State Conservation Area. Within the development site, vegetation associated with the corridor is consistent with EECs *Coastal Swamp Sclerophyll Forest of New South Wales and South East*	The direct impacts to this movement corridor are restricted to the removal or modification of 0.50 ha of PCT 3544 and 3995 contiguous with larger patches of those PCTs to the west of the subject land. Such an impact is considered negligible when considered at the locality scale and at the bioregional scale. Significant future disruption of this movement corridor may result in severance of connectivity between the habitats within Tilligerry State Conservation and other habitats on the north and west side of the development site, however connectivity will

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
		Queensland (Endangered, EPBC Act) and *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).	not be severed or substantially impacted by the project. The project will not sever the connectivity present in the broader locality and as such, impacts to species using the corridor is considered negligible. The project is not considered to impact on the movement of threatened species that maintains their survival. Species considered likely to utilize the subject land are highly mobile and connectivity will be maintained within remnant vegetation to the north, west and south of the subject land.
Water bodies or any hydrological processes that sustain threatened entities	The subject land includes approximately 0.76 ha of a mapped Coastal Wetland and 1.42 ha of Coastal Wetland Proximity Area which extends west and south of the subject land. The wetland is located on waterlogged or periodically inundated alluvial flats associated with coastal floodplain and is sustained by a shallow groundwater regime and surface water inflows from the surrounding landscape. The unnamed stream in the south of the subject land delivers surface flows to the wetland during periods of rainfall. There is a dam to the north-east of the development site, located within 200 m of the subject land, that will not be impacted by the project.	Based on the results of field survey, the Coastal Wetland provides: • Known foraging habitat for Powerful Owl and Masked Owl. • Known foraging and dispersal habitat for Koala. • Known foraging and breeding habitat for Wallum Froglet. • Known habitat for two EECs, including *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* (Endangered, EPBC Act) and *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act). • Potential habitat for a broad suite of other threatened ecosystem credit fauna species. Swamp Sclerophyll Forest ECC is a groundwater dependent ecosystem and is dependent on the groundwater and surface water regime associated	The development is not expected to substantially alter hydrological processes on which the Coastal Wetland depends. The project will employ industry standard erosion and sedimentation control measures to mitigate potential for polluted or sediment-laden water to flow beyond the construction area and into the wetland via the unnamed stream or overland flow. Stormwater infrastructure for the associated college has been designed to detain and treat stormwater and other potentially contaminated sources of water on-site, ensuring no substantial change to the quality or quantity of water entering the wetland from the subject land. The construction and operation of the development is not expected to substantially alter the groundwater or surface hydrology that sustains threatened species or EECs which provides foraging habitat for threatened entities.

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
		with the Coastal Wetland. In turn, the Swamp Sclerophyll Forest EEC supports Swamp Mahogany, a preferred Koala feed tree. The Wallum Froglet breeds in swamp habitats such as those available within Swamp Sclerophyll Forest EEC within the subject land associated with the Coastal Wetland and waterway.	
Protected animals that may use the proposed wind farm development site as a flyway or migration route	The project does not include operation of wind turbines.	NA	NA
Where the project may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Native vegetation adjacent to the subject land supports foraging and dispersal of Koala.	Habitat connectivity for Koala within the development site is mainly north to south via Key Corridor 1 (Port Stephens Council 2016) and discussed in detail above. There is little habitat providing east – west connectivity within the development site, nevertheless, some east to west movement of Koala from the development site to east across Medowie Road likely occurs from time to time.	The development will not increase vehicle movements any more than the associated approved EIS. Measures to mitigate the risk of vehicle strike to Koala are to be implemented during construction and operation of the associated college. These measures include adequate signage and appropriate speed restrictions in the vicinity of the school as well as increased awareness through construction site inductions and school/community education. Measures proposed to increase awareness and reduce vehicle speeds in the vicinity of the associated college are expected to result in an overall negligible increase in risk to Koala from vehicle strike associated with the subject land assessed herein.

6.4. Impacts considered uncertain

There are no impacts considered uncertain.

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 (LEP).

The development site sits within the Karuah and Hunter River regions as defined in the Groundwater Dependent Ecosystem (GDE) Atlas (BOM 2019, NSW DCCEEW 2024f) and is located within the Hunter Unregulated and Alluvial Groundwater management Area. Vegetation within and adjoining the subject land is identified in the GDE Atlas as low or medium likelihood of functioning as a terrestrial GDE based on regional studies.

PCTs mapped within the subject land and broader development site have moderate potential of being GDE. The NSW Scientific Committee final determination for Swamp Sclerophyll Forest EEC (Threatened Species Scientific Committee 2011) identifies the Swamp Sclerophyll Forest EEC as forming part of a complex of forested and treeless wetland ecological communities throughout coastal NSW. The Swamp Sclerophyll Forest community occurs on waterlogged or periodically inundated alluvial flats and drainage lines and has been impacted by historic changes to hydrological process across its current and former range. Vegetation within the subject land and broader development site is considered a GDE and may be impacted by the project in the absence of appropriate mitigation and management measures.

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 33 Measures to mitigate and manage impacts

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Development of an updated Biodiversity Management Plan (BMP) for inclusion in a CEMP. The BMP will outline measures for staged vegetation clearing to manage fauna species during tree removal, including having a spotter/catcher present. The updated BMP will detail procedures for dealing with trapped or injured wildlife during the construction period with particular focus on rescue and care of Koalas should an individual gain entrance to the construction site.	Mitigate impacts to resident fauna.	Prior to vegetation removal/Ongoing	Construction contractor.
	Any hollow-bearing trees that may be impacted will be assessed 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. • A qualified ecologist is to be present during hollow-bearing tree clearing to manage any microbats or other hollow-dependent fauna that may be present in hollows at time of clearing.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	Selection and retention of suitable logs (>10 centimetres diameter only) and hollows for placement within retained native vegetation adjoining the subject land.	Mitigate impacts to resident fauna.	Immediately following vegetation removal.	Qualified ecologist and construction contractor.
Indirect impacts on native vegetation and habitat	A CEMP has been developed which includes standard measures as specified below.	Mitigate risk of impact to environmental controls during project construction.	Prior to vegetation removal/Ongoing.	Construction contractor.
	As far as practicable, all construction activities are to be undertaken during daylight hours to minimise noise impacts on fauna utilising adjacent habitats.	No indirect impact to fauna in retained vegetation and habitats.	Before and throughout construction.	Construction contractor.
	Security lighting is to be minimised and where required, is to be oriented such that light spill beyond the subject land and into patches of retained vegetation and associated habitats is minimised.	No indirect impact to fauna in retained vegetation and habitats.	Throughout construction/Ongoing.	Construction contractor.
	Installation of appropriate exclusion fencing to the boundary of the retained vegetation and any construction areas where there is some potential for accidental encroachment. This will include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. Identification of any 'No Go Zones' in site inductions for all construction personnel. Fencing/barricades are to be used to establish TPZs around retained native trees in accordance with the Standards Australia Committee (2009): • The radius of the TPZ is calculated for each tree by multiplying its diameter at breast height by 12 (Council of Australian Standards 2009). • A TPZ should not be less than 2 m, or greater than 15 m, except where crown protection is required (Council of Australian Standards 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 CEMP.	No further degradation to retained vegetation and habitats.	Before and throughout construction/Ongoing.	Construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	Appropriate signage warning road users of fauna crossing along internal college access roads and approaches from Medowie Road are to be installed to minimise vehicle – wildlife interactions.	No indirect impact to fauna in retained vegetation and habitats.	Throughout construction/Ongoing.	Construction contractor.
	Sedimentation and erosion control measures including silt fencing, sediment traps, etc. to prevent sediment-laden stormwater exiting the construction areas and to prevent scouring and erosion of land beyond the development footprint. Sediment and silt-screens are to be used to manage instream sedimentation and erosion during construction of the access roads over the unnamed stream in the south of the subject land. All erosion and sediment control measures are to be constructed and installed in accordance with relevant guidelines, are to be regularly maintained for the duration of the construction period and are to be carefully removed at completion of works. Sediment and erosion control measures should follow recommendations of *The Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004).	No further degradation to retained vegetation and habitats. Mitigate risk of impact to waterways during project construction.	Prior to construction works commencing/Ongoing/Throughout construction	Construction contractor.
	Where appropriate native vegetation cleared from the development site should be mulched for re-use on the site, to stabilise bare ground.	No further degradation to retained vegetation and habitats.	Throughout construction/ Ongoing.	Construction contractor.
	Dust suppression measures to ensure dust deposition beyond the construction area is minimised.	No further degradation to retained vegetation and habitats.	Throughout construction/ Ongoing.	Construction contractor.
	All material stockpiles, vehicle parking and machinery storage should be located within the areas proposed for clearing, and not in areas of native vegetation that are to be retained.	No further degradation to retained vegetation and habitats.	Throughout construction/ Ongoing.	Construction contractor.
	Weed and pathogen management including weed hygiene protocols for personnel, machinery and construction materials entering and exiting construction areas to minimise risk of weed and pathogen introduction and spread.	No further degradation to retained vegetation and habitats.	Throughout construction	Construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	A VMSP to guide the management of native vegetation is to be prepared and implemented, and will describe retention of native vegetation and the management of weeds, rubbish etc. The VMSP will prescribe measures to minimise fertiliser and herbicide use in situations where chemicals could be transported beyond the subject land.	No further degradation to retained vegetation and habitats.	Throughout construction/ Ongoing.	Qualified ecologist and construction contractor.
	A 10 metre VRZ is to be maintained along either side of the waterway traversing the southern section of the subject land from the top of both banks. Wherever possible works within the VRZ should be avoided and the VRZ protected.	No further degradation to retained vegetation and habitats.	Throughout construction/ Ongoing.	Construction contractor.
Mitigating prescribed biodiversity impacts	NA – No prescribed impacts have been identified.	-	-	-
Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain	Implementation of an appropriate CEMP during works.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

7.1. Adaptive management strategy

The project will have only minor direct impacts to biodiversity in the locality and may have some indirect impacts to adjacent habitats. The severity and consequence of direct and indirect impacts are sufficiently well understood that a detailed adaptive management strategy which includes measures to monitor impacts, is not considered necessary. Both the CEMP and VMSP will include actions to monitor, assess and adaptively manage the effectiveness of planned mitigation measures.

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 14 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.

There are no species considered to meet the above principles with potential to be impacted by the development. No threatened species that are SAII have been recorded within the subject land or wider development site.

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 (DPIE 2020a), 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 all vegetation zones as they have a vegetation integrity score greater than 20. There are no impacts to native vegetation that do not require an offset.

The offset requirement for the proposal was calculated using the BAM Calculator. Table 34 provides a summary of the ecosystem credit offsets required for impacts from project at the subject land.

Table 34 Offsets required (ecosystem credits)

Vegetation zone	PCT	Condition	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement	
									SSD-8989-Mod-3	SSD-8989-Mod-5
3544_Moderate	PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*	Moderate	0.26	Clearance	-49.1	Yes	No	Yes	5	5
3995_Moderate	PCT 3544 *Coastal Sands Apple-Blackbutt Forest*	Moderate	0.24	Clearance	-69.5	Yes	Yes	Yes	8	8
TOTAL									**13**	**13**

8.3.2. Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM (DPIE 2020a) 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 35 provides a summary of the species credit offsets required for impacts from project at the subject land.

Table 35 Offsets required (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)/Count	Biodiversity risk weighting	Credit requirement	
					SSD-8989-Mod-3	SSD-8989-Mod-5
Flora						
3544_Moderate	Charmhaven Apple *Angophora inopina*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Netted Bottle Brush *Callistemon linearifolius*	-49.1	1 individual	1.50	2	0
3995_Moderate		-69.5	1 individual		2	0
3544_Moderate	Dwarf Kerrawang *Commersonia prostrata*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Sand Doubletail *Diuris arenaria*	-49.1	0.26	3.00	10	0
3995_Moderate		-69.5	0.24		13	0
3544_Moderate	Earp's Gum *Eucalyptus parramattensis* subsp. *decadens*	-49.1	1 individual	2.00	2	0
3995_Moderate		-69.5	1 individual		3	0
3544_Moderate	*Grevillea parviflora* subsp. *parviflora*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Noa"s False Chickweed *Lindernia alsinoides*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Villous Mint-bush *Prostanthera densa*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Scrub Turpentine *Rhodamnia rubescens*	-49.1	1 individual	3.00	3	0
3995_Moderate		-69.5	1 individual		3	0
Fauna						
3544_Moderate	Wallum Froglet *Crinia tinnula*	-49.1	0	1.50	0	0
3995_Moderate		-69.5	0.04		1	1
3544_Moderate	Stephens' Banded Snake *Hoplocephalus stephensii*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Southern Myotis *Myotis macropus*	-49.1	0.07	2.00	4	0
3995_Moderate		-69.5	0.04		1	0
3544_Moderate		-49.1	0.26	3.00	10	0

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)/Count	Biodiversity risk weighting	Credit requirement	
					SSD-8989-Mod-3	SSD-8989-Mod-5
3995_Moderate	Giant Dragonfly *Petalura gigantea*	-69.5	0.24		13	0
3544_Moderate	Greater Glider (southern and central) *Petauroides volans*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Squirrel Glider *Petaurus norfolcensis*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Brush-tailed Phascogale *Phascogale tapoatafa*	-49.1	0.26	2.00	6	0
3995_Moderate		-69.5	0.24		8	0
3544_Moderate	Koala *Phascolarctos cinereus*	-49.1	0.26	2.00	6	6
3995_Moderate		-69.5	0.24		8	8
3544_Moderate	Common Planigale *Planigale maculata*	-49.1	0.26	2.00	6	6
3995_Moderate		-69.5	0.24		8	8
3544_Moderate	Eastern Cave Bat *Vespadelus troughtoni*	-49.1	0.26	3.00	10	0
3995_Moderate		-69.5	0.24		13	0
Total					**244**	**29**

Species polygons for the above species credit species impacted by the project are illustrated in Figure 14 below.

8.4. Identification of impacts not requiring offset

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

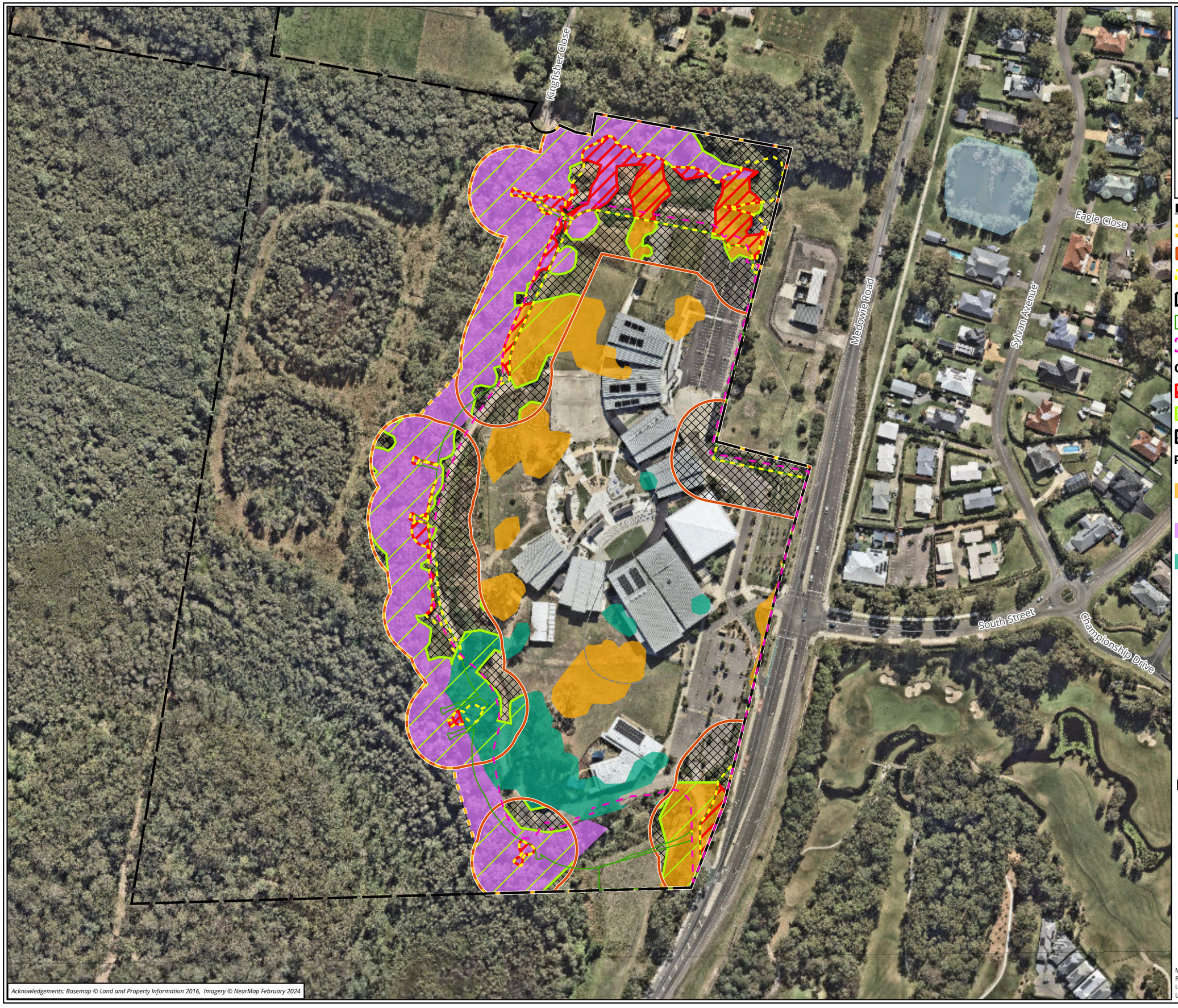
- Up to 2.71 ha of indirect impacts to native vegetation, including:
  - Up to 0.48 ha of PCT 3544 *Coastal Sands Apple-Blackbutt Forest*.
  - Up to 2.23 ha of PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest* consistent with EEC *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* (Endangered, EPBC Act) and *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- Up to 2.71 ha of retained foraging and dispersal habitat for species assumed present as part of the current assessment, including Koala and Common Planigale.
- Up to 0.87 ha of retained foraging and dispersal habitat for Wallum Froglet assumed present as part of the current assessment.

- Up to 2.71 ha of indirect impacts to retained foraging and dispersal habitat for EPBC Act and/or BC Act listed BAM ecosystem credit species, including; Regent Honeyeater, Dusky Woodswallow, Australasian Bittern, Sanderling, Red Knot, Curlew Sandpiper, Great Knot, Gang-gang Cockatoo, Glossy Black-Cockatoo, Greater Sand-plover, Lesser Sand-plover, Spotted Harrier, Brown Treecreeper (eastern subspecies), Varied Sittella, Spotted-tailed Quoll, Black-necked Stork, Beach Stone-curlew, Eastern False Pipistrelle, Little Lorikeet, White-bellied Sea-Eagle, Little Eagle, White-throated Needletail, Black Bittern, Swift Parrot, Bar-tailed Godwit (baueri), Square-tailed Kite, Hooded Robin (south-eastern form), Black-chinned Honeyeater (eastern subspecies), Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Turquoise Parrot, Eastern Curlew, Eastern Osprey, Yellow-bellied Glider, Scarlet Robin, Golden-tipped Bat, Grey-crowned Babbler (eastern subspecies), Eastern Chestnut Mouse, New Holland Mouse, Grey-headed Flying-fox, Superb Fruit-Dove, Speckled Warbler, Australian Painted Snipe, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat, Diamond Firetail, Common Blossom-bat, and Terek Sandpiper.

8.5. Identification of areas not requiring assessment

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

- Up to 2.69 ha of land containing non-native vegetation or cleared areas within the subject land.



Legend

- Study area
- Subject land
- Development footprint
- Development site
- Approved BDAR area
- Approved EIS area

Offsets

- Impacts requiring offsets
- Impacts not requiring offsets
- Cleared

Plant Community Types

- PCT 3544 Coastal Sands Apple-Blackbutt Forest
- PCT 3995 Hunter Coast Paperbark-Swamp Mahogany Forest
- Exotic vegetation (Slash Pine)

Figure 14 Offsets

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

APEM Group

Matter: 40623, Date: 20 February 2025,
Prepared for CH, Prepared by HL, JB, Last edited by: hliswoyo
Location: P:\40600s\40623\Mapping\40623_CMCC_BDAR_RtS.aprx
Layout: 40623_F14_Offsets

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 project on MNES, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. MNES relevant to the project are summarised in Table 36.

Table 36 Assessment of the project against the EPBC Act

MNES	Project specifics	Potential for significant impact
Threatened species	A total of 23 threatened flora and 37 threatened fauna species listed under the EPBC Act have been recorded or are predicted to occur in the locality. One species (Koala) listed under the EPBC Act has been assumed present as part of the assessment. One additional species, Grey-headed Flying-fox was recorded within the subject land, utilising the site as foraging habitat. Significant impact criteria (SIC) assessments have been prepared for two fauna species.	A significant impact is unlikely to result from the project as per SIC assessments provided in Appendix 4.
Threatened ecological communities	One Threatened Ecological Community listed under the EPBC Act was mapped in the subject land. A SIC assessment has been prepared for this EEC.	A significant impact is unlikely to result from the project as per SIC assessment provided in Appendix 4.
Migratory species	Up to 20 migratory bird species have been recorded or are predicted to occur in the locality. The subject land does not provide important habitat for any of these species.	Significant impact unlikely to result from the project.
National Heritage Places	There are no National Heritage Places mapped within the subject land.	Significant impact unlikely to result from the project.
Wetlands of international importance (Ramsar sites)	The subject land does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.	The project will not result in changes to the ecological character of any Ramsar site.

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

The EP&A Act was enacted to encourage the proper consideration and management of impacts of project or land-use changes on the environment (both natural and built) and the community. The EP&A Act is administered by NSW DCCEEW.

The EP&A Act provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment are outlined further below.

Section 1.7 of the EP&A Act requires proponents and consent authorities to consider if a development will have a significant effect on threatened species, populations or communities listed under the BC Act and FM Act.

Where a development will result in a significant effect to a threatened species, population or community a Species Impact Statement (SIS) or preparation of a BOS application is required. This BDAR has been prepared for the development.

Threatened species and communities listed under the BC Act are discussed in Section 4. An assessment of whether the project will result in a significant effect to these threatened species, populations and communities is provided in Section 4.2.5 and Appendix 2.

9.3. State Environmental Planning Policies

9.3.1. State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

The subject land is zoned Large Lot Residential (R5), Low Density Residential (R2) and Rural Landscape (RU2). However, as it is within Port Stephens LGA, the provisions of this chapter under the SEPP do not apply in accordance with Clause 2.3.

Chapter 3: Koala Habitat Protection 2020

This chapter applies to land zoned RU1, RU2 or RU3. As the proposal occurs on land zoned Large Lot Residential (R5), Low Density Residential (R2) and Rural Landscape (RU2), this chapter applies.

The project has been assessed against Koala Habitat Protection 2020 as it repealed SEPP No. 44.

The subject land supports known and/or potential habitat for Koalas. The development is therefore required to demonstrate compliance with Koala Habitat Protection 2020. As advised by NSW DCCEEW in a response to the SEARS for the project, compliance of the development with the provisions of Appendix 4 of the Port Stephens CKPoM (Port Stephens Council & Australian Koala Foundation 2002) constitutes compliance with

Koala Habitat Protection 2020. A Koala habitat assessment was undertaken for the development in accordance with the guidelines provided in Appendix 6 of the CKPoM (Port Stephens Council & Australian Koala Foundation 2002). The results of the habitat assessment are summarised in Table 37 below.

Table 37 Koala habitat assessment

Appendix 6 – Guidelines for Koala Habitat Assessment	Comments	Compliance (Y/N)
Qualifications	Koala habitat assessment for the development was carried out by suitably qualified personnel with experience in tree species identification, biological science, fauna survey and management. Brief curricula vitae for relevant personnel are provided in Appendix 5.	Y
Preliminary assessment	Presence of preferred Koala habitat, habitat buffers and habitat linking areas were confirmed as per Koala Habitat Planning Map. Presence of individual preferred Koala feed trees was confirmed within habitat buffers.	Y
Vegetation mapping	Vegetation mapping undertaken for the development is provided in Figure 5. LGA vegetation mapping of the site was confirmed to be accurate.	Y
Preferred Koala feed trees	The location of all individual preferred Koala feed trees was mapped where these occurred outside of Preferred Koala Habitat (i.e., within the habitat buffers and habitat linking areas.	Y
Koala habitat mapping	Figure 10 shows Koala habitat mapping in the context of the development.	Y
Koala habitat utilisation	Habitat utilisation within the Preferred Koala Habitat adjacent to the development was assumed to be at >30 % given Koalas were recorded in these areas during field assessment for the approved BDAR (Biosis 2018) and moderate to high Koala activity was identified. It is assumed that this applies for the subject land as part of the current assessment, as no targeted survey has been undertaken for this assessment.	Y

Using the results of the Koala habitat assessment the development was assessed against the performance criteria outlined in Appendix 4 of the CKPoM (Port Stephens Council & Australian Koala Foundation 2002). The results of this assessment are provided in Table 38 below.

Table 38 Performance criteria assessment

Appendix 4 – Performance criteria	Comments	Compliance (Y/N)
1. Development works cannot be located to avoid removal of Koala habitat	Habitat utilisation throughout the development footprint was calculated to be at <30 % as part of the approved BDAR (Biosis 2018). These results could therefore not be used to refine the development layout.	Y
2. Development aims to minimise removal of Koala habitat	Overall the development has been designed to avoid removal of native vegetation, including Preferred Koala Habitat, where possible. Where possible, scattered trees within the development footprint will be retained.	Y

Appendix 4 – Performance criteria	Comments	Compliance (Y/N)
4. Koala habitat assessment used to determine development footprint	Koala habitat assessment was undertaken to define Preferred Koala Habitat areas, to identify and map locations of preferred Koala feed trees within habitat buffer and habitat linking areas and to determine Koala habitat utilisation within the project area as part of the approved BDAR (Biosis 2018). Koala has been assumed present for the current assessment.	Y
a. Must minimise removal of vegetation within Preferred Koala Habitat or Habitat Buffers	Vegetation removal within Koala habitat cannot be avoided due to the existing impacts from the project, therefore request Port Stephens waive this provision given compliance with 1, 2 and 4 above.	N
b. Maximise retention and minimise degradation of vegetation within Habitat Linking Areas	Habitat Linking Areas will be maintained north and south of the project. Vegetation removal within the habitat linking area cannot be avoided, therefore some loss of relatively poor quality Habitat Linking Areas will occur.	Y
c. Minimise removal of Koala feed trees	Where possible Koala feed trees will be retained within the development footprint and the project, as areas will be regenerated following impacts.	Y
d. Make provision for restoration of Koala Habitat within Habitat Buffers and Habitat Linking Areas	Weed management and control as part of a VMSP will minimise edge effects on adjacent Preferred Koala Habitat.	Y
e. Make provision for long term Koala habitat management.	A VMSP will guide management of native vegetation within the subject land and the interface of the subject land and preferred Koala habitat.	Y
f. Avoid compromising safe Koala movement across the site.	Koala feed trees will be retained as far as practicable and appropriate boundary and internal fencing will be installed to facilitate Koala movement or to safely exclude Koalas where required.	Y
g. Vegetation clearing restricted to building envelopes, infrastructure and fire fuel reduction.	Clearing will be restricted to the development footprint, including stormwater infrastructure and stockpiles.	Y
h. Minimise threats from dogs, motor vehicles and swimming pools.	The development and associated college will exclude dogs, provide strict speed limits, and fencing to avoid danger to children and staff. These measures will also be effective for Koalas.	Y

The development was also assessed for compliance against additional considerations of the CKPoM (Port Stephens Council & Australian Koala Foundation 2002) as well as the Draft Revised Medowie Planning Strategy (Port Stephens Council 2016). The results of this assessment are provided in Table 39 below.

Table 39 Additional considerations

Provisions	Comments	Compliance (Y/N)
Development application requirements	Koala habitat assessment has been undertaken by suitably qualified personnel in accordance with the guidelines provided in Appendix 6 (Port Stephens Council & Australian Koala Foundation 2002). Clear details of vegetation removal and retention, and the development footprint are provided in the relevant sections of this report. Proposed measures to manage Koala habitat, impacts of dogs and roads and appropriate fencing are outlined in Table 33. Details of these measures will be provided in relevant Landscape Design Plans, Vegetation Management Plans and/or Biodiversity Management Plans for the project. Koala monitoring programs are not required, given the development is not a subdivision.	Y
Koala Management Unit requirements	The subject land is located within the Medowie Koala Management Unit (KMU) as mapped in the CKPoM (Port Stephens Council & Australian Koala Foundation 2002). As per the CKPoM, habitat restoration within the Medowie KMU is recommended 'pending the effective abatement of the threat posed by dogs and traffic'. Restoration of Koala habitat within the development footprint is recommended as mitigation measures associated with the college will minimise the potential for Koala mortality from traffic in the development site and along Medowie Road to the east.	Y
Draft Revised Medowie Planning Strategy	This provides mapping of Key Koala corridors. The subject land is located adjacent to Corridor 1 (North-South). This corridor links major connective patches of preferred Koala habitat as the 'primary' habitat corridor within Medowie. The development footprint has been located to avoid removal of Preferred Koala Habitat to the west which forms a component of Corridor 1. The development will therefore not result in any severance or reduction to Corridor 1.	Y

The results of these assessments have determined that the development will be consistent with the objectives of the Port Stephens Council CKPoM (Port Stephens Council & Australian Koala Foundation 2002) and therefore with this chapter of the SEPP provided the recommended safeguards are implemented.

Chapter 4: Koala Habitat Protection 2021

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. It applies to areas of native vegetation greater than one hectare and in councils listed in Schedule 2 of the SEPP.

The development site is zoned Large Lot Residential (R5), Low Density Residential (R2) and Rural Landscape (RU2) and Port Stephens LGA is listed in Schedule 2 of the SEPP and as such, this chapter is relevant to the project, however, as the project is a State Significant Development this chapter does not apply.

Chapter 13: Strategic conservation planning

This chapter aims to facilitate appropriate development on biodiversity certified areas and therefore does not apply to the subject land.

9.3.2. Coastal Management Act 2016 and State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2: Coastal Management

The State Environmental Planning Policy (Resilience and Hazards) 2021 aims to promote a co-ordinated approach to land use planning in the coastal zone of NSW in a manner consistent with the objects of the *Coastal Management Act 2016* (CM Act). The SEPP, including Chapter 2 Coastal Management, has replaced the now repealed:

- SEPP No. 14 Coastal Wetlands.
- SEPP No. 26 Littoral Rainforests.
- SEPP No. 71 Coastal Protection.
- SEPP Coastal Management

The CM Act and Resilience and Hazards SEPP provide maps for Coastal Wetlands and associated Proximity Area, Coastal Environment Area and Coastal Use Area. Development consent cannot be granted within these areas unless the Consent Authority is satisfied that the project will not significantly impact on areas mapped as Coastal Wetlands, Coastal Wetlands Proximity Area, Coastal Environment Area, or Coastal Use Area.

The subject land is within a 'coastal zone' as defined by clause 6 of this policy, including Coastal Wetlands and Coastal Wetlands Proximity Area. The subject land contains 0.76 hectares of land mapped Coastal Wetland and 1.42 hectares of Coastal Wetland Proximity Area, of which 0.03 hectares of mapped Coastal Wetland and 0.08 hectares of Coastal Wetland Proximity Area is proposed for removal.

Therefore, the CM Act and Resilience and Hazards SEPP apply to this project.

Under Clause 10, development consent may not be granted for a development on mapped Coastal Wetlands unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.

Under Clause 11 development consent may not be granted for a development on mapped Coastal Wetlands Proximity Areas unless the consent authority is satisfied that the project will not significantly impact on:

- The biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or
- The quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The development will therefore require removal or modification of native vegetation within the mapped extent of the Coastal Wetland within the development site. Mitigation measures are to be implemented during construction and operation of infrastructure such that the environmental effects of the project are likely to be negligible.

Taking into consideration the small area of mapped wetland to be impacted, the predominance of high disturbed non-native vegetation within the mapped extent of Coastal Wetland in the subject land and the measures proposed to mitigate potential indirect impacts, the project is not considered to be inconsistent with the aims and objectives of Coastal Wetlands.

9.4. Other Environmental Planning Instruments

9.4.1. Port Stephens Local Environmental Plan 2013

Local Environmental Plans (LEPs) are created by Councils in consultation with their community and guide planning decisions for LGAs. They apply either to the whole or part of a LGA and make provision for the protection or utilisation of the environment through zoning of land and development controls. Port Stephens LEP is relevant to the subject land.

The project has minimised impacts to native vegetation and flora and fauna habitats and is therefore consistent with the environmental (biodiversity) related objectives of Large Lot Residential (R5), Low Density Residential (R2) and Rural Landscape (RU2) zoning in the Port Stephens LEP (2013). The proposed activities are listed as Permitted with Consent.

Vegetated parts of the development site are mapped as being Class 3, Class 4 and Class 5 Acid Sulfate Soils (Naylor et al. 1998, NSW DCCEEW 2024d).

For Class 3 Acid Sulfate Soils development consent is required (LEP) for:

- Works more than 1 m below the natural ground surface.
- Works by which the water table is likely to be lowered more than 1 m below the natural ground surface.

For Class 4 Acid Sulfate Soils development consent is required for:

- Works more than 2 m below the natural ground surface.
- Works by which the watertable is likely to be lowered more than 2 m below the natural ground surface.

For Class 5 Acid Sulfate Soils development consent is required for:

- Works within 500 m of adjacent Class 1, 2, 3 or 4 land that is below 5 m Australian Height Datum and by which the water table is likely to be lowered below 1 m Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

9.4.2. Port Stephens Development Control Plan 2014

Development Control Plans (DCPs) are developed by Council and provide detailed planning and design guidelines to support the planning controls in the LEP. DCPs identify additional development controls and standards for addressing development issues at a local level and can be applied more flexibly than a LEP. Port Stephens DCP is relevant to the subject land and 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 LEP for development in Port Stephens.

Under s79(c) of the Act, the consent authority is required to take into consideration the relevant provisions of the DCP in determining applications for development in the Newcastle LGA.

Parts of the DCP that are relevant to this ecological assessment are outlined with reference to the subject land in Table 40 below.

Table 40 Port Stephens DCP clauses relevant to the project

Reference	Relevant Port Stephens DCP controls	Assessment against controls
B1 Tree Management		
B1.1	*Where any activity specified in Column 2 is proposed an applicant must attain the corresponding approval type specified in Column 1 except for an activity where no approval is required.*	Clearing of native vegetation that is subject to the BOS, therefore this control applies and therefore native vegetation panel approval is required.
B1.2	*Council assessment of applications to remove or prune trees or other vegetation has regard for:* • *Whether the tree is dead and provides habitat.* • *Damage to an existing structure or utility service substantiated by a qualified person.* • *Interfering with a solar photovoltaic/hot water system.* • *Interfering with the amenity of a habitable room.* • *Threatened by a development consent.* • *Consistency with a flora, fauna or conservation strategy.* • *The tree is interfering, or likely to interfere, with the provision of a public utility or road/driveway construction, provided the impact on the trees has been considered in the design phase.* • *Impact on threatened species, populations or ecological communities and their habitats.* • *Retention value under the tree technical specification.* • *Other relevant circumstances, as per the tree technical specification.*	An arborist report (Pidutti 2017) has been prepared for the associated college development. The assessment has considered the Port Stephens CKPoM (Port Stephens Council & Australian Koala Foundation 2002) and *Medowie Planning Strategy* (Port Stephens Council 2016).
B1.3	*An arborist report consistent with tree technical specification is required:* • *For a tree or other vegetation listed under register of significant trees.* • *To assess the impact on existing trees as part of a development application as per AS 4970 – Protection of trees on development sites.* • *To support reassessment of applications for tree removal on a technical basis.* • *To support the release of a tree bond.*	This assessment forms part of a development application via an EIS (de Witt Consulting 2018). An arborist report (Pidutti 2017) has been prepared for the associated college development.
B1.5	*A request to remove 20 or more trees requires a vegetation management plan consistent with vegetation technical specification.* *Note: An application to remove 20 or more trees, where tree height exceeds 3 m or circumference breast height exceeds 300 mm, may require a referral to be provided to Hunter Water by the assessing officer in accordance with*	This assessment involves removal or impact of greater than 20 trees. A VMP (Biosis 2019a) has been prepared for the associated college development.

Reference	Relevant Port Stephens DCP controls	Assessment against controls
	the 'Guidelines for developments in the drinking water catchments'.	
B1.6	*Compensatory planting consistent with the tree technical specification may be required when council approval to remove trees is provided.*	A VMP (Biosis 2019a) has been prepared for the associated college development that includes compensatory planting.
B1.7	*A hollow tree assessment is required to remove hollow bearing trees:* • *Two replacement hollows are provided for each hollow tree identified by the hollow tree assessment.* • *Salvaged hollows are preferred over nest boxes, which are consistent with the nest box technical specification.* *Note: B2.1 requires a hollow tree assessment and replacement or salvaged hollows if a flora and fauna survey report proposes their removal.*	A FMP (Biosis 2019d) and BMSP (Biosis 2019c) has been prepared for the associated college development. The conditions of consent for the approved EIS development did not include the requirement for compensatory hollows/nest boxes. The BMSP (Biosis 2019c) includes the recommendation to retain salvaged hollows within retained vegetation.
B2 Natural Resources		
B2.1	*Development located on land or is within 500 m of land that contains items of environmental significance, such as threatened species or communities, listed migratory species, wildlife corridors, wetlands or riparian corridors and has the potential to impact biodiversity provides:* • *a flora and fauna survey to inform the assessment of significance.* • *The flora and fauna survey is in accordance with:* – *NSW Department of Environment and Conservation 2004 'Threatened Species Survey and Assessment: Guidelines for development and activities'.* – *Hunter and Central Coast Regional Environmental Management Systems 2002 'Lower Hunter and Central Coast Regional Fauna and Flora Guidelines'.* • *If development poses a significant effect under 5A of the EP&A Act or if development is on land which is, or is part of, critical habitat then a species impact statement (SIS) is required.* • *If development does not pose a significant effect under 5A of the EP&A Act, but proposes unavoidable vegetation impacts then a vegetation management plan (VMP) that is consistent with the vegetation technical specification is required.* *Note: Under section 5.5 of the EP&A Act the determining authority has a duty to consider the environmental impact of proposed activities.* • *If the flora and fauna survey proposes the removal of hollow bearing trees then a hollow tree assessment is required:*	This BDAR has been prepared to address the impact of the development on threatened species, populations or ecological communities. Targeted survey has not been undertaken. General field investigations have been conducted in line with relevant survey guidelines, outlined in Section 4.2.1. A VMP (Biosis 2019a) has been prepared for the associated college development. See item B1.7 above regarding hollows. A 30 m buffer has been considered for indirect impacts. Refer to Section 6.2.

Reference	Relevant Port Stephens DCP controls	Assessment against controls
	– *Two replacement hollows are provided for each hollow tree identified by the hollow tree assessment.* – *Salvaged hollows are preferred over nest boxes that are consistent with the nest box technical specification.* *Note: This is consistent with B1.7 that requires a hollow tree assessment to remove hollow bearing trees on land to which B1 applies.* • *A proposed buffer on the land subject to the development is provided to items of environmental significance. The width of the buffer is recommended by the flora and fauna survey report based and is based on taking into account the following parameters:* – *The condition of the item of environmental significance.* – *Proposed methods of mitigating adverse impact.* – *Possible external effects, such as weed encroachment or domestic animals and their potential to cause impact.* – *Where the vegetation of buffers are proposed, the vegetation is established along the relevant boundaries prior to the issuing of the relevant subdivision or occupation certificate.* *Note: C4.11 nominates a suitable buffer for residential accommodation adjoining land used for agricultural purposes.*	
B2.2	*If biodiversity offsets are employed as a suitable compensatory measure under the TSC Act then they are:* • *Calculated in accordance with the bio-metric terrestrial biodiversity assessment tool.* • *Consistent with the vegetation technical specification.* • *In a secure tenure ownership.* • *Located on land to which this Plan applies.*	Biodiversity offsets are addressed in Section 6.1.
B2.3	*Development situated on land that contains noxious weeds, as identified by a section 64 certificate under the Noxious Weeds Act 1993 will seek to prevent, eliminate or restrict the spread of noxious weeds in accordance with noxious weeds technical specification.*	A VMP (Biosis 2019a) and VMSP (Biosis 2019b) has been prepared for the associated college development, that includes management of priority weeds in line with the Biosecurity Act.
B2.4	*Development located on or in proximity to land identified as Koala habitat complies with the Port Stephens Comprehensive Koala Plan of Management through consideration to the performance criteria, being:* • *Minimising the removal or degradation of native vegetation within preferred Koala habitat or supplementary Koala habitat.*	Avoidance, minimisation and mitigation of impacts to Koala habitat are addressed in Sections 5 and 7. A FMP (Biosis 2019d), BMSP (Biosis 2019c) and KMSP (Biosis 2019e) has been prepared for the associated college development to mitigate impacts to threatened fauna, including Koala.

Reference	Relevant Port Stephens DCP controls	Assessment against controls

	• *Maximising the retention and minimising degradation of native vegetation within supplementary habitat, habitat buffers and habitat linking areas.*
	• *Minimising removal of any individual preferred Koala feed trees.*
	• *Where appropriate, restore and rehabilitate Koala habitat/buffers and linking areas.*
	  – *Removal of Koala habitat is off-set by a net gain of Koala habitat on-site or adjacent.*
	• *Make provision for long-term management of both existing and restored Koala habitat.*
	• *Not compromise the safe movement of Koalas, through:*
	  – *Maximisation of tree retention.*
	  – *Minimising barriers for movement, such as fences.*
	• *Restrict development to defined building envelopes.*
	• *Minimising the threat to Koalas from dogs, motor vehicles and swimming pools. Development demonstrates consideration to the performance criteria within the statement of environmental effects (SEE) by providing the following:*
	  – *Assessment of Koala habitat in accordance with Appendix 6 – Guidelines for Koala Habitat Assessment of the Port Stephens Comprehensive Koala Plan of Management.*
	  – *Site analysis plan indicates vegetation to be disturbed, cleared or retained.*
	  – *Illustration of the Asset Protection Zone (APZ).*
	  – *Proposed measures for the safe movement of Koalas, such as fencing or traffic control measures.*
	  – *Details of any programs to monitor Koala populations.*
	Note: The Port Stephens Comprehensive Koala Plan of Management applies through the application of the SEPP (Koala Habitat Protection) 2019.
		Koala vegetation removal is being offset under the BAM and this BDAR has been prepared accordingly.

B3 Environmental Management		
B3.1	*Development located on acid sulfate soils as identified on the Acid Sulfate Maps of the LEP adheres to the Local Environmental Plan requirements by taking one of the following three paths:* • *1. Accept that acid sulfate soils is present and prepare a development application and an acid sulfate soils management plan as set out in the NSW Acid Sulfate Soils Manual.* • *2. Provide a framework for the on-going management and monitoring of the impacts throughout the development, in your acid sulfate soils management plan. There is no set formula for managing acid*	The presence of acid sulfate soils mapping is provided in Sections 2.1.9 and assessed against the LEP in 9.4.1. The construction contractor should adhere to the DCP accordingly.

Reference	Relevant Port Stephens DCP controls	Assessment against controls
	sulfate soils and each case must depend on the particular circumstance. Please refer to the NSW Acid Sulfate Soils Manual for details. • *3. Undertake a preliminary assessment as set out in the NSW Acid Sulfate Soils Manual, to determine whether acid sulfate soils is present and whether the proposed works are likely to disturb or oxidise these soils or lower the water table.* *If acid sulfate soils is present, Council must consider the following matters before development consent is granted:* • *The likelihood of the proposed development resulting in the discharge of acid water.* • *The adequacy of the acid sulfate soils management plan prepared for the proposed development in accordance with the NSW acid sulfate soils assessment guidelines.*	
B4.D Riparian Corridors		
B4.11	*Development involving a controlled activity within waterfront land (within 40 m from the highest bank of the river, lake or estuary) adheres to the Water Management Act 2000.* *Note: Council can advise on the location and order of waterfront land*	An assessment against the WM Act is provided in Section 9.8.
B4.12	*Development provides the following buffers to riparian corridors that are generally consistent with the recommendations of the NSW Office of Water 2012 'Guidelines for riparian corridors on waterfront land':* • *50 m buffer from 3rd order water courses or above with a 40 m vegetated riparian zone and 10 m vegetated buffer.* • *30 m buffer from 1st-2nd order water courses with a 20 m vegetated riparian zone and 10 m vegetated buffer.*	An assessment against the WM Act in relation to VRZs is provided in Section 9.8.

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

As the subject land is not within a rural area, and the development does not require consent, the LLS Act does not apply to the development with respect to clearing of native vegetation.

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 species and communities and key threatening processes (KTPs). Impacts to threatened species and communities are assessed under Section 7.3 of the BC Act.

Further, the BOS has been triggered under the EP&A Act and BC Act as the project is a SSD. This BDAR has been prepared for the proposal development.

Threatened species and communities listed under the BC Act are discussed in Section 4. An assessment of whether the project will result in a significant effect to these threatened species, populations and communities is provided in Section 4.2.5 and Appendix 2.

9.7. Biosecurity Act 2015

The 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.

One priority weed for the Hunter LLS Region (which includes the Port Stephens LGA) has been recorded in the subject land and is listed in Table 41, along with their associated Duty.

Table 41 Priority weeds within the subject land

Scientific name	Common name	Relevant biosecurity duty
***Rubus fruticosus* sp. agg.**	Blackberry	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. The following guidelines are relevant:

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

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). One unnamed and unmapped ephemeral waterway traverses the southern section of the subject land. Consultation with DPI Water has clarified that as the waterway is not mapped on the 1:25,000 topographic map for the region. The watercourse within the

subject land is considered to be a first order stream for the purposes of assessment against relevant provision of the NSW WM Act. The project is SSD, it is therefore exempt from the requirement to obtain a Controlled Activity Approval for activities on or under waterfront land and works proposed within the mapped riparian corridor will be assessed as part of the EIS.

Controlled activities on waterfront land - guidelines for riparian corridors on waterfront land (DPE 2022c) defines a riparian management envelope referred to as the VRZ. The width of the VRZ within a riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses according to the Strahler System of ordering watercourses and is measured from the top of the highest bank on both sides of the watercourse. This guideline also presents the riparian corridor matrix that assists applicants for controlled activity approvals to identify certain works and activities that can occur on waterfront land and in riparian corridors. The guideline includes overarching management measures for works on waterfront land.

Consultation with DPI Water has clarified that while the waterway is not mapped on the 1:25,000 topographic map for the region, DPI Water expects that an appropriate VRZ be maintained along the waterway and the overarching objective of the controlled activity provisions of the WM Act and objectives for riparian corridor management (DPE 2022c) be met. Recommendations to ensure that the project meets these criteria have been made in section 4.1.

The proposed works are consistent with the riparian corridor matrix (first and second order waterways) of the NSW Natural Resources Access Regular (NRAR) (2022c), and includes the establishment a 10 metre VRZ for the waterways and may require the preparation of a VMP (DPE 2022c).

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 5 kilometres of the subject land on the BioNet Atlas of NSW and no species have been predicted by the Protected Matters Search Tool (PMST) given the limited and mostly disturbed nature of aquatic habitats available. The unnamed stream provides only *Class 3 – Minimal key fish habitat* for fish passage and is not considered habitat for threatened aquatic species. As there is no mapped key fish habitat within the subject land or records within 5 kilometres, the project is unlikely to result in impacts to fish passage.

There is one waterway within the subject land, which is considered a first order stream for the purposes of the assessment. The project will directly impact 0.02 hectares of the mapped extent of a Coastal Wetland and 2.52 hectares of Coastal Wetland Proximity Area. None of the directly impacted wetland supports freshwater or marine aquatic vegetation and the project will not require the removal of snags. Therefore, the project is not considered 'dredging' under the relevant provisions of the FM Act.

The project includes the construction of a single carriageway access road from Medowie Road across the unnamed stream in the southern part of the subject land. The access road is to be constructed at a section of the stream which is already culverted. As such, the proposed access road is not expected to create, or exacerbate existing barriers to fish passage along the unnamed stream.

No instream woody debris is proposed to be removed and therefore a permit under Part 7 of the FM Act is not required. 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.

Mitigation and management measures detailed in Section 7 include measures to minimise sediment and pollutant transport to the Coastal Wetland and unnamed stream during construction and operation of the college and associated infrastructure. Provided all measures are implemented in full, the project is unlikely to significantly impact any threatened species, populations or ecological communities listed under the FM Act.

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
00037496/BAAS17051/24/00048158

Proposal Name
Catherine McAuley Catholic College - Modification 5

BAM data last updated *
28/10/2024

Assessor Name
Mitchell Palmer

Report Created
11/04/2025

BAM Data version *
Current classification (live - default) (80)

Assessor Number
BAAS17051

BAM Case Status
Finalised

Date Finalised
27/02/2025

Assessment Revision
1

Assessment Type
Major Projects

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

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Coastal Sands Apple-Blackbutt Forest												
1	3544_Moderate	Not a TEC	49.1	49.1	0.26	PCT Cleared - 22%	High Sensitivity to Gain			1.50		5
											Subtotal	**5**
Hunter Coast Paperbark-Swamp Mahogany Forest												
2	3995_Moderate	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	69.5	69.5	0.24	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		8
											Subtotal	**8**
											Total	**13**

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

Crinia tinnula / Wallum Froglet (Fauna)									
3995_Moderate	69.5	69.5	0.04	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	1
								Subtotal	**1**
Phascolarctos cinereus / Koala (Fauna)									
3995_Moderate	69.5	69.5	0.24	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	8
3544_Moderate	49.1	49.1	0.26	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	6
								Subtotal	**14**
Planigale maculata / Common Planigale (Fauna)									
3995_Moderate	69.5	69.5	0.24	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	8

3544_Moderate	49.1	49.1	0.26	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	6
								Subtotal	**14**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00037496/BAAS17051/24/00048158

Proposal Name
Catherine McAuley Catholic College - Modification 5

BAM data last updated *
28/10/2024

Assessor Name
Mitchell Palmer

Assessor Number
BAAS17051

BAM Data version *
Current classification (live - default) (80)

Proponent Names

Report Created
11/04/2025

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Major Projects

Date Finalised
27/02/2025

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3544-Coastal Sands Apple-Blackbutt Forest	Not a TEC	0.3	5	0	5
3995-Hunter Coast Paperbark-Swamp Mahogany Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.2	8	0	8

3544-Coastal Sands Apple-Blackbutt Forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_Moderate	Yes	5	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
3995-Hunter Coast Paperbark-Swamp Mahogany Forest	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	3995_Moderate	Yes	8	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Crinia tinnula / Wallum Froglet	**3995_Moderate**	0.0	1.00
Phascolarctos cinereus / Koala	**3995_Moderate, 3544_Moderate**	0.5	14.00
Planigale maculata / Common Planigale	**3995_Moderate, 3544_Moderate**	0.5	14.00

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

Crinia tinnula / Wallum Froglet	Spp	IBRA subregion
	Crinia tinnula / Wallum Froglet	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW

References

Australian National Botanic Gardens & Australian National Herbarium 2007. *Australian Plant Name Index - APNI*, *Botanical Databases*, accessed 8 March 2024, https://www.anbg.gov.au/apni/.

Biosis 2018. *Catherine McAuley Catholic College, Medowie Biodiversity Development Assessment Report*, Report prepared for Webber Architects. Authors: Barreto, A, Allison, S, and Corden, C. Biosis Pty Ltd, Newcastle, NSW. Project no. 26652.

Biosis 2019a. *Vegetation Management Plan for Catherine McAuley Catholic College, Medowie*, Prepared for Webber Architects. Authors: Scheid T, Price P. Biosis Pty Ltd, Newcastle. Project no. 28870.

Biosis 2019b. *Vegetation Management Sub Plan – Construction Phase for Catherine McAuley Catholic College, Medowie*, Prepared for North Construction and Building Pty Ltd. Authors: Scheid, T, Price, P. Biosis Pty Ltd, Newcastle, NSW. Project no. 30449.

Biosis 2019c. *Catherine McAuley Catholic College, Medowie Biodiversity Management Sub Plan*, Report prepared for North Construction and building Pty Ltd. Authors: Scheid, T. Biosis Pty Ltd, Newcastle, NSW. Project no. 30449.

Biosis 2019d. *Catherine McAuley Catholic College Fauna Management Plan*, Report prepared for North Construction & Building Pty Ltd. Authors: Allison, S. Biosis Pty Ltd, Newcastle, NSW. Project no. 30449.

Biosis 2019e. *Catherine McAuley Catholic College: Koala Management Plan*, Report prepared for North Construction & Building Pty Ltd. Authors: Allison, S. Biosis Pty Ltd, Newcastle, NSW. Project no. 30449.

BOM 2019. *GDE Atlas Home: Water Information: Bureau of Meteorology*, *Bureau of Meteorology: Climate Data Online*, accessed 9 July 2019, http://www.bom.gov.au/water/groundwater/gde/.

Cockerill A, Harrington S, & Bagel T 2013. *Lower Hunter Vegetation Mapping*, Report funded by the department of Sustainability, Environment, Water, Population and Communities though the Sustainable Regional Development Program. Parsons Brinkerhoff, Canberra.

Council of Australian Standards 2009. AS 4970-2009 Protection of Trees on Development Sites, Standards Australia. Sydney, NSW. https://www.tcaa.com.au/wp-content/uploads/2018/11/AS-4970-2009-Protection-of-trees-on-development-sites.pdf.

Cropper S 1993. *Management of Endangered Plants*, CSIRO Publications Victoria, Melbourne, Victoria.

Cth DCCEEW 2019. *Directory of Important Wetlands in Australia*, *Australian Commonwealth Department of Climate Change, Energy, the Environment and Water*, accessed 26 February 2024, https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands.

Cth DCCEEW 2021. *Phytophthora dieback*, *Environment. Invasive species. Diseases, fungi and parasites*, Australian Government Department of Climate Change, Energy, the Environment and Water. https://www.dcceew.gov.au/environment/invasive-species/diseases-fungi-and-parasites/phytophthora-cinnamomi-disease.

Cth DCCEEW 2023. *National Flying-fox monitoring viewer*, *Australian Government Department of Climate Change, Energy, the Environment and Water*, Australian Government Department of Climate Change, Energy, the Environment and Water https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf.

Cth DCCEEW 2025. *Protected Matters Search Tool*, *Australian Commonwealth Government Department of Climate Change, Energy, the Environment and Water*, https://www.environment.gov.au/epbc/protected-matters-search-tool.

DAWE 2008. Approved Conservation Advice for *Grevillea parviflora subsp. parviflora* Small-flower Grevillea, The Commonwealth Department of Agriculture, Water and the Environment. Canberra. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fwww.environment.gov.au%2Fbiodiversity%2Fthreatened%2Fspecies%2Fpubs%2F64910-conservation-advice.pdf&clen=80603&chunk=true.

DAWE 2021a. Conservation Advice for the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland, Department of Agriculture Water and The Environment, Canberra, ACT. http://www.environment.gov.au/biodiversity/threatened/communities/pubs/171-conservation-advice.pdf.

DAWE 2021b. *Myrtle rust (Austropuccinia psidii)*, *Environment. Invasive species. Diseases, fungi and parasites*, accessed 18 October 2022, Australian Government Department of Agriculture, Water and the Environment, Canberra, ACT. https://www.dcceew.gov.au/environment/invasive-species/diseases-fungi-and-parasites/myrtle-rust.

DCCEEW 2024. *Grey-headed Flying Fox in the Species Profile and Threats (SPRAT) database*, *Species Profile and Threats Database. Commonwealth Department of Climate Change, Energy the Environment and Water. Canberra, ACT*, http://www.environment.gov.au/cgi-bin/sprat/public/spratlookupspecies.pl?earchtype=Sciname&name=Pteropus%20poliocephalus.

de Witt Consulting 2018. *Environmental Impact Statement Proposed Catholic College - 2 Kingfisher Close and 507 Medowie Road, Medowie*, Prepared by de Witt Consulting on behalf of Trustees of the Roman Catholic Church for the Diocese of Maitland - Newcastle. Author Maund, M. de Witt Consulting.

DEC 2004. *Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (Working Draft)*, New South Wales Department of Environment and Conservation, Hurstville, NSW.

Department of Environment & Climate Change NSW 2002. *NSW ecosystems study: background and methodology*, Author: Mitchell P, NSW National Parks and Wildlife Service, Hurtsville, NSW. https://www.environment.nsw.gov.au/resources/conservation/EcosystemsMethodology.pdf.

DEW 2021. National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*, Department for Environment and Water, Adelaide, SA. https://www.agriculture.gov.au/sites/default/files/documents/recovery-plan-grey-headed-flying-fox.pdf.

DEWHA 2008. Approved Conservation Advice for *Angophora inopina*, Department of the Environment, Water, Heritage and the Arts, Canberra, ACT. https://www.environment.gov.au/biodiversity/threatened/species/pubs/64832-conservation-advice.pdf.

DoE 2013. *Matters of National Environmental Significance Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*, Department of the Environment, Canberra, ACT, accessed 14 February 2024, https://www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance.

DoE 2014a. Approved Conservation Advice for Eucalyptus parramattensis subsp. decadens (Earp's gum), Department of the Environment, Canberra, ACT. https://www.environment.gov.au/biodiversity/threatened/species/pubs/56148-conservation-advice.pdf.

DoE 2014b. *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)*, Department of the Environment, accessed 29 May 2019, Australian Government Department of the Environment and Energy.

DoE 2015. *Referral guideline for management actions in grey-headed and spectacled flying-fox camps*, Australian Government Department of Climate Change, Energy, the Environment and Water, https://www.dcceew.gov.au/sites/default/files/documents/referral-guideline-flying-fox-camps.pdf.

DoEWHA 2008. Approved Conservation Advice for Prostanthera densa, Department of the Environment, Water, Heritage and the Arts, Canberra, ACT. https://www.environment.gov.au/biodiversity/threatened/species/pubs/12233-conservation-advice.pdf.

DPE 2022a. Updating BioNet Plant Community Types: Eastern New South Wales PCT Classification Version 1.1 (2022), NSW Government Department of Planning and Environment. Parramatta, NSW. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/BioNet/updating-bionet-plant-community-types-eastern-nsw-pct-classification-220177.pdf.

DPE 2022b. *Threatened reptiles Biodiversity Assessment Method survey guide*, The Department of Planning and Environment (DPE).

DPE 2022c. Controlled activities – Guidelines for Riparian Corridors on Waterfront Land, https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0008/386207/licensing_approvals_controlled_activities_riparian_corridors.pdf.

DPE 2022d. Controlled activities - Guidelines for watercourse crossings on waterfront land, NSW Department of Planning and Environment. https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0010/386209/licensing_approvals_controlled_activities_watercourse_crossings.pdf.

DPE 2022e. Controlled Activities - Guidelines for Outlet Structures on Waterfront Land, NSW Department of Planning and Environment. https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0007/386206/licensing_approvals_controlled_activities_outlet_structures.pdf.

DPE 2022f. Controlled Activities - Guidelines for Laying Pipes and Cables in Watercourses on Waterfront Land, NSW Department of Planning and Environment, Parramatta, NSW. https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0006/386205/licensing_approvals_controlled_activities_laying_pipes_cables.pdf.

DPE 2022g. Controlled Activities - Guidelines for Instream Works on Waterfront Land, Department of Planning and Environment, Parramatta, NSW. https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0005/386204/licensing_approvals_controlled_activities_instream_works.pdf.

DPE 2022h. Conservation Action Plan Sand doubletail (Diuris arenaria), NSW Department of Planning and Environment, Sydney, NSW. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Conservation-Action-Plans-adopted/conservation-action-plan-sand-doubletail-diuris-arenaria-220388.pdf.

DPI 2012. *Risk assessment guidelines for groundwater dependent ecosystems*, New South Wales Government Department of Primary Industries.

DPI 2013. *Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update)*, NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf.

DPIE 2019. *Guidance to assist a decision-maker to determine a serious and irreversible impact*,.

DPIE 2020a. *Biodiversity Assessment Method (BAM)*, NSW Department of Planning, Industry and the Environment, https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020.

DPIE 2020b. Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method, accessed 11 June 2020, https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf.

DSEWPaC 2009. *Census of Australian Vertebrates*, Australian Government Department of Sustainability Environment, Water, Population and Communities, Canberra, ACT.

DSEWPC 2011. *Survey Guidelines for Australia's Threatened Reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*,.

DSEWPC 2012. Approved Conservation Advice for Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory) (koala Northern Designatable Unit), http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf.

Eby P & Lunney D 2002. *Managing the grey-headed flying-fox as a threatened species in NSW*, Mosman, Australia.

Harden GJ (ed.) 1992. *Flora of New South Wales*, NSW University Press, Kensington, NSW.

Harden GJ 1993. *Flora of New South Wales*, NSW University Press, Kensington, NSW.

Harden GJ 2000. *Flora of New South Wales*, Revised Edition, NSW University Press, Kensington, NSW.

Harden GJ 2002. *Flora of New South Wales*, NSW University Press, Kensington, NSW.

IUCN 2012. IUCN Red List Categories and Criteria (Version 3.1). Second edition., https://www.iucnredlist.org/resources/categories-and-criteria.

IUCN SSC 2020. IUCN SSC Bat Specialist Group (BSG) Recommended Strategy for Researchers to Reduce the Risk of Transmission of SARS-CoV-2 from Humans to Bats, https://www.iucnbsg.org/uploads/6/5/0/9/6509077/map_recommendations_for_researchers_v._1.0_final.pdf.

IUCN Standards and Petitions Committee 2019. Guidelines for using the IUCN Red List Categories and Criteria (Version 14), http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf.

Landcom 2004. *Managing Urban Stormwater: Soils and Construction*, 4th edn, New South Wales Government.

Matthei LE 1995. *Soil Landscapes of the Newcastle 1:100 000 Sheet Report*, Department of Land and Water Conservation, Sydney, NSW.

Moir Landscape Architecture 2018. *Catherine McAuley Catholic College Landscape Master Plan Report*, Report prepared for Catholic Schools Office - Diocese of Maitland Newcastle. Moir Landscape Architecture.

MRBG & DSE 2010. *National Recovery Plan for the Dwarf Kerrawang Rulingia prostrata*, Authors: O Carter, Department of Sustainability and Environment, Melbourne, Victoria; and N Walsh, Royal Botanic Gardens, Melbourne, VIC, https://www.dcceew.gov.au/sites/default/files/documents/rulingia-prostrata.pdf.

Naylor SD, Chapman GA, Atkinson G, Murphy CL, Tulau MJ, Flewin TC, Milford HB, & Morand DT 1998. *Guidelines for the use of acid sulfate soil risk maps*, Department of Land and Water Conservation, Sydney, accessed 27 April 2020, http://www.dlwc.nsw.gov.au/care/soil/ass/pdfs/ass_maps_guide.pdf.

Newcastle Bushfire Consulting 2018. *Bushfire Assessment Report - Proposed School Alternate Solution for Lot 412 and 413 DP 1063902 507 Medowie Road, Medowie*, Newcastle Bushfire Consulting. Warners Bay, NSW, https://majorprojects.accelo.com/public/fbce2f1607e998e89d0fbaf8acb0b501/Appendix%2020%20Bushfire%20Assessment%20Report.pdf.

NSW DCCEEW 2024a. *BAM - Important Areas mapping portal*, *NSW Government*, accessed 24 July 2024, https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas.

NSW DCCEEW 2024b. *NSW BioNet Vegetation Classification database*, *BioNet, New South Wales Department of Climate Change, Energy, the Environment and Water*, accessed 4 March 2024, https://vegetation.bionet.nsw.gov.au/.

NSW DCCEEW 2024c. *eSPADE*, NSW Department of Climate Change, Energy, the Environment and Water. https://www.environment.nsw.gov.au/eSpade2Webapp.

NSW DCCEEW 2024d. *ePlanning Spatial Viewer*, NSW Department of Climate Change, Energy, the Environment and Water , Parramatta, NSW. https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/lot.

NSW DCCEEW 2024e. *Vegetation Information System: Classification*, *BioNet Vegetation Classification New South Wales Government Department of Climate Change, Energy, the Environment and Water*, https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/nsw-plant-community-type-classification.

NSW DCCEEW 2024f. Spatial Layer of HEVAE Vegetation Groundwater Dependent Ecosystems Value in NSW, https://datasets.seed.nsw.gov.au/dataset/hevae-vegetation-groundwater-dependent-ecosystems-in-nsw.

NSW DCCEEW 2024g. *Diuris arenaria (a terrestrial orchid) - Endangered species listing*, *NSW Government, Environment and Heritage*, accessed 1 July 2024, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/diuris-arenaria-a-terrestrial-orchid-endangered-species-listing.

NSW DCCEEW 2024h. *Giant Dragonfly - profile*, *NSW Department of Climate Change, Energy, the Environment and Water*, https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10600&linkId=99343958.

NSW DCCEEW 2024i. NSW State Vegetation Type Map (SVTM C2.0M2.1), https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/state-vegetation-type-map.

NSW DCCEEW 2025a. *BioNet the website for the Atlas of NSW Wildlife*, *BioNet, New South Wales Department of Climate Change, Energy, the Environment and Water*, https://atlas.bionet.nsw.gov.au/.

NSW DCCEEW 2025b. *Biodiversity Values Map NSW*, *Biodiversity Values Map and Threshold*, https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap.

NSW DCCEEW 2025c. *Biodiversity Values Map and Threshold Tool NSW*, *Biodiversity Values Map and Threshold Tool*, accessed 9 August 2024, https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap.

NSW Scientific Committee 1998. *Giant dragonfly (Petalura gigantea) - endangered species listing*, https://www2.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/1996-1999/giant-dragonfly-petalura-gigantea-endangered-species-listing.

NSW Scientific Committee 2011. Hunter Lowland Redgum Forest in the Sydney Basin - endangered ecological community listing, NSW Threatened Species Scientific Committee. https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2011-2012/hunter-lowland-redgum-forest-in-the-sydney-basin-minor-amendment-determination.

NSW TSSC 2018. Guidelines for interpreting listing criteria for species, populations and ecological communities under the NSW Biodiversity Conservation Act 2016, NSW Threatened Species Scientific Committee. https://www.environment.nsw.gov.au/resources/threatenedspecies/1AGuidelines20180302.pdf.

OEH 2016. The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 VIS_ID 4489, https://datasets.seed.nsw.gov.au/dataset/the-native-vegetation-of-the-sydney-metropolitan-area-oeh-2016-vis-id-4489.

OEH 2017. *Biodiversity Assessment Method (BAM)*, New South Wales Office of Environment and Heritage, https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-170206.pdf.

OEH 2020. *Grey-headed Flying-fox - profile*, *Threatened species*, https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697.

Pennay M, Law B, & Reinhold L 2004. Bat calls of New South Wales, https://www.environment.nsw.gov.au/resources/nature/batcallsofnsw.pdf.

Pidutti J 2017. *Arboricultural Impact Assessment Report for Catherine McAuley Catholic College, 507 Medowie Road*, Prepared for Catholic Schools Office Maitland-Newcastle. Author: Pidutti. J, Eleebana, NSW.

Port Stephens Council 2016. *Medowie Planning Strategy*, Port Stephens Council.

Port Stephens Council & Australian Koala Foundation 2002. Port Stephens Council Comprehensive Koala Plan of Management (CKPoM).

Strahler A 1964.' Quantitative geomorphology of drainage basins and channel networks' *in* Chow V (ed.), *Handbook of Applied Hydrology*, McGraw-Hill, New York.

Threatened Species Scientific Committee 2011. *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*, Office of Environment and Heritage, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/swamp-sclerophyll-forest-coastal-floodplains-endangered-ecological-listing.

TSSC 2020. Conservation Advice for *Rhodamnia rubescens*, Threatened Species Scientific Committee. https://www.environment.gov.au/biodiversity/threatened/species/pubs/15763-conservation-advice-11122020.pdf.

Webber Architects 2018. Site Staging Plan - Catherine McAuley Catholic College 507 Medowie Road, Medowie.

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 & Australian National Herbarium 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 was conducted under the terms of Biosis' Scientific Licence issued by NSW DCCEEW (SL100758, expiry date 30 June 2026). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Mitchell Palmer (BAAS17051).

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 winter during cool but wet weather, with additional targeted surveys undertaken in summer during warm and occasionally wet weather. 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

Appendix 2.1. Threatened flora 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							
Nabiac Casuarina ***Allocasuarina simulans***	VU	VU	Yes	Straggling shrub confined to an area between Nabiac to Forster. Grows in heath communities in Maritime Grasslands. Grows in sand soils.	Low	No	No	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. The species has not been recorded within 5 km of the subject land.
Charmhaven Apple ***Angophora inopina***	VU	VU	Yes	Small to large tree endemic to the Central Coast region from Karuah to the Charmhaven - Morisset area. Grows in woodland with a dense shrubby understorey in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Eastern Riverine Forests and Sydney Coastal Heaths. Grows on sandstone substrates in deep, white sandy soils.	Medium	Yes	Yes, undertaken	No impact	While the subject land contains woodland, with a moderately dense understorey in sections, it is not within Singleton or Cessnock LGAs. Marginal habitat exists along vegetation remnants adjacent to the subject land. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land. Targeted survey was undertaken and the species was not recorded.
Asperula asthenes **Trailing Woodruff**	VU	VU	Yes	Low trailing perennial herb with a scattered distribution spanning Bulahdelah north to	Low	No	No	No impact	Whilst this species can occur within the surrounds of the Newcastle region, populations occur more

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							
				Kempsey. Grows in damp areas, often adjacent to riverbanks in a variety of communities including, New England Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Coastal Freshwater Lagoons and Dry Rainforests.					predominantly in Northern areas of NSW (i.e. Kempsey, Port Macquarie). The species requires damp habitats in tall moist forests, which is not present within the subject land. The subject land is considered to be substantially degraded due to routine mowing of understorey and weed infestation in damp sites. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land.
Netted Bottle Brush ***Callistemon linearifolius***	-	VU	Yes	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.	Medium	Yes	Yes, undertaken	No impact	Populations of this species predominantly occur within the; Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. Marginal habitat exists along vegetation remnants adjacent to the subject land. Targeted survey was undertaken and the species was not recorded.
Dwarf Kerrawang ***Commersonia prostrata***	EN	EN	Yes	Ground hugging shrub with populations sparsely distributed in the Southern Highlands, Southern Tablelands and the North Coast. Grows in gullies, along	Medium	Yes	Yes, undertaken	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. Targeted survey was

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							
				drainage lines and in disturbed areas in a variety of communities including Coastal Freshwater Wetlands of the Sydney Basin Bioregion, New England Dry Sclerophyll Forests, Temperate Montane Grasslands and Subalpine Grasslands. Grows in sand or peat soils.					undertaken and the species was not recorded.
Red Helmet Orchid ***Corybas dowlingii***	-	EN	Yes	Tuberous Orchid restricted to the Port Stephens, Bulahdelah, Lake Macquarie and Freemans Waterhole areas in the Central Coast and Hunter regions. Grows in sheltered gullies and southerly slopes in Northern Hinterland Wet Sclerophyll Forests and North Coast Wet Sclerophyll Forests. Grows in well-drained gravelly soils.	Low	No	No	No impact	This species generally grows in sheltered gullies on well-drained gravelly soil. Marginal species habitat within the subject land is considered to be substantially degraded due to routinely mown understorey.
Leafless Tongue-orchid ***Cryptostylis hunteriana***	VU	VU	Yes	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests	Low	No	No	No impact	This species is recorded mainly on coastal and near coastal ranges north to near Forster, with two isolated occurrences inland north-west of Grafton. Other populations occur predominantly within the Shoalhaven area. Marginal species habitat within the subject land is considered to be substantially degraded due to routinely mown understorey. This species was not detected during field

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							
				and Sydney Coastal Heaths. Grows in sandy soils.					investigations, nor has it been recorded within 5 km from the subject land.
White-flowered Wax Plant *Cynanchum elegans*	EN	EN	Yes	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	No impact	Preferred habitat for this species includes rainforest gullies and slopes. The species habitat within the subject land is considered to be substantially degraded due to shrub layer removal and routinely mown understorey. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land.
Sand Doubletail *Diuris arenaria*	-	EN	Yes	Terrestrial orchid with a scattered distribution between Kanangra-Boyd National Park south to Bungendore. Grows on gently undulating country in Coastal Heaths and Dry Grassy Eucalypt Forests on sandy flats Temperate Montane Grasslands, Subalpine Woodlands and Southern Escarpment Wet Sclerophyll Forests. Grows in clay soil	Medium	Yes	Yes, undertaken	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. Targeted survey was undertaken and the species was not recorded.
Newcastle Doubletail *Diuris praecox*	VU	VU	Yes	Terrestrial orchid growing between Bateau Bay and Smiths Lake. Grows on hills	Low	No	No	No impact	The subject land is located too far from the typical coastal locations generally considered potential

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							
				and slopes of near-coastal districts in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Floodplain Wetlands and North Coast Wet Sclerophyll Forests.					habitat for this species. Furthermore, marginal species habitat within the subject land is considered to be substantially degraded due to routinely mown understorey. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land.
Camfield's Stringybark ***Eucalyptus camfieldii***	VU	VU	No	Mallee tree restricted to a narrow band stretching from Raymond Terrace to the north and Waterfall in the south. Grows in scattered, localised distributions including sites at Norah Head, Terrey Hills, North Head, Menai, Mt Colah, Peats Ridge and Elvina Bay Trail. Grows in scattered stands near the boundaries of tall coastal heath and low open woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Sydney Coastal Heaths and Wallum Sand Heaths. Grows in sandy soils on Hawkesbury sandstone.	Low	No	No	No impact	This species has a restricted distribution, generally occurring within the Horsnby/Gosford regions. Whilst scattered occurrences can occur further north, this species is highly conspicuous and was not detected during field 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							
Earp's Gum *Eucalyptus parramattensis* subsp. *decadens*	VU	VU	Yes	Small to medium sized tree, growing in two metapopulations, the Kurri Kurri meta-population spans from Cessnock - Kurri Kurri in the north to Mulbring - Abedare in the south and the Tomago Sandbends meta-population spans Salt Ash and Tanilba Bay in the north to Williamtown and Tomago in the south. Grows on wet sites subject to periodic inundation in Coastal Swamp Forests. Grows in deep, low nutrient sandy soils.	Medium	Yes	Yes, undertaken	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land. Targeted survey was undertaken and the species was not recorded.
Small-flower Grevillea *Grevillea parviflora* subsp. *parviflora*	VU	VU	Yes	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, Corymbia maculata - Angophora costata Open Forest in the Dooralong Area, Sydney Sandstone Ridgetop Woodland at Wedderburn and Cooks	Medium	Yes	Yes, undertaken	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land. Targeted survey was undertaken and the species was not 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							
				River/Castlereagh Ironbark Forest at Kemps Creek. Grows in sandy or light clay soils including tertiary alluviums over thin shales and lateritic ironstone gravels.					
Noah's False Chickweed ***Lindernia alsinoides***	-	EN	Yes	Erect annual herb found growing coastal areas from Bulahdelah to Coopernook including occurrences north at Shannon's Creek west of Coutts Crossing and at Bungawalbyn. Grows in swampy sites and wetlands along coastal and hinterland creeks in Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons and Coastal Valley Grassy Woodlands.	Medium	Yes	Yes, undertaken	No impact	Swamp forest habitat exists along vegetation remnants adjacent to the subject land. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land. Targeted survey was undertaken and the species was not recorded.
Villous Mint-bush ***Prostanthera densa***	VU	VU	Yes	Medium sized erect shrub recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens. Found growing in sclerophyll forest and shrubland on rocky slopes near coastal headlands and near-coastal ranges in South Coast Sands Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests,	Medium	Yes	Yes, undertaken	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land. Targeted survey was undertaken and the species was not 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							
				Maritime Grasslands, Sydney Coastal Heaths, Wallum Sand Heaths and Southern Lowland Wet Sclerophyll Forests. Grows on Sandstone substrates.					
Eastern Underground Orchid *Rhizanthella slateri*	EN	VU, E2	Yes	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	No	No	No impact	The species habitat within the subject land is considered to be substantially degraded due to shrub layer removal and routinely mown understorey. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land.
Scrub Turpentine *Rhodamnia rubescens*	CE	CE	Yes	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll	Medium	Yes	Yes, undertaken	No impact	This species generally prefers littoral, warm temperate and subtropical rainforests, of which is not present within the subject land. 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							
				forest usually on volcanic and sedimentary soils.					was not detected during field investigations, nor has it been recorded within 5 km from the subject land. Targeted survey was undertaken and the species was not recorded.
Native Guava ***Rhodomyrtus psidioides***	CE	CE	Yes	Shrub or small tree which typically grows to 12 metres high. Populations are typically restricted to coastal regions of low elevation between Sydney and Maryborough, Queensland. Often found in littoral, warm temperate and subtropical rainforests and wet sclerophyll forests near creeks and drainage lines. This species is known to be particularly susceptible to myrtle rust.	Low	No	No	No impact	The species habitat within the subject land is considered to be substantially degraded due to shrub layer removal and routinely mown understorey. This species was not detected during field investigations, nor has it been recorded within 5 km from the subject land.
Coast Groundsel ***Senecio spathulatus***	-	EN	Yes	Low growing perennial herb or shrub with populations occurring in Nadgee Nature Reserve and between Kurnell in Sydney and Myall Lakes National Park with additional populations occurring between Wilsons Promontory in Victoria to the NSW border. Found growing in coastal areas mostly on frontal dunes and forming low, broad clumps in Maritime Grasslands and Sydney Coastal	Low	No	No	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. The species has not been recorded within 5 km 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							
				Heaths. Grows in soils ranging from clay to loamy sands.					
Magenta Lilly Pilly ***Syzygium paniculatum***	VU	EN	Yes	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.	Low	No	No	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. The species has not been recorded within 5 km of the subject land.
Black-eyed Susan ***Tetratheca juncea***	VU	VU	Yes	Small shrub confined to the northern area of the Sydney Basin bioregion and the southern area of the North Coast bioregion in the Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock Local Government Areas. Found growing at well drained sites which experience annual rainfall levels between 1000 and 1200 mm at elevations below 200 metres in	Low	No	No	No impact	The species habitat within the subject land is considered to be substantially degraded due to shrub layer removal and routinely mown understorey. This species was not detected during field investigations, nor has it been recorded within 5 km from 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							
				swampy heath and moist forests. Usually found growing in soils from the Awaba soil landscape comprising of low nutrient sandy, skeletal soils, sandy loam soils and clay soils on sandstone or conglomerate substrates.					

Appendix 2.2. Threatened fauna species assessment

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							
Rufous Bettong ***Aepyprymnus rufescens***	-	VU	Yes	The original range from Coen in north Queensland to central Victoria has been reduced to a patchy distribution from Cooktown, Queensland, to north-eastern NSW as far south as Mt Royal National Park. In NSW it has largely vanished from inland areas but there are sporadic, unconfirmed records from the Pilliga and Torrington districts. Occurs in a variety of habitats for coastal eucalypt forest,	Low	No	No	No impact	Marginal habitat exists along vegetation remnants adjacent to the subject land but has been subject to degradation. The species has not been recorded within 5 km 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							
				through tall, wet sclerophyll, to low, dry open woodland. Only occurs in areas with a sparse or grassy understorey, adjacent to areas of dense undergrowth.					
Regent Honeyeater ***Anthochaera phrygia***	CE	CE	Yes	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.	Low	No	No	No impact	The subject land is not included on the Important Areas map for the species. The species unlikely to breed within the subject land as habitat is not suitable. Breeding records not known from the locality.
Wedge-tailed Shearwater ***Ardenna pacifica***	Mi	-	No	Common breeding and non-breeding visitor to coastal and pelagic waters off the east and west coasts of Australia, vagrants to north and south Australian waters. Breeds on vegetated islands, atolls and cays and nests in rock crevices or burrows.	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are generally from coastal areas.
Bush Stone-curlew ***Burhinus grallarius***	-	EN	Yes	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it	Low	No	No	No impact	This species depends on vegetation with an open understorey and suitable fallen debris for cover and foraging (such as dead timber and logs). There is no suitable habitat within the subject land. The 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							
				still common however and in the south-east it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.					has not been recorded within 5 km of the subject land.
Sanderling *Calidris alba*	Mi	VU	Yes	Occurs on the coast mostly on open sand beaches exposed to open sea-swells.	Low	No	No	No impact	The habitat for this species in the form of open sand beaches is not present within the study area. The study area is not included on the Important Areas map for the species.
Red Knot, Knot *Calidris canutus*	VU, Mi	-	Yes	Typically located within intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Occasionally found on sandy open beaches or shallow pools, or in saline wetlands close to the coast.	Low	No	No	No impact	This species is a non-breeding migratory visitor from Arctic regions of Siberia. The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies and does not include inland lakes or swamps.
Curlew Sandpiper *Calidris ferruginea*	CE, Mi	CE	Yes	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are

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							
									generally from high quality freshwater wetlands.
Pectoral Sandpiper ***Calidris melanotos***	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	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are generally from coastal areas.
Great Knot ***Calidris tenuirostris***	VU	VU	Yes	Mainly found on intertidal mudflats, sandflats and sandy beaches. Rarely found on inland lakes and swamps, instead preferring sheltered coastal habitats. In hot conditions, the Great Knot often roosts on damp substrates to keep cool.	Low	No	No	No impact	The habitat for this species in the form of intertidal mudflats, and sandy beaches is not present in the study area. The study area is not included on the Important Areas map for the species. The species has not been recorded within 5 km of the subject land.
Gang-gang Cockatoo ***Callocephalon fimbriatum***	EN	EN, E2	Yes	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	Low	No	No	No impact	Old growth forests and woodland habitats preferred by the species are not present in the subject land. Species breeding habitat not present within the subject land. Presence is likely to be limited to transient foraging. While there are some hollows on site, the breeding habitat is of poor quality. The species has 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							
				lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.					been recorded within 5 km of the subject land.
South-eastern Glossy Black-Cockatoo ***Calyptorhynchus lathami lathami***	VU	VU, E2	Yes	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.	Low	No	No	No impact	Species breeding habitat not present within the subject land. Presence is likely to be limited to transient foraging. While there are some hollows on site, the breeding habitat is of poor quality.
Eastern Pygmy-possum ***Cercartetus nanus***	-	VU	Yes	Patchily distributed from the coast to the Great Dividing Range, and as far as Pilliga, 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	Low	No	No	No impact	Habitat in the form of woodland with hollow-bearing trees is present within the subject land, however banksias and bottlebrushes are not present. Suitable habitat is not present within the subject land. The species has not been recorded within 5 km 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							
				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 sites within a 0.5 ha area over a 5 month period.					
Greater Sand Plover, Large Sand Plover ***Charadrius leschenaultii***	VU, Mi	VU	Yes	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries and roosting during high tide on sandy beaches or rocky shores. Individuals have been recorded on inshore reefs, rock platforms, small rocky islands and sand cays on coral reefs, within Australia. Occasional sightings have also occurred on near-coast salt lakes, brackish swamps, shallow freshwater wetlands and grassed paddocks.	Low	No	No	No impact	The habitat for this species in the form of intertidal sand and mudflats, and sandy beaches is not present in the subject land. The subject land is not included on the Important Areas map for the species.
Lesser Sand-plover ***Charadrius mongolus***	EN, Mi	VU	Yes	In Australia, the species is known to favour coastal environs including beaches, mudflats and mangroves. Within NSW, individuals have been observed on intertidal sand and mudflats in estuaries	Low	No	No	No impact	The habitat for this species in the form of mudflats, beaches and mangroves is not present in the subject land. The subject land is not included on the Important Areas map for the species. The species has not been recorded within 5 km 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							
				or roosting on sandy beaches or rocky shores at high tide.					
White-winged Black Tern *Chlidonias leucopterus*	Mi	-	No	Irregular summer visitor from northern Eurasia to coastal and subcoastal grassy swamps and fresh or saline wetlands of western, northern and eastern mainland Australia. Rarely recorded inland or at sea except during migration.	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are generally from coastal areas.
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	VU	VU	N/A	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 impact	Eucalypt woodlands without a dense shrub layer are present within the subject land. Though uncommon east of the Great Dividing Range, there is a low likelihood of occurrence.
Wallum Froglet *Crinia tinnula*	-	VU	Yes	The Wallum Froglet is a coastal species, confined to acid, paperbark swamps and sedge swamps of the "wallum" country. The species occurs from near Noosa in southern Queensland south to the central coast of NSW, with a disjunct population on Kurnell Peninsula. The species is a late winter breeder and males call in choruses from within sedge tussocks or at the water edge.	High (Recorded)	Yes	Yes, not undertaken – presence assumed	Potential for impact to breeding and foraging habitat	Habitat in the form of a first order creekline is present on site, however the habitat quality is poor. Potential habitat exists within the study area, outside the subject land. The species was recorded during survey associated with the college and approved EIS, as well as the current 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							
Spotted-tailed Quoll ***Dasyurus maculatus***	EN	VU	N/A	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 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.	Low	-	No	No impact	Marginal foraging habitat may exist within the subject land, however it has been subjected to disturbance. There is no suitable breeding habitat within the subject land.
***Dromaius novaehollandiae* - endangered population**	-	E2	Yes	The Emu formerly occurred throughout mainland Australia and Tasmania though only rarely in dense tropical forests	Low	No	No	No impact	The habitat for this species is not present in the subject land. The species has not been recorded within 5 km 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							
				or parts of the arid interior. It is now generally absent from densely settled regions. The species was formerly widespread in north-eastern NSW, but is now restricted to coastal and near-coastal areas between Evans Head and Red Rock and a small isolated population further west in the Bungawalbin area. It is not known whether a natural population continues to persist in the Port Stephens area. On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant					

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							
				species, and over long distances.					
Beach Stone-curlew ***Esacus magnirostris***	-	CE	Yes	In Australia, the Beach Stone-curlew occupies coastlines from about Point Cloates in Western Australia, across northern and north-eastern Australia south to north-eastern NSW, with occasional vagrants to south-eastern NSW and Victoria. In NSW, the species occurs regularly to about the Manning River, and the small population of north-eastern NSW is at the limit of the normal range of the species in Australia. Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass,	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are generally from coastal areas. The species has not been recorded within 5 km 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							
				scattered shrubs or low trees; also among open mangroves.					
Latham's Snipe *Gallinago hardwickii*	VU, Mi	VU	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	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there is a waterway present in the subject land, observations are generally from coastal areas. The species has not been recorded within 5 km of the subject land.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	-	VU	Yes	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	No	No	No impact	This species nests on cliff ledges, headlands or at the top of large trees near coasts or rivers. Nests are usually in sight of large waterbodies. The breeding habitat for this species is not present in the subject land. No nests or evidence of breeding were observed during the field investigations.
Little Eagle *Hieraaetus morphnoides*	-	VU	Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been	Low	No	No	No impact	This species nests in tall living trees within a remnant patch of open eucalypt forest, which is present as habitat in the subject land, however no nests or evidence of breeding was

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							
				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.					observed during the field investigations. The species has not been recorded within 5 km of the subject land.
White-throated Needletail *Hirundapus caudacutus*	VU, Mi	VU	N/A	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.	Transient	-	No	No impact	The species has been recorded roosting in trees in forests and woodlands, though little is known about the species. The species does not breed in Australia and nearby sightings are likely vagrants.
Stephens' Banded Snake *Hoplocephalus stephensii*	-	VU	Yes	This nocturnal species is partly arboreal and is usually found in wet sclerophyll forest or rainforest. It feeds on lizards, birds and small mammals (Cogger, 1992 346 /id).	Medium	Yes	Yes, undertaken	No impact	Habitat in the form of hollow-bearing trees are present on site. The species has not been recorded within 5 km of the subject land. Targeted survey was undertaken and the species was not recorded.
Swift Parrot *Lathamus discolor*	CE	EN	Yes	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	Low	No	No	No impact	The subject land is not included on the Important Areas map for the 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							
				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.					
Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit *Limosa lapponica baueri*	EN	-	Yes	The Bar-tailed Godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it does not contain estuarine wetlands or lakes. While there are waterways present in the study area, observations are generally from brackish wetlands. The study area is not included on the Important Areas map for the species.
Green and Golden Bell Frog *Litoria aurea*	VU	EN	Yes	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and	Low	No	No	No impact	Semi-permanent wet areas associated with a first order creekline are considered potential habitat for the species. There is one poor-quality waterway in 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							
				northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.					however it is degraded and does not represent suitable habitat for the species as it is lacking fringing vegetation that would be suitable for perching. Plague Minnow Gambusia holbrooki were observed in the waterway. The species was not detected within the subject land during diurnal or nocturnal investigations as part of the current assessment, which took place during the calling period of the species. The species has not been recorded within 5 km of the subject land.
Square-tailed Kite ***Lophoictinia isura***	-	VU	Yes	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy	Low	No	No	No impact	Breeding habitat for this species includes large eucalypts in preferred vegetation types located along or near watercourses. No nests or evidence of breeding were observed during the field investigations.

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							
				large hunting ranges of more than 100 km^2. 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.					
Little Bent-winged Bat ***Miniopterus australis***	-	VU	Yes	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.	Low	No	No	No impact	There are no habitat features suitable for breeding (i.e. culverts, caves, mines or tunnels) within 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							
Large Bent-winged Bat *Miniopterus orianae oceanensis*	-	VU	Yes	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 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.	Low	No	No	No impact	There are no habitat features suitable for breeding (i.e. culverts, caves, mines or tunnels) within the subject land.
Southern Myotis *Myotis macropus*	-	VU	Yes	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	Medium	Yes	Yes, undertaken	No impact	Breeding and foraging habitat was considered to be present within the subject land due to the presence of hollow-bearing trees within 200 m of waterways. The species has not been recorded within 5 km of the subject land. Targeted survey was undertaken and the species was not 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							
				large hind claws, and also catch flying insects.					
Flatback Turtle *Natator depressus*	VU, Mi	-	No	The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Nesting is confined to Australia and four genetic stocks are recognised.	Low	No	No	No impact	Key habitat for this species is not present within the subject land.
Barking Owl *Ninox connivens*	-	VU	Yes	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.	Low	No	No	No impact	Potential breeding habitat in the form of hollow-bearing trees are present in the subject land but not suitable for the species. The species has not been recorded within 5 km of the subject land.
Powerful Owl *Ninox strenua*	-	VU	Yes	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	High (Recorded)	No	No	Foraging habitat - Potential	The species requires living or dead trees with hollows greater than 20 cm diameter for breeding habitat. No suitable hollow-bearing trees are present. One individual was recorded during survey associated with the college and approved EIS, as well 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							
				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.					the current assessment, likely utilising the habitat for foraging.
Eastern Curlew *Numenius madagascariensis*	CE, Mi	-	Yes	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	No impact	Habitat in the form of sheltered estuaries and intertidal flats are absent in the subject land.
Eastern Osprey *Pandion cristatus*	-	VU	Yes	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for 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	Low	No	No	No impact	Breeding habitat for this species consists of dead trees or artificial structures that are located within 100 m of a floodplain, with a preference for coastline, therefore the habitat is absent in the subject land. No nests or evidence of breeding were found during the field investigations. The species has not been recorded within 5 km 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							
				up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.					
Giant Dragonfly *Petalura gigantea*	-	EN	Yes	Live in permanent swamps and bogs with some free water and open vegetation. Adults spend most of their time settled on low vegetation on or adjacent to the swamp.	Medium	Yes	Yes, undertaken	No impact	Habitat in the form of swamps are not present in the subject land, but may occur to the south-west of the development site. The species has not been recorded within 5 km of the subject land. Targeted survey was undertaken and the species was not recorded.
Greater Glider (southern and central) *Petauroides volans*	EN	EN, E2	Yes	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.	Medium	Yes	Yes, undertaken	No impact	Habitat in the form of hollow-bearing trees are present in the subject land, however of poor quality and unlikely to be suitable for breeding. The species has not been recorded within 5 km of the subject land. Targeted survey was undertaken and the species was not recorded.
Squirrel Glider *Petaurus norfolcensis*	-	VU, E2	Yes	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	Medium	Yes	Yes, undertaken	No impact	This species prefers Blackbutt-Bloodwood forest with a heath understorey and an Acacia midstorey. The species requires hollow-abundant vegetation for refuge or breeding sites. While hollows are present on site, they are

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							
				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.					of poor quality. Targeted survey was undertaken and the species was not recorded.
Brush-tailed Rock-wallaby *Petrogale penicillata*	VU	EN	Yes	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	No impact	Natural rocky escarpments, outcrops and cliffs, which are key habitat areas for this species, are absent from the subject land. The species has not been recorded within 5 km of the subject land.
Brush-tailed Phascogale *Phascogale tapoatafa*	-	VU	Yes	The Brush-tailed Phascogale had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. Nests and shelters in tree hollows, tree stumps and occasionally birds nests, and can use more than 40 nests in a year.	Medium	Yes	Yes, undertaken	No impact	Habitat in the form of dry sclerophyll open forest, heath, swamps or rainforest, containing hollow-bearing trees, is present within the subject land however it has been subjected to degradation. Targeted survey was undertaken and the species was not 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							
Koala *Phascolarctos cinereus*	EN	EN, E2	Yes	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. haemostoma* and *E. signata*. They are solitary with varying home ranges.	High (Recorded)	Yes	Yes, not undertaken – presence assumed	Foraging habitat - Preferred Koala habitat identified at western edge of subject land as well as isolated feed trees scattered within subject land.	Native vegetation containing Koala food trees are of poor quality within the development footprint, being heavily degraded by past disturbance and clearance, however habitat exists adjacent to the development footprint within the subject land. The species was recorded within the development site during survey associated with the college and approved EIS. The subject land likely provides marginal foraging habitat for the species.
Common Planigale *Planigale maculata*	-	VU	Yes	The Common Planigale is known to occur in a variety of habitats from weed-infested urban reserves to cool mountain forests, from sea level up to 400 m. Habitat selection is considered to be dependent on an adequate surface cover of grasses, hollow logs, rocks and leaf litter. It feeds on insects, spiders and small lizards. This species shelters under rocks,	Medium	Yes	Yes, not undertaken – presence assumed	Potential impact	Habitat in the form of woodland containing grassed areas, hollows and leaf litter is degraded within the subject land. The species has not been recorded within 5 km 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							
				timber, rubbish and termite mounds.					
Long-nosed Potoroo ***Potorous tridactylus***	VU	VU, E2	Yes	Usually found within 50 km of the coast. Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy. Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue.	Low	No	No	No impact	Habitat in the form of coastal heath is absent from the subject land. Marginal habitat with groundcover is available, however it is highly degraded. The species has not been recorded within 5 km of the subject land.
New Holland Mouse ***Pseudomys novaehollandiae***	VU	-	N/A	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 impact	Suitable habitat in the form of heathland understorey and vegetated sand dunes is absent from 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							
				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.					
Grey-headed Flying-fox *Pteropus poliocephalus*	VU	VU	Yes	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.	High (Recorded)	No	No	Foraging habitat - Potential	No camps (communal breeding/roosting sites) were identified within the subject land during the field investigations. The species was recorded during survey associated with the college and approved EIS. The subject land may be utilised on occasion for foraging.
Masked Owl *Tyto novaehollandiae*	-	VU	Yes	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 mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal	High (Recorded)	No	No	Foraging habitat - Potential	This species breeds in moist eucalypt forests and woodlands, and the species relies on medium sized hollows with close proximity to open habitat. No suitable hollow-bearing trees are present. The species was recorded during survey associated

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							
				marsupials and terrestrial mammals.					with the college and approved EIS, likely utilising the habitat for foraging.
Mahony's Toadlet ***Uperoleia mahonyi***	EN	EN	Yes	Small robustly built frog distinguished from other Uperoleia species by black and white belly pattern that appears marbled or blotched (rather than small dots or specs) and lack of colour patch below the knee. Mahony's Toadlet is endemic to the mid-north coast of NSW and has been found between Kangy Angy and Seal Rocks. Occurs in ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic	Low	No	No	No impact	The subject land does not contain the soil type or vegetation consistent with the habitat needs of the 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							
				vegetation at breeding sites includes sedges (*Shoenoplectus* spp., *Baumea* spp. and *Lepironia articulata*) and Broadleaf Cumbungi *Typha orientalis*.					
Eastern Cave Bat *Vespadelus troughtoni*	-	VU	Yes	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. It roosts in small groups, often in well-lit overhangs and caves, mine tunnels, road culverts, and occasionally in buildings.	Medium	Yes	Yes, undertaken	No impact	The subject land does not contain habitat features suitable for roosting or breeding in the form of culverts, stormwater drains, mines or tunnels in the locality, but there may be old buildings or sheds within 2 km of the subject land. Targeted survey was undertaken and the species was not recorded.
Terek Sandpiper *Xenus cinereus*	VU, Mi	VU	Yes	Mainly found on saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons.	Low	No	No	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies, and does not contain brackish pools. The subject land is not included on the Important Areas map for the species.

Appendix 3. Flora

Appendix 3.1. BAM plot field data

Table A 3 BAM plot floristics

Family	Scientific name	Common name	40623.01		40623.02		40623.03		40623.04	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Native species										
Anthericaceae	*Tricoryne* spp.	-	-	-	0.1	1	-	-	-	-
Apiaceae	*Centella asiatica*	Indian Pennywort	0.1	40	0.1	20	-	-	-	-
Apiaceae	*Daucus* spp.	-	-	-	-	-	-	-	-	-
Apiaceae	*Hydrocotyle sibthorpioides*	-	0.1	20	-	-	-	-	-	-
Apocynaceae	*Parsonsia straminea*	Common Silkpod	3	50	-	-	-	-	-	-
Asphodelaceae	*Dianella caerulea* var. *producta*	-	0.1	5	0.1	20	0.3	100	0.2	20
Asteraceae	*Asteraceae indeterminate*	Daisies	-	-	0.1	30	-	-	-	-
Asteraceae	*Euchiton* spp.	-	-	-	-	-	-	-	0.1	20
Campanulaceae	*Lobelia purpurascens*	whiteroot	0.1	40	1	1000	-	-	0.1	20
Casuarinaceae	*Casuarina glauca*	Swamp Oak	15	-	0.1	1	-	-	-	-
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	0.2	100	-	-	0.1	5	-	-
Convolvulaceae	*Polymeria calycina*	-	0.1	5	0.1	20	-	-	-	-
Cyperaceae	*Machaerina articulata*	Jointed Twig-rush	0.1	100	-	-	-	-	-	-
Cyperaceae	*Carex* spp.	-	-	-	-	-	0.4	30	-	-
Cyperaceae	*Cyperus* spp.	-	-	-	-	-	-	-	-	-
Cyperaceae	*Lepidosperma limicola*	-	-	-	0.1	5	-	-	-	-
Cyperaceae	*Schoenus brevifolius*	-	-	-	0.1	40	-	-	0.1	20
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	5	-	4	50	-	-	-	-

Family	Scientific name	Common name	40623.01		40623.02		40623.03		40623.04	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	70	-	2	40	5	-	-	-
Dilleniaceae	*Hibbertia riparia*	-	-	-	0.1	5	-	-	-	-
Ericaceae	*Leucopogon* spp.	-	-	-	-	-	1	30	-	-
Fabaceae (Faboideae)	*Pultenaea paleacea*	Chaffy Bush-pea	-	-	0.2	20	-	-	-	-
Fabaceae (Faboideae)	*Kennedia rubicunda*	Dusky Coral Pea	-	-	0.1	5	-	-	-	-
Fabaceae (Faboideae)	*Grona varians*	-	-	-	-	-	-	-	0.1	10
Fabaceae (Faboideae)	*Glycine microphylla*	Small-leaf Glycine	-	-	-	-	-	-	0.1	10
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. sophorae*	Coastal Wattle	-	-	0.5	10	0.5	20	0.3	4
Fabaceae (Mimosoideae)	*Acacia suaveolens*	Sweet Wattle	-	-	0.1	2	-	-	-	-
Goodeniaceae	*Goodenia bellidifolia*	-	-	-	1	1000	-	-	-	-
Lauraceae	*Cassytha glabella*	-	-	-	0.1	5	-	-	-	-
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	-	-	-	-	0.2	20	-	-
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	-	-	0.1	10	0.5	30	-	-
Malvaceae	*Abutilon* spp.	Lantern-bush	0.1	2	-	-	-	-	-	-
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	-	-	10	-	-	-	-	-
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	20	-	0.1	20	-	-	-	-
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	2	1	6	-	-	-	5	-
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	-	-	-	-	5	-	-	-
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	-	-	-	-	-	-	10	-
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree	-	-	0.1	2	-	-	-	-
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	5	1	10	-	-	-	10	-
Myrtaceae	*Angophora costata*	Sydney Red Gum	-	-	-	-	9	-	-	-
Oxalidaceae	*Oxalis* spp.	-	-	-	-	-	-	-	-	-
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	5	-	0.2	10	-	-	0.1	2

Family	Scientific name	Common name	40623.01		40623.02		40623.03		40623.04	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	-	-	0.1	1	-	-	0.1	7
Phyllanthaceae	*Phyllanthus* spp.	-	-	-	-	-	-	-	-	-
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry	-	-	0.1	1	-	-	-	-
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	0.2	3	-	-	-	-	0.2	3
Poaceae	*Imperata cylindrica*	Blady Grass	-	-	20	-	40	-	5	-
Poaceae	*Entolasia marginata*	Bordered Panic	5	-	0.3	20	-	-	-	-
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	-	-	0.1	10	-	-	-	-
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass	-	-	1	40	1	100	-	-
Poaceae	*Cynodon dactylon*	Common Couch	-	-	0.2	40	1	100	5	-
Poaceae	*Digitaria* spp.	-	-	-	-	-	-	-	-	-
Poaceae	*Oplismenus imbecillis*	-	0.5	200	-	-	-	-	0.1	20
Poaceae	*Paspalidium distans*	-	-	-	0.1	10	-	-	-	-
Poaceae	*Pennisetum* spp.	-	-	-	-	-	0.1	5	-	-
Poaceae	*Themeda triandra*	-	-	-	-	-	0.5	100	-	-
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	-	-	-	-	0.5	40	-	-
Poaceae	*Microlaena stipoides*	Weeping Grass	-	-	0.2	50	0.5	50	-	-
Poaceae	*Entolasia stricta*	Wiry Panic	-	-	0.3	30	-	-	-	-
Proteaceae	*Persoonia lanceolata*	Lance Leaf Geebung	-	-	-	-	0.2	5	-	-
Proteaceae	*Conospermum longifolium*	Long Leaf Smoke-bush	-	-	-	-	0.1	20	-	-
Ranunculaceae	*Ranunculus lappaceus*	Common Buttercup	0.1	20	-	-	-	-	-	-
Ranunculaceae	*Ranunculus* spp.	-	-	-	0.5	300	-	-	-	-
Ranunculaceae	*Ranunculus inundatus*	River Buttercup	0.1	20	-	-	-	-	-	-
Rubiaceae	*Galium* spp.	-	-	-	0.1	30	-	-	-	-
Rubiaceae	*Pomax umbellata*	Pomax	-	-	-	-	1	1000	-	-

Family	Scientific name	Common name	40623.01		40623.02		40623.03		40623.04	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	-	-	-	-	-	-	0.1	1
Sapindaceae	*Alectryon subcinereus*	Wild Quince	0.3	1	-	-	-	-	-	-
Solanaceae	*Solanum* spp.	-	-	-	-	-	-	-	-	-
Violaceae	*Viola hederacea*	Ivy-leaved Violet	-	-	1	1000	-	-	0.1	10
Introduced species										
Amaranthaceae	*Alternanthera philoxeroides*	Alligator Weed	0.1	10	-	-	-	-	-	-
Asteraceae	*Ambrosia* spp.	-	-	-	-	-	0.4	30	-	-
Poaceae	*Andropogon virginicus*	Whisky Grass	1	40	1	50	0.5	50	5	-
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	-	-	0.5	50	2	200	5	-
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	-	-	-	-	0.1	30	-	-
Asteraceae	*Cirsium vulgare*	Spear Thistle	-	-	-	-	-	-	-	-
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	-	-	0.1	10	-	-	-	-
Poaceae	*Eragrostis curvula*	African Lovegrass	-	-	-	-	0.1	10	-	-
Poaceae	*Eragrostis* spp.	-	-	-	-	-	0.1	10	-	-
Apiaceae	*Hydrocotyle bonariensis*	-	-	-	-	-	0.1	10	-	-
Asteraceae	*Hypochaeris radicata*	Catsear	-	-	0.1	3	0.1	10	-	-
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	0.5	20	-	-	-	-	0.2	5
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	-	-	-	-	-	-	-	-
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	-	-	-	-	-	-	0.2	40
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive	-	-	-	-	-	-	0.2	1
Poaceae	*Paspalum urvillei*	Vasey Grass	0.2	40	0.1	5	-	-	-	-
Passifloraceae	*Passiflora edulis*	Common Passionfruit	-	-	-	-	-	-	0.2	1
Pinaceae	*Pinus elliottii*	Slash Pine	-	-	0.1	3	0.3	30	-	-
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	-	-	0.1	20	-	-	-	-

Family	Scientific name	Common name	40623.01		40623.02		40623.03		40623.04	
			Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.	Cvr%	Abund.
Rubiaceae	*Richardia* spp.	-	-	-	-	-	0.1	5	-	-
Euphorbiaceae	*Ricinus communis*	Castor Oil Plant	-	-	-	-	-	-	1	100
Rosaceae	*Rubus fruticosus* sp. agg.	Blackberry complex	3	500	0.1	5	-	-	0.1	4
Asteraceae	*Senecio madagascariensis*	Fireweed	-	-	0.1	1	-	-	-	-
Poaceae	*Setaria parviflora*	-	0.5	20	0.2	20	1	60	10	
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	-	-	-	-	0.2	20	0.1	3
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	0.2	5	-	-	-	-	-	-
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	-	-	-	-	-	-	1	-
Verbenaceae	*Verbena bonariensis*	Purpletop	0.1	3	-	-	0.1	10	-	-
Verbenaceae	*Verbena rigida* var. *rigida*	Veined Verbena	-	-	-	-	-	-	0.2	30

Table A 4 BAM plot summary

Category	40623.01	40623.02	40623.03	40623.04
PCT	3995	3995	3544	3544
Area (ha)	0.24	0.24	0.26	0.26
Patch size	>100	>100	>100	>100
Condition class	Moderate	Moderate	Moderate	Moderate
Zone	56	56	56	56
Easting	393580	393477	393587	393646
Northing	6374661	6374597	6374117	6374609
Bearing	349	4	15	250
Composition				
Tree	5	6	2	5
Shrub	3	6	4	4
Grass	4	12	11	6
Forbs	7	10	3	7
Ferns	1	1	1	0
Other	2	4	0	2
Structure				
Tree	47.0	26.4	14.0	25.2
Shrub	0.6	1.1	1.8	0.6
Grass	10.6	26.5	44.8	10.2
Forbs	0.8	4.1	1.4	0.5
Ferns	70.0	2.0	5.0	0.0
Other	3.1	0.4	0.0	0.2
Function				
Large trees	1	0	0	0
Hollow trees	1	0	2	2
Litter cover	100	97	61	17
Length fallen logs	20	22	15	4
Tree stem 5-9	1	1	1	1
Tree stem 10-19	1	0	0	0
Tree stem 20-29	1	1	0	0
Tree stem 30-49	5	3	1	0
Tree stem 50-79	3	6	4	1

Category	40623.01	40623.02	40623.03	40623.04
Tree regeneration	1	1	1	1
High threat exotic	4.8	1.9	3.0	11.3

Appendix 3.2. BAM plot data sheets

Table A 5 BAM Plot 40623.01

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/05/2024	CMCC RTS BDAR		Moderate	BAC			
Zone 56	Datum GDA94	Plot ID	40623.01	Plot dimensions	50x20	Orientation of middle	349	
Easting 393580	Northing 6374661	IBRA region	NSW North Coast	Photo #				
Plant Community Type		3995				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	3
	Grasses etc.	4
	Forbs	7
	Ferns	1
	Other	2
Sum of Cover of native vascular plans by growth form group	Trees	47
	Shrubs	0.6
	Grasses etc.	10.6
	Forbs	0.8
	Ferns	70
	Other	3.1
High Threat Weed cover		4.8

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	3
50 - 79 cm	3
30 - 49 cm	5
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	20
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	100	100	100	100	100
Average of the 5 subplots	100				

Notes	

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

Landform Pattern		Slope	Flat 1 degree	Soil Surface Texture	Clay loam
Soil Colour	Dark grey brown	Site Drainage	Intermittent in7ndation	Distance to nearest water	300m?

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	R	Adjoining
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	0		
Fire damage	0		
Storm damage	0		
Weediness	2	R	Blackberry and minor privet
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/05/2024	CMCC RTS BDAR	40623.01	BAC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	*Abutilon spp.*	N	0.1	2	Mid Storey
SG	*Alectryon subcinereus*	N	0.3	1	Ground
	Alternanthera philoxeroides	HTE	0.1	10	Ground
	Andropogon virginicus	HTE	1	40	Ground
TG	*Casuarina glauca*	N	15		Canopy
FG	*Centella asiatica*	N	0.1	40	Ground
FG	*Commelina cyanea*	N	0.2	100	Ground
FG	*Dianella caerulea* var. *producta*	N	0.1	5	Ground
GG	*Entolasia marginata*	N	5		Ground
TG	*Eucalyptus robusta*	N	5	1	Canopy
TG	*Eucalyptus tereticornis*	N	2	1	
GG	*Gahnia clarkei*	N	5		Ground
TG	*Glochidion ferdinandi*	N	5		Mid Storey
FG	*Hydrocotyle sibthorpioides*	N	0.1	20	Ground
	Ligustrum sinense	HTE	0.5	20	Mid Storey
FG	*Lobelia purpurascens*	N	0.1	40	Ground
GG	*Machaerina articulata*	N	0.1	100	Ground
TG	*Melaleuca quinquenervia*	N	20		Canopy
GG	*Oplismenus imbecillis*	N	0.5	200	Ground
OG	*Parsonsia straminea*	N	3	50	Ground
	Paspalum urvillei	HTE	0.2	40	Ground
SG	*Pittosporum undulatum*	N	0.2	3	Mid Storey
OG	*Polymeria calycina*	N	0.1	5	Ground
EG	*Pteridium esculentum*	N	70		Ground
FG	*Ranunculus inundatus*	N	0.1	20	Ground
FG	*Ranunculus lappaceus*	N	0.1	20	Ground
	Rubus fruticosus sp. agg.	HTE	3	500	Mid Storey
	Setaria parviflora	E	0.5	20	Ground
	Solanum mauritianum	E	0.2	5	Mid Storey
	Verbena bonariensis	E	0.1	3	Ground

Table A 6 BAM Plot 40623.02

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/05/2024	CMCC RFS BDAR		Moderate	BAC			
Zone 56	Datum GDA94	Plot ID	40623.02	Plot dimensions	50x20	Orientation of middle	4	
Easting 393477	Northing 6374597	IBRA region	NSW North Coast	Photo #				
Plant Community Type		3995				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	6
	Grasses etc.	12
	Forbs	10
	Ferns	1
	Other	4
Sum of Cover of native vascular plans by growth form group	Trees	26.4
	Shrubs	1.1
	Grasses etc.	26.5
	Forbs	4.1
	Ferns	2
	Other	0.4
High Threat Weed cover		1.9

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	1
50 - 79 cm	6
30 - 49 cm	3
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	22
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	90	95	100	100	100
Average of the 5 subplots	97				

Notes	

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

Landform Pattern		Slope	1 deg	Soil Surface Texture	Sandy clay loam
Soil Colour	Dark grey brown	Site Drainage	Intermittent inundation	Distance to nearest water	100m

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

Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/05/2024	CMCC RFS BDAR	40623.02	BAC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	*Acacia longifolia* subsp. *sophorae*	N	0.5	10	Mid Storey
SG	*Acacia suaveolens*	N	0.1	2	
	Andropogon virginicus	HTE	1	50	Ground
FG	*Asteraceae indeterminate*	N	0.1	30	Ground
	Axonopus fissifolius	HTE	0.5	50	Ground
OG	*Billardiera scandens*	N	0.1	1	Mid Storey
SG	*Breynia oblongifolia*	N	0.1	1	Mid Storey
OG	*Cassytha glabella*	N	0.1	5	Mid Storey
TG	*Casuarina glauca*	N	0.1	1	Canopy
FG	*Centella asiatica*	N	0.1	20	Ground
	Conyza bonariensis	E	0.1	10	Mid Storey
GG	*Cynodon dactylon*	N	0.2	40	Ground
FG	*Dianella caerulea* var. *producta*	N	0.1	20	Ground
GG	*Echinopogon caespitosus*	N	1	40	Ground
GG	*Entolasia marginata*	N	0.3	20	Ground
GG	*Entolasia stricta*	N	0.3	30	Ground
GG	*Eragrostis brownii*	N	0.1	10	Ground
TG	*Eucalyptus pilularis*	N	10		Canopy
TG	*Eucalyptus robusta*	N	10		Canopy
TG	*Eucalyptus tereticornis*	N	6		Canopy
GG	*Gahnia clarkei*	N	4	50	Ground
FG	*Galium* spp.	N	0.1	40	
FG	*Galium* spp.	N	0.1	30	Ground
TG	*Glochidion ferdinandi*	N	0.2	10	Mid Storey
FG	*Goodenia bellidifolia*	N	1	1000	Ground
SG	*Hibbertia riparia*	N	0.1	5	Ground
	Hypochaeris radicata	E	0.1	3	Ground
GG	*Imperata cylindrica*	N	20		
OG	*Kennedia rubicunda*	N	0.1	5	Mid Storey
GG	*Lepidosperma limicola*	N	0.1	5	Ground
SG	*Leptospermum trinervium*	N	0.1	2	Mid Storey
FG	*Lobelia purpurascens*	N	1	1000	Ground

GG	*Lomandra longifolia*	N	0.1	10	Ground
TG	*Melaleuca quinquenervia*	N	0.1	20	Mid Storey
GG	*Microlaena stipoides*	N	0.2	50	Ground
GG	*Paspalidium distans*	N	0.1	10	
	Paspalum urvillei	HTE	0.1	5	Ground
	Pinus elliottii	HTE	0.1	3	
	Plantago lanceolata	E	0.1	20	Ground
OG	*Polymeria calycina*	N	0.1	20	Ground
EG	*Pteridium esculentum*	N	2	40	Ground
SG	*Pultenaea paleacea*	N	0.2	20	Mid Storey
FG	*Ranunculus* spp.	N	0.5	300	
	Rubus fruticosus sp. agg.	HTE	0.1	5	Mid Storey
GG	*Schoenus brevifolius*	N	0.1	40	Ground
	Senecio madagascariensis	HTE	0.1	1	Ground
	Setaria parviflora	E	0.2	20	Ground
FG	*Tricoryne* spp.	N	0.1	1	Ground
FG	*Viola hederacea*	N	1	1000	Ground

Table A 7 BAM Plot 40623.03

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/05/2024	CMCC RFI BDAR		Moderate	BAC			
Zone 56	Datum GDA94	Plot ID	40623.03	Plot dimensions	50x20	Orientation of middle	15	
Easting 393587	Northing 6374117	IBRA region	NSW North Coast	Photo #				
Plant Community Type		3436				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	4
	Grasses etc.	11
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	14
	Shrubs	1.8
	Grasses etc.	44.8
	Forbs	1.4
	Ferns	5
	Other	0
High Threat Weed cover		3

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	1
50 - 79 cm	4
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	15
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	100	100	100	5	0
Average of the 5 subplots	61				

Notes	

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

Landform Pattern		Slope	1 degree	Soil Surface Texture	Sandy
Soil Colour	Light grey	Site Drainage	Free	Distance to nearest water	30 m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			

Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/05/2024	CMCC RFI BDAR	40623.03	BAC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	*Acacia longifolia* subsp. *sophorae*	N	0.5	20	Mid Storey
	Ambrosia spp.	E	0.4	30	Ground
	Andropogon virginicus	HTE	0.5	50	Ground
TG	*Angophora costata*	N	9		Canopy
	Axonopus fissifolius	HTE	2	200	Ground
	Bidens pilosa	HTE	0.1	30	Ground
GG	*Carex* spp.	N	0.4	30	Ground
FG	*Commelina cyanea*	N	0.1	5	Ground
SG	*Conospermum longifolium*	N	0.1	20	Ground
GG	*Cynodon dactylon*	N	1	100	Ground
FG	*Dianella caerulea* var. *producta*	N	0.3	100	Ground
GG	*Echinopogon caespitosus*	N	1	100	Ground
	Eragrostis curvula	HTE	0.1	10	Ground
GG	*Eragrostis leptostachya*	N	0.5	40	Ground
GG	*Eragrostis* spp.	E	0.1	10	Ground
TG	*Eucalyptus resinifera*	N	5		Canopy
	Hydrocotyle bonariensis	E	0.1	10	Ground
	Hypochaeris radicata	E	0.1	10	Ground
GG	*Imperata cylindrica*	N	40		Ground
SG	*Leucopogon* spp.	N	1	30	Mid Storey
GG	*Lomandra longifolia*	N	0.5	30	
GG	*Lomandra multiflora* subsp. *multiflora*	N	0.2	20	Ground
GG	*Microlaena stipoides*	N	0.5	50	Ground
GG	*Pennisetum* spp.	N	0.1	5	Ground
SG	*Persoonia lanceolata*	N	0.2	5	Mid Storey
	Pinus elliottii	HTE	0.3	30	Canopy
FG	*Pomax umbellata*	N	1	1000	Ground
EG	*Pteridium esculentum*	N	5		Ground
	Richardia spp.	E	0.1	5	Ground
	Setaria parviflora	E	1	60	Ground
	Sida rhombifolia	E	0.2	20	Mid Storey
GG	*Themeda triandra*	N	0.5	100	Ground
	Verbena bonariensis	E	0.1	10	Mid Storey

Table A 8 BAM Plot 40623.04

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/05/2024	CMCC RFI BDAR		Low	BAC			
Zone 56	Datum GDA94	Plot ID	40623.04	Plot dimensions	50x20	Orientation of middle	250	
Easting 393646	Northing 6374609	IBRA region	NSW North Coast	Photo #				
Plant Community Type		3433				EEC: None	Confidence L	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	4
	Grasses etc.	6
	Forbs	7
	Ferns	0
	Other	2
Sum of Cover of native vascular plans by growth form group	Trees	25.2
	Shrubs	0.6
	Grasses etc.	10.2
	Forbs	0.5
	Ferns	0
	Other	0.2
High Threat Weed cover		11.3

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	2
50 - 79 cm	1
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	4
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	20	15	5	5
Average of the 5 subplots	17				

Notes	Slightly higher elevation than other plots

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

Landform Pattern		Slope	5 deg north	Soil Surface Texture	Sandy clay
Soil Colour	Brown	Site Drainage	Free	Distance to nearest water	100m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			

Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/05/2024	CMCC RFI BDAR	40623.04	BAC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	*Acacia longifolia* subsp. *sophorae*	N	0.3	4	Mid Storey
	Andropogon virginicus	HTE	5		Ground
TG	*Angophora floribunda*	N	10		Canopy
	Axonopus fissifolius	HTE	5		Ground
SG	*Breynia oblongifolia*	N	0.1	7	Mid Storey
	Cirsium vulgare	E			Ground
TG	*Cupaniopsis anacardioides*	N	0.1	1	Mid Storey
GG	*Cynodon dactylon*	N	5		Ground
GG	*Cyperus* spp.	N			Ground
FG	*Daucus* spp.	N			Ground
FG	*Dianella caerulea* var. *producta*	N	0.2	20	Ground
GG	*Digitaria* spp.	N			Ground
TG	*Eucalyptus robusta*	N	10		Canopy
TG	*Eucalyptus tereticornis*	N	5		Canopy
FG	*Euchiton* spp.	N	0.1	20	
TG	*Glochidion ferdinandi*	N	0.1	2	Mid Storey
OG	*Glycine microphylla*	N	0.1	10	Ground
OG	*Grona varians*	N	0.1	10	Ground
GG	*Imperata cylindrica*	N	5		Ground
	Ligustrum sinense	HTE	0.2	5	Mid Storey
FG	*Lobelia purpurascens*	N	0.1	20	Ground
	Lysimachia arvensis	E			Ground
	Modiola caroliniana	E	0.2	40	Ground
	Olea europaea subsp. cuspidata	E	0.2	1	Mid Storey
GG	*Oplismenus imbecillis*	N	0.1	20	Ground
FG	*Oxalis* spp.	N			Ground
	Paspalum urvillei	HTE			Ground
	Passiflora edulis	E	0.2	1	Ground
SG	*Phyllanthus* spp.	N			Ground
SG	*Pittosporum undulatum*	N	0.2	3	Mid Storey
	Ricinus communis	HTE	1	100	
	Rubus fruticosus sp. agg.	HTE	0.1	4	Mid Storey

GG	*Schoenus brevifolius*	N	0.1	20	Ground
	Setaria parviflora	E	10		Ground
	Sida rhombifolia	E	0.1	3	Mid Storey
FG	*Solanum* spp.	N			Ground
	Sonchus oleraceus	E	1		Ground
	Verbena rigida var. *rigida*	E	0.2	30	Mid Storey
FG	*Viola hederacea*	N	0.1	10	Ground

Appendix 4. Significant Impact Criteria assessments

Appendix 4.1. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

EEC background

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (Coastal Swamp Sclerophyll Forest) is listed as an EEC under the EPBC Act and is a swamp community that commonly occurs in low-lying coastal alluvial areas. The EEC structure varies from open woodland to closed forest with a canopy that is dominated by Swamp Paperbark (or other *Melaleuca* spp.) and/or Swamp Mahogany. It is associated with hydric soils that are characterized by alluvial deposits and that are either waterlogged or intermittently seasonally inundated. The ecological community occurs between the Great Dividing Range and the coastline from near Gladstone in Queensland, through to the south coast of New South Wales (DAWE 2021a).

Occurrence in the subject land

Coastal Swamp Sclerophyll Forest aligns with PCT 3995 *Hunter Coast Paperbark-Swamp Mahogany Forest*. Approximately 2.48 hectares of Coastal Swamp Sclerophyll Forest is present within the subject land of which consists of 0.24 hectares occurs within the development footprint. An assessment of whether the proposed works are likely to lead to a significant impact for Coastal Swamp Sclerophyll Forest is provided below.

Table A 9 SIC assessment for Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

SIC assessment for critically endangered and endangered ecological community
Reduce the extent of an ecological community.
The total extent of Coastal Swamp Sclerophyll Forest is estimated to be 114,358 ha (DAWE 2021a). Coastal Swamp Forest occurs along the western and northern edges of the subject land. The EEC within the subject land occurs as a large, connected patch of vegetation ≥ 100 ha of similar habitat, being low-lying flats in proximity to drainage lines subject to periodic inundation. Greater than 30 ha of the patch is likely to be consistent with PCT 3995 which is associated with Coastal Swamp Sclerophyll Forest EEC. Impacts of the development includes 0.24 ha of Coastal Swamp Forest along an existing edge of the community. Impacts are associated with a material stockpile and associated works. This equates to disturbance to approximately 9.5 % of the EEC within the subject land and <1 % of the local occurrence and is therefore considered unlikely to lead to a significant reduction in the extent of the ecological community.
Fragment or increase fragmentation of an ecological community.
The EEC currently consists of a large, connected patch both within, and extending outside of the subject land. The Impacts associated with the development occur along the edge of the large edge effected patch of the EEC. The subject land is contiguous with a large patch greater than 30 ha in area, Furthermore, vegetation in the study area is regularly trimmed to maintain separation from overhead electrical cables. Impacts as a result of the development includes 0.24 ha of Coastal Swamp Sclerophyll Forest within the subject land. Potential habitat for the EEC within the subject land is predominantly in the form of moderate condition vegetation in largely connected patch of bushland. However, vegetation to be impacted by the development is situated on the fringes of this patch within edge effected, low diversity bushland. Although the impact area will decrease the amount of potential habitat within the subject land by reducing the extent of the large patch, impacts will not fragment remaining habitat and therefore, is unlikely to reduce connectivity for this species.

SIC assessment for critically endangered and endangered ecological community
Adversely affect habitat critical to the survival of an ecological community.
The Approved conservation Advice for Coastal Swamp Sclerophyll Forest states: 'the areas (including habitat) most critical to the survival of the ecological community are those where the hydrological regime remains reasonably intact such that the vegetative diagnostic features are maintained' (DAWE 2021a). Coastal Swamp Sclerophyll Forest within the subject land is present on low lying areas along the western edge of the subject land extending further west into areas contiguous with the subject land. One waterway has been mapped within the southeast of the subject land. The waterway is not impacted as part of the development works. The development will also not result in changes to the existing landscape drainage or hydrology, and will therefore, not adversely affect habitat critical to the survival of the ecological 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.
As outlined above, abiotic factors necessary for Coastal Swamp Sclerophyll Forest survival relate to hydrology to create suitable habitat to support the suite of species associated with the community. Habitat for the community within the study area to floodplain areas of low vegetation primarily west of the study area, which will not be altered by the proposal.
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.
Impacts of the development are not expected to alter species composition of retained patches of the EEC.
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.***
Invasive species are currently present in moderate density within the community, including the high threat weed Blackberry. The prevalence of blackberry, along with other exotic species, is indicative of increased nutrient levels within community which is also at existing risk from the mobilisation of herbicide and other chemicals into the waterway from nearby properties. While the development impacts will result in soil disturbance which may lead to the establishment of new exotic plant species via stimulation of the weed seed bank, it is unlikely to result in the introduction of new species or exacerbate existing pressures in a manner that is likely to cause the Coastal Swamp Sclerophyll Forest to decline in the locality or as a whole.
Interfere with the recovery of an ecological community.
A National Recovery Plan for Coastal Swamp Sclerophyll Forest has not been produced; however the Approved Conservation Advice sufficiently outlines the priority actions needed for this ecological community (DAWE 2021a). Some of the key threatening processes significant to the proposed works are: • Clearing of native vegetation. • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants. • Novel biota and their impact on biodiversity (including the effects of Myrtle Rust *Austropuccinia psidii* and feral deer). • Dieback caused by the root-rot fungus *Phytophthora cinnamomi*. Impacts to key threatening processes can be minimised by implementing management strategies and ensuring any potential impacts are avoided if possible.

SIC assessment for critically endangered and endangered ecological community

Conclusion.

Based on the assessment provided above, it is concluded that Coastal Swamp Sclerophyll Forest is unlikely to be significantly impacted by the proposal. This conclusion was made on the basis that the proposed works are:

- Limited to the disturbance of 0.24 ha of PCT 3995.
- Unlikely to contribute to substantial fragmentation of the community in the locality.
- Unlikely to result in impacts that modify or destroy abiotic factors necessary for the survival of the EEC.
- Unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the EEC.
- Unlikely to increase invasive species establishment and mobilise chemicals such as fertilisers or herbicides.

Considering the above, a Commonwealth referral to the minister is not recommended regarding impacts to the community.

Appendix 4.2. Koala *Phascolarctos cinereus*

Species background

Koala is listed as Endangered under the EPBC Act. Koalas occupy a range of eucalypt-dominated forest and woodland types throughout their range, but favour habitats that support key forage species in more mesic microhabitats. Altitude (<800 metres ASL) and temperature restrict the Koalas distribution, as does leaf moisture at the western and northern ends of the range (DSEWPC 2012).

Key threats to Koala include habitat fragmentation, predation by dogs, vehicle strikes and disease. Climate change may also be affecting Koala populations through increased temperatures causing heat stress and a reduction in the level of moisture within the leaves of browse trees.

Occurrence in the subject land

The subject land comprises 3.22 hectares of native vegetation predominantly in the form of isolated trees with exotic grasses and native groundcover. In addition, scattered trees comprising of known Koala feed tree species, exotic trees and trees not known as Koala feed tree species occur within the subject land. Habitat to the west of the subject land is mapped as a preferred Koala habitat by the Port Stephens Koala Plan of Management. This corridor links major connective patches of preferred Koala habitat as the 'primary' habitat corridor within Medowie.

Previous records of Koala's exist within the development site and surrounding locality. Koala habitat has been identified as occurring within the development site during field assessment for the approved BDAR (Biosis 2018) and one Koala was recorded within the development site. The results of prior surveys indicate that Koala activity within the Preferred Koala habitat adjacent to the subject land was 30 %. This suggests that activity within the development site occurs primarily within the higher-quality habitat outside of the subject land (Biosis 2018).

No Koalas have been recorded as part of field investigations for the current assessment, however they have been assumed present on the basis of prior knowledge.

A total of 0.50 hectares of Koala habitat has been mapped by Biosis within the development footprint to be directly impacted by the project, in addition to 2.71 hectares of foraging habitat that may be indirectly impacted.

Table A 10 SIC assessment for Koala

SIC assessment for critically endangered or endangered species
Lead to a long-term decrease in the size of a population.
While the development will result in the removal of potential foraging and breeding habitat for Koala, the total area of habitat being removed is small in relation to the amount of retained, and non-impacted habitat. The subject land has been aligned to avoid areas of high-quality Koala habitat and movement corridors where Koalas are more likely to occur. Given the scale of the impact in the context of available habitat in the region, and the retention of vegetation to the west of the subject land to maintain habitat corridors it is unlikely that the project will lead to a long-term decrease in the size of an important Koala population.
Reduce the area of occupancy of the species.
The species is likely to be relatively widespread, but patchily distributed in larger consolidated blocks of remnant native vegetation within the locality. Due to the relatively localised and limited amount of habitat affected by the development, the overall area of occupancy for Koala is likely to remain unchanged. The species will continue to forage and breed in retained habitat either side of the cleared construction footprint and the completed construction will not represent a barrier to the movement of individuals.
Fragment an existing population into two or more populations.
The Koala occurs from Queensland through to the Victorian boarder, the proposed construction is not at the limit of the species range. The local population is not part of an endangered population. The subject land is well connected to preferred Koala habitat to the south and west, to the east of the subject land is Medowie Road and to the north are residential dwellings with cleared paddocks and patches of remnant vegetation. Koalas are capable of moving large distances between preferred feeding locations. The development is largely sited within previously cleared areas and will remove a small area of foraging and dispersal habitat. The development will avoid areas of good connectivity within high-quality habitat to the west of the subject land. The development will not limit the ability of the species to move through the landscape from north to south. Medowie road is an existing barrier to dispersal however some movement across Medowie Road likely occurs from time to time. The development will not substantially reduce east-west movement of Koalas across Medowie Road. Taking the above into consideration, the local Koala population will not be fragmented or isolated as a result of the project.
Adversely affect habitat critical to the survival of a species.
Approximately 3.22 ha of Preferred Koala habitat has been mapped within the subject land as defined by the Port Stephens KPOM (Port Stephens Council & Australian Koala Foundation 2002). Habitat critical to the survival of the Koala as defined in *EPBC Act Referral Guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DoE 2014b) occurs within the subject land. Using the Koala habitat assessment tool in Table 4 of the referral guidelines, it is considered likely some remnant vegetation within the subject land would constitute habitat critical to the survival of Koala. Using the criteria in Figure 2 (DoE 2014b) the project is considered to adversely affect Koala habitat for the following reasons: • The impact area contains habitat critical to the survival of the Koala. • The area to be cleared contains known Koala feed trees. • Less than 2 ha of habitat (0.50 ha) will be cleared. The development footprint has been sited to avoid as far as possible key areas of Koala habitat in the consolidated blocks of preferred Koala habitat to the south and west. Up to 0.50 ha of Koala habitat will be affected by the project, the impacts associated with the clearing will not significantly increase the level of fragmentation.
Disrupt the breeding cycle of a population.

SIC assessment for critically endangered or endangered species

While the project may result in the removal of vegetation occupied by Koala, including individuals that are breeding, the project will not result in the disruption to the breeding cycle of any local Koala population or the species as a whole. It is unlikely that disturbance from noise or lighting associated with the construction and operation of the college will substantially interfere with the species' ability to reproduce successfully. Koalas will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of an important population will not be disrupted.

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

Koalas are assumed to be present at low densities within the subject land. The project will only impact 0.50 ha of mostly disturbed habitat with larger areas of better condition habitat available in the broader landscape.

The project is not likely to isolate populations as the development will not significantly impact on the Koala corridor and is not likely to constitute a barrier to movement. While the project will result in the removal of scattered trees, some of which are likely to be used by the species, this level of loss is not likely to result in the decline of the species at a national scale.

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

Feral animals, including introduced predators, and plants are known or likely to be well established in the subject land. Some of these are known to negatively impact Koalas, including dogs and foxes. However, it is unlikely that the project would result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the project area. Industry standard weed and pathogen hygiene procedures will prevent the spread of pathogens such as *Phytophthora cinnamomi*.

Introduce disease that may cause the species to decline.

The project is unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of Koala populations in or near the project area.

Interfere with the recovery of the species.

Actions considered likely to substantially interfere with the recovery of Koala are defined in *EPBC Act Referral Guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DoE 2014b) as follows:

- Increasing Koala fatalities in habitat critical to the survival of the Koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.
- Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.
- Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi* to habitat critical to the survival of the Koala, that are likely to reduce the carrying capacity of the habitat.
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

The project will not result in increased dog attacks, which are primarily an issue where new urban development encroaches upon Koala habitat. The project is unlikely to result in an increase in traffic, and mitigation measures will be implemented such that sustained increases in road mortalities for Koala is unlikely. The project is unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of Koala populations in or near the subject land. Similarly, the project is unlikely to exacerbate the current level of invasive species threat operating within the subject land. High standards of machinery wash-down will prevent the spread of pathogens such as *Phytophthora cinnamomi*. The development will not constitute a barrier to the movement of Koalas between habitat patches and therefore will not restrict the species' ability to disperse or carry out normal demographic processes. The project is not

SIC assessment for critically endangered or endangered species
expected to result in substantial changes to hydrology which would result in degradation of any critical habitat to the extent that the carrying capacity of that habitat is reduced. The project is therefore unlikely to substantially interfere with the recovery of the Koala.
Conclusion.
The development footprint has been sited to avoid core areas of remnant native vegetation, which are expected to provide the higher quality habitat for Koala. While the project will remove 0.50 ha of Koala habitat, this loss has been minimised wherever possible and the overall area of occupancy for the species will remain unchanged. The project will not limit the ability of Koalas to move between habitat patches, does not constitute a barrier to movement and will not fragment populations. It is unlikely that habitat within the subject land constitutes habitat critical to the survival of the species and this habitat will not be adversely affected to the extent that it would result in a substantial decline in the species. The project will not interfere substantially with the recovery of the Koala. In consideration of the above significant impact criteria, the proposed activity is not likely to significantly impact Koala within the subject land or wider locality, as: • While small numbers of individuals may occasionally forage within woodland that will be impacted by the project, its removal is not likely to constitute a significant impact the local population. • Mitigation measures will be implemented to minimise risk of indirect impacts. A Commonwealth referral is not recommended for impacts to this species.

Appendix 4.3. Grey-headed Flying-fox *Pteropus poliocephalus*

Species background

Grey-headed Flying-foxes are listed as Vulnerable under the EPBC Act and as Vulnerable under the BC Act in NSW. They occur within 200 kilometres of the eastern coast of Australia from Rockhampton in Queensland to Adelaide in South Australia (OEH 2020).

Adult Grey-headed Flying-foxes forage over a large area and can travel up to 50 kilometres in one night (OEH 2020) but more often forage within 20 kilometres of their roost site (DEW 2021). They feed on blossom and fruit of primarily canopy vegetation including *Eucalyptus, Corymbia, Angophora, Melaleuca, Banksia* and *Ficus* species. The Grey-headed Flying-fox trends with the distribution of plants with similar flowering and fruiting times, support regular annual cycles of migration (Eby & Lunney 2002). It can be associated with flowering eucalyptus dependant on seasonality. Adults may migrate in response to changes in the amount and location of food as these resources are not annually reliable and may occur at different times in different locations (DEW 2021).

The Grey-headed Flying-fox roost most often in communal camps which are generally located within 20 kilometres of regular foraging resources and are often located along watercourses, mating and breeding occurs within these camps with conception occurring in April or May and young born in October or November.

Although separate camps exist and the species is spatially structured into colonies, the Grey-headed Flying-fox is a highly mobile species with genetic exchange occurring between camps, this species is considered as one continuous population (DCCEEW 2024).

Nationally significant camps are defined as camps occupied by >10,000 Grey-headed Flying-foxes in more than one year in the last 10 years or occupied by 2,500 Grey-headed Flying-foxes permanently or seasonally every year for the last 10 years (DoE 2015).

Key threats to the Grey-headed Flying-fox include Habitat loss and fragmentation (loss of roosting and foraging sites), exploitation (culling of individuals due to conflict with farmers), electrocution on power lines and entanglement in netting and barbed wire, heat stress, and a lack of knowledge of the species (OEH 2020, DCCEEW 2024).

Occurrence in the subject land

Two Grey-headed Flying-fox camps are located within 10 kilometres of the subject land, one in Raymond Terrace to the west and one at Moffats Swamp to the east (Cth DCCEEW 2023). The camp located at Raymond Terrace is a nationally significant Flying-fox camp.

Within the subject land potentially significant winter foraging resources exist in the form of Swamp Mahogany and *Melaleuca* species. These resources are unlikely to be significantly impacted by the project as they occur largely outside of the development footprint with only 0.50 hectares occurring on the subject land to be removed or modified.

Grey-headed Flying-foxes were recorded flying over the subject land from the east to the west during field assessment for the approved BDAR (Biosis 2018). The species were not recorded foraging within the subject land (Biosis 2018).

No Grey-headed Flying-foxes have been recorded as part of field investigations for the current assessment, however they have been assumed present on the basis of prior knowledge, as the subject land provides suitable foraging habitat. A total of 0.50 hectares of Grey-headed Flying-fox foraging habitat has been mapped by Biosis within the development footprint to be directly impacted by the project, in addition to 2.71 hectares of foraging habitat that may be indirectly impacted.

Table A 11 SIC assessment for Grey-headed Flying-fox

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
While the proposal will result in the removal of potential foraging resources for Grey-headed Flying-fox, the total area of habitat being removed is small in relation to the amount of retained, and non-impacted habitat. Also, the subject land avoids large areas of consolidated forest and woodland which the species prefers and where more significant foraging resources occur. Given the scale of the impact in the context of available habitat in the region, it is unlikely that it will lead to a long-term decrease in the size of an important Grey-headed Flying-fox population.
Reduce the area of occupancy of an important population.
The species is highly mobile and relatively widespread, roosting and maternity sites are well documented and conspicuous. No roosting or breeding habitat was recorded during field assessment. Due to the small area and limited number of potential feed trees to be removed, and the higher-quality habitat which was observed to be in use by foraging Grey-headed Flying-fox during field survey, the overall area of occupancy of the species will remain unchanged. The species will continue to forage in retained habitat either side of the construction footprint and the development will not represent a barrier to the movement of individuals.
Fragment an existing important population into two or more populations.
The national population of the Grey-headed Flying-fox is considered a single population as it is a highly mobile species. The subject land is a small area of previously modified and cleared land surrounded by higher-quality habitat. It is surrounded to the south and west by more in-tact remnant forest and swamp vegetation including protected land of the

SIC assessment for vulnerable species

Tilligerry State Conservation Area, and by rural residences with relatively scattered clumps of remnant vegetation to the north. Areas to the east include a golf course and Moffats Swamp Nature reserve.

The project will not impact on the nationally significant flying-fox camp located approximately 10 km west in the town of Raymond Terrace.

The project will remove 0.50 hectares of native vegetation and will not fragment the population.

Adversely affect habitat critical to the survival of a species.

Habitat critical to the survival of the Grey-headed Flying-fox includes important breeding and foraging resources. Breeding occurs within camps, two camps are located within 10 km of the subject land. One of these is a nationally significant camp located within 10 km to the west of the subject land, the other camp is located approximately 2 km to the east. Limiting foraging resources may constitute habitat critical for the survival of Grey-headed Flying-fox and may include areas with highly productive winter flowering tree species.

It is considered unlikely that remnant vegetation within the subject land would constitute habitat critical to the survival of the Grey-headed Flying-fox for the following reasons:

- No camps will be impacted by the project.
- Remnant vegetation within the subject land is considered unlikely to be selected as a roosting site in the future as vegetation occurs at the edge of a clearing and consists of relatively isolated paddock trees.
- The subject land has been selected to avoid identified areas of potentially important foraging resources for the Grey-headed Flying-fox including Swamp Mahogany and Melaleuca species.

Disrupt the breeding cycle of an important population.

While the project may result in the removal of vegetation utilised for foraging by the species, including individuals that are breeding, the project will not result in the disruption to the breeding cycle of any local Grey-headed Flying-fox population or the species as a whole. It is unlikely that disturbance from noise or lighting associated with the development will substantially interfere with the species' ability to reproduce successfully as the subject land is not within close proximity to breeding areas. Grey-headed Flying-foxes will continue to breed in camps unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.

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

Grey-headed Flying-foxes are assumed to utilise the subject land on occasion for foraging. The project will only impact a small number of trees which may provide foraging resources at certain times of the year. The project will not impact on any existing camps and is unlikely to have an impact on the nationally significant camp located at Raymond Terrace as this small patch is unlikely to produce sufficient foraging resources to support a large number of Flying-foxes. There exists higher-quality resources within in-tact native vegetation to be retained surrounding the subject land, therefore the project will only impact a very small number of resources within the broader landscape.

The subject land is considered unlikely to be suitable for future use as a camp as it does not support habitat features associated with Flying-fox camps.

The project will remove 0.50 hectares of native vegetation, which will not fragment or isolate the population as it is a small area, surrounding vegetation to be retained is well-connected to large areas of native bushland including protected reserves and due to the highly mobile nature of the species.

While the project will result in the removal or disturbance of scattered trees, some of which may be used by the species, this level of loss is not likely to result in the decline of the species at a national scale.

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

There are a large number of feral animals and plants that are known or likely to be well established in the subject land. Some of these have potential to negatively impact Grey-headed Flying-fox. However it is unlikely that the project would

SIC assessment for vulnerable species

result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the project area.

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 currently circulating the globe and causing a pandemic of the illness Covid-19 (IUCN SSC 2020). However, introduction of this disease to Grey-headed Flying-fox within the subject land as a result of the proposed works 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 works.
- The subject land does not contain breeding habitat for the species.
- When a preclearance inspection is undertaken by an ecologist for removal of native vegetation, the recommendations provided by the IUCN will be followed, including the wearing of a face mask by the ecologist, and avoidance of handling of any Flying-foxes.

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

Interfere substantially with the recovery of the species.

Actions considered likely to substantially interfere with the recovery of the Grey-headed Flying-fox as determined by key threats to the species (DEW 2021) are as follows:

- Habitat loss and fragmentation including important foraging species such as Forest Red Gum.
- Winter Foraging resources are limited to a narrow coastal strip in QLD and northern NSW.
- Spring foraging resources are considered critical to the survival of the species.
- Exploitation – shooting of Grey-Headed Flying-foxes to protect fruit crops involves death of the individual and indirect death as a result of shooting of pregnant and lactating females.
- Competition and hybridisation – indirect competition by Black Flying-fox which has had a range expansion in the past.
- Pollutants, electrocution and pathogens. A disproportionately higher number of lactating females are killed by electrocution on power lines.

The project will not fragment habitat for the Grey-headed Flying-fox and will not significantly contribute to the loss of habitat as it will result in the removal of only 0.50 hectares of native vegetation. Vegetation to be removed is not considered to comprise significant foraging resources. Vegetation to be retained in the surrounding area comprises of species considered as potentially important spring and winter foraging resources including Melaleuca species, Swamp Mahogany and Red Gum species.

The project will not result in activities likely to result in exploitation of the species as the development is related to ancillary infrastructure only. The project is not likely to increase incidence of competition or hybridisation.

The project will not interfere substantially with the recovery of the Grey-headed Flying-fox.

Conclusion.

Foraging may occasionally occur within the subject land. The subject land will avoid areas of core, in-tact remnant vegetation which are expected to provide the higher quality habitat for Grey-headed Flying-fox. The project will remove a very small area of potential habitat and the overall area of occupancy of this species will remain unchanged. The project will not interfere substantially with the recovery of the Grey-headed Flying-fox.

In consideration of the above significant impact criteria, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the subject land or wider locality, as:

- The subject land does not contain any breeding camps.
- While small numbers of individuals may occasionally forage within woodland that will be impacted by the project, its removal is not likely to constitute a significant impact the local population.
- Mitigation measures will be implemented to minimise risk of indirect impacts.

A Commonwealth referral is not recommended for impacts to this species.

Appendix 5. Curricula vitae of key personnel

Curriculum vitae

Mitch Palmer

Manager – Ecology (NSW)

Qualifications

- Bachelor of Science, University of Newcastle
- NSW BAM Assessor BAAS17051
- NSW Biobanking Assessor No. 222

Other qualifications and training

- Provide First Aid (HLTAID011)
- General Construction Induction (white card)
- Four Wheel Drive, Driver Training and Recovery
- Biodiversity Offset Scheme Accredited Assessors Course
- BioBanking Assessment Methodology Accredited Assessors Course
- Advanced Plant Identification – Centre for Ecosystem Science
- Wildlife survey school - Niche Environmental
- Wildlife immediate care and rescue – Wires
- Koala rescue and rehabilitation – Wires
- Assess applications for legislative compliance
- Rail Industry Safety Induction Card

Professional experience

Mitch has over 14 years' experience and key expertise in the identification of native flora, vegetation communities and avifauna species throughout NSW, Victoria and Tasmania, particularly within the Hunter Valley, Central and New England Tablelands, Riverina, Central West, North West Slopes and Western NSW. Mitch currently manages the NSW ecology and GIS operations as well as various large complex projects within NSW. Mitch has a diverse range of project experience, particularly ecological constraints analyses, ecological impact assessment and site feasibility for Major Projects including Biodiversity Development and Stewardship Assessment Reports (BDAR and BSSAR), all in accordance with the NSW Biodiversity Offsets Scheme (BOS) and Biodiversity Assessment Methodology (BAM). Mitch also has vast experience with EPBC Referrals and regulator consultation. Of particular note, Mitch also has significant experience and specialises in project management, planning approval process and leading field logistics for large scale and complex renewable projects, particularly solar and wind, within NSW. Mitch has qualifications in geological and environmental science and is an accredited BAM assessor.

Key project experience

Project Manager/Quality Assurance

Hills Of Gold Wind Farm

Project mentoring, project management and quality assurance regarding the BDAR, Bird and Bat operational studies and collision modelling for the Hills of Gold Wind Farm biodiversity studies, submissions reports and Independent Planning Commission (IPC) being undertaken for Someva and Engie.

Project Manager/ Principal Ecologist

Coffs Harbour Bypass

Project direction, project management and target flora surveys for the Coffs Harbour Bypass, for Transport for NSW.

Project Director/ Principal Ecologist

Hunter Hydrogen Hub

Project direction and technical advice relating to ecological constraints and opportunities assessment for the Hunter Hydrogen Hub, in the Port of Newcastle, for GHD, on behalf of Origin Energy.

Project Manager/ Principal Ecologist

Dinawan Energy Hub

Project direction, management and comprehensive seasonal ecological surveys for the Dinawan Energy Hub in the Riverina, for Spark Renewables.

Project Manager/ Principal Ecologist

Renewable energy projects - Solar

Project direction, management, technical advice relating to ecological constraints and opportunities assessment and modelling for several in development renewable solar energy projects in NSW.

Project Manager/ Principal Ecologist

Bodangora Wind Farm

Project management, detailed ecological surveys and technical advice relating to ecological matters for the Bodangora Wind Farm compliance and legislation updates, Infigen Energy

Professional affiliations and memberships

Environment Institute of Australia and New Zealand (EIANZ)

Curriculum vitae

Caragh Heenan

Senior Zoologist - Major Projects

Qualifications

- PhD (Science), University of Adelaide
- Bachelor of Science (Honours), University of Adelaide
- Diploma Applied Science (Animal Technology), Tafe SA

Other qualifications and training

- Provide First Aid (HLTAID011)
- General Construction Induction (white card)
- Four Wheel Drive, Driver Training and Recovery
- Chemical Accreditation AQF-3 (AHCCM303, AHCCHM304)

Professional experience

Dr Caragh Heenan has been working in the natural resource management and environmental sector since 2014, working in ecology and threatened species management in NSW, NT and SA, including community engagement and education at Uluru-Kata Tjuta National Park, Land for Wildlife program throughout central Australia, and the Northern Rivers of NSW. Caragh brings a strong project management and research background to the Biosis team, and has been involved in many ecological studies, both as a field zoologist and project manager. Caragh's field experience, technical writing skills, and attention to detail make her an asset to the Newcastle ecology team.

Caragh has experience in the provision of preclearance assessments, fauna salvage, biodiversity constraints and biodiversity assessments. She has experience across a range of projects, from small residential developments and subdivisions, to state significant infrastructure (SSI) and state significant development (SSD) projects, including mining projects and renewable energy developments. Caragh has worked on a range of NSW Biodiversity Assessment Methodology (BAM) projects and has managed and undertaken numerous surveys to support the preparation of Biodiversity Development Assessment Reports (BDARs). These surveys have included broad-scale fauna habitat survey as well as targeted surveys for a wide range of threatened fauna species in accordance with state and Commonwealth guidelines. Her experience includes preparation of BDARs as well as the calculation of offset credits utilising the BAM Calculator (BAM-C). Caragh is skilled in undertaking bird utilization surveys (BUS) for wind farm projects, as well as the use of collision risk modelling (CRM) to guide wind farm biodiversity assessments.

Key project experience

Project Manager/ Senior Zoologist

Seasonal and targeted surveys and approvals for Wollongong Resources Pty Ltd.

Project tasks included project management, client liaison, and reporting for seasonal surveys, targeted flora/fauna surveys, vegetation and swamp mapping, and biodiversity approval documents for Wollongong Resources Pty Ltd.

Project Manager/ Senior Zoologist

Orchard Hills Precinct on behalf of the Department of Planning and Environment.

Project tasks included project management, client and stakeholder engagement/liaison, specialist ecological advisory and reporting services for the proposed precinct planning and rezoning of Orchard Hills, as well as biodiversity and riparian assessment reporting.

Project Manager/ Consultant Zoologist

Bywong and Wamboin Detailed Biodiversity Values Assessment on behalf of Queanbeyan-Pellarang Regional Council.

Project tasks included Environmental Living (E4) zone review for Bywong and Wamboin, including project management, client and landholder liaison, field planning and desktop review, as well as preparation of assessment report.

Project Manager/ Senior Zoologist

Deeargee Solar Farm BDAR on behalf of EMM Consulting Pty Ltd.

Project tasks included project management, client liaison, preliminary biodiversity assessment, land category assessment, BAM-C calculations, planning and implementing targeted flora/fauna surveys and provision of ecological advice.

Senior Zoologist

Dinwan Solar Farm BDAR on behalf of EMM Consulting Pty Ltd.

Project tasks included undertaking multi-seasonal and bat and BUS, as well as qualitative and quantitative CRM to determine the risk of strike for threatened and common avifauna at the proposed wind farm.

Project Manager/ Consultant Zoologist

Summerhill Materials Recycling Facility BDAR on behalf of City of Newcastle and GHD Newcastle.

Project tasks included project management, client liaison, BAM-C calculations, planning and implementing targeted flora/fauna surveys, BDAR preparation and provision of ecological advice.

Key publications

Heenan, C.B., Goodman, B.A. & White, C.R. (2015) The influence of climate on avian nest construction across large geographical gradients. Global Ecology and Biogeography. 24 (11), 1203-1211. doi: 10.1111/geb.12378 [journal cover image by Heenan, C.B.]

Heenan, C.B. (2013) An overview of the factors influencing the morphology and thermal properties of avian nests. Avian Biology Research. 6 (2), 104-118. doi: 10.3184/003685013X13614670646299

Heenan C.B. (2013) The structural and thermal properties of avian cup-shaped nests. PhD thesis, The University of Adelaide.

Heenan, C.B. & Seymour, R.S. (2012) The effect of wind on the rate of heat loss from avian cup-shaped nests. PLoS1. 7 (2), e32252. doi: 10.1371/journal.pone.0032252

Heenan, C.B. & Seymour, R.S. (2011) Structural support, not insulation, is the primary driver for avian cup-shaped nest design. Proceedings of the Royal Society B – Biological Sciences. 278 (1720), 2924- 2929. doi: 10.1098/rspb.2010.2798 [journal cover image by Heenan, C.B.

Curriculum vitae

Brooke Corrigan

Senior Botanist - Offset Coordinator

Qualifications

- Bachelor of Environmental Science, University of Newcastle
- Diploma of Project Management, UNE Partnerships
- NSW BAM Assessor BAA19061

Other qualifications and training

- Provide First Aid (HLTAID011)
- Four Wheel Drive, Driver Training and Recovery
- NSW Biodiversity Offset Scheme Accredited Assessor Course
- Threatened Species Translocation Workshop
- Eucalypt and Grasses Identification Training (Van Klaphake)
- OH&S General Induction
- Chemical Users Certificate AQF3
- Chainsaw Operations (cross-cut and fell)
- Defence NSW Contractor Induction

Professional experience

Brooke has over 18 years' experience assisting Industry, government and private landholders to assess and manage biodiversity assets. A grounding in land management, ecological restoration and ecosystem assessment provides key insights for applying the NSW BAM methodology and is invaluable in providing accurate and practical advice. Brooke has acted as project and technical lead in a number of offset, stewardship and development assessments and specialises in applying a risk management framework to ecological considerations in NSW. Her ecological knowledge has been endorsed by the industry as a Certified Environmental Practitioner.

Brooke exhibits strong technical skills in botany, biodiversity assessment and offsetting, implementation of the BAM, ecological and restoration constraints identification, mapping, and cost benefit analysis to provide ecologically and economically sustainable management outcomes. Providing advice which facilitates a high degree of confidence in the feasibility and effectiveness of proposed actions at the assessment stage for clients and approval authorities.

Key project experience

Lead BAM Assessor

Biosis nominated assessor to the NSW Department of Planning & Environment (DPE) Credit Supply Taskforce – Accredited Assessor Services Panel.

Brooke delivered streamlined assessment and support for the establishment of Biodiversity Stewardship Agreements (BSAs) for 'in-demand' biodiversity credits. Technical and assessment lead managing implementation of the BAM, field surveys, habitat model development, BAM calculations and report preparation. Including delivery of the complex assessment for a 620 hectare BSA site.

Co-lead BAM Assessor/Restoration specialist

DPE Biodiversity Stewardship Sites in Western Sydney's Koala Corridor and Cumberland Plain Conservation Plan (CPCP).

Brooke undertook detailed vegetation mapping, BAM plots and management action assessment in the field to support the preparation of Biodiversity Stewardship Site Assessment Report (BSSAR) Biodiversity Stewardship Management Plan (BSSMP) and Total Fund Deposit (TFD) development for multiple sites across Western Sydney.

BAM Assessor

Kellyville and Bella Vista Station Precincts – detailed design phase.

Landcom and Sydney Metro are working together under a Program Development Agreement (PDA) on the long-term planning and development of Sydney Metro owned land surrounding the NSW Government's new Sydney Metro Northwest (SMNW) stations. Technical lead and BAM assessor providing ecology assessment advice within a complex planning context including preparation of a revised Biodiversity Development Assessment Report (BDAR) for Bella Vista Station Precinct, including managing fieldwork approach, threatened species assessments, BAM plots, BDAR and BAM calculations, strategic advice, various ecology assessment reports and client liaison.

BAM Assessor

State Significant Infrastructure (SSI) Biodiversity Offsets Package (BOP) development

Brooke developed a Biodiversity Offsets Package (BOP) for EnergyAustralia Mt Piper Power Station State Significant Infrastructure upgrade of Lithgow Power Station. Technical lead managing implementation of the BAM, field surveys, habitat model development, BAM calculations and report preparation.

BAM Assessor

Sparke Street Hexham Streamlined Small Area BDAR

BDAR over contaminated land within the Hunter RAMSAR wetlands implementing Small Area Streamlined Assessment Module of the BAM. Serious and Irreversible Impact (SAII) assessment of Migratory Wader mapped important habitat.

Botanist

Map extent of Coastal Upland Swamps on the Woronora plateau for Wollongong Resources.

Brooke applied senior botanical expertise to delineate complex groundwater dependent ecosystems and facilitate long term monitoring against the potential impacts of mining subsidence.

Professional affiliations and memberships

Certified Environmental Practioner Scheme (CEnvP) No. 656
Environment Institute of Australia and New Zealand


biosis
APEM Group