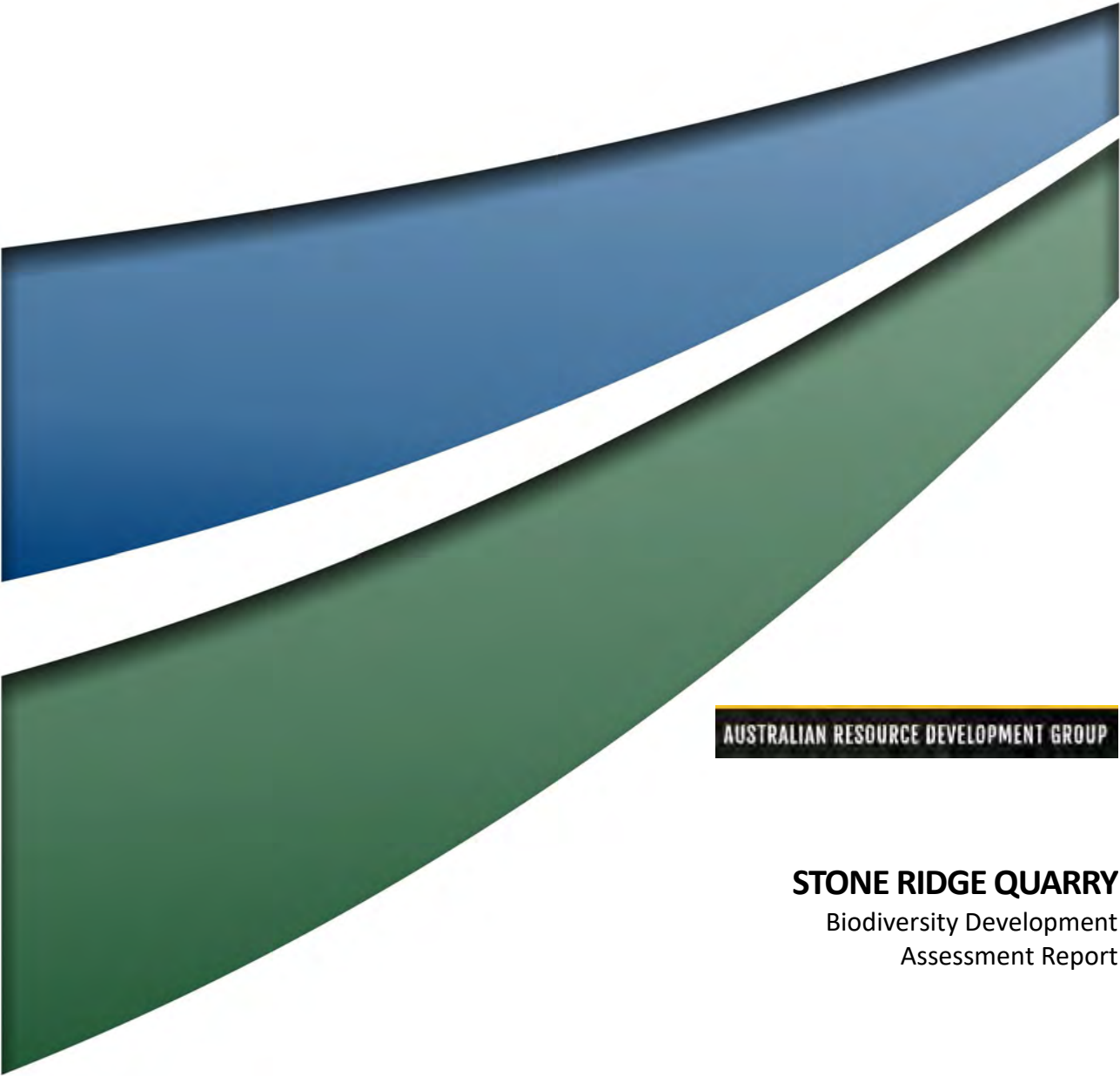


**APPENDIX 11**

**Biodiversity Development Assessment Report**



**AUSTRALIAN RESOURCE DEVELOPMENT GROUP**

**STONE RIDGE QUARRY**  
Biodiversity Development  
Assessment Report

**FINAL**

**May 2023**

**AUSTRALIAN RESOURCE DEVELOPMENT GROUP**

## **STONE RIDGE QUARRY**

Biodiversity Development Assessment Report

### **FINAL**

Prepared by  
**Umwelt (Australia) Pty Limited**  
on behalf of  
**Australian Resource Development Group**

Project Director: David Holmes  
Project Manager: Penelope Williams  
Technical Director: Kate Connolly  
Technical Manager: Jacob Manners  
Report No. 4158/R08  
Date: March 2023



This report was prepared using  
Umwelt's ISO 9001 certified  
Quality Management System.

### **Acknowledgement of Country**

*Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.*

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### Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
FINAL	Kate Connolly	30 May 2023	David Holmes	30 May 2023

# Executive Summary

Australian Resource Development Group (ARDG) (the Proponent) engaged Umwelt (Australia) Pty Limited (Umwelt) to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed Stone Ridge Quarry located at Balickera, NSW (the project).

The Project is a State Significant Development (SSD-10432) under the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) as it is development that extracts more than 500,000 tpa of extractive material and also extracts from a resource of more than 5 million tonnes. A development application (DA) for the Project is required to be submitted under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project Area is located on land managed by Forestry Corporation of New South Wales (FCNSW) and ARDG holds a Deed of Agreement (Deed) in relation to the Project Area for a Forest Materials Licence (FML) with FCNSW under section 42 of the *Forestry Act 2012* (Forestry Act).

This BDAR has been prepared by Umwelt to assess the potential biodiversity impacts of the Project in accordance with the Biodiversity Assessment Method (BAM). This has included the completion of detailed plot-based vegetation surveys and seasonal targeted threatened species surveys between 2017 and 2023.

The surveys and assessments resulted in the identification of the following Plant Community Types (PCTs) which will be impacted by the project:

- PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast (0.33 ha)
- PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (45.63 ha)
- PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - *Melaleuca sieberi* shrubby open forest on lowlands of the lower North Coast (0.88 ha)
- PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands (28.27 ha)
- PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast (3.91 ha).

The completion of surveys and assessments has identified habitat for the following threatened entities listed within the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Rusty Greenhood (*Pterostylis chaetophora*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Koala (*Phascolarctos cinereus*)

- River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions endangered ecological community as listed under the BC Act
- Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion endangered ecological community as listed under the BC Act
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions endangered ecological community as listed under the EPBC Act.

The following key impact avoidance and mitigation measures have been identified for the project:

- Reduction of the Disturbance Area over multiple iterations to reduce the disturbance area footprint.
- Avoidance of the north-western section of the Subject land, which contains areas occupied by the Rusty Greenhood (*Pterostylis chaetophora*).
- Alignment of the site access to the existing access track from Italia Road, to minimise impacts to the *River-flat Eucalypt Forest on Coastal Floodplains EEC*.


Following the application of avoidance and mitigation measures, the following biodiversity credits are required to offset the impacts of the project:

Entity	Credits Required
PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast	13
PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	1268
PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast	34
PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	782
1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast	131
Rusty Greenhood ( <i>Pterostylis chaetophora</i> )	149
Squirrel Glider ( <i>Petaurus norfolcensis</i> )	2929
Brush-tailed Phascogale ( <i>Phascogale tapoatafa</i> )	2929
Koala ( <i>Phascolarctos cinereus</i> )	2929

The biodiversity offset strategy for the project will be developed during the assessment process in consultation with the NSW Department of Planning and Environment and based on the following offset options available under the BC Act, including:

- Land based offsets (potentially within the Wallaroo State Forest);
- Purchasing of credits from the market; and/or
- Payment into the Biodiversity Conservation Fund.

# Declarations

- i. Certification under clause 6.15 Biodiversity Conservation Act 2016
2. I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method (2020) and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).
3. Name: Jacob Manners
4. Signature:  \_\_\_\_\_
5. Date: 30 May 2023
6. BAM Assessor Accreditation no: BAAS17099

## Project Team

Name	Experience / Qualifications	BAM Accreditation Number	Contribution to the project
<b>Kate Connolly</b>	BEnvScMgt	BAAS17005	Biodiversity Assessment Project Director / BAM Plot Surveys / Threatened flora surveys
<b>Jacob Manners</b>	GCert ArbCult, BSc, MWldMgt	BAAS17099	Biodiversity Assessment Project Manager / Accredited assessor / BAM plot surveys / plant community mapping / microbat call analysis
<b>Phillipa Fagan</b>	BBioCon, MenvBusMgt	BAAS18117	BAM plot surveys / plant community mapping / threatened flora and fauna surveys
<b>Patricia Robinson</b>	BEnvSc	BAAS18123	Threatened flora surveys / BAM Plot Surveys
<b>Belinda Howe</b>	BEnvScMgt	BAAS21019	Threatened flora and fauna surveys
<b>Rhys Osborne</b>	BBioSc, BEnvScMgt	BAAS20026	Threatened flora and fauna surveys
<b>William Brown</b>	BEnvScMgt	-	Threatened flora and fauna surveys
<b>Amber Wilson</b>	BEnvScMgt	-	Threatened flora and fauna surveys
<b>Brayden Luke</b>	BSc	-	Threatened flora and fauna surveys
<b>Alex Cottle</b>	BEnvScMgt	-	Threatened flora and fauna surveys

Name	Experience / Qualifications	BAM Accreditation Number	Contribution to the project
<b>Dayna Mitchell</b>	BEnvScMgt	-	Threatened flora and fauna surveys
<b>Logan Shea</b>	BEnvScMgt	-	Threatened flora and fauna surveys
<b>Stewart Jefferys</b>	BSc	-	GIS Mapping
<b>Kate Faber</b>	BEnvScMgt	-	Threatened flora surveys

# Abbreviations

<b>AHD</b>	Australian Height Datum
<b>ARDG</b>	Australian Resource Development Group
<b>BAM</b>	Biodiversity Assessment Method
<b>BAM-C</b>	Biodiversity Assessment Method Calculator
<b>BC Act</b>	Biodiversity Conservation Act 2016 (NSW)
<b>BC Regulation</b>	Biodiversity Conservation Regulation 2017 (NSW)
<b>BDAR</b>	Biodiversity Development Assessment Report
<b>BOAMS</b>	Biodiversity Offsets and Agreement Management System
<b>BOS</b>	Biodiversity Offsets Scheme
<b>CEEC</b>	critically endangered ecological community
<b>Development Footprint</b>	The area of land that is directly impacted by a proposed development, the disturbance footprint.
<b>Development Site</b>	An area of land that is subject to a proposed development under the EP&A Act, including areas which will be retained and impacted by the project (synonymous with Subject Land and Project Area).
<b>DBH</b>	diameter at breast height over bark
<b>EC</b>	ecological community listed under the EPBC Act
<b>EIS</b>	Environmental Impact Statement
<b>EPBC Act</b>	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
<b>EP&amp;A Act</b>	Environmental Planning and Assessment Act 1979 (NSW)
<b>EEC</b>	endangered ecological community
<b>GIA</b>	Groundwater Impact Assessment
<b>HTW</b>	high threat weed
<b>IBRA</b>	Interim Biogeographic Regionalisation for Australia
<b>LLS Act</b>	Local Land Services Act 2013 (NSW)
<b>MNES</b>	matters of national environmental significance
<b>NPW Act</b>	National Parks and Wildlife Act 1974 (NSW)
<b>NSW</b>	New South Wales
<b>PCT</b>	plant community type
<b>SAIL</b>	serious and irreversible impact
<b>SEARs</b>	Secretary's Environmental Assessment Requirements
<b>SSD</b>	State Significant Development

<b>Subject Land</b>	The land subject to the development application (synonymous with development site). The development footprint/disturbance footprint is located within the Subject Land area.
<b>SWIA</b>	Surface Water Impact Assessment
<b>TBDC</b>	Threatened Biodiversity Data Collection
<b>TEC</b>	threatened ecological community
<b>The Project</b>	The proposed Stone Ridge Quarry.
<b>VEC</b>	vulnerable ecological community

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# 1.0 Introduction

## 1.1 Background Information

Australian Resource Development Group (ARDG) (the Proponent) engaged Umwelt (Australia) Pty Ltd (Umwelt) to prepare a Biodiversity Development Assessment Report (BDAR) for a new hard rock quarry, known as Stone Ridge Quarry (the Project). The Project is located within the Wallaroo State Forest at Balickera, NSW. The Subject Land is within the Local Government Area of Port Stephens and is located approximately 30 km north of Newcastle.

This BDAR has been prepared as part of the Environmental Impact Statement (EIS) documentation for the Project to address the Secretary's Environmental Assessment Requirements (SEARs) in relation to Biodiversity. This Report provides an assessment of the biodiversity values of the Subject Land, documents the application of the avoid, minimise and offset framework and assesses the likely biodiversity impacts of the Project.

This BDAR has been prepared in accordance with the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the Biodiversity Assessment Method (BAM) (DPIE 2020a). The Project is State significant development (SSD) under Division 4.7 of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the development application for the Project is therefore required to be accompanied by a BDAR in accordance with Section 7.9 of the BC Act.

As discussed further in **Section 1.5**, the Project requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). The BAM has been endorsed as the assessment method for Matters of National Environmental Significance under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act.

A summary of the SEARs and BAM biodiversity assessment requirements and compliance is provided in **Appendix A**.

## 1.2 Proposed Development

### 1.2.1 Development Overview

The Project is seeking to access a high quality, hard rock resource suitable for producing a wide range of quarry products, particularly for the Lower Hunter, Central Coast and northern Sydney construction materials markets.

The Project is State significant development (SSD) and requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

### 1.2.2 Location and Subject Land Description

Wallaroo State Forest comprises three separate areas of land that have a combined area in excess of 3,600 ha. The Project Area (139 ha) is located within a Licence Area (391 ha) inside the boundaries of the western part of Wallaroo State Forest. The central part of the site referred to in this report as 'Stone Ridge'

(previously informally referred to as ‘Hamburger Hill’) is a rocky volcanic ridge that trends northeast-southwest and has been the focus of the resource assessment investigations undertaken by the Proponent. The boundary of the Subject Land is shown on the Site Map provided as **Figure 1.1** and the Location Map, provided as **Figure 1.2**. Operational and constructions works will be undertaken wholly within the Disturbance Area (development footprint) mapped.

Stone Ridge is the main topographic feature within the Subject Land. It comprises two rocky hills separated by a low saddle. The hill at the southwest end of the ridge has a maximum elevation of 107.5 m AHD (Australian Height Datum), whereas the hill to the northeast has a maximum elevation of 83 m AHD. More gently undulating topography to the northwest and southeast of the subject land is associated with more weathered volcano-sedimentary geology that typically ranges in elevation from 20–60 m AHD. A prominent broad low ridge (‘South Ridge’) extends from the central south-eastern flank of Stone Ridge, approximately 1600 m southeast to the Pacific Highway. This ridge has a maximum elevation of approximately 62 m AHD.

The Subject Land supports ephemeral tributaries of Caswells Creek and Nine Mile Creek. northern part of the Subject Land contains first and second order tributaries of Caswells Creek, which flows to an area historically diverted from Mosman Swamp (part of the Williams River catchment) to Grahamstown Dam via the Balickera Canal. The south-eastern part of the Subject Land contains first and second order tributaries of Nine Mile Creek, which flows directly to the Grahamstown Dam. The Grahamstown Dam overflows to the Williams River just upstream of the confluence with the Hunter River.

The Subject Land is predominantly located on Eagleton Volcanics of the Gilmore Volcanic Group Rock Unit, with a band of Mount Johnstone Formation conglomerate along the southern boundary. The area of the Eagleton Volcanics is of particular interest for quarrying of hard rock material.

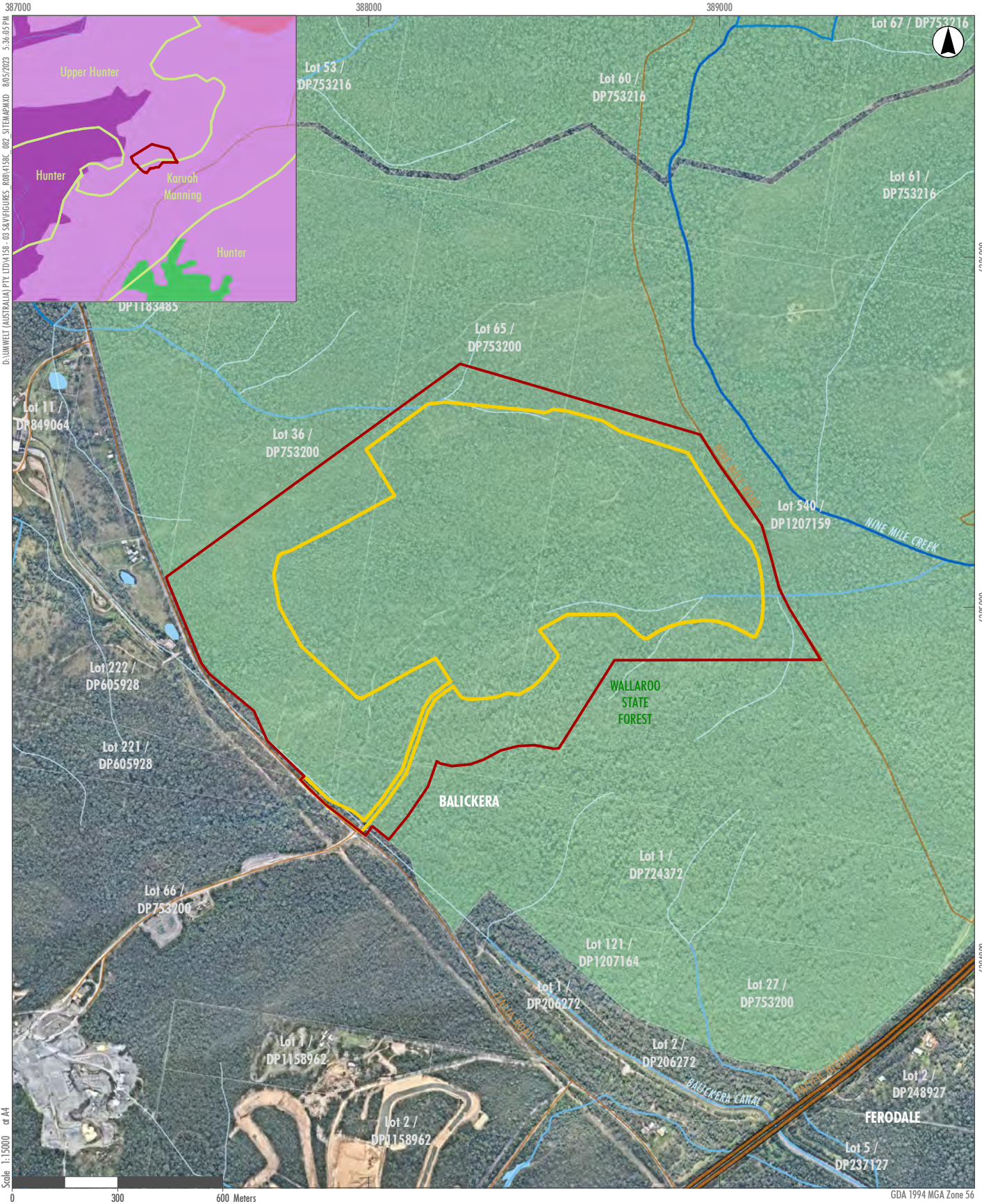
### **1.2.3 Proposed Development Description**

The proposed development footprint areas associated with the Project are mapped in **Figure 1.3**. The key components of the Project include:

- an extraction area with sufficient resources to support the extraction and processing of material to enable the transport of up to 1.5 Mtpa over 30 years
- processing and stockpiling area
- storage area for overburden/plant and equipment
- product loading area
- surface water management infrastructure
- weighbridge and administration area (offices, parking, amenities)
- site access and internal roadways
- buffer areas.

## **1.2.4 Other Documentation**

Other information sources relied upon are referenced in the text and are listed in the References Section of this Report.



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Scale 1:15000 or A4

**Legend**

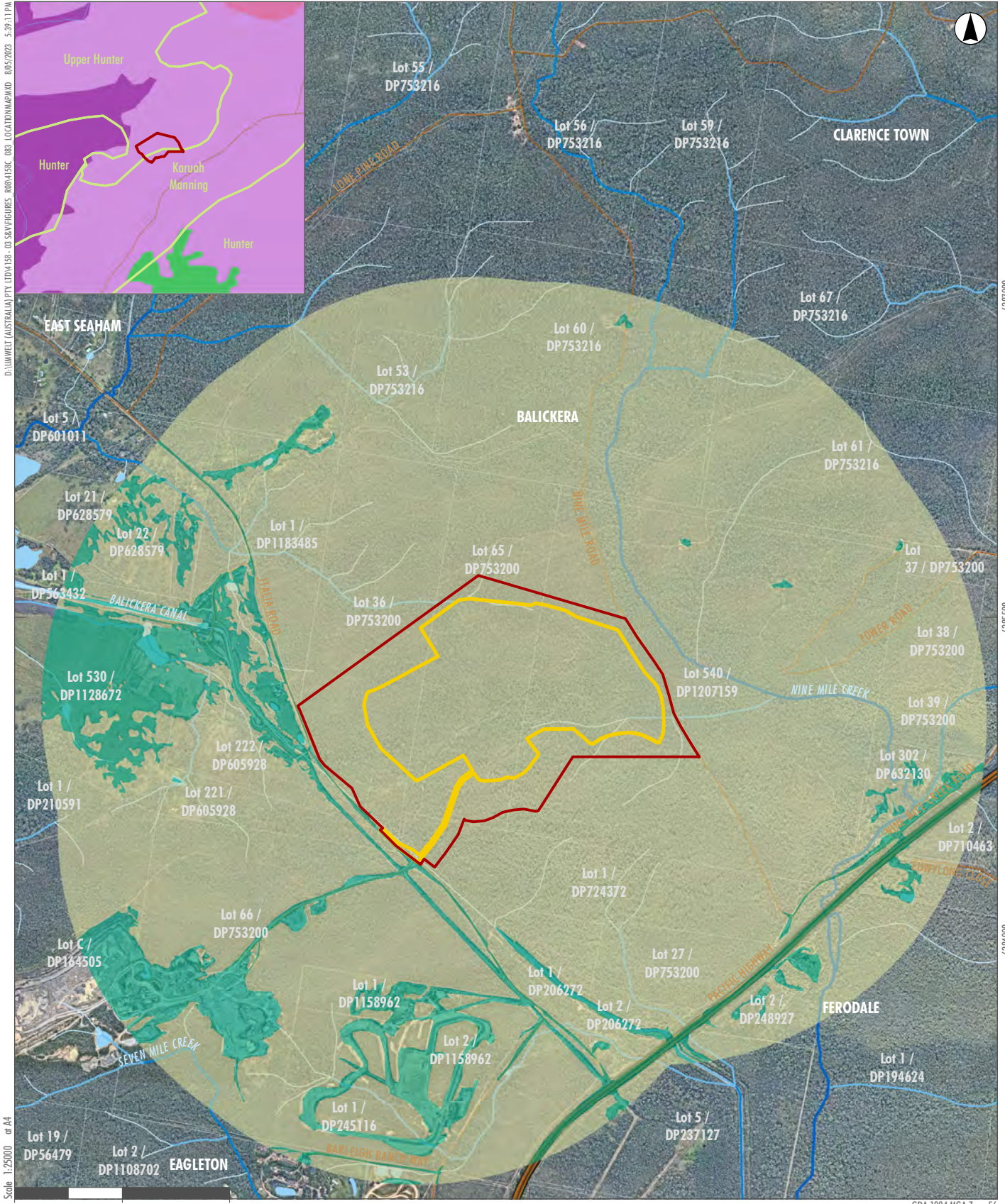
- |  |                  |   |
|--|------------------|---|
| Project Area (Subject Land)              | 1st Order Stream | IBRA Subregions (inset only)            |
| Disturbance Area (Development Footprint) | 2nd Order Stream | Mitchell Landscapes (inset only)        |
| State Forest                             | 3rd Order Stream | Lower Hunter Channels and Floodplains   |
| Pacific Highway                          | 4th Order Stream | Newcastle Coastal Ramp                  |
| Road                                     |                  | Stroud Mountains                        |
| Waterbody                                |                  | Sydney - Newcastle Barriers and Beaches |
| Lot Boundaries                           |                  |   |

**FIGURE 1.1**  
**Site Map**

387000

388500

390000



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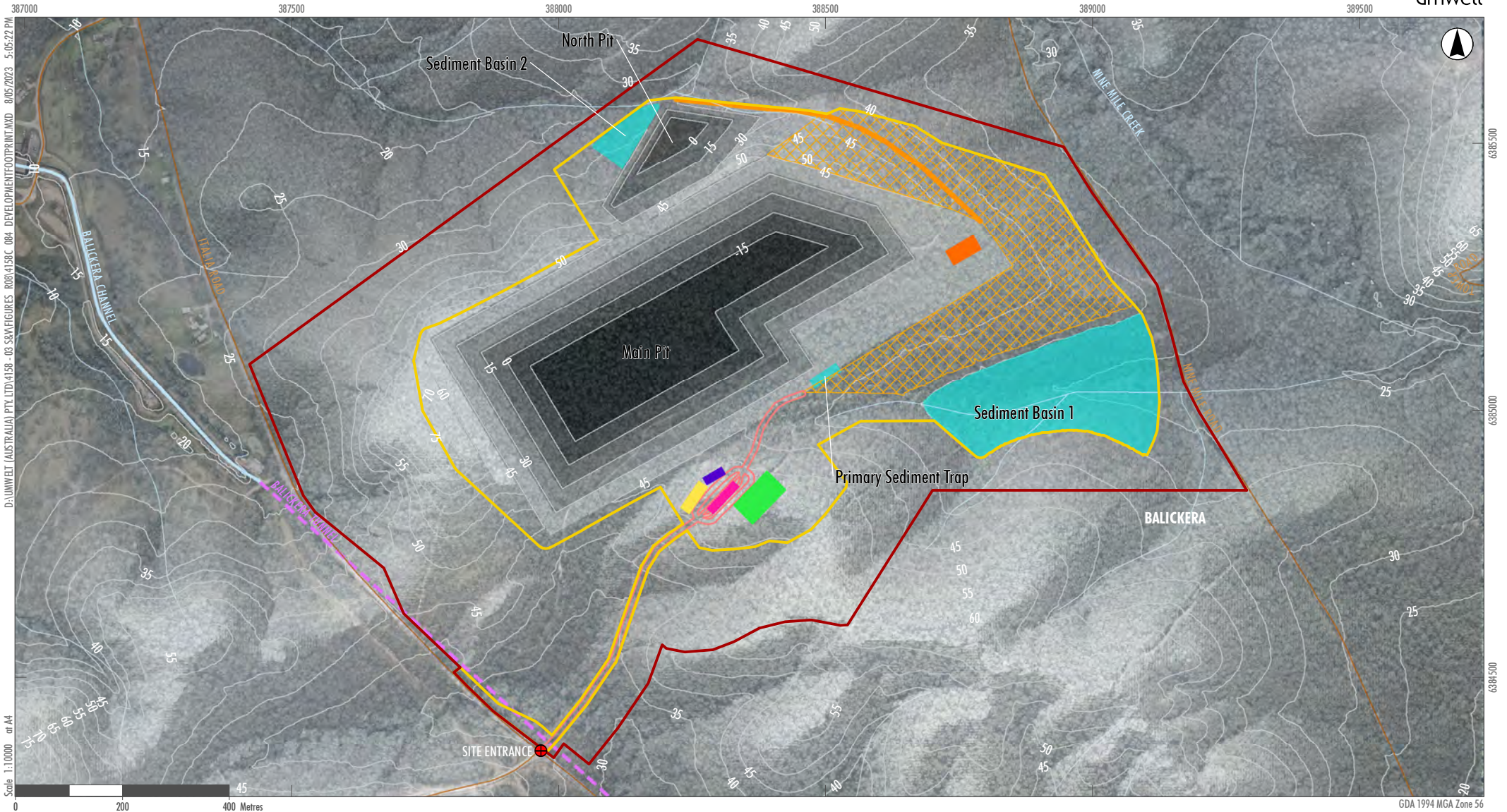
Scale 1:25000 or A4

- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Pacific Highway
  - Road
  - Waterbody
  - Lot Boundaries
  - Vegetation Cover within Assessment Area**
  - Native Vegetation
  - Cleared Land

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

- IBRA Subregions (inset only)**
- Lower Hunter Channels and Floodplains
  - Newcastle Coastal Ramp
  - Stroud Mountains
  - Sydney - Newcastle Barriers and Beaches

**FIGURE 1.2**  
**Location Map**



Legend

- |  |                       |                          |
|--|-----------------------|--------------------------|
| Project Area (Subject Land)              | Office                | Access Road              |
| Disturbance Area (Development Footprint) | Weighbridge           | Stockpile and Plant Area |
| Road                                     | Northern Haul Road    | Dams                     |
| Balickera Tunnel                         | Workshop              |                          |
| Drainage Line                            | Truck Parking         |                          |
| Contour Line                             | Light Vehicle Parking |                          |

FIGURE 1.3  
Development Footprint

### 1.3 Biodiversity Offsets Scheme Entry

The biodiversity offset scheme (BOS) applies to all State significant development projects and the SEARs require a BDAR to be prepared for the Project in accordance with Section 7.9 of the BC Act. The Subject Land is included on the Biodiversity Values Map layer and, as shown in **Figure 1.4**, includes areas mapped as Core Habitat within an approved Koala Plan of Management.

### 1.4 Excluded impacts / Category 1 Land

Clause 6.8(3) of the BC Act specifies that the Biodiversity Assessment Method (BAM) is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (as defined in Part 5A of the *Local Land Services Act 2013* (LLS Act)), other than prescribed impacts (as defined in clause 6.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation)).

The LLS Act does not apply to State Forestry Land (LLS Act S60Ac).

### 1.5 Matters of National Environmental Significance

The Project has been determined by the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) to be a Controlled Action due to likely significant impact to listed threatened species and ecological communities. The Project therefore requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

The threatened species for which a likely significant impact has been identified are:

- Koala (*Phascolarctos cinereus*), and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

DCCEEW has noted the Project may significantly impact the following species:

- Swift Parrot (*Lathamus discolor*)
- Spotted-tailed Quoll South-eastern mainland population (*Dasyurus maculatus maculatus*)
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)
- New Holland Mouse (*Pseudomys novaehollandiae*)
- South-eastern Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*)

An area of the endangered ecological community (EEC), Coastal Swamp Sclerophyll Forest of NSW and South East QLD, was identified as potentially being impacted by the Project at the referral stage. Further floristic surveys and analysis have determined that this EEC, as listed under the EPBC Act, is not present within the subject land, however the Subtropical Eucalypt Floodplain Forest and Woodland of the NSW North Coast and South East QLD EEC listed under the EPBC Act is present. Further details on Threatened Ecological Communities (TECs) are provided in **Section 4.3** of this Report.

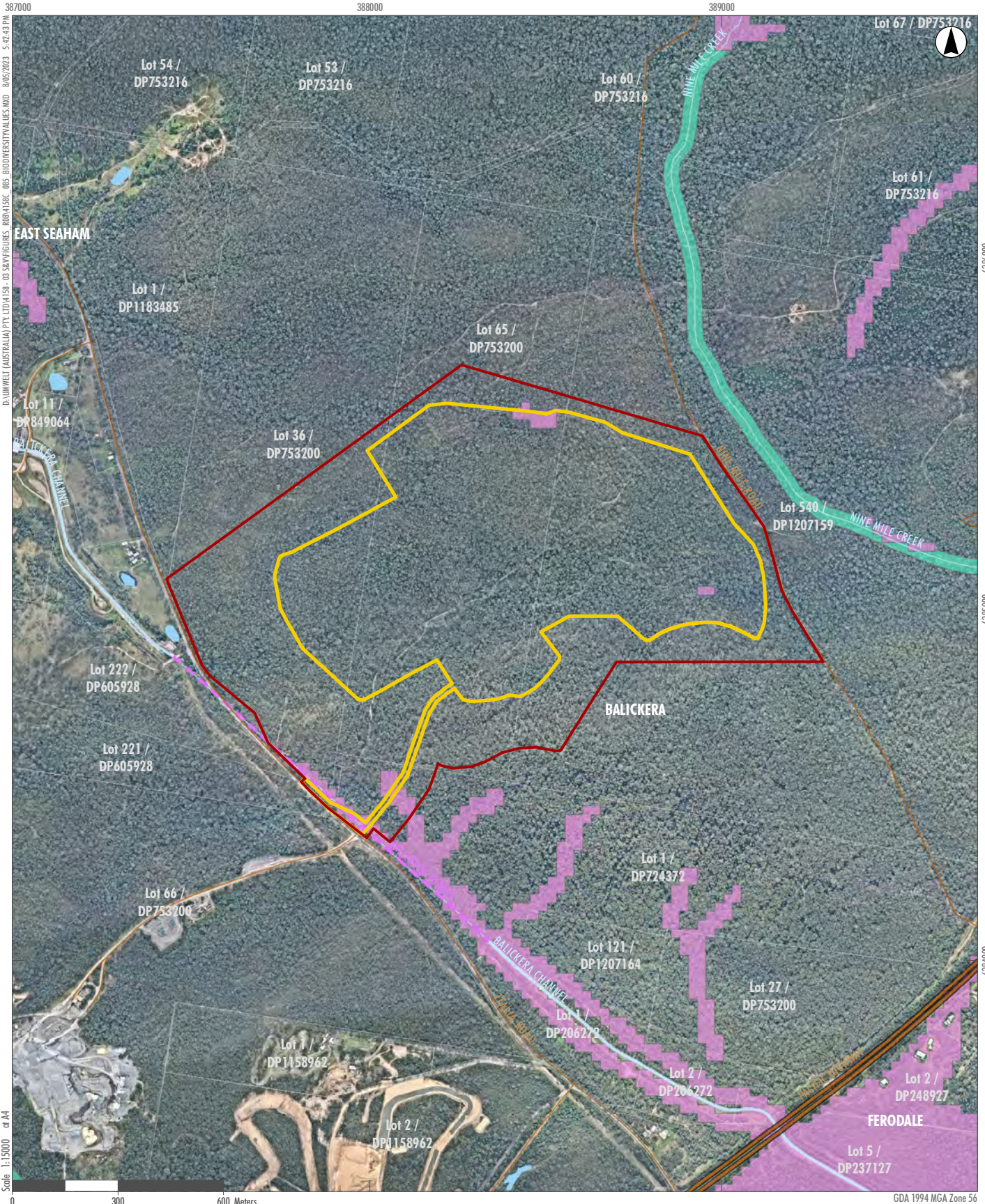
The BAM has been endorsed as the assessment method for Matters of National Environmental Significance (MNES) under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act. Nationally listed threatened species, TECs and migratory species have been considered and assessed as part of this BDAR. A separate MNES assessment addressing the requirements of the Project Assessment Notes provided by DCCEW is included in **Appendix B**.

## 1.6 Information Sources

The following guidance documents and resources relevant to the preparation of this Biodiversity Development Assessment Report were reviewed:

- Biodiversity Development Assessment Method (NSW DPIE 2020a)
- Biodiversity Assessment Method Operational Manual – Stage 1 (NSW DPIE 2020b)
- Biodiversity Assessment method Operational Manual – Stage 2 (NSW DPIE 2019)
- Biodiversity Assessment Method (BAM) Calculator User Guide (NSW OEH 2017)
- NSW Bionet including the Bionet Atlas, Bionet Vegetation Database and Threatened Species Data Collection (DPE 2023)
- Guidance for the Biodiversity Development Assessment Report Template (including the template) (NSW DPE 2022a)
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment method (DPIE 2020c)
- Flora Species with Specific Survey Requirements List Version 1
- ‘Species Credits’ threatened bats and their habitats (NSW OEH 2018)
- NSW Survey Guide for Threatened Frogs (NSW DPIE 2020d)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (DEC 2004).
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE 2022b).
- NSW State Vegetation Type Map - Revised eastern NSW PCT Classification C1.1) (DPE, 2022c)
- Probable Vegetation Groundwater Dependant Ecosystems Hunter / Central Rivers (NSW DPE 2022d)

Other information sources relied upon are referenced in the text and are listed in the References Section of this Report.



- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Pacific Highway
  - Road
  - Balickera Tunnel
  - Drainage Line
  - Waterbody
  - Lot Boundaries
  - Biodiversity Values Map Layer (v14.3)**
  - Biodiverse riparian land
  - Core Habitat within an approved Koala Plan of Management (Koala SEPP)

**FIGURE 1.4**  
**Biodiversity Values Map**

## 2.0 Methods

### 2.1 Site Context Methods

#### 2.1.1 Landscape Features

As detailed in Section 3 of the BAM (DPE 2020a), a landscape assessment for the Project is required, which was initially conducted as a desktop assessment and confirmed during the field surveys. The following landscape and site context features were identified for the Assessment Area (1500 m buffer) in accordance with Section 3 of the BAM (DPE, 2020a) from analysis and reference to available spatial information:

- IBRA bioregion
- IBRA subregions
- native vegetation extent
- cleared areas
- rivers, streams and wetlands
- connectivity features
- patch size.

### 2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Methods

#### 2.2.1 Existing Information

The following existing information was reviewed to inform the identification of Plant Community Types (PCTs) (Section 4.2) and TECs (Section 4.3):

- Bionet Vegetation Information System (DPE 2023)
- EPBC Act Protected Matters Search Tool (DCCEEW 2023)
- NSW State Vegetation Type Map - Revised eastern NSW PCT Classification C1.1) (DPE, 2022c)
- The NSW Scientific Committee Final Determinations made for various TECs under the BC Act
- Approved Conservation Advice published for various TECs under the EPBC Act
- Biodiversity Assessment Report – Eagleton Quarry, 13 Barleigh Ranch Way, Eagleton NSW (Kleinfelder 2017)

- Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project (Volumes 1 & 2) (Somerville 2009a; 2009b)
- New South Wales Seamless Geology dataset (Single Layer), version 2.1 (Colquhoun *et al.* 2021).

## 2.2.2 Mapping Native Vegetation Extent, Plant Community Types and Vegetation Condition Zones

The native vegetation extent (**Section 4.1**) within the Subject Land was determined during site surveys, through GIS Mapping and aerial photograph interpretation using recent aerial imagery. Native vegetation and plant community type mapping was undertaken using best-practice techniques to delineate vegetation communities across the Subject Land. Vegetation mapping involved the following key steps:

- Review of aerial imagery to assess vegetation distribution patterns as dictated by change in canopy texture, tone, and colour, as well as topography.
- Review of the modelled distribution of vegetation communities within broader scale regional based vegetation mapping.
- Preparation of a draft plant community type map based on interpretation of digital aerial imagery.
- Field-based ground-truthing of the draft plant community type mapping through completion of rapid point-based assessments of canopy vegetation at 136 grid-based rapid PCT assessment points to identify the dominate canopy species at each location across the Study Area. The locations of the grid-based rapid PCT assessment points are shown in **Figure 2.1**.
- Confirmation of vegetation community floristic delineations based on plot data.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata. Slight variations in species composition are typical across the extent of a community and are often associated with microhabitats or ecotones with adjoining plant communities.

The extent of native ground-cover vegetation within offsite areas where a canopy of native species is absent has mostly been estimated based on the visual interpretation of aerial imagery, taking into account areas of cultivation and fenced boundaries. The offsite mapping of native vegetation extent is broad-scale and was prepared specifically for the estimation of native vegetation cover under the BAM (DPE, 2020a).

## 2.2.3 Plot-Based Vegetation Survey

A stratified plot-based floristic vegetation survey of the development footprint was undertaken in accordance with Table 3 and Section 4.2.1 of the BAM. A total of 18 BAM Plots were previously surveyed within the subject land by Umwelt during 2018, however this plot data was not used for this assessment as the site was recovering from a bushfire and follow-up surveys in 2022 identified changes in the site vegetation due to regrowth. Consultation with the BCD Newcastle office in 2022 confirmed this approach.

An additional 20 updated BAM plots were sampled by Umwelt ecologists on the following dates:

- 12 October 2022

- 9 November 2022
- 16 November 2022.

Plot survey stratification for each plant community type is listed in **Table 2.1**.

**Table 2.1 Plant Community Type Survey Plot Stratification details**

Current BAM-C PCT ID	PCT name	Vegetation Condition Zone	Area (ha) in Development Footprint	Quantity of Plots Required (BAM 2020 Table 3)	Plots Completed in 2022
762	Cabbage Gum open forest or woodland on flats of the North Coast	1 PCT 762 Intact	0.33	1	2 Plots (Plot 17, Plot 22)
1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest)	2 PCT 1590 - Intact	45.63	4	6 Plots (Plot 8, Plot 9, Plot 10, Plot 16, Plot 20, Plot 21)
1618	Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast (Hunter Coast Lowland Flats Damp Forest)	3 PCT 1618 - Intact	0.88	1	1 Plot (Plot 12B)
1619	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	4 PCT 1619 - Intact (Apple Variant)	19.52	3	4 Plots (Plot 11, Plot 13, Plot 15, Plot 24)
	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	5 PCT 1619 – Intact (Apple – Ironbark Variant)	8.75	3	3 Plots (Plot 12A, Plot 14, Plot 23)
1716	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.	6 PCT 1716 - Regenerating	3.91	2	2 Plots (Plot 07, Plot 19)

Plot-based vegetation surveys were completed to assess the condition of the development footprint, sample areas of expected environmental variation and verify the results of previous mapping and available site information. In some instances, plots sampled may be located within the Subject Land outside of the development footprint if they are representative of the habitats to be impacted. This is due to subsequent development footprint refinements made following the completion of surveys.

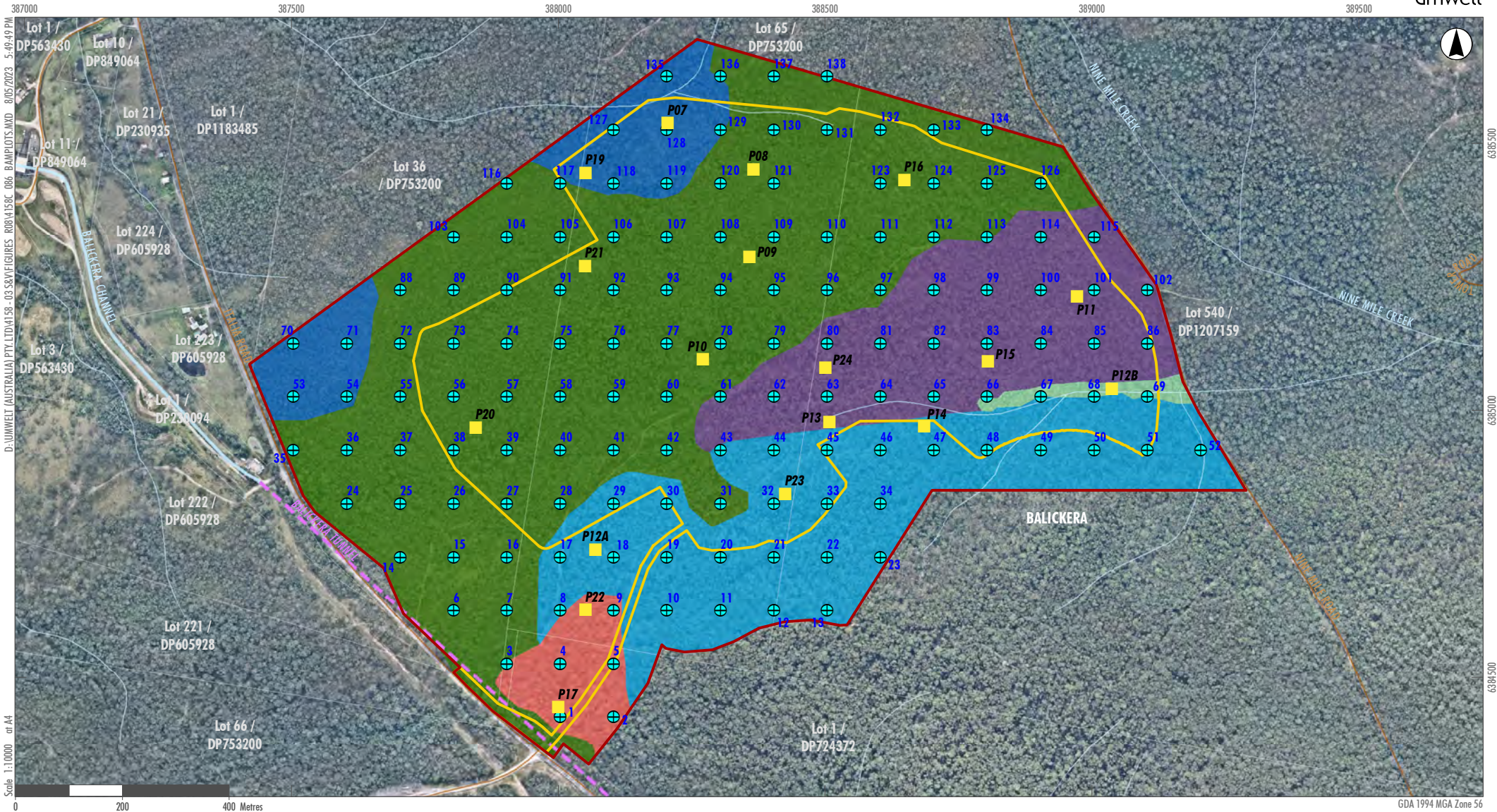
Each BAM Plot consisted of a 20 x 20 m floristic plot nested within each 20 x 50 m vegetation integrity plot. Plot locations were recorded with a hand-held GPS device and are shown in **Figure 2.1**. All vascular plants recorded within floristic plots were identified using keys and nomenclature in PlantNet NSW Flora Online Identification Keys (The Royal Botanic Gardens and Domain Trust 2023).

Floristic survey data collected was in accordance with Table 1 of the BAM and the plot survey effort was completed to ensure compliance with the stratification requirements of Table 3 of the BAM. Plot locations were selected to ensure that they captured attributes relevant to each vegetation condition zone, to provide a representative assessment of the vegetation integrity of the vegetation zone, accounting for the level of variation in the broad condition state of the vegetation zone. Plots were positioned to avoid locations on ecotones, tracks (their edges) and/or small disturbed areas generally inconsistent with the target vegetation zone (e.g., small patches of bare ground).

At each plot, roughly 45 to 60 minutes was spent searching for all vascular flora species present within the 20 x 20 m floristic plot. Searches were generally undertaken through parallel transects from one side of the plot to another. Most efforts were spent examining the groundcover, which consistently supported well over half of the species present. An effort was made to search the tree canopy and tree trunks for mistletoes, vines, and epiphytes where present.

#### **2.2.4 Vegetation Integrity Survey**

As part of the plot-based vegetation survey, native vegetation composition, structure and function attributes identified in Section 4.3.4 of the BAM was assessed for each BAM plot. The locations of the plots sampled are mapped to scale and shown as BAM Plots in **Figure 2.1**.



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line
- BAM Plots
- ⊕ Rapid PCT Survey Locations

**Plant Community Types**

- PCT762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast - Regenerating

**FIGURE 2.1**  
**BAM Plot Locations and Rapid PCT**  
**Survey Locations**

## 2.3 Threatened Flora Survey Methods

### 2.3.1 Review of Existing Information

The following existing information was reviewed to inform the threatened flora species surveys and assessment of habitat constraints and microhabitats:

- NSW Government Biodiversity Assessment Method Calculator (BAMC) (BAM Data Update Version 58 / Updated 13/04/2023).
- Threatened flora records held on the NSW BioNet Atlas of NSW Wildlife within the Subject Land (NSW DPE 2023).
- Vegetation associations reports for the relevant IBRA Bioregion and IBRA Sub-region for each PCT present, to determine threatened fauna species PCT associations.
- Habitat constraints listed in the Threatened Biodiversity Data Collection (DPE 2023).
- BAM Flora species with specific survey requirements spreadsheet (DPIE 2020e).

### 2.3.2 Bionet Atlas Threatened Flora Records

Details of the threatened flora species recorded on the Bionet Atlas within 5 km of the subject land are summarised in **Table 2.2**.

**Table 2.2 Bionet Atlas Threatened Flora Records within 5 km**

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records
<i>Angophora inopina</i>	Charmhaven Apple	V	V	15/06/2000	2
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	21/06/2021	1
<i>Corybas dowlingii</i>	Red Helmet Orchid	E	-	30/07/2021	383
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	V	V	26/09/2016	7
<i>Maudia triglochinosoides</i>		V	-	10/10/2008	1
<i>Pterostylis chaetophora</i>		V	-	11/10/2019	519
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	31/01/1934	1

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	18/11/2006	1
<i>Tetradthea juncea</i>	Black-eyed Susan	V	V	21/08/1961	1
Key to BC Act / EPBC Act Listing Status V = vulnerable, E = endangered, CE = critically endangered					

### 2.3.3 Habitat Constraints Assessment

The following field-based surveys were undertaken to assess the habitat constraints for the candidate threatened flora species:

- Field searches for habitat constraints identified from the desktop review of the TBDC.
- Direct observation of the quality and suitability of micro-habitats present.
- Collection of 136 rapid flora assessments across all plant community types, to assess the condition of the habitats present on 14 and 16 September 2022.
- Collection of site photographs to assess the condition of habitats present.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM Calculator. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted.

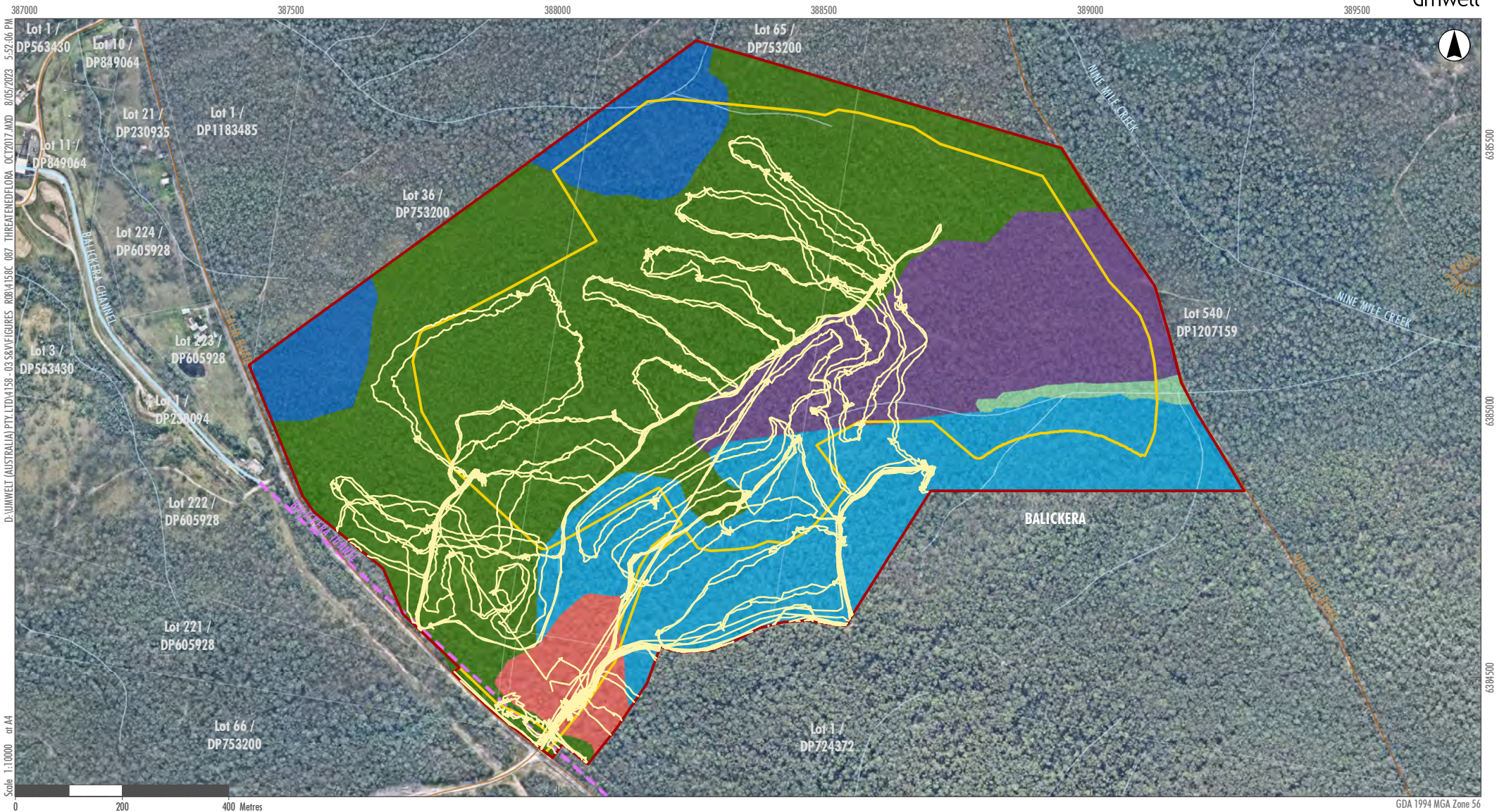
### 2.3.4 Field Surveys

Searches for threatened flora species were completed in accordance with the NSW Survey Guide, 'Surveying threatened plants and their habitats' (DPIE 2020c) and any relevant species requirements listed in the Threatened Biodiversity Data Collection (DPE 2023). Details of the field survey methods used and species targeted are listed in Table 2.3 and the locations of the surveys completed are mapped in **Figure 2.2A to 2.2D**.

**Table 2.3 Candidate Threatened Flora Species Targeted and Field Survey Methods Used**

Survey Group	Target Species	Species Survey Period	Survey Dates	Survey Method	Plant Community Type Associations / Areas Surveyed				
					762	1590	1618	1619	1716
Group 1	<i>Angophora inopina</i>	All year	25, 26, 28 July 2022	Parallel traverse	^	^	✓	✓	✓
	<i>Eucalyptus glaucina</i>	All Year	25, 26, 28 July 2022	Parallel traverse	^	✓	^	^	^
	<i>Cynanchum elegans</i>	All year	25, 26, 28 July 2022	Parallel traverse	^	✓	^	^	^
	<i>Rhodamnia rubescens</i>	All year	25, 26, 28 July 2022	Parallel traverse	^	^	^	^	^
	<i>Rhodomyrtus psidioides</i>	All year	25, 26, 28 July 2022	Parallel traverse	^	^	^	^	^
Group 2	<i>Callistemon linearifolius</i>	October - January	8,9,10,11,12 October 2018 12, 17, 19, 20, 25, 26, 31 October 2022	Parallel traverse	^	✓	✓	✓	^
	<i>Grevillea parviflora subsp. parviflora</i>	August - November	8, 9, 10, 11, 12 October 2018 12, 17, 19, 20, 25, 26, 31 October 2022	Parallel traverse	^	✓	✓	✓	^
	<i>Rutidosis heterogama</i>	All year	12, 17, 19, 20, 25, 26, 31 October 2022	Parallel traverse	^	✓	✓	✓	^
	<i>Tetratheca juncea</i>	September - October	25, 26, 30 October 2017 8, 9, 10, 11, 12 October 2018 12, 17, 19, 20, 25, 26, 31 October 2022	Parallel traverse	^	✓	✓	✓	^
	<i>Pterostylis chaetophora</i>	September - November	25, 26, 30 October 2017 8, 9, 10, 11, 12 October 2018	Parallel traverse	^	✓	^	^	^

Survey Group	Target Species	Species Survey Period	Survey Dates	Survey Method	Plant Community Type Associations / Areas Surveyed				
					762	1590	1618	1619	1716
			12, 17, 19, 20, 25, 26, 31 October 2022						
Group 3	<i>Maundia triglochinoxides</i>	November - March	12, 17, 19, 20, 25, 26, 31 October 2022  9,11 November 2022	Initial searches to identify areas of potential aquatic habitat and plants completed in October 2022. Follow up traverses along drainage lines targeting fruiting plants completed in November 2022 (Triglochinox identified)	^	^	^	^	^
Group 4	<i>Corybas dowlingii</i>	June - July	Surveys pending, to be completed during 2023	Parallel traverse	^	^	✓	^	^
<p><b>KEY TO SYMBOLS</b></p> <p>✓ = Associated PCT, targeted species survey completed in PCT</p> <p>^ = Non-associated PCT, targeted surveys completed in areas of suitable habitat</p> <p>Blank cells = If blank non-associated PCT / targeted survey for species not completed in PCT as no suitable habitat present</p>									



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line

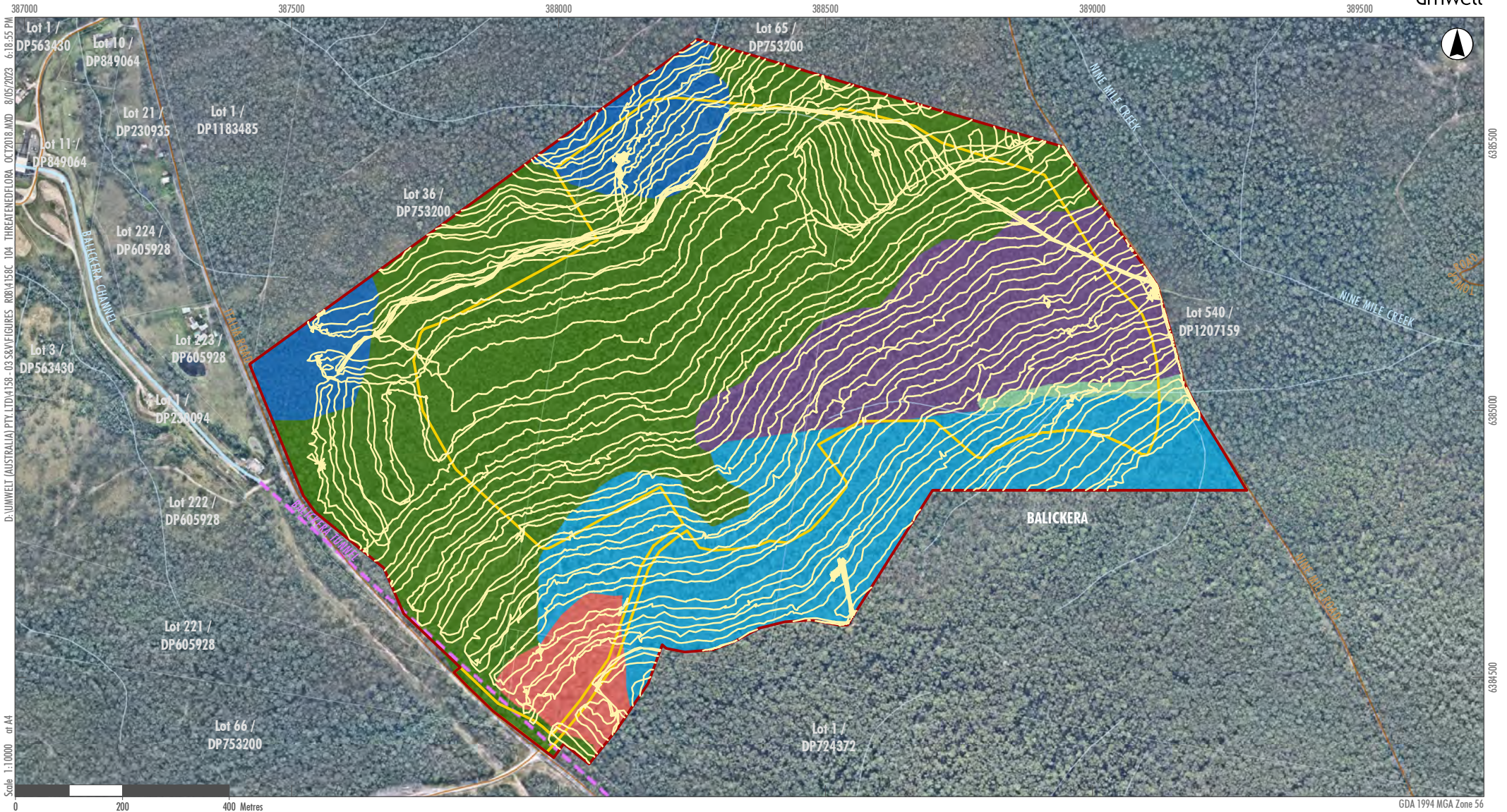
**Threatened Flora Transects**

- October 2017

**Plant Community Types**

- PCT762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast - Regenerating

**FIGURE 2.2A**  
**Threatened Flora Survey Locations**  
**– October 2017**



**Legend**

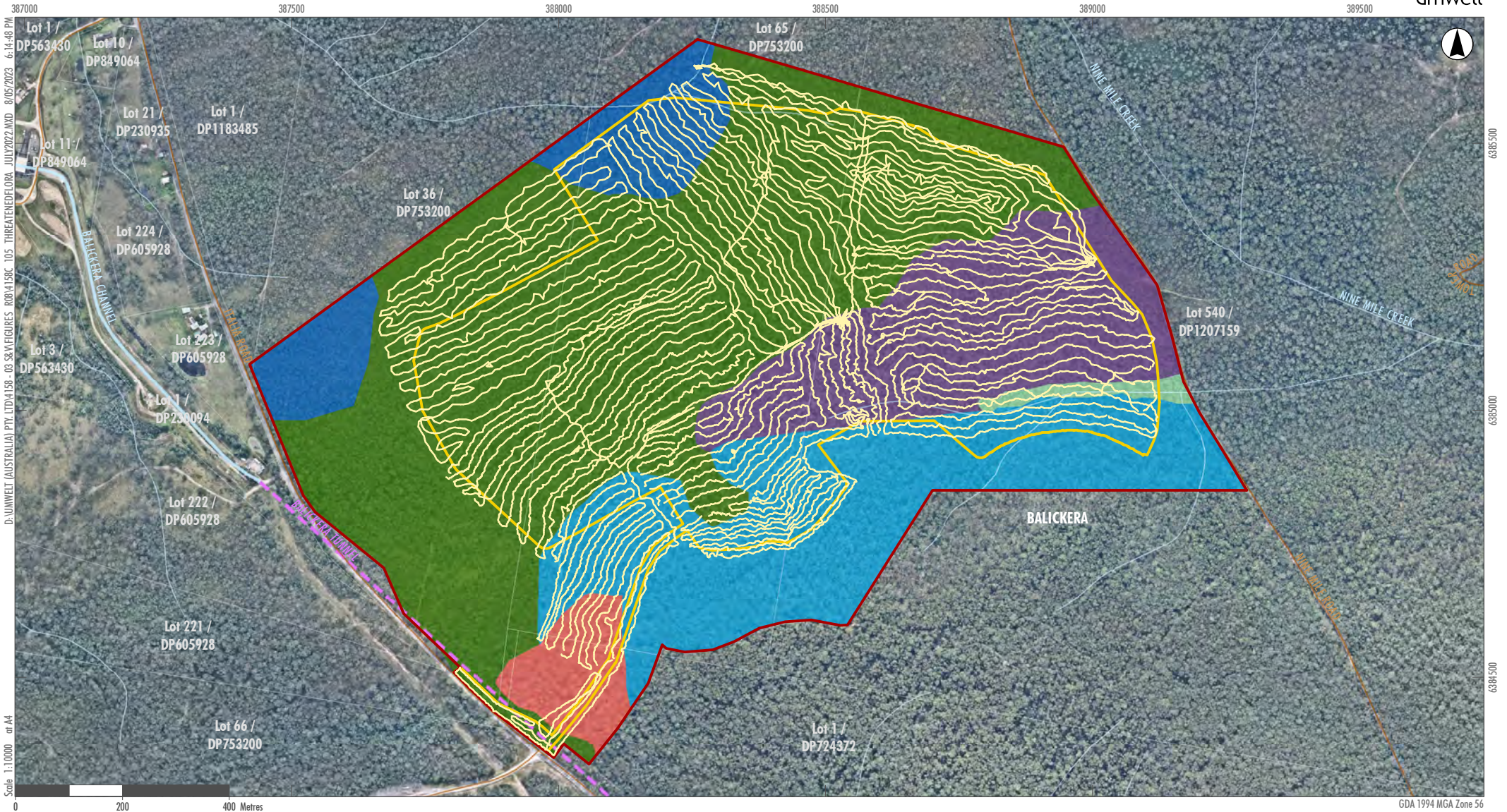
- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line

- Threatened Flora Transects**
- October 2018

**Plant Community Types**

- PCT1762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast - Regenerating

**FIGURE 2.2B**  
**Threatened Flora Survey Locations**  
**– October 2018**



**Legend**

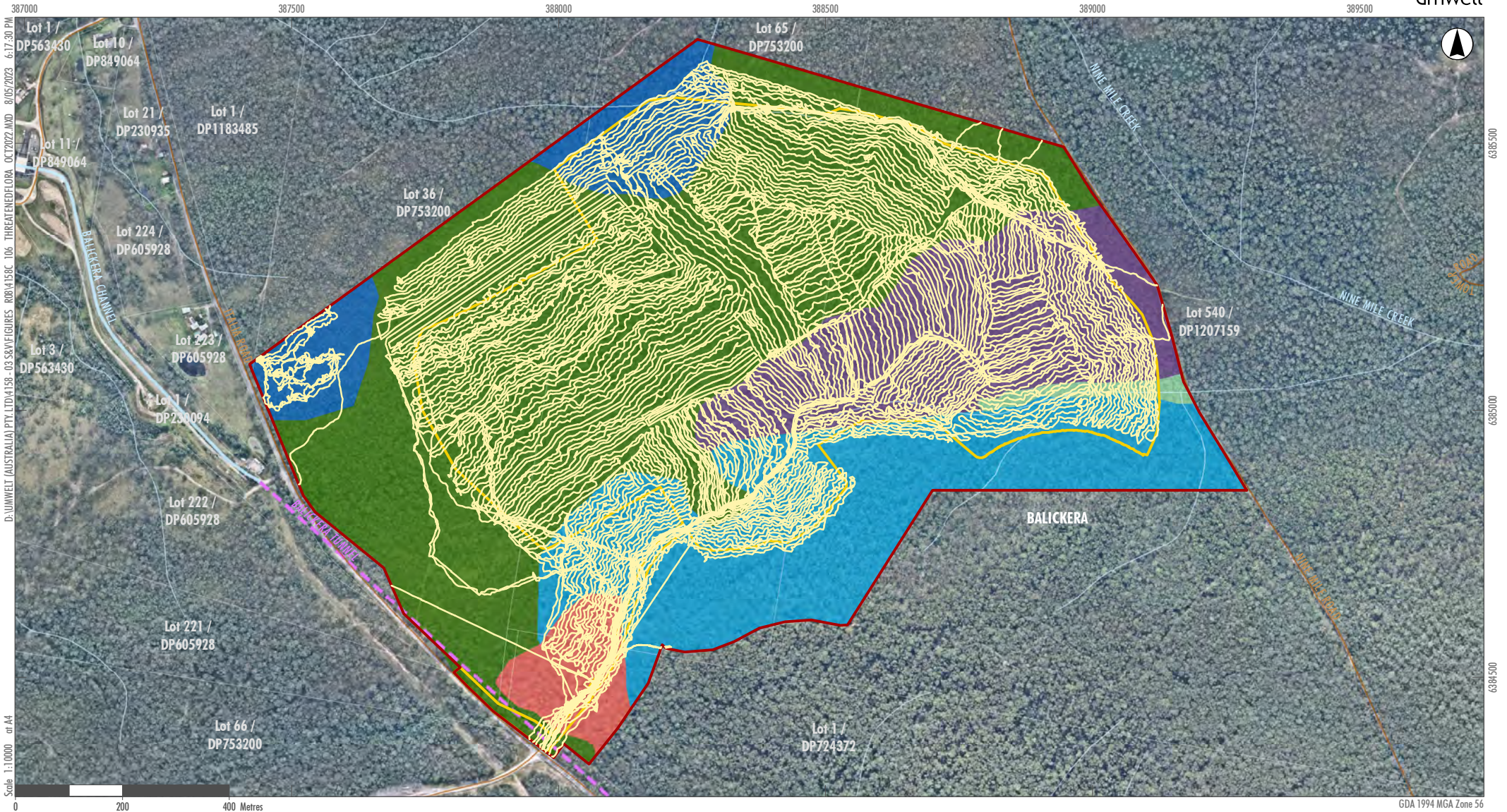
- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line

- Threatened Flora Transects**
- July 2022

**Plant Community Types**

- PCT1762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast - Regenerating

**FIGURE 2.2C**  
**Threatened Flora Survey Locations**  
 – July 2022



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Balickera Tunnel
- Drainage Line

**Threatened Flora Transects**

- October 2022

**Plant Community Types**

- PCT1762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast - Regenerating

**FIGURE 2.2D**  
**Threatened Flora Survey Locations**  
**– October 2022**

## 2.4 Threatened Fauna Survey Methods

### 2.4.1 Review of Existing Information

The following existing information was reviewed to inform the threatened fauna species surveys and assessment of habitat constraints and microhabitats:

- BAM Calculator (App Version 1.4.0.00 - 13/04/2023/ Data version 58 - 14/04/2023).
- Threatened fauna records held on the NSW BioNet Atlas of NSW Wildlife within the Subject Land (NSW DPE 2023).
- Vegetation associations reports for the relevant IBRA Bioregion and IBRA Sub-region for each PCT present to determine threatened fauna species PCT associations.
- Habitat constraints listed in the Threatened Biodiversity Data Collection (TBDC) (DPE 2023).

### 2.4.2 Bionet Atlas Threatened Fauna Records

Details of the threatened fauna species recorded on the Bionet Atlas within 5 km of the subject land are summarised in **Table 2.4**. Fauna species with a moderate or high potential to occur have been included for further assessment as either ecosystem credit, species credit or dual credit entities.

**Table 2.4 Bionet Atlas Threatened Fauna Records within 5 km**

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records	Likelihood of Occurrence
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	30/11/1999	1	Moderate
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	30/11/1999	1	Not likely
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	23/08/2006	1	Not likely
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	V	28/07/2021	18	Moderate
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	13/12/2005	1	Low
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	17/01/2013	1	Low
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	30/11/1999	1	Moderate

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records	Likelihood of Occurrence
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	25/01/2013	3	Low
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	31/01/2019	4	High / Observed
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	30/06/2006	17	High
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	24/01/2003	3	Not likely
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	17/01/2013	4	Moderate
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	10/09/2020	5	High / Observed
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	29/01/2020	13	High / Observed
<i>Lathamus discolor</i>	Swift Parrot	E	CE	15/05/2020	6	High
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	14/08/2020	1	Moderate / Low
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	10/01/2017	5	Moderate
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	27/01/2021	82	High / Observed
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	25/09/2018	11	High / Observed
<i>Myotis macropus</i>	Southern Myotis	V	-	7/09/2020	6	High / Potentially observed
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	3/12/1997	1	Not likely
<i>Ninox connivens</i>	Barking Owl	V	-	30/11/1999	2	Moderate

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Date Last Recorded	Number of Records	Likelihood of Occurrence
<i>Ninox strenua</i>	Powerful Owl	V	-	16/04/2004	5	Observed
<i>Petaurus australis</i>	Yellow-bellied Glider	V	V	13/12/2005	1	Moderate
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	31/01/2019	21	Observed
<i>Petroica boodang</i>	Scarlet Robin	V	-	25/01/2013	2	Low
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	30/07/2020	18	Observed
<i>Phascolarctos cinereus</i>	Koala	E	E	24/01/2022	211	Observed
<i>Phoniscus papuensis</i>	Golden-tipped Bat	V	-	30/11/1999	1	Low
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-	29/01/2020	5	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	27/09/2018	7	Not likely
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	8/11/2018	8	Observed
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-	30/11/1999	1	Low
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-	25/09/2018	1	Moderate
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	18/03/2004	3	Observed
<i>Vespadelus trougtoni</i>	Eastern Cave Bat	V	-	17/01/2013	3	Moderate / Potentially observed

### 2.4.3 Habitat Constraints Assessment

Field-based searches were undertaken to assess the habitat constraints for the candidate threatened fauna species, these searches included observation of habitat constraints identified from the desktop review of the TBDC and recording of the presence, quality and/or suitability of micro-habitats present including:

- hollow bearing trees, particularly those of suitable size for threatened cockatoo and owl breeding habitat
- koala use trees
- aquatic habitats suitable for amphibians
- rocky habitats suitable for reptiles
- outcrops, caves, tunnels and old buildings suitable for threatened microbat species.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM Calculator. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted.

### 2.4.4 Field Surveys

#### 2.4.4.1 Fauna Survey Guidelines

Targeted surveys for candidate threatened fauna species were completed with reference to the Threatened Biodiversity Data Collection (DPE 2023) and following guidelines:

- NSW Survey Guide for Threatened Frogs, A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE 2020d).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, NSW Department of Environment and Conservation (DEC 2004).
- 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method, Office of Environment and Heritage (OEH 2018).
- Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010a).
- Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DSEWPC 2011).
- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010b).

- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010c).
- Camera Trapping: wildlife management and research (Meek and Fleming 2014).

Surveys for the Pale-headed Snake were commenced and substantially completed prior to the release of the DPE Threatened Reptiles BAM Survey Guide in November 2022. Surveys for this species consisted of spotlighting however did not apply funnel trapping methods. Funnel trapping was also not completed due to unacceptable WHS risk associated with venomous snake handling.

#### 2.4.4.2 Diurnal Fauna Surveys

The following methods were utilised for targeted diurnal fauna surveys:

- nest site searches for candidate raptor species
- searches for threatened cockatoo feeding and breeding trees
- searches and assessment of potential threatened owl nest trees
- searches for microbat roosts and ultrasonic call recording
- amphibian aural/visual and call playback nocturnal surveys
- spotlighting for threatened reptiles and mammals
- opportunistic observation.

The details of diurnal fauna surveys completed are provided in **Table 2.5** and fauna survey locations are mapped in **Figure 2.3**.

**Table 2.5 Details of diurnal threatened fauna surveys completed**

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
09/07/2018	Diurnal winter bird census x 5 points	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	10°C, no wind, fine	5hrs x 2 people (1230-1730)
10/07/2018	Diurnal winter bird census x 4 points	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	13°C, partly cloudy, light wind, fine	5hrs 25min x 2 people (1205-1730)
11/07/2018	Diurnal winter bird census x 5 points	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	11°C, Light wind, fine	6.25hrs x 2 people (1115-1730)
12/07/2018	Diurnal winter bird census x 3 points	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	11°C, no wind, fine	4hrs x 2 people (1330-1730)
25/07/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search)	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	18°C, NW breeze, no rain	4hrs x 2 people (0830-1230)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
26/07/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search)	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	20°C, W wind, no rain	7.5hrs x 2 people (0830-1600)
28/07/2022	Candidate species habitat search and assessment	Glossy Black-Cockatoo Red-backed Buttonquail Red Goshawk White-bellied Sea-Eagle	18°C, NW wind, no rain	6hrs x 2 people (1000-1600)
29/07/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search)	Glossy Black-Cockatoo Red Goshawk White-bellied Sea-Eagle	16°C, SW breeze, no rain	6.5hrs x 2 people (0830-1500)
14/09/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Candidate species habitat search and assessment	Glossy Black-Cockatoo Red-backed Buttonquail Red Goshawk Little Eagle Square-tailed Kite White-bellied Sea-Eagle	18°C, variable W-E breeze, no rain	8.5hrs x 2 people (0830-1700)
16/09/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Candidate species habitat search and assessment	Glossy Black-Cockatoo Red-backed Buttonquail Red Goshawk Little Eagle Square-tailed Kite White-bellied Sea-Eagle	25°C, WNW wind, no rain	7.5hrs x 2 people (0830-1600)
17/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Gang-gang Cockatoo Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	21°C, SE wind, no rain	8.5hrs x 2 people (0830-1700)
18/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Gang-gang Cockatoo Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	22°C, SE wind, overcast with light intermittent rain	10.5hrs x 3 people (0700-1730)
19/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Gang-gang Cockatoo Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	25°C, variable NE-SE wind, overcast, no rain	8.5hrs x 2 people (0830-1700)
25/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Gang-gang Cockatoo Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	27°C, N breeze, no rain.	8.5hrs x 2 people (0830-1700)
26/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Gang-gang Cockatoo Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	29°C, moderate W wind, no rain	8.5hrs x 2 people (0830-1700)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
31/10/2022	- Diurnal fauna census - Avifauna breeding activity survey (stick nest and breeding hollow search) - Bat breeding habitat search	Red Goshawk Grey-headed Flying-fox Little Eagle Square-tailed Kite White-bellied Sea-Eagle	20°C, overcast, moderate W wind, no rain	4hrs x 4 people (0900-1300)
1/11/2022	- Diurnal fauna census - Bat breeding habitat search	Red Goshawk Grey-headed Flying-fox Square-tailed Kite White-bellied Sea-Eagle	20°C, fine, W wind increasing, no rain	3hrs x 2 people (1700-2000)
2/11/2022	- Diurnal fauna census - Bat breeding habitat search	Red Goshawk Grey-headed Flying-fox Square-tailed Kite White-bellied Sea-Eagle	20°C, calm, no rain	4hrs x 2 people (1600-2000)
9/11/2022	- Diurnal fauna census - Bat breeding habitat search	Red Goshawk Red-backed Buttonquail Grey-headed Flying-fox Square-tailed Kite White-bellied Sea-Eagle	23°C, NE breeze, no rain	7.25hrs x 2 people (0815-1530)
16/11/2022	- Diurnal fauna census - Bat breeding habitat search	Red Goshawk Red-backed Buttonquail Grey-headed Flying-fox Square-tailed Kite White-bellied Sea-Eagle	22°C, W breeze, no rain	7.75hrs x 2 people (0815-1600)

#### 2.4.4.3 Nocturnal fauna surveys

The following methods were utilised for targeted nocturnal fauna surveys:

- spotlighting and stag-watching searches
- amphibian aural/visual searches
- quiet listening for candidate threatened fauna calls
- targeted call playback.

Details of these surveys are provided in **Table 2.6**.

**Table 2.6 Details of nocturnal threatened fauna surveys completed**

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
19/03/2018	Nocturnal call playback x2 Spotlighting (Call playback GPS points not available)	Green and Golden Bell-frog Pale-headed snake Squirrel Glider Koala	28C, no wind, no cloud	2hrs x 2 people (1900-2100)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
20/03/2018	Nocturnal call playback Spotlighting (Call playback GPS points not available)	Green and Golden Bell-frog Pale-headed snake Squirrel Glider Koala	25C, light E breeze, fine	2hrs 40min x 2 people (1900-2140)
22/03/2018	Amphibian search / call playback x 2	Green and Golden Bell-frog	25C, overcast, no wind, fine.	3hrs x 2 people (1900-2200)
28/03/2018	Spotlighting / call playback x 2 (Call playback GPS points not available)	Squirrel Glider Koala Green and Golden Bell-frog	25C, no wind, no cloud	2hrs x 2 people (1900-2100)
09/07/2018	Nocturnal call playback x2 Spotlighting	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	10°C, no wind, fine.	2.5hrs x 2 people (1730-2000)
10/07/2018	Nocturnal call playback x3 Spotlighting	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	13°C, partly cloudy, light wind, fine	2hrs 50min x 2 persons (1730-2020)
11/07/2018	Nocturnal call playback x2 Spotlighting	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	11°C, , light wind, fine	1.75hrs x 2 people (1730-1915)
12/07/2018	Nocturnal call playback x 4 Spotlighting	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	11°C, no wind, fine	1.5hrs x 2 people (1730-1900)
26/08/2019	Nocturnal call playback Spotlighting Stag watching	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	15°C, fine	1.5hrs x 2 people (1720-1910)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
27/08/2019	Nocturnal call playback Spotlighting Stag watching	Koala Greater Glider Squirrel Glider Grey-headed Flying-fox Barking Owl Masked Owl Powerful Owl	14°C, light wind, no rain	2hrs 10min x 2 people (1720-1930)
1/11/2022	Amphibian surveys - aural/visual and call playback (4 person hrs)	Green and Golden Bell-frog Mahony's Toadlet Wallum Froglet	20°C, fine, wind increasing at end of survey, no rain.	2hrs x 2 people (between 2000-2300)
1/11/2022	Spotlighting (2 persons hrs)	Pale-headed Snake Red-backed Button Quail Eastern Pygmy Possum Koala Greater Glider Squirrel Glider Brush-tailed Phascogale Grey-headed Flying-fox	20°C, fine, wind increasing at end of survey, no rain.	1 hr x 2 people (between 2000-2300)
2/11/2022	Amphibian surveys - aural/visual and call playback (4 person hrs)	Green and Golden Bell-frog Mahony's Toadlet Wallum Froglet	20°C, fine, wind increasing at end of survey, no rain.	2hrs x 2 people (between 2000-2230)
2/11/2022	Spotlighting (1 person hr)	Pale-headed Snake Red-backed Button Quail Eastern Pygmy Possum Koala Greater Glider Squirrel Glider Brush-tailed Phascogale Grey-headed Flying-fox	20°C, fine, wind increasing at end of survey, no rain.	0.5hrs x 2 people (between 2000-2230)
30/11/2022	Amphibian surveys - aural/visual and call playback (3 person hrs)	Green and Golden Bell-frog Mahony's Toadlet Wallum Froglet	19°C, E breeze, no rain.	1.5hrs x 2 people (between 2000-2230)
30/11/2022	Spotlighting (2 person hrs)	Pale-headed Snake Red-backed Button Quail Eastern Pygmy Possum Koala Greater Glider Squirrel Glider Brush-tailed Phascogale Grey-headed Flying-fox	19°C, E breeze, no rain.	1hr x 2 people (between 2000-2230)
1/12/2022	Amphibian surveys - aural/visual and call playback (3 person hrs)	Green and Golden Bell-frog Mahony's Toadlet Wallum Froglet	19°C, E breeze, no rain.	1.5hrs x 2 people (between 2000-2230)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
1/12/2022	Spotlighting and nocturnal call playback x 2 (2 person hrs)	Pale-headed Snake Barking Owl Red-backed Button Quail Eastern Pygmy Possum Koala Greater Glider Squirrel Glider Brush-tailed Phascogale Grey-headed Flying-fox	19°C, E breeze, no rain.	1hr x 2 people (between 2000-2230)

#### 2.4.4.4 Remote detection fauna surveys

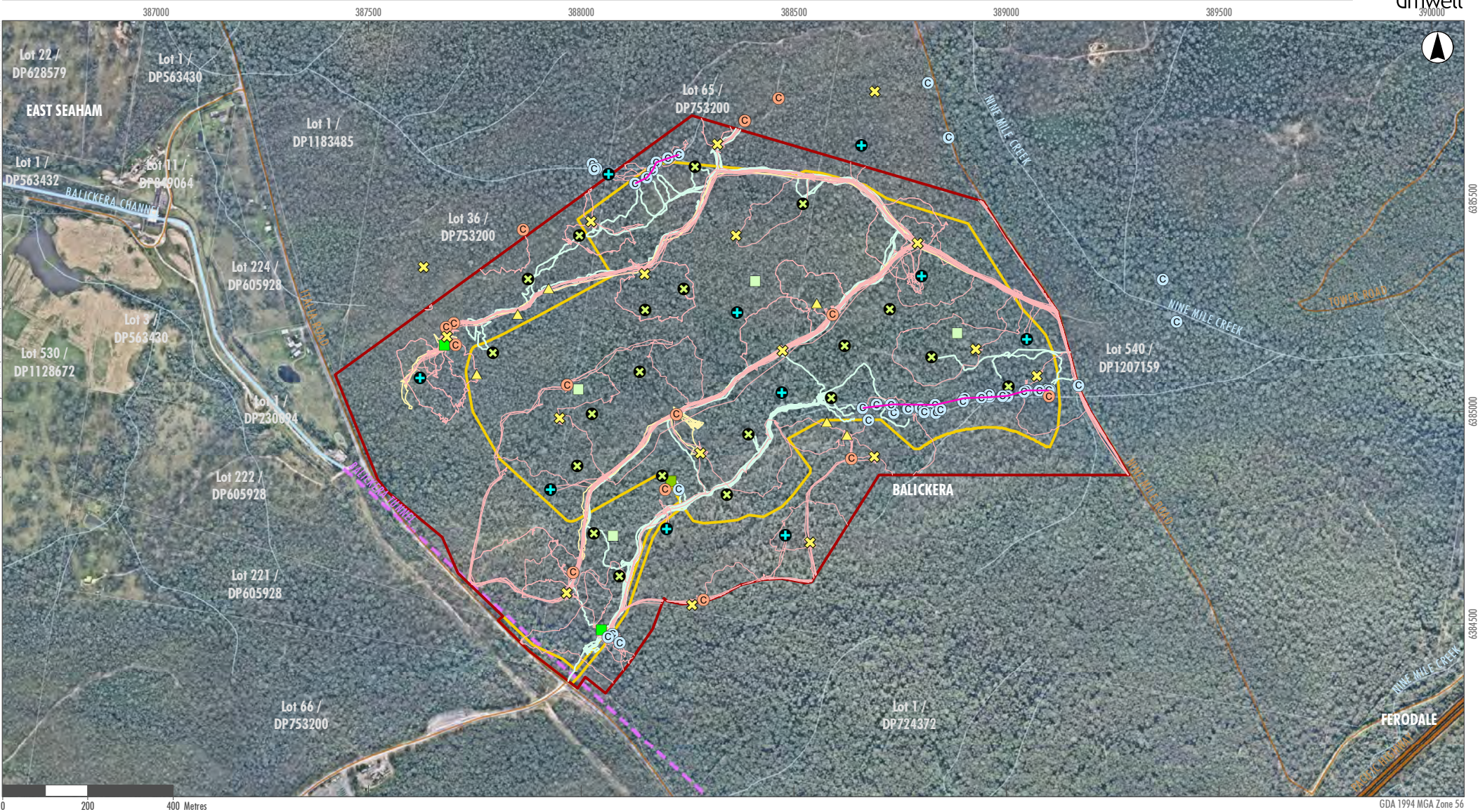
The following methods were utilised for the completion of targeted fauna remote detection surveys, as detailed in **Table 2.7**:

- baited remote camera surveys
- ultrasonic microbat call recording.

**Table 2.7 Details of Remote Detection Threatened Fauna Surveys Completed**

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
23 January 2018 – 19 March 2018	Baited remote camera survey	All threatened mammals (Koala, Greater Glider, Brush-tailed Phascogale, Squirrel Glider and Eastern Pygmy-possum)	Variable	315 camera trap nights (10 cameras x up to 55 nights / survey dates reflect actual survey duration / battery life of cameras)
1/11/22 - 1/12/22	Baited arboreal remote camera survey	All threatened mammals (Koala, Greater Glider, Squirrel Glider and Eastern Pygmy-possum)	Variable	600 recording nights (20 cameras x 30 nights)
23/01/2018- 24/01/2018	Microbat ultrasonic call recording (Anabat)	All threatened microbat species	Variable	4 recording nights (2 units x 2 nights)
28/11/2022- 08/12/2022	Microbat ultrasonic call recording (Anabat)	All threatened microbat species	Variable	8 recorder nights (1 unit)
01/12/2022— 2/12/2022	Microbat ultrasonic call recording (Anabat)	All threatened microbat species	Variable	2 recorder nights (1 unit)

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
24/01/23- 12/02/23	Microbat ultrasonic call recording (Anabat)	All threatened microbat species	Variable	76 recorder nights (4 Units x 19 nights)



**Legend**

- |  |  |  |   |
|--|--|--|---|
| Project Area (Subject Land)              | Amphibian Aural Visual Survey Transects      | Baited Remote Camera Locations 2018              | Spotlight Transect Locations March 2018             |
| Disturbance Area (Development Footprint) | Amphibian Call Playback                      | Baited Remote Camera Locations 2022              | Spotlight Transect Locations August 2019            |
| Pacific Highway                          | Nocturnal Call Playback                      | Microbat Ultrasonic Call Recorder Locations 2018 | Spotlight Transect Locations November/December 2022 |
| Road                                     | Diurnal Bird Census Point                    | Microbat Ultrasonic Call Recorder Locations 2022 |   |
| Balickera Tunnel                         | Hollows-bearing Trees (>20cm hollow opening) | Microbat Ultrasonic Call Recorder Locations 2023 |   |
| Drainage Line                            |  |  |   |

GDA 1994 MGA Zone 56

**FIGURE 2.3**  
**Threatened Fauna Survey Locations**

## 2.5 Threatened Fungi

No threatened fungi species were identified as predicted or candidate threatened species.

## 2.6 Weather Conditions

All surveys were completed during suitable weather conditions. The weather conditions during fauna surveys are listed in **Table 2.5** and **Table 2.6**.

## 2.7 Limitations

The surveys completed were undertaken during the appropriate seasons specified within the Threatened Biodiversity Data Collection (TBDC) to maximise the probability of detection. Surveys for *Corybas dowlingii* (Red Helmet Orchid) were requested by NSW Department of Planning and Environment, Biodiversity Conservation Division (DPE BCD) following the 2022 flowering period. Surveys for this species are proposed to be completed during 2023, as agreed with DPE BCD.

All surveys for candidate threatened flora species consisted of multi-species searches in groups according to detection period and stratum as indicated in **Table 2.1**. These surveys were limited to a maximum of five species per group and the same stratum to overcome limitations associated with species detection.

Further surveys for *Corybas dowlingii* and Powerful Owl breeding habitat are ongoing and will be completed post-submission. The completion of post-submission surveys has been discussed and agreed with DPE BCD.

## 3.0 Site Context

### 3.1 Assessment Area and Type

The 1500m buffer Assessment Area, including the development footprint and the area of land within the 1500 m buffer zone surrounding the development footprint are shown on the Location Map in **Figure 1.2**. The Project has been assessed as a site-based assessment.

### 3.2 Landscape Features

Landscape features identified within the Subject Land are shown on the Site Map provided as **Figure 1.1** and landscape features in the assessment area are shown on the Location Map provided as **Figure 1.2**. Further information on landscape features is provided in **Section 3.2.1** to **Section 3.2.7**.

#### 3.2.1 IBRA Bioregions and IBRA Subregions

The Subject Land is located within the NSW North Coast Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. The Subject Land occurs on the boundary of the Upper Hunter and Karuah Manning IBRA subregions and is mostly located within the Upper Hunter IBRA subregion.

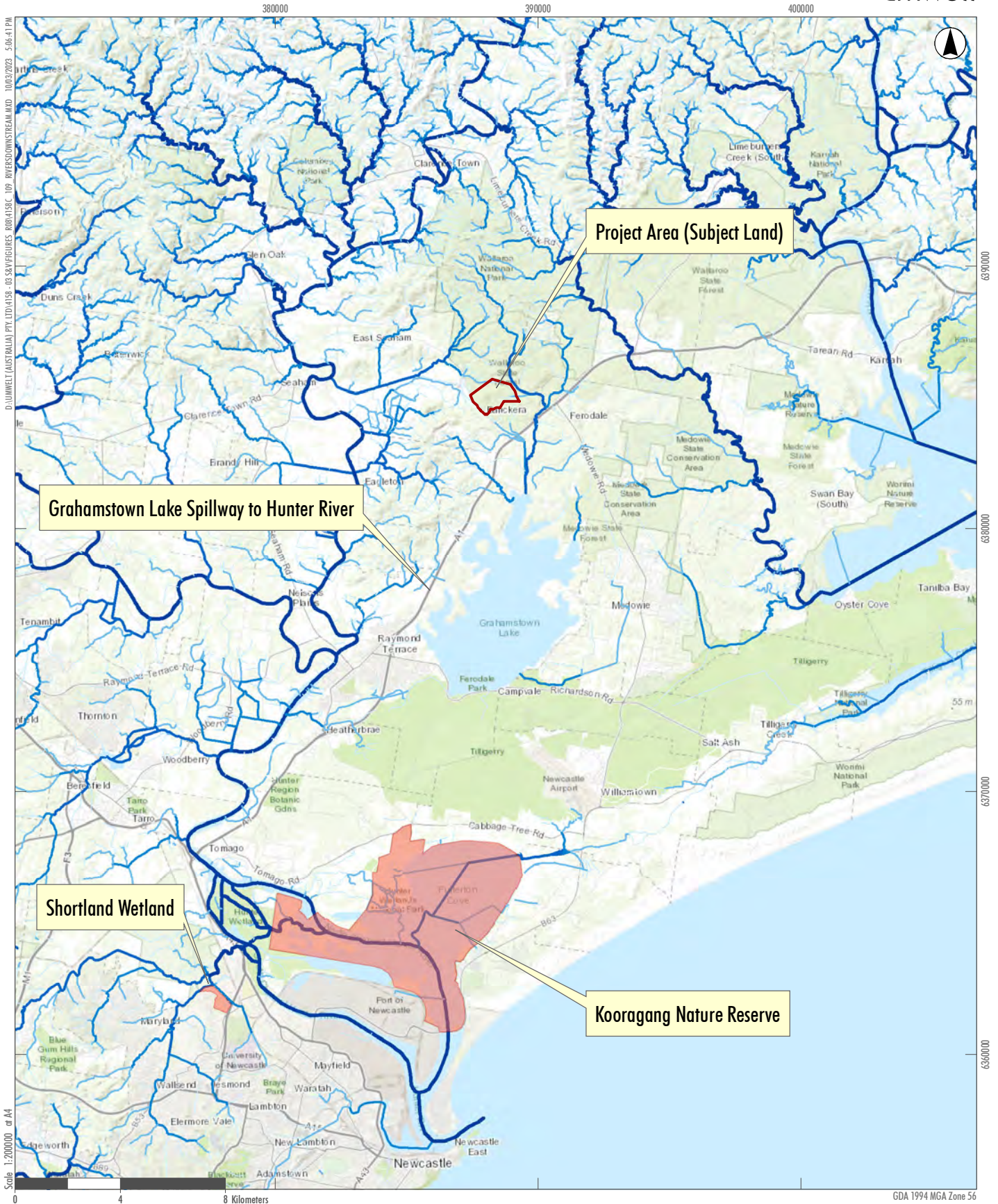
#### 3.2.2 Rivers, Streams, Estuaries and Wetlands

The locations of the streams classified by stream order within the Subject Land are shown on the Site Map, provided as **Figure 1.1** and the locations of streams and rivers within the 1500 m buffer Assessment Area are shown on the Location Map, provided as **Figure 1.2**. The wetlands and estuaries downstream of the subject land are shown in **Figure 3.1**.

The Subject Land supports ephemeral tributaries of Caswells Creek and Nine Mile Creek. The northern part of the Subject land contains first and second order sections of Caswells Creek, which flows to an area historically diverted from Mosman Swamp (part of the Williams River catchment). Caswells Creek flows into the western section of Balickera Channel. Flows from the west part of the Channel are pumped into the eastern section at the Balickera pump station, which is located to the west of the Balickera Tunnel to Grahamstown Dam.

The south-eastern part of the Subject Land contains first and second order sections of Nine Mile Creek, which flows directly to the Grahamstown Dam.

The Grahamstown Dam overflows to the Hunter River catchment. The RAMSAR listed Hunter Estuary Wetlands – Kooragang Nature Reserve is downstream of the Grahamstown Dam spillway.



D:\UMWELT (AUSTRALIA) PTY LTD\4159 - 03 SKV\FIGURES ROB\4159C - 109 RIVERSDOWNSTREAM.MXD 10/03/2023 5:06:41 PM  
 Scale 1:200000 or A4

- Legend**
- Project Area (Subject Land)
  - RAMSAR Wetlands
  - Stream Order**
  - 1st Order Stream
  - 2nd Order Stream
  - 3rd Order Stream
  - 4th Order Stream
  - 5th Order Stream or Higher

FIGURE 3.1

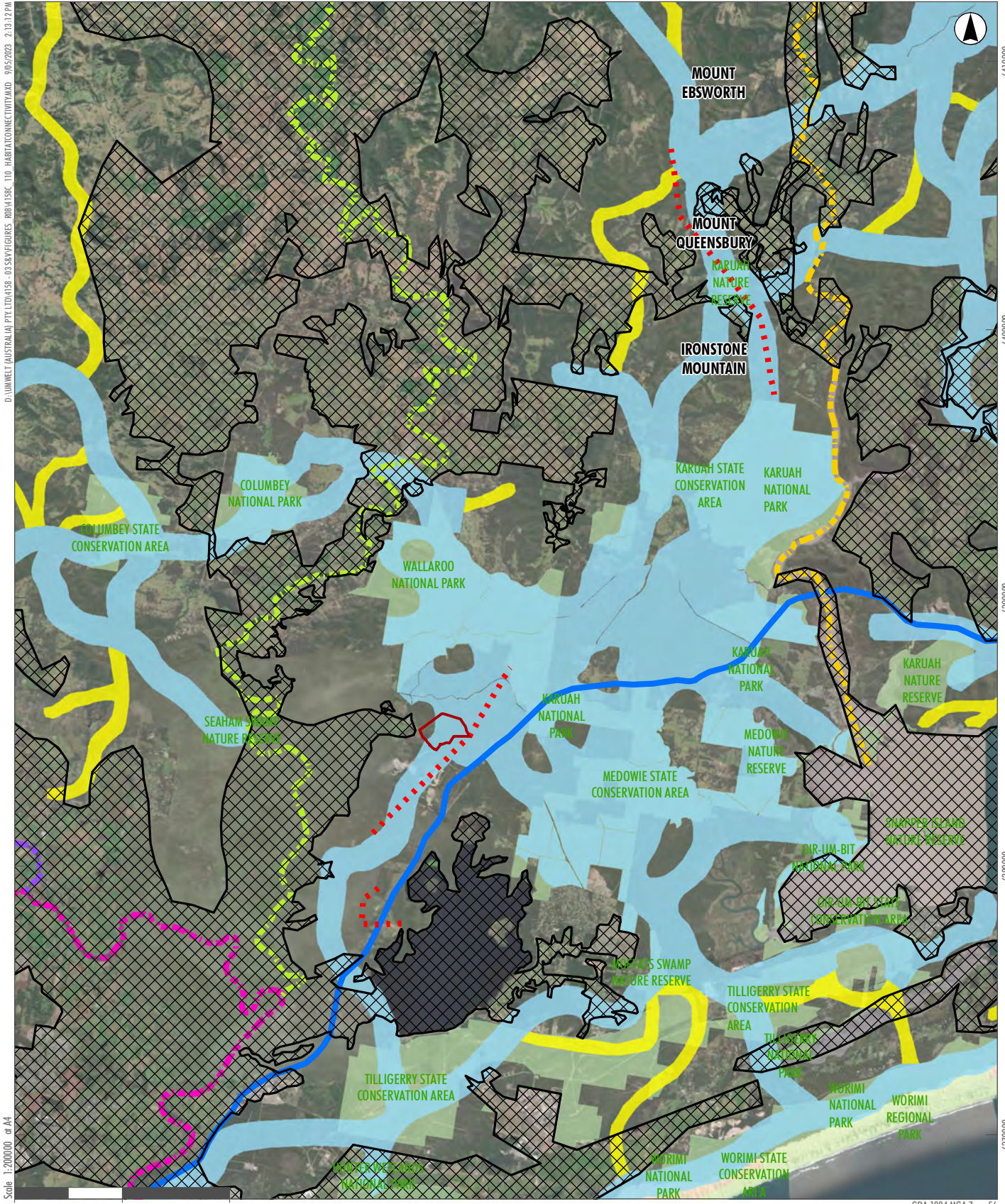
Rivers, Streams, Estuaries and Wetlands Downstream of the Subject Land

### 3.2.3 Habitat Connectivity

The Fauna Corridors for North East NSW dataset (DPE 2010) shows the subject land as part of a regional fauna corridor, which narrows beyond the site to the south-west (Fauna Corridors layer shown in **Figure 3.2**).

The Subject Land is part of a larger habitat patch which is notionally bounded by Karuah River in the east, the Pacific Highway in the south and the Williams River in the west. Connectivity in the north is provided through remnant vegetation within Mount Queensbury, Karuah Nature Reserve, Ironstone Mountain and the Karuah National Park to a larger area within the Mount Ebsworth region. Direct connectivity past the Pacific Highway is limited to under a bridge which flows to the Grahamstown Dam. Connectivity for mobile fauna species is likely to be achieved over the Pacific Highway, however this road provides a significant vehicle strike risk for terrestrial species such as the Koala.

The Subject Land is surrounded by large areas of intact native vegetation within the Wallaroo State Forest, with direct connection to Wallaroo National Park, Karuah National Park and Karuah State Conservation Area. The Pacific Highway separates the Wallaroo State Forest and the Subject Land from other local conservation areas to the east of the Pacific Highway, such as parts of the Karuah National Park, the Medowie State Conservation Area, the Medowie Nature Reserve, Moffats Swamp Nature Reserve and Tilligerry State Conservation Area.



- Scale 1:200000 or A4
- 0 4 8 Kilometers
- GDA 1994 MGA Zone 56
- Legend**
- Project Area (Subject Land)
  - Local Habitat Linkage (mapped by Umwelt)
  - Broad Area Habitat Linkage Barrier
  - National Parks (NPWS Estate)
  - Hunter River (likely barrier to connectivity)
  - Karuah River (likely barrier to connectivity)
  - Paterson River (likely barrier to connectivity)
  - Williams River (likely barrier to connectivity)
  - Pacific Highway (Barrier / risk of vehicle strike)
- Fauna Corridors**
- Regional
  - Subregional

**FIGURE 3.2**  
**Habitat Connectivity**

### 3.2.4 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance

No karst, caves, crevices, cliffs, rocks or other geological features of significance were observed within the Subject Land. Review of aerial imagery has identified the presence of rock areas and small cliffs outside of the Subject Land, within the Assessment Area.

### 3.2.5 Areas of Outstanding Biodiversity Value

The Subject Land and Assessment Area do not contain any areas of outstanding biodiversity value, as identified under the BC Act.

### 3.2.6 NSW (Mitchell) Landscapes

The Subject Land is mapped as occurring within the Newcastle Coastal Ramp Mitchell Landscape.

### 3.2.7 Additional Landscape Features Identified in the SEARS

There are no specific additional landscape features identified for assessment in the SEARS.

## 3.3 Native Vegetation Cover

The native vegetation cover within the Assessment Area was determined through site surveys of the Subject Land and aerial photograph interpretation using ArcMap software and Nearmap aerial imagery dated 6 August 2022. Field reconnaissance of areas of private land were not undertaken due to access constraints and is considered unnecessary due to the high quality of aerial imagery available.

**Table 3.1** summarises the extent of native vegetation cover within the Assessment Area and **Figure 1.2** shows the extent of native vegetation cover within the 1500 m buffer Assessment Area.

**Table 3.1 Native Vegetation Cover in the 1500 m Buffer Assessment Area**

Native Vegetation Cover	
1500m Buffer Assessment Area (ha)	1429.6
Total Area of native vegetation cover (ha)	1266.6
Percentage of native vegetation cover (%)	88.6
Class (0–10, >10–30, >30–70 or >70 %)	>70%

## **4.0 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity**

### **4.1 Native Vegetation Extent**

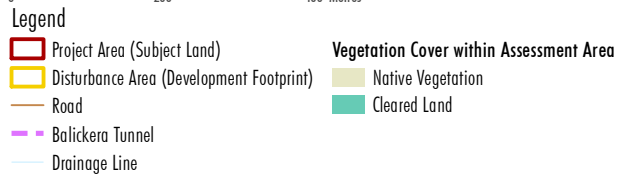
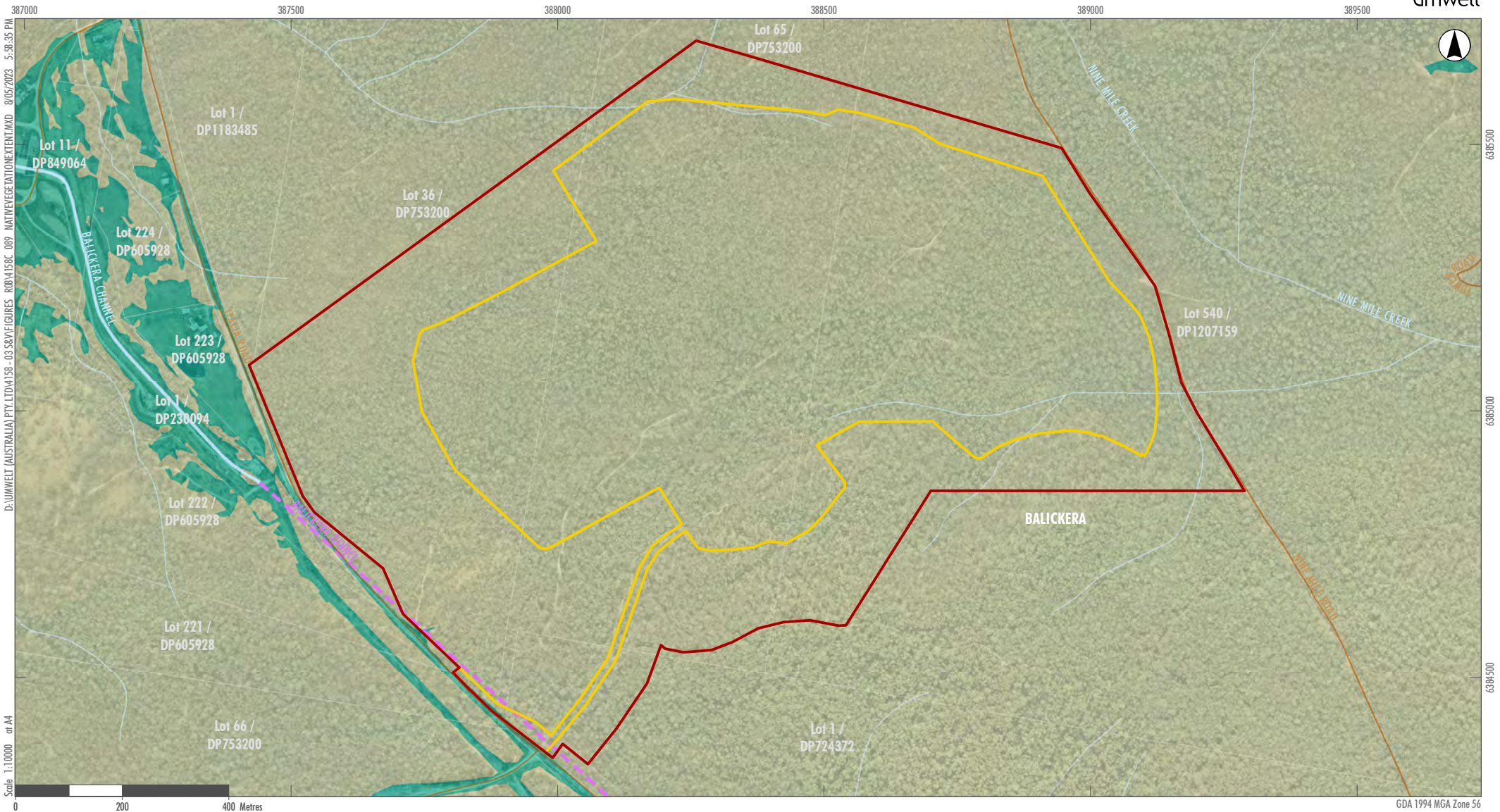
The parts of the development footprint assessed as native vegetation for the purposes of the vegetation integrity surveys are shown in **Figure 4.1**.

#### **4.1.1 Changes to the Mapped Native Vegetation Extent**

No changes were observed during surveys to the mapped native vegetation extent visible on the aerial imagery utilised for this assessment.

#### **4.1.2 Areas that are not Native Vegetation**

No areas of non-native vegetation were identified.



**FIGURE 4.1**  
**Native Vegetation Extent**

## 4.2 Plant Community Types

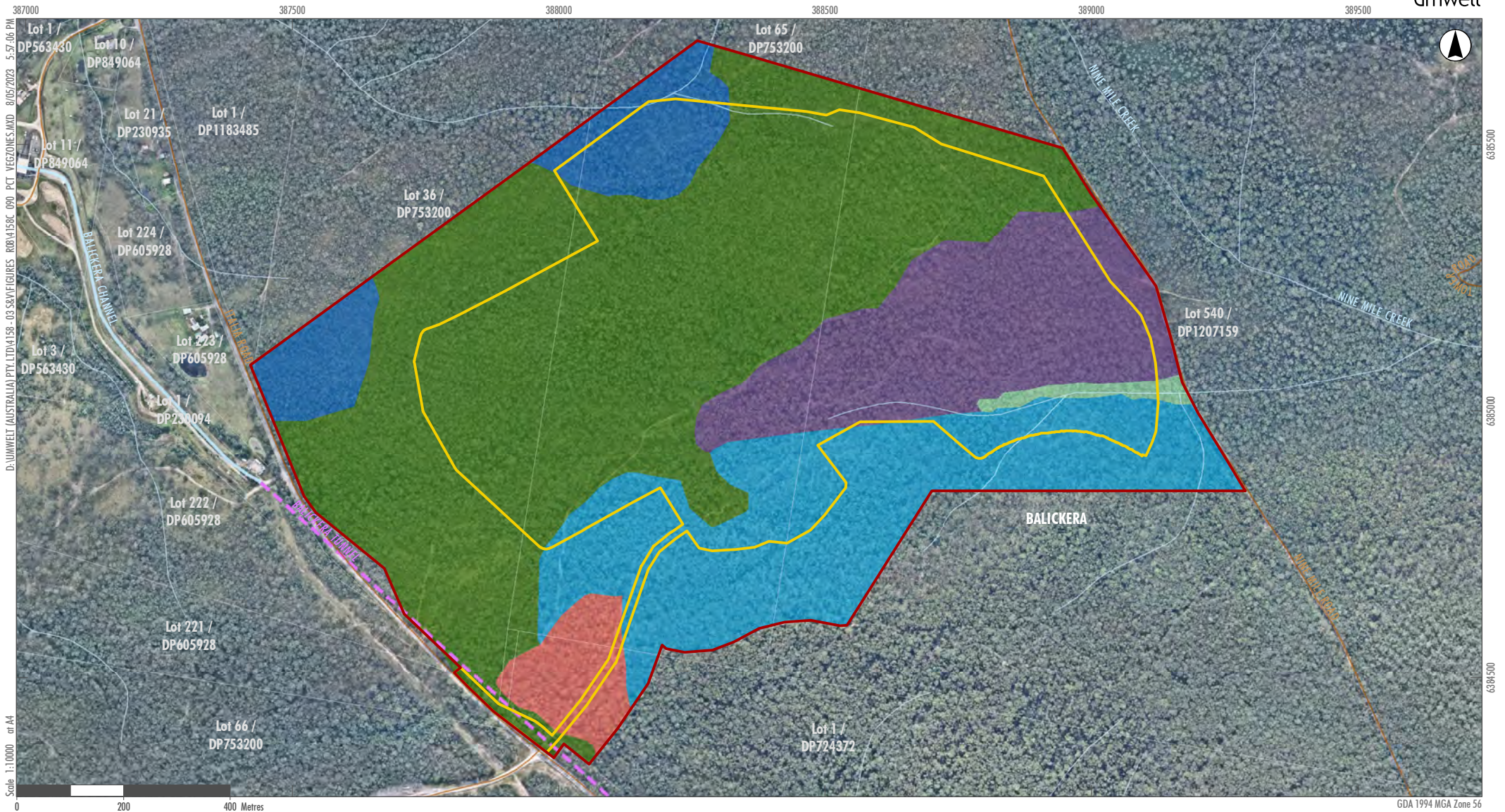
### 4.2.1 Overview of Plant Community Types Present

The PCTs identified in this assessment are based on the PCTs available prior to the release of the revised PCTs for eastern NSW and associated update to the BAM Calculator which occurred in February 2023. In-progress BAM-C assessments and projects with substantially progressed surveys are able to undertake this approach, in accordance with the transitional arrangements.

Vegetation within the development footprint has been assessed using BioNet Vegetation Classification tool as aligning to the PCTs identified within **Table 4.1** and mapped in **Figure 4.2**. Detailed descriptions of each PCT, including justification of PCT selections are provided in **Section 4.2.2**.

**Table 4.1 Plant Community Types Identified within the Development Footprint**

Current BAM-C PCT ID	Likely NSW VIS PCT Equivalent	PCT name	Vegetation Class	Vegetation Formation	Vegetation Condition Zone	NSW VIS Percentage Cleared Estimate	Area within Development Footprint (ha)
762	4042	Cabbage Gum open forest or woodland on flats of the North Coast	Grassy Woodlands	Coastal Valley Grassy Woodlands	Z1 PCT 762 Intact	70%	0.33
1590	3433	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	Z2 PCT 1590 - Intact	48%	45.63
1618	3435	Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast	Dry Sclerophyll Forests (Shrubby Sub-formation)	Coastal Dune Dry Sclerophyll Forests	Z3 PCT 1618 - Intact	56%	0.88
1619	3581	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	Z4 PCT 1619 - Intact (Apple Variant)	45%	19.52
	3432	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	Z5 PCT 1619 – Intact (Apple – Ironbark Variant)		8.75
1716	3436	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.	Forested Wetlands	Coastal Swamp Forests	Z6 PCT 1716 - Regenerating	66%	3.91
<b>Total area</b>							<b>79.02</b>



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line

**Plant Community Types**

- PCT762, Cabbage Gum open forest or woodland on flats of the North Coast - Intact
- PCT1590, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Intact
- PCT1618, Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast - Intact
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple variant
- PCT1619, Smooth-barked Apple-Red Bloodwood-Brown Stringybark-Hairpin Banksia heathy open forest of coastal lowlands - Intact / Apple-Ironbark variant
- PCT1716, Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast – Regenerating


**FIGURE 4.2**  
**Plant Community Types and Vegetation Zones**

## 4.2.2 Detailed Descriptions and Justification for Plant Community Types Present

### 4.2.2.1 PCT 762 Cabbage Gum Open Forest or Woodland on Flats of the North Coast

This PCT occurs as a tall forest in a sheltered location in the south-western corner of the development footprint. The characteristics of this PCT are described in **Table 4.2**.

**Table 4.2 PCT 762 Sheltered Moderate to Good Condition Zone**


PCT Name	Cabbage Gum Open Forest or Woodland on Flats of the North Coast
<b>BAM C PCT Number (Decommissioned)</b>	PCT 762
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	4042 – Lower North Riverflat Eucalypt-Paperbark Forest
<b>Vegetation Condition Zone</b>	1 - moderate to good
<b>Extent within development footprint (ha)</b>	0.33 ha
<b>Plots Completed</b>	2 Plots (Plot 17, Plot 22)
<b>Formation</b>	Grassy Woodlands
<b>Class</b>	Coastal Valley Grassy Woodlands
<b>Photo</b>	
<b>Location</b>	This PCT occurs in the south-western part of the site in an area of lower lying topography associated with an unmapped drainage line.
<b>Canopy Description</b>	The canopy is characterised by <i>Eucalyptus tereticornis</i> with a mix of other eucalypts, including <i>Eucalyptus globoidea</i> , <i>Eucalyptus fibrosa</i> and <i>Eucalyptus canaliculata</i> .
<b>Sub-canopy</b>	There is a tall subcanopy of paperbarks to approximately 10m tall, composed of <i>Melaleuca styphelioides</i> , <i>Melaleuca sieberi</i> , <i>Melaleuca decora</i> , <i>Melaleuca nodosa</i> and <i>Callistemon salignus</i> .

PCT Name	Cabbage Gum Open Forest or Woodland on Flats of the North Coast
<b>Mid-storey Description</b>	The mid-storey is sparse and characterised by <i>Leucopogon juniperinus</i> , <i>Breynia oblongifolia</i> , <i>Leptospermum polygalifolium</i> , <i>Acacia irrorata</i> and <i>Hibbertia aspera</i> .
<b>Ground Cover Description</b>	The groundcover is dominated by grasses and sedges, including <i>Aristida vagans</i> , <i>Carex inversa</i> , <i>Carex longebrachiata</i> , <i>Digitaria divaricatissima</i> , <i>Echinopogon caespitosus</i> , <i>Entolasia marginata</i> , <i>Entolasia stricta</i> , <i>Imperata cylindrica</i> , <i>Microlaena stipoides</i> , <i>Oplismenus aemulus</i> , <i>Schoenus apogon</i> and <i>Themeda triandra</i> .
<b>Introduced Species</b>	Exotic cover is very low and limited to the shrub and ground layers. Exotic species observed include <i>Lantana camara</i> , <i>Bidens pilosa</i> and <i>Senecio madagascarensis</i> .
<b>PCT Allocation Justification</b>	<p><b>General:</b> PCT 762 is described in the VIS as being constructed from a range of classification sources with only sparse descriptive data and no traceable plot data available.</p> <p><b>Location:</b> PCT 762 is known to occur on coastal lowlands on poorly drained lower slopes, valley flats and creek banks.</p> <p><b>Community structure:</b> PCT 762 is described in the VIS as having an upper stratum of trees with a tussock grass / graminoid ground layer. This description corresponds with the area assigned to this PCT.</p> <p><b>Species assemblage:</b> The floristics description for PCT 762 in the VIS is depauperate, however <i>Eucalyptus tereticornis</i> is listed as a component of the canopy.</p> <p><b>Other PCTs considered:</b> PCT 1716 Prickly-leaved paperbark forest on coastal lowlands of the Central Coast and Lower North Coast was considered and discounted due to a lack of <i>Eucalyptus tereticornis</i> in the canopy. PCT 1716 also has the structural characteristics of a tall shrubland or low open forest which is incongruous with the tall open forest present.</p> <p><b>Current VIS PCT Characteristics:</b> PCT 4042 is identified in the VIS lineage information as replacing PCT 762, which has now been decommissioned in the VIS. PCT 4042 is characterised as a very tall to extremely tall sclerophyll open forest with a sub-canopy of Melaleuca trees and a grassy and herbaceous ground cover on low-lying alluvial soils on the Central and North Coast. The characteristic tree species <i>Glochidion ferdinandi</i>, <i>Notelaea longifolia</i>, <i>Eucalyptus tereticornis</i>, <i>Eucalyptus globoidea</i>, <i>Corymbia maculata</i>, <i>Eucalyptus siderophloia</i> were recorded within plots. The sub-canopy contains a prominent layer of paperbarks and the landscape position for PCT 4042 of creek flats below 50m ASL aligns with the mapped area.</p>
<b>BC Act Status</b>	This PCT corresponds with the River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC. Further analysis of BC Act listed TECs is provided in <b>Section 4.3.2</b> and <b>Appendix C</b> .
<b>EPBC Act Status</b>	This PCT corresponds to the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC listed under the EPBC in October 2022. Further analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3</b> .

#### 4.2.2.2 PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark Shrubby Open Forest

This PCT is described in **Table 4.3**, it occupies the largest area within the development footprint.

**Table 4.3 PCT 1590 Moderate to Good Condition Zone**

PCT Name	Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
<b>BAM C PCT Number (Decommissioned)</b>	PCT 1590
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	3433 – Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
<b>Vegetation Condition Zone</b>	2 - Intact
<b>Extent within development footprint (ha)</b>	45.63 ha
<b>Plots Completed</b>	6 Plots (Plot 8, Plot 9, Plot 10, Plot 16, Plot 20, Plot 21)
<b>Formation</b>	Dry Sclerophyll Forests (Shrub/grass sub-formation)
<b>Class</b>	Hunter-Macleay Dry Sclerophyll Forests
<b>Photo</b>	
<b>Location</b>	PCT 1590 is the dominant vegetation type across the study area. It occurs along the ridge and foot slope areas of the development footprint.
<b>Canopy Description</b>	The canopy forms an open forest and is dominated by <i>Corymbia maculata</i> , which occurs in association with <i>Eucalyptus fibrosa</i> , <i>Eucalyptus umbra</i> , <i>Eucalyptus canaliculata</i> , <i>Eucalyptus siderophloia</i> , <i>Eucalyptus globoidea</i> and <i>Eucalyptus tereticornis</i> .
<b>Sub-canopy</b>	A tall mid-layer of regenerating eucalypts occurs, often in association with <i>Melaleuca nodosa</i> .
<b>Mid-storey Description</b>	A prominent shrub layer is present and is typically composed of <i>Pultenaea villosa</i> , <i>Leptospermum polygalifolium</i> , <i>Acacia longifolia</i> , <i>Hakea dactyloides</i> , <i>Acacia ulicifolia</i> , <i>Breynia oblongifolia</i> , <i>Indigofera australis</i> , <i>Jacksonia scoparia</i> , <i>Leucopogon juniperinus</i> , <i>Notelaea longifolia</i> and <i>Pittosporum multiflorum</i> .

PCT Name	Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
<b>Ground Cover Description</b>	The ground cover is dominated by grasses and includes <i>Cyathochaeta diandra</i> , <i>Dichelachne crinita</i> , <i>Echinopogon caespitosus</i> , <i>Entolasia marginata</i> , <i>Entolasia stricta</i> , <i>Hibbertia aspera</i> , <i>Imperata cylindrica</i> , <i>Lomandra filiformis</i> , <i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Panicum simile</i> , <i>Poa affinis</i> , <i>Schoenus apogon</i> and <i>Themeda triandra</i> .
<b>Introduced Species</b>	<i>Lantana camara</i> and <i>Senecio madagascarensis</i> were observed in low densities.
<b>PCT Allocation Justification</b>	<p><b>General:</b> PCT 1590 is described in the VIS as a Spotted Gum (<i>Corymbia maculata</i>) dominated open forest.</p> <p><b>Location:</b> PCT 1590 is known to occur on flats, low rises (hillslopes) and low ranges of the lower Hunter Valley and Central Coast. The development footprint matches these locational characters.</p> <p><b>Community structure:</b> PCT 1590 is described in the VIS an open forest with a mid-storey composed of a diverse open shrub layer with various small climbers and a ground layer which is characteristically grassy with a mix of forbs, small ferns and other graminoids. This community structure is characteristic of the vegetation assigned to this PCT.</p> <p><b>Species assemblage:</b> PCT 1590 is characterised by the canopy species, <i>Corymbia maculata</i>, <i>Eucalyptus umbra</i> and <i>Eucalyptus fibrosa</i>. These are also typically the dominant canopy species throughout the areas mapped as this PCT.</p> <p><b>Other PCTs considered:</b> There is a continuum of Spotted Gum / Ironbark dominated open forest PCTs that occur throughout the Hunter Valley and lower Mid-north Coast. This PCT was selected as it is considered to be the best floristic and locational match based on the results of the plot surveys completed. The following other Spotted Gum / Ironbark dominated PCTs were also considered and ruled out:</p> <p><b>PCT 1589 – Spotted Gum – Broad-leaved Mahogany – Grey Gum grass – shrub open forest on Coastal Lowlands of the Central Coast</b> - Excluded due to presence of <i>Eucalyptus punctata</i> and lack of <i>Eucalyptus fibrosa</i> in the description and site locations outside of the Central Coast area.</p> <p><b>PCT 1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter</b> - Excluded due to lack poor floristic match including lack of Grey Gum (<i>Eucalyptus punctata</i>) in the canopy and lack or low density of many of the characteristic mid stratum species such as <i>Lissanthe strigosa</i> and <i>Podolobium ilicifolium</i>.</p> <p><b>PCT 1593 – Red Ironbark - Spotted Gum - Prickly-leaved Paperbark shrubby open forest of the Lower Hunter</b> - Excluded due to poor floristic match, including lack of prominent areas dominated by <i>Eucalyptus fibrosa</i> with <i>Corymbia maculata</i> as a sub-dominant. Several of the common middle stratum species are also absent or in low density including <i>Bursaria spinosa</i>, <i>Pultenaea spinosa</i>, <i>Acacia parvipinnula</i>, <i>Correa reflexa</i> and <i>Macrozamia flexuosa</i>.</p> <p><b>PCT 1600 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter</b> - Excluded due to poor floristic match, including the absence of <i>Eucalyptus crebra</i> and <i>Eucalyptus moluccana</i> within the canopy.</p>


PCT Name	Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
	<p><b>PCT 1601 - Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter</b></p> <p>- Excluded due to poor floristic match, including lack of <i>Eucalyptus crebra</i> and many of the characteristic middle stratum species including <i>Daviesia ulicifolia</i>, <i>Lissanthe strigosa</i>, <i>Bursaria spinosa</i> and <i>Acacia parvipinnula</i>.</p> <p><b>PCT 1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter</b></p> <p>- Excluded due to poor floristic match, particularly the lack of <i>Eucalyptus crebra</i> in the canopy.</p> <p><b>PCT 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter</b></p> <p>- Excluded due to poor floristic match, particularly the lack of <i>Eucalyptus crebra</i> and <i>Eucalyptus moluccana</i> in the canopy.</p> <p><b>Current VIS PCT Characteristics:</b></p> <p>PCT 1590 has a moderate relationship to PCT 3433, one of three PCTs with which it has been replaced.</p> <p>PCT 3433 is defined in the VIS as a tall to very tall sclerophyll open forest with dry and soft-leaved shrubs and a grassy ground cover on the undulating foothills of the Hunter Coast hinterland from Tuggerah to Stratford, and Lower Hunter Valley around Cessnock.</p> <p>The canopy of PCT 3433 is described as almost always including one or more ironbarks (<i>Eucalyptus fibrosa</i> or <i>Eucalyptus siderophloia</i>), very frequently with <i>Corymbia maculata</i>. Mahoganies (<i>Eucalyptus umbra</i> or <i>Eucalyptus acmenoides</i>) are also commonly present in the canopy. The canopy species listed for this PCT (except for <i>Eucalyptus acmenoides</i>), were encountered and are common throughout the development footprint.</p> <p>The sparse mid-stratum almost always includes one or more <i>Acacia</i> species, of which <i>Acacia falcata</i> and <i>Acacia ulicifolia</i> are the most frequent and abundant. The shrubs and small trees that complete the mid-stratum very frequently include <i>Daviesia ulicifolia</i> and commonly <i>Bursaria spinosa</i> and melaleucas (<i>Melaleuca nodosa</i> or <i>Melaleuca decora</i>). The mid-dense ground layer typically includes graminoids, forbs, twiners and a hardy fern. <i>Entolasia stricta</i> is almost always present with <i>Themeda triandra</i>, <i>Lobelia purpurascens</i>, <i>Microlaena stipoides</i>, <i>Aristida vagans</i>, <i>Lomandra multiflora</i> subsp. <i>multiflora</i>, <i>Glycine clandestina</i> and <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> all very frequent. This PCT occurs primarily on Permian sediments, however is also present on claystones of the Narrabeen Group. It is known from elevations below 130 metres asl in a moist climate with a mean annual rainfall of 1030 mm.</p>
<b>BC Act Status</b>	<p>This PCT does not correspond to any TECs listed under the BC Act.</p> <p>Consideration was given to the potential presence of the Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions endangered ecological community. This PCT corresponds with MU 65 Spotted Gum / Broad-leaved Mahogany/Red Ironbark moist shrubby open forest, of Somerville 2009. The site contains the differences noted in the final determination for MU 65, notably a canopy of <i>Corymbia maculata</i> dominating in association with <i>Eucalyptus umbra</i>, <i>Eucalyptus fibrosa</i>, <i>Eucalyptus siderophloia</i> and <i>Allocasuarina torulosa</i>. The shrub layer also exhibits more frequent occurrence of <i>Acacia ulicifolia</i>, <i>Breynia oblongifolia</i>, <i>Leucopogon juniperinus</i> and <i>Notelaea longifolia</i> and scarcity or absence of <i>Grevillea montana</i>, <i>Grevillea parviflora</i>, <i>Melaleuca decora</i>, and <i>Pultenaea spinosa</i>. Further detailed analysis of BC Act listed TECs is provided in <b>Section 4.3.2</b> and <b>Appendix C</b>.</p>

<b>PCT Name</b>	<b>Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest</b>
<b>EPBC Act Status</b>	Consideration was given to the potential alignment of this PCT with the Central Hunter Valley Eucalypt Forest and Woodland CEEC. The presence of this CEEC was excluded based on lack of key diagnostic characteristics including lack of Permian geology and presence of high densities of <i>Eucalyptus fibrosa</i> (>2 trees per ha), a species which must be largely absent for the listed community to occur. Further detailed analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3</b> .

#### 4.2.2.3 PCT 1618 Smooth-Barked Apple - White Stringybark - Red Mahogany - Melaleuca Sieberi Shrubby Open Forest on Lowlands of the Lower North Coast

A description of PCT 1618 is provided in **Table 4.4**. This PCT occupies a narrow shallow drainage line in the south-easter section of the development footprint.

**Table 4.4 PCT 1618 Moderate to Good Condition**

<b>PCT Name</b>	<b>Smooth-barked Apple – White Stringybark – Red Mahogany – <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast</b>
<b>BAM C PCT Number (Decommissioned)</b>	PCT 1618
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	3435 – Hunter Coast Lowland Flats Damp Forest
<b>Vegetation Condition Zone</b>	3 - Moderate to good
<b>Extent within development footprint (ha)</b>	0.88 ha
<b>Plots Completed</b>	1 Plot (Plot 12B)
<b>Formation</b>	Dry Sclerophyll Forests (Shrubby Sub-formation)
<b>Class</b>	Coastal Dune Dry Sclerophyll Forests
<b>Photo</b>	

<b>PCT Name</b>	<b>Smooth-barked Apple – White Stringybark – Red Mahogany – <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast</b>
<b>Location</b>	This PCT occurs in a shallow drainage line in the south-easter section of the development footprint.
<b>Canopy Description</b>	The canopy is dominated by <i>Eucalyptus resinifera</i> in association with <i>Angophora costata</i> , <i>Eucalyptus fibrosa</i> , <i>Eucalyptus globoidea</i> and <i>Eucalyptus tereticornis</i> .
<b>Sub-canopy</b>	A prominent tall shrub layer of Melaleucas is present and includes <i>Melaleuca decora</i> , <i>Melaleuca linariifolia</i> , <i>Melaleuca nodosa</i> and <i>Melaleuca sieberi</i> .
<b>Mid-storey Description</b>	The mid-storey is sparse and is composed of <i>Leptospermum polygalifolium</i> , <i>Acacia falcata</i> , <i>Sannantha crassa</i> , <i>Glochidion ferdinandi</i> , <i>Pultenaea retusa</i> and <i>Pultenaea villosa</i> .
<b>Ground Cover Description</b>	The ground cover is influenced by high moisture levels and is dominated by <i>Carex inversa</i> , <i>Echinopogon caespitosa</i> , <i>Entolasia marginata</i> , <i>Entolasia stricta</i> , <i>Imperata cylindrica</i> , <i>Microlaena stipoides</i> , <i>Panicum simile</i> and <i>Schoenus apogon</i> .
<b>Introduced Species</b>	No notable incursions of exotic flora were observed.
<b>PCT Allocation Justification</b>	<p><b>General:</b></p> <p>This PCT is described in the VIS as an open forest with an overstorey dominated by <i>Angophora costata</i>. The mid-storey is identified as tall and shrubby, but also with a diversity of smaller shrubs. The ground layer is described as being dominated by grasses, graminoides and forbs. The above description provided in the VIS lacks detail, however the vegetation assigned to this PCT correlates well with PCT 3435 which replaces and has a strong association to this decommissioned PCT.</p> <p><b>Location:</b></p> <p>PCT 1618 is known to occur on coastal valley flats and low coastal hills of the lower North Coast and Central Coast, mainly on sandy substrates. This PCT occurs in association with a shallow drainage line within the development footprint.</p> <p><b>Community structure:</b></p> <p>PCT 1618 is described in the VIS an open forest with a tall mid-storey. This community structure is characteristic of the vegetation assigned to this PCT.</p> <p><b>Species assemblage:</b></p> <p>PCT 1618 is characterised by the canopy species, <i>Angophora costata</i>, <i>Eucalyptus globoidea</i> and <i>Eucalyptus resinifera</i>. These species were all observed within the single plot surveyed. The mid-storey species, <i>Melaleuca sieberi</i>, <i>Melaleuca nodosa</i>, <i>Melaleuca linariifolia</i>, <i>Leptospermum polygalifolium</i>, <i>Pultenaea retusa</i> and <i>Pultenaea villosa</i> are listed within the VIS for this PCT and were recorded within the plot sampled.</p> <p><b>Other PCTs considered:</b></p> <p>PCT 762 was considered due to the presence of <i>Eucalyptus tereticornis</i>, however was discounted due to the low abundance of this species and the presence of the other dominant eucalypts.</p> <p><b>Current VIS PCT Characteristics:</b></p> <p>PCT 1618 has been decommissioned (but remains the only relevant PCT in BAM-C) and replaced by PCT 3435 and PCT 3998. PCT 3998 is aligned with <i>Eucalyptus robusta</i> which was not observed. PCT 3435 corresponds well with the vegetation assigned to PCT 1618, having a mid to high canopy composed of <i>Angophora costata</i>, <i>Eucalyptus resinifera</i>, <i>Eucalyptus globoidea</i> with lower densities of <i>Corymbia maculata</i>, <i>Eucalyptus fibrosa</i>, <i>Eucalyptus umbra</i> and <i>Eucalyptus tereticornis</i>.</p>


<b>PCT Name</b>	<b>Smooth-barked Apple – White Stringybark – Red Mahogany – <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast</b>
<b>BC Act Status</b>	It is considered that this PCT corresponds to River-flat Eucalypt Forest on Coastal Floodplains EEC. Further analysis of BC Act listed TECs is provided in <b>Section 4.3.2</b> and <b>Appendix C</b> .
<b>EPBC Act Status</b>	This PCT corresponds to the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC listed under the EPBC in October 2022. Further analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3</b> .

#### 4.2.2.4 PCT 1619 Smooth-Barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia Heathy Open Forest of Coastal Lowlands

PCT 1619 has been assessed in two condition zones, approximately dissected by a watercourse in the southern section of the site which forms a tributary of Nine Mile Creek. Both condition zones are in moderate to good condition, however Condition Zone 4 is described in **Table 4.6** as an Apple (*Angophora costata*) variant and Condition Zone 5 is described in **Table 4.5** as a Hunter Coast Foothills Apple-Ironbark (*Angophora costata* – *Eucalyptus fibrosa*) variant. These variants align well to separate updated PCTs in the VIS which will eventually replace the decommissioned PCT 1619 available in BAM-C.

**Table 4.5 PCT 1619 Moderate to Good Condition – Apple Variant**


<b>PCT Name</b>	<b>Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands</b>
<b>BAM C PCT Number (Decommissioned)</b>	PCT 1619
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	3581 – Hunter Coast Foothills Apple Forest
<b>Vegetation Condition Zone</b>	4 - Moderate to good (apple variant)
<b>Extent within development footprint (ha)</b>	19.52 ha
<b>Plots Completed</b>	4 Plots (Plot 11, plot 13, Plot 15, Plot 24)
<b>Formation</b>	Dry Sclerophyll Forests (Shrubby sub-formation)
<b>Class</b>	Sydney Coastal Dry Sclerophyll Forests

PCT Name	Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands
<b>Photo</b>	
<b>Location</b>	<p>This PCT condition zone is located on footslopes and sandy soils as a single patch in the central and south-eastern parts of the site, to the north of the watercourse which forms a tributary of Nine Mile Creek.</p>
<b>Canopy Description</b>	<p>The canopy is dominated by <i>Angophora costata</i>, <i>Eucalyptus globoidea</i> and <i>Corymbia gummifera</i> in association with <i>Eucalyptus resinifera</i>, <i>Eucalyptus piperita</i> and <i>Eucalyptus canaliculata</i>. <i>Eucalyptus fibrosa</i> is notably absent.</p>
<b>Sub-canopy</b>	<p>The subcanopy, where present is mostly composed of <i>Allocasuarina littoralis</i>, <i>Allocasuarina torulosa</i> and eucalypts saplings.</p>
<b>Mid-storey Description</b>	<p>The mid-storey is heathy and dominant species include <i>Leptospermum polygalifolium</i>, <i>Glochidion ferdinandi</i>, <i>Pultenaea paleacea</i>, <i>Banksia spinulosa</i>, <i>Lambertia formosa</i>, <i>Callistemon salignus</i>, <i>Pultenaea villosa</i> and <i>Dillwynia retorta</i>.</p>
<b>Ground Cover Description</b>	<p>The ground cover is dominated by grasses, graminoides and sedges including <i>Anisopogon avenaceus</i>, <i>Entolasia stricta</i>, <i>Lomandra obliqua</i>, <i>Ptilothrix deusta</i>, <i>Imperata cylindrica</i>, <i>Themeda triandra</i>, <i>Cyathochaeta diandra</i>, <i>Microlaena stipoides</i> and <i>Xanthorrhoea latifolia</i>.</p>
<b>Introduced Species</b>	<p>No notable incursions of exotic flora species were observed.</p>
<b>PCT Allocation Justification</b>	<p><b>General:</b> PCT 1590 is described in the VIS as an open forest dominated by <i>Angophora costata</i> and <i>Corymbia gummifera</i> with a shrubby mid-storey and a ground layer of grasses, graminoids and scattered forbs. These characteristics resemble the vegetation mapped as this PCT condition zone.</p> <p><b>Location:</b> The VIS describes this PCT as occurring on coastal lowlands and low ranges of the lower North Coast and Central Coast on sandy substrates. These characteristics resemble the vegetation mapped as this PCT condition zone.</p> <p><b>Community structure:</b> PCT 1619 is described as an open forest with a shrubby understory. These structure attributes correspond to the vegetation within the development footprint mapped as this PCT.</p>

PCT Name	Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands
	<p><b>Species assemblage:</b></p> <p>PCT 1619 is characterised by the canopy species, <i>Angophora costata</i>, <i>Corymbia gummifera</i> and <i>Eucalyptus capitellata</i>. All three species are present, with <i>Eucalyptus capitellata</i> being present in low densities only and not typically recorded in the plots sampled. The majority of the middle stratum and ground stratum species identified in the VIS for this PCT are also present.</p> <p><b>Other PCTs considered:</b></p> <p>PCT 1618 was considered however PCT 1619 is a better floristic match due to the presence of <i>Corymbia gummifera</i> and <i>Eucalyptus capitellata</i>.</p> <p><b>Current VIS PCT Characteristics:</b></p> <p>PCT 1619 has a moderate relationship to PCT 3581, which is one of three PCTs which has replaced it.</p> <p>PCT 3581 is defined in the VIS (NSW DPE 2023) as a tall to very tall sclerophyll open forest with a dry shrub layer and a grassy ground layer found on enriched sedimentary hills and rises on coastal plains between Gosford and Wallis Lake.</p> <p>The canopy of PCT 3581 is identified as almost always including a high cover of <i>Angophora costata</i> with <i>Corymbia gummifera</i> and commonly <i>Eucalyptus piperita</i>. Frequently occurring shrubs include <i>Persoonia linearis</i>, <i>Podolobium ilicifolium</i>, <i>Persoonia levis</i>, <i>Breynia oblongifolia</i>, <i>Leptospermum polygalifolium</i> and <i>Acacia</i> spp.</p>
<b>BC Act Status</b>	This PCT does not correspond to any TECs listed under the BC Act. Further analysis of BC Act listed TECs is provided in <b>Section 4.3.2</b> and <b>Appendix C</b> .
<b>EPBC Act Status</b>	This PCT does not correspond to any TECs listed under the EPBC Act. Further analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3</b> .

**Table 4.6 PCT 1619 Moderate to Good Condition Apple-Ironbark Variant**

PCT Name	Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands
<b>BAM C PCT Number (Decommissioned)</b>	PCT 1619
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	3432 – Hunter Coast Foothills Apple-Ironbark Grassy Forest
<b>Vegetation Condition Zone</b>	5 - Moderate to good (apple / ironbark variant)
<b>Extent within development footprint (ha)</b>	8.75 ha
<b>Plots Completed</b>	3 Plots (Plot 12, plot 14, Plot 23)
<b>Formation</b>	Dry Sclerophyll Forests (Shrubby sub-formation)
<b>Class</b>	Sydney Coastal Dry Sclerophyll Forests


PCT Name	Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands
<b>Photo</b>	
<b>Location</b>	This PCT is located on footslopes and sandy soils as a single patch in the central and south-eastern parts of the site.
<b>Canopy Description</b>	The canopy is dominated by <i>Angophora costata</i> , <i>Corymbia gummifera</i> , <i>Eucalyptus fibrosa</i> , <i>Eucalyptus globoidea</i> , <i>Eucalyptus resinifera</i> and <i>Eucalyptus globoidea</i> .
<b>Sub-canopy</b>	The subcanopy, where present is mostly composed of <i>Allocasuarina littoralis</i> and eucalypt saplings.
<b>Mid-storey Description</b>	The mid-storey is healthy and dominant species include <i>Daviesia ulicifolia</i> , <i>Dillwynia retorta</i> , <i>Dodonaea triquetra</i> , <i>Leptospermum polygalifolium</i> , <i>Leptospermum trinervium</i> , <i>Pultenaea paleacea</i> , <i>Pultenaea villosa</i> , <i>Breynia oblongifolia</i> , <i>Acrotriche divaricata</i> , <i>Notelaea longifolia</i> and <i>Glochidion ferdinandi</i> .
<b>Ground Cover Description</b>	The ground cover is dominated by grasses, graminoides and sedges including <i>Carex inversa</i> , <i>Dianella caerulea</i> , <i>Echinopogon caespitosus</i> , <i>Entolasia marginata</i> , <i>Entolasia stricta</i> , <i>Gonocarpus teucrioides</i> , <i>Imperata cylindrica</i> , <i>Lobelia purpurascens</i> , <i>Lomandra obliqua</i> , <i>Microlaena stipoides</i> , <i>Panicum simile</i> , <i>Ptilothrix deusta</i> and <i>Themeda triandra</i> .
<b>Introduced Species</b>	Very low levels of <i>Senecio madagascarensis</i> were observed.
<b>PCT Allocation Justification</b>	<p><b>General:</b></p> <p>PCT 1590 is described in the VIS as an open forest dominated by <i>Angophora costata</i> and <i>Corymbia gummifera</i> with a shrubby mid-storey and a ground layer of grasses, graminoids and scattered forbs. These characteristics resemble the vegetation mapped as this PCT condition zone, with the addition of the notable presence of <i>Eucalyptus fibrosa</i>.</p> <p><b>Location:</b></p> <p>The VIS describes this PCT as occurring on coastal lowlands and low ranges of the lower North Coast and Central Coast on sandy substrates. These locational characteristics resemble the vegetation mapped as this PCT condition zone, however the soils appear to have lower levels of sand.</p>

PCT Name	Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia Heath Open Forest of Coastal Lowlands
	<p><b>Community structure:</b> PCT 1619 is described as an open forest with a shrubby understorey. These structure attributes correspond to the vegetation within the development footprint mapped as this PCT.</p> <p><b>Species assemblage:</b> PCT 1619 is characterised by the canopy species, <i>Angophora costata</i>, <i>Corymbia gummifera</i> and <i>Eucalyptus capitellata</i>. <i>Angophora costata</i> and <i>Corymbia gummifera</i> are both present with <i>Eucalyptus capitellata</i> being absent or in very low densities.</p> <p><b>Other PCTs considered:</b> PCT 1618 was considered however PCT 1619 is a better floristic match due to the presence of <i>Corymbia gummifera</i> and <i>Eucalyptus capitellata</i> in that PCT.</p> <p><b>Current VIS PCT Characteristics:</b> PCT 1619 is described as having a moderate relationship to PCT 3432, which is one of three PCTs which has replaced it. PCT 3432 is considered to strongly represent the vegetation assigned to this PCT and condition zone. PCT 3432 is defined in the VIS (NSW DPE 2023) as a tall to very tall sclerophyll open forest with a sparse dry shrub layer and grassy ground cover found on coastal hills, rises and escarpment foot slopes between Wyong and The Branch on the Lower North and Hunter coasts. The canopy of PCT 3432 is identified as having a frequent occurrence of <i>Angophora costata</i> in association with <i>Corymbia gummifera</i>, <i>Corymbia maculata</i> or occasionally <i>Eucalyptus umbra</i>. There are five ironbark species which have been recorded for PCT 3432, with only <i>Eucalyptus fibrosa</i> being common. Stringybarks have been described as collectively common, with no single species occurring more than occasionally. Many of the shrub and ground covers recorded in PCT 3432 are also present.</p>
<b>BC Act Status</b>	This PCT does not correspond to any TECs listed under the BC Act. Further analysis of BC Act listed TECs is provided in <b>Section 4.3.2</b> and <b>Appendix C</b> .
<b>EPBC Act Status</b>	This PCT does not correspond to any TECs listed under the EPBC Act. Further analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3</b> .

#### 4.2.2.5 PCT 1716 Prickly-Leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.

This PCT is located on the northern part of the development footprint in an exposed location with a north-facing aspect. It appears to be in a regenerating condition following likely historically logging and bushfires. This PCT is described in **Table 4.7**.

**Table 4.7 PCT 1716 Exposed Regenerating Condition Zone**

PCT Name	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast
<b>BAM C PCT Number (Decommissioned)</b>	PCT 1716
<b>Likely Equivalent NSW VIS PCT Name and Number</b>	3436 – Hunter Coast Sandy Creekflat Paperbark Scrub
<b>Vegetation Condition Zone</b>	6 - Regenerating
<b>Extent within development footprint (ha)</b>	3.91 ha
<b>Plots Completed</b>	2 Plots (Plot 07, Plot 19)
<b>Formation</b>	Forested Wetlands
<b>Class</b>	Coastal Swamp Forests
<b>Photo</b>	
<b>Location</b>	This PCT occurs in the northern part of the site in areas of low-lying topography which are poorly draining.
<b>Canopy Description</b>	There is a sparse eucalypt canopy composed of <i>Eucalyptus tereticornis</i> , <i>Eucalyptus siderophloia</i> and <i>Corymbia maculata</i> to approximately 10m high.
<b>Sub-canopy</b>	The sub-canopy is composed of a dense <i>Melaleuca nodosa</i> scrub to approximately 4m high.
<b>Mid-storey Description</b>	The mid-storey is composed of <i>Callistemon salignus</i> , <i>Acacia implexa</i> and <i>Leptospermum polygalifolium</i> .
<b>Ground Cover Description</b>	The understorey is dominated by sedges and grasses including <i>Entolasia marginata</i> , <i>Haloragis heterophylla</i> , <i>Microlaena stipoides</i> , <i>Panicum simile</i> , <i>Ptilothrix deusta</i> , <i>Schoenus apogon</i> and <i>Themeda triandra</i> .
<b>Introduced Species</b>	No notable incursions of exotic species were observed.

PCT Name	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast
<b>PCT Allocation Justification</b>	<p><b>General:</b> PCT 1716 is described in the VIS as a myrtaceous; seasonally wet tall shrubland/low open forest with emergent Eucalypts. The main canopy may contain a variety of species in association with <i>M. nodosa</i>. The ground stratum is relatively dense and is dominated by grasses. This community is found on poorly drained areas on the undulating coastal lowlands from Wamberal north to Yarratt State Forest. This community typically occurs on unconsolidated sediments or on fine-grained sedimentary geologies at elevations up to 100m.</p> <p>The vegetation mapped as this PCT is consistent with this general description provided for the PCT.</p> <p><b>Location:</b> Within the development footprint PCT 1716 occurs in low lying poorly drained areas.</p> <p><b>Community structure:</b> PCT 1716 is described in the VIS as a tall shrubland to low open forest. This description corresponds with the area assigned to this PCT.</p> <p><b>Species assemblage:</b> The area allocated to this PCT corresponds with the VIS floristics description which identifies a variety of species occurring in association with <i>Melaleuca nodosa</i>, including emergent eucalypts. <i>Melaleuca nodosa</i> is dominant and <i>Eucalyptus tereticornis</i>, <i>Eucalyptus siderophloia</i> and <i>Corymbia maculata</i> occur as emergent eucalypts.</p> <p><b>Other PCTs considered:</b> PCT 1715 Prickly-leaved Paperbark - Flax-leaved Paperbark swamp forest on poorly drained soils of the Central Coast was considered and discounted as it is described as occurring in the Tuggerah Lakes and Wamberal areas, typically on Narrabeen Sandstone. PCT 762 Cabbage Gum Open Forest or Woodland on Flats of the North Coast was considered. This PCT occurs within the development footprint in association with a sheltered drainage line. PCT 762 is typically a tall forest rather than a tall shrubland and has a more prominent eucalypt canopy.</p> <p><b>Current VIS PCT Characteristics:</b> PCT 3436 is identified as in the VIS lineage information as replacing PCT 1716, which has now been decommissioned in the VIS. PCT 3436 accords well with the vegetation assigned to PCT 1716 in relation to both floristic and locational characters. The VIS describes the main diagnostic feature of PCT 3436 as a closed canopy that almost always is completely dominated by <i>Melaleuca nodosa</i>.</p>
<b>BC Act Status</b>	<p>This PCT corresponds with the Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC. Further analysis of BC Act listed TECs is provided in <b>Section 4.3.2 and Appendix C.</b></p>
<b>EPBC Act Status</b>	<p>This PCT corresponds to the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC listed under the EPBC Act which was listed in October 2022. Further analysis of EPBC Act listed TECs is provided in <b>Section 4.3.3.</b></p>

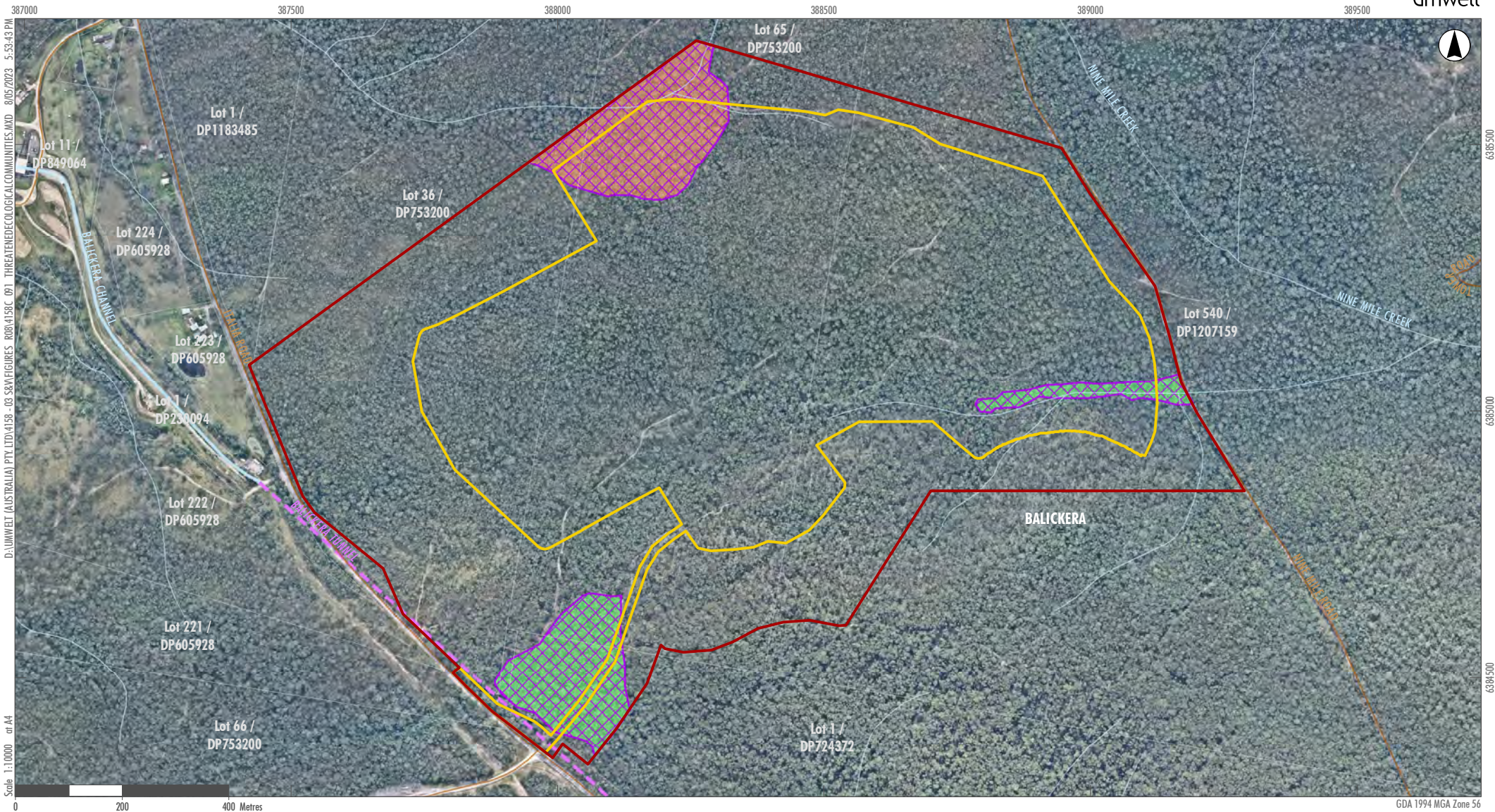
## 4.3 Threatened Ecological Communities

### 4.3.1 Threatened Ecological Community Summary

A summary of the TECs observed within the development footprint are listed in **Table 4.8** and the extent of each TEC is mapped in **Figure 4.3**. Detailed assessments of potentially occurring TECs are provide in **Section 4.3.2** for TECs listed under the BC Act and **Section 4.3.3** for TECs listed under the EPBC Act.

**Table 4.8 Summary of TECs within the Development Footprint**

Corresponding TEC name	Profile ID (from TBDC)	Act and Listing Status	Associated PCTs and vegetation condition zones within the development footprint	Area (ha)
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	10787	Endangered Ecological Community Listed under the BC Act	PCT 762 Intact	0.33 ha
			PCT 1618 Intact	0.88 ha
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	10944	Endangered Ecological Community Listed under the BC Act	PCT 1716 Regenerating	3.91 ha
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	N/A	Endangered Ecological Community Listed under the EPBC Act	PCT 762 Intact PCT 1618 Intact PCT 1716 Regenerating	5.12 ha



**Legend**

- |  |   |
|--|---|
| Project Area (Subject Land)              | EPBC TEC<br>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions |
| Disturbance Area (Development Footprint) | BC TEC<br>River Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney and South East Corner Bioregions |
| Road                                     | Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion  |
| Balickera Tunnel                         |   |
| Drainage Line                            |   |

**FIGURE 4.3**  
**Threatened Ecological Communities within the Subject Land**

### 4.3.2 Biodiversity Conservation Act Threatened Ecological Communities

Umwelt has undertaken targeted surveys and assessments for threatened ecological communities (TECs) listed under the BC Act, within the subject land. The following TECs listed within the BC Act were considered to have potential to occur within the subject land:

- Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC
- Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions EEC
- Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC
- Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions EEC
- Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions EEC
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC
- Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC.

A detailed analysis of the potential occurrence of each threatened ecological community is provided in Section 1 of **Appendix C** and includes assessments of the relevant final determinations published by the NSW Scientific Committee. The assessments undertaken have identified that the following two threatened ecological communities listed under the BC Act are present within the subject land:

- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which corresponds to parts of the subject land mapped as PCT 762 and PCT 1618.
- Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion, which corresponds to the parts of the subject land mapped as PCT 1716.

### 4.3.3 Environment Protection and Biodiversity Conservation Act Threatened Ecological Communities

The following TECs listed within the EPBC Act were considered to have potential to occur within the subject land:

- Central Hunter Valley eucalypt forest and woodland
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.

A detailed analysis of the potential occurrence of each threatened ecological community is provided in Section 2 of **Appendix C** and includes assessments of the relevant approved conservation advice and key diagnostic characteristics published by the Australian Government. The assessments undertaken have determined that one nationally listed endangered ecological community, Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions, occurs with the subject land and development footprint. This TEC is represented by PCTs 762, 1618 and 1716.

#### **4.4 Plant Community Type Condition Zones**

A description of each PCT vegetation condition zone within the development footprint is provided in **Section 4.2** of this Report. A map of the PCT vegetation condition zones is provided in **Figure 4.2** and the details of each PCT condition zone, including area, patch size class and the BAM survey plots required and completed are provided in **Table 4.9**.

**Table 4.9 PCT Condition Zones and Patch Sizes**

Vegetation Condition Zone	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
1	762 Cabbage Gum open forest or woodland on flats of the North Coast	Intact	0.33	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	1	2	2	Plot 17 Plot 22
2	1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Intact	45.63	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	4	6	6	Plot 8 Plot 9 Plot 10 Plot 16 Plot 20 Plot 21
3	1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast	Intact	0.88	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	1	1	1	Plot 12B
4	1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Intact / Apple variant	19.52	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	4	4	4	Plot 11 Plot 13 Plot 15 Plot 24

Vegetation Condition Zone	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
5	1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Intact / Apple-Ironbark Forest variant	8.75	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	3	3	3	Plot 12 Plot 14, Plot 23
6	1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.	Regenerating	3.91	<input type="checkbox"/> <5 ha <input type="checkbox"/> 5–24 ha <input type="checkbox"/> 25–100 ha <input checked="" type="checkbox"/> >100 ha	2	2	2	Plot 07 Plot 19

## 4.5 Vegetation Integrity (Vegetation Condition)

### 4.5.1 Vegetation Integrity Survey Plots

Details on the number of BAM plots (floristic and vegetation integrity survey plots) required and completed for each vegetation condition zone, in accordance with Table 3 of the BAM, are provided in **Table 4.10**. The vegetation integrity plot survey locations are shown in **Figure 2.1** and the vegetation integrity plot survey data is provided in **Appendix D**.

### 4.5.2 Vegetation Integrity Scores

The vegetation integrity condition scores for the BAM Plots completed are provided in **Table 4.10**. This table represents the combined scores from all plots completed for each vegetation condition zone, including the vegetation integrity score and the presence of hollow bearing trees.

**Table 4.10 Vegetation Integrity Condition Scores**

Plant Community Type No.	Vegetation zone description (condition class)	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
762	Intact	88.3	74.8	74.1	78.8	No
1590	Intact	97	62.7	66.9	74.1	Yes
1618	Intact	87.9	76.7	70.7	78.1	No
1619	Intact /Apple variant	80.8	69	63.5	70.7	Yes
	Intact / Apple - Ironbark variant	89.3	81.8	71.5	80.5	No
1716	Regenerating	90.3	78.6	62.8	76.4	No

### 4.5.3 Use of Benchmark Data

The standard BAM-C benchmark values were used in this assessment for each vegetation zone.

## 4.6 Groundwater Dependant Ecosystems

The NSW Government DPIE - Water have identified the following types of groundwater dependant ecosystems:

- Aquifer ecosystems
- Cave and karst ecosystems

- Baseflow stream ecosystems
- Groundwater dependant terrestrial vegetation
- Groundwater dependant wetlands
- Great Artesian Basin Springs
- Estuarine and Marine Ecosystems.

The Project Groundwater Impact Assessment (GIA) prepared by GHD (2022) (Appendix 11 of EIS), identifies that the nearest high priority GDEs are located near the Williams River, approximately eight and five kilometres from the Project, to the west and north-west. These GDEs are well outside the predicted radius of drawdown of the Project (refer to **Figure 4.4**).

The maximum extent of predicted drawdown (using higher permeability assumptions) and areas of probable vegetation GDEs within this area have been mapped as part of the Probable Vegetation Groundwater Dependand Ecosystems – Hunter / Central Rivers dataset (DPE 2022d), and are reproduced in **Figure 4.4**. All of the vegetation within the Disturbance Area will be removed and the extent of probable GDEs to be retained within the predicted groundwater drawdown radius are summarised in **Table 4.11**. All of the GDEs mapped within the predicted drawdown area are identified as Terrestrial Type GDEs. Potential impacts to GDEs are further addressed in **Section 8.3.7** of this Report.

**Table 4.11 Probable Vegetation Groundwater Dependent Ecosystems - Hunter / Central Rivers to be retained within the predicted groundwater drawdown radius**

Corresponding PCT Identified by DPE (2022)	Likely Corresponding PCT mapped by Umwelt (based on floristics) on Subject Land	Low Probability GDE Extent Mapped	Medium Probability GDE Extent Mapped	High Probability GDE Extent Mapped
<b>PCT 3244 Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest</b>	PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	0	1.05	1.01
<b>PCT 3432 Hunter Coast Foothills Apple-Ironbark Grassy Forest</b>	PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	10.4	12.86	0
<b>PCT 3433 Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest</b>	PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	13.57	5.90	0
<b>PCT 3436 Hunter Coast Sandy Creekflat Low Paperbark Scrub</b>	PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	2.01	14.42	1.29

Corresponding PCT Identified by DPE (2022)	Likely Corresponding PCT mapped by Umwelt (based on floristics) on Subject Land	Low Probability GDE Extent Mapped	Medium Probability GDE Extent Mapped	High Probability GDE Extent Mapped
<b>PCT 3442 Lower Hunter Lowland Ironbark-Paperbark Forest</b>	No direct matches, it is most similar to PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest, but could also represent an intermediate community with PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	0	1.09	0
<b>PCT 3446 Lower North Foothills Ironbark-Box-Gum Grassy Forest</b>	PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	1.77	11.45	0
<b>4001 Northern Floodplain Paperbark Fern Swamp Forest</b>	PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	0	0	4.71
<b>PCT 4042 Lower North Riverflat Eucalypt-Paperbark Forest</b>	PCT 762 Cabbage Gum Open Forest or Woodland on Flats of the North Coast, however is located in an area likely to contain PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	0	0	2.35
<b>Totals (note some areas of subject land not mapped/labelled in dataset)</b>		27.75	46.77	9.36



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Pacific Highway
- Road
- Balickera Tunnel
- Drainage Line
- Groundwater Drawdown Extent
- Modelled extent of drawdown in Stage 7 and 8:  $K_{max} = 3.5 \times 10^{-2}$
- GDE Probability
- High
- Medium
- Low
- Cleared Land

Image Source: Nearmap (2022) Data source: NSW FSDF (2022), DPE (2022), Umwelt (2023)

**FIGURE 4.4**  
**Probable Vegetation Groundwater Dependent Ecosystems mapped by probability class (DPE Water)**

## 5.0 Habitat Suitability for Threatened Species

### 5.1 Identification of Threatened Species for Assessment

#### 5.1.1 Ecosystem Credit Species

The ecosystem credit species predicted to occur on or use the development footprint are identified in **Table 5.1**. Justification is provided for any species from the BAM-C automatically populated list excluded from assessment.

**Table 5.1 Predicted Ecosystem Credit Species**

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 - PCT 762	Z2 - PCT 1590	Z3 - PCT 1618	Z4/Z5- PCT 1619	Z6 - PCT 1716	
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Yes	BAM-C	N/A	Yes	N/A		x				High
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	Yes	BAM-C		Yes	N/A		x		x		Moderate
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	V	Yes	BAM-C	Presence of Allocasuarina and casuarina species	Yes	N/A	x	x	x	x		High
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x		High
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x		High
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 - PCT 762	Z2 - PCT 1590	Z3 - PCT 1618	Z4/Z5- PCT 1619	Z6 - PCT 1716	
<i>Dasyurus maculatus*</i>	Spotted-tailed Quoll	V	E	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Yes	BAM-C	Waterbodies; Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes	N/A	x	x	x	x	x	High
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 - PCT 762	Z2 - PCT 1590	Z3 - PCT 1618	Z4/Z5- PCT 1619	Z6 - PCT 1716	
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	No	BAM-C	N/A	Yes	N/A					x	Moderate
<i>Lathamus discolor</i>	Swift Parrot (Foraging)	E	CE	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	Moderate
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Yes	Bionet Atlas	N/A	Yes	N/A	x	x	x	x	x	Moderate
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x		Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 -PCT 762	Z2 – PCT 1590	Z3 – PCT 1618	Z4/Z5- PCT 1619	Z6 – PCT 1716	
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	No	BAM-C	N/A	Yes	N/A		x	x	x		Moderate
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	No	BAM-C	N/A	Yes	N/A		x	x	x		High
<i>Ninox connivens</i>	Barking Owl	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 - PCT 762	Z2 - PCT 1590	Z3 - PCT 1618	Z4/Z5- PCT 1619	Z6 - PCT 1716	
<i>Ninox strenua</i>	Powerful Owl	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x		High
<i>Petaurus australis*</i>	Yellow-bellied Glider	V	V	No	BAM-C	N/A	Yes	N/A	x	x	x	x		High
<i>Petroica boodang</i>	Scarlet Robin	V	-	No	BAM-C	N/A	Yes	N/A	x	x		x		Moderate
<i>Phoniscus papuensis</i>	Golden-tipped Bat	V	-	No	BAM-C	N/A	Yes	N/A		x	x	x	x	High
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x		Moderate
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	-	No	BAM-C	N/A	Yes	N/A			x	x	x	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 -PCT 762	Z2 – PCT 1590	Z3 – PCT 1618	Z4/Z5- PCT 1619	Z6 – PCT 1716	
<i>Pseudomys gracilicaudatus</i> *	New Holland Mouse	-	V	No	SEARS – DCCEEW Project Assessment Notes / Bionet Atlas	N/A	Yes	Included as a precaution only, not associated with any PCTs within the development footprint	x	x	x	x	x	High
<i>Pteropus poliocephalus</i> *	Grey-headed Flying-fox	V	V	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	No	BAM-C	N/A	Yes	N/A	x	x	x	x	x	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within					Sensitivity to gain class
		BC Act	EPBC Act						Z1 - PCT 762	Z2 - PCT 1590	Z3 - PCT 1618	Z4/Z5- PCT 1619	Z6 - PCT 1716	
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	No	BAM-C	N/A	Yes	N/A	x	x				Moderate
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Yes	BAM-C	N/A	Yes	N/A	x	x	x	x		High
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Yes	BAM-C	N/A	Yes	N/A					x	High
<p><b>Key</b></p> <p><b>to BC Act / EPBC Act Listing Status:</b> V = vulnerable, E = endangered, CE = critically endangered</p> <ul style="list-style-type: none"> <li>* = Identified by DCCEEW as potentially significantly impacted by the Project</li> </ul>														

## 5.1.2 Species Credit Species

### 5.1.2.1 Predicted Flora Species Credit Entities

The flora species credit species predicted to occur on the development footprint are identified in **Table 5.2**. An assessment of these species to determine those retained for further assessment is provided. Justification is provided for any species from the BAM-C automatically populated list excluded from assessment.

**Table 5.2 Predicted Flora Species Credit Species**

Scientific Name	Common name	Listing status		Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y/ Excluded = N)				
		BC Act	EPBC Act					PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716
<i>Angophora inopinata</i>	Charmhaven Apple	V	V	BAM - C	N/A	Yes	N/A			Y	Y	Y
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	BAM - C	N/A	Yes	N/A		Y	Y	Y	
<i>Corybas dowlingii</i>	Red Helmet Orchid	E	-	BAM - C	N/A	Yes	N/A			Y		
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	BAM - C	N/A	Yes	N/A		Y			
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	BAM - C	N/A	Yes	N/A		Y			
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	V	V	BAM - C	N/A	Yes	N/A		Y	Y	Y	
<i>Maundia triglochinoidea</i>		V	-	Bionet Atlas	N/A	Yes	Surveyed targeted to watercourses only	-	-	-	-	-
<i>Pterostylis chaetophora</i>	Rusty Greenhood	V	-	BAM - C	N/A	Yes	N/A		Y		Y	
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	Bionet Atlas	N/A	Yes	N/A	-	-	-	-	-
<i>Rhodomyrtus osidioides</i>	Native Guava	CE	CE	Bionet Atlas	N/A	Yes	N/A	-	-	-	-	-
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	V	BAM - C	N/A	Yes	N/A		Y	Y	Y	
<i>Tetraloche juncea</i>	Black-eyed Susan	V	V	BAM - C	N/A	Yes	N/A		Y	Y	Y	
<i>Thesium australe</i>	Austral Toadflax	V	V	BAM - C	N/A	No	The Threatened Species Profile Database identifies that this species 'occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast'. The subject land is located at the eastern extent of the Upper Hunter IBRA subregion within a coastal area. The associated PCTs within the subject land			Y	Y	

Scientific Name	Common name	Listing status		Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N)					
		BC Act	EPBC Act					PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716	
							consist of open forest vegetation near to the coast and are considered not consistent with the microhabitats and distribution of this species, which is typically further west for populations occurring in woodland. The nearest coastal headland records are at Seal Rocks (72km NE) and the nearest inland woodland records are from the Mangoola / Wybong area (110km to the north-west).						

**Key to BC Act / EPBC Act Listing Status**  
V = vulnerable, E = endangered, CE = critically endangered.

### 5.1.2.2 Threatened Fauna Candidate Species

The fauna species credit species predicted to occur on the development footprint are identified in **Table 5.3**.

Justification is provided for any species from the BAM-C automatically populated list excluded from assessment. Geographic limitations, vagrant species, habitat constraints, degradation or lack of suitable microhabitats are the permitted reasons for excluding species credit species.

**Table 5.3 Predicted Threatened Fauna Species Credit Species**

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)					
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716	
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Yes	BAM - C	As per mapped areas	Yes	No mapped areas present		N				
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	Yes	BAM - C	Hollow bearing trees; Eucalypt tree species with hollows greater than 9 cm diameter	Yes	N/A		Y	Y	Y		

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)				
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	V	Yes	BAM - C	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground.	Yes	N/A	Y	Y	Y	Y	
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	No	BAM - C	N/A	Yes	N/A	Y	Y	Y	Y	Y
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	No	BAM - C	N/A	Yes	N/A	Y		Y	Y	Y
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	V	No	BAM - C	N/A	Yes	N/A	Y				
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Yes	BAM - C	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes	N/A	Y	Y	Y	Y	Y
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Yes	BAM - C	Nest trees - live (occasionally dead) large old trees within vegetation.	Yes	N/A	Y	Y	Y	Y	Y
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	--	No	BAM - C	N/A	Yes	N/A	Y	Y	Y	Y	Y
<i>Lathamus discolor</i>	Swift Parrot	E	CE	Yes	BAM - C	As per mapped areas	Yes	No mapped areas present.	N	N	N	N	N
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	No	BAM - C	N/A	Yes	N/A		Y	Y	Y	Y

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)				
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Yes	Bionet Atlas	Nest Trees	Yes	N/A	Y	Y	Y	Y	Y
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	V	-	Yes	BAM - C	Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with numbers of individuals >500; or from the scientific literature.	No	No breeding habitat present within the subject land or development footprint.	N	N	N	N	N
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Breeding)	V	-	Yes	BAM - C	Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500	No	No breeding habitat present within the subject land or development footprint.	N	N	N	N	N

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)				
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716
<i>Myotis macropus</i>	Southern Myotis	V	-	No	BAM - C	Waterbodies; This include rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site, 3m wide or greater.	Yes, retained for indirect impact assessment only	All watercourses present and within 200m are <3m wide. Retained for indirect assessment of potential impacts to breeding habitat within the Balickera Tunnel.	N	N	N	N	N
<i>Ninox connivens</i>	Barking Owl (Breeding)	V	-	Yes	BAM - C	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	Yes	Retained for assessment, although excluded from PCTs with no suitable breeding habitat / hollow bearing trees.	N	Y	N	Y	N
<i>Ninox strenua</i>	Powerful Owl (Breeding)	V	-	Yes	BAM - C	Hollow bearing trees; Living or dead trees with hollow greater than 20cm diameter	Yes	Retained for assessment, although excluded from PCTs with no suitable breeding habitat / hollow bearing trees.	N	Y	N	Y	N
<i>Petauroides volans</i>	Greater Glider	E	V	No	BAM - C	N/A	Yes	N/A		Y	Y	Y	
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	No	BAM - C	N/A	Yes	N/A	Y	Y	Y	Y	Y
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	No	BAM - C	N/A	Yes	N/A	Y	Y	Y	Y	
<i>Phascolarctos cinereus*</i>	Koala	E	E	No	BAM - C	N/A	Yes	N/A	Y	Y	Y	Y	Y

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)				
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	V	V	Yes	BAM - C	Breeding camps	Yes	N/A	Y	Y	Y	Y	Y
<i>Turnix maculosus</i>	Red-backed Button-quail	V	-	No	BAM - C	N/A	Yes	N/A	Y	Y			
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	V	-	Yes	BAM - C	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	Yes	Retained for assessment, although excluded from PCTs with no suitable breeding habitat / hollow bearing trees.	N	Y	N	Y	N
<i>Tyto tenebricosa</i>	Sooty Owl (Breeding)	V	-	Yes	BAM - C	Caves; Caves or cliffines / ledge Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	No	No suitable breeding habitat within the only associated PCT (1716).	N	N	N	N	N
<i>Vespardelus troughtoni</i>	Eastern Cave Bat	V	-	No	Bionet Atlas	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds	No	No associated PCTs present					

Scientific name	Common name	Listing status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment ?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y / Excluded = N / Blank = not associated with PCT)				
		BC Act	EPBC Act						PCT 762	PCT 1590	PCT 1618	PCT 1619	PCT 1716

**Key**

to BC Act / EPBC Act Listing Status: V = vulnerable, E = endangered, CE = critically endangered  
 Identified by DCCEEW as potentially significantly impacted by the Project.

## 5.2 Presence of Candidate Species Credit Species

### 5.2.1 Threatened Flora Species Observations

#### 5.2.1.1 Summary of Species Credit Threatened Flora Survey Results

A summary of the methods used and determination of presence for candidate threatened flora species credit species is provided in **Table 5.4**.

**Table 5.4 Determining the Presence of Candidate Flora Species Credit Species on the Development Footprint**

Scientific Name	Common Name	Listing status		Method used to determine presence	Present?	Further assessment required?
		BC Act	EPBC Act			
<i>Angophora inopina</i>	Charmhaven Apple	V	V	Targeted threatened species survey	No	No
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Targeted threatened species survey	No	Yes
<i>Corybas dowlingii</i>	Red Helmet Orchid	E	-	Further surveys required	N/A	N/A
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Targeted threatened species survey	No	No
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	Targeted threatened species survey	No	No
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	V	V	Targeted threatened species survey	No	No
<i>Maundia triglochinosides</i>		V	-	Targeted threatened species survey	No	No

Scientific Name	Common Name	Listing status		Method used to determine presence	Present?	Further assessment required?
		BC Act	EPBC Act			
<i>Pterostylis chaetophora</i>	Rusty Greenhood	V	-	Targeted threatened species survey	Yes	Yes
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	Targeted threatened species survey	No	No
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	Targeted threatened species survey	No	No
<i>Rutidosis heterogama</i>	Heath Wrinklewort	V	V	Targeted threatened species survey	No	No
<i>Tetratheca juncea</i>	Black-eyed Susan	V	V	Targeted threatened species survey	No	No
<b>Key to BC Act / EPBC Act Listing Status</b> <i>V = vulnerable, E = endangered, CE = critically endangered.</i>						

### 5.2.1.2 Species Credit Threatened Flora Observation Details

The threatened flora species, **Rusty Greenhood (*Pterostylis chaetophora*)**, was observed during surveys and has been assessed for species credits within the development footprint. A total of 58 individuals were observed in the initial development footprint during surveys in 2018. The initial development footprint was subsequently reduced to avoid impacts to the main population of *Pterostylis chaetophora* present (refer to **Figure 5.1**). Two individuals observed in 2018, which occur as an outliers to the main population, will be impacted by the current development footprint. Targeted flora species transect surveys undertaken in 2022 did not record any additional *Pterostylis chaetophora* in the development footprint. A photograph of the Rusty Greenhood from the area which will be retained is provided as **Photo 5.1**.



**Photo 5.1**      **Rusty Greenhood within area to be Retained**

Previous site records for the **Netted Bottle Brush (*Callistemon linearifolius*)** were identified by samples sent to the NSW Royal Botanic Gardens in 2017 during a period when the subject land was in an early fire recovery phase. During 2022 targeted searches for *Callistemon linearifolius* were undertaken and the species was not observed, despite the presence of other *Callistemon* species. Resampling of *Callistemon* plants of all species observed across the subject land was undertaken, including at the locations where RBG had confirmed records of *Callistemon linearifolius*. Based on the results of the field surveys undertaken during 2022 and further advice received from the NSW Royal Botanic Gardens in 2023, it is considered that no *Callistemon linearifolius* was observed within the subject land during the current surveys and is not likely to be present. The advice received from the NSW Royal Botanic Gardens is provided in **Appendix E**.

Further *Grevillea* and *Corybas* plant material was also sent to the NSW Royal Botanical Gardens. The samples sent were confirmed as *Grevillea humilis* and *Corybas* sp. Further targeted ***Corybas dowlingii*** surveys are planned for the 2023 flowering period.

## **5.2.2 Threatened Fauna Species Observations**

### **5.2.2.1 Summary of Species Credit Threatened Fauna Survey Results**

A summary of the methods used and determination of presence for candidate threatened fauna species credit species is provided in **Table 5.5**.

**Table 5.5 Summary of Candidate Fauna Species Observed within the Development Footprint**

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	Targeted threatened species survey	No	No
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	V^	Targeted threatened species survey	No	No
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Targeted threatened species survey	No	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Targeted threatened species survey	No	No
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	V	Targeted threatened species survey	No	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Targeted threatened species survey	No	No
<i>Hieraetus morphnoides</i>	Little Eagle	V	-	Targeted threatened species survey	No	No
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	Targeted threatened species survey	No	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Targeted threatened species survey	No	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Targeted threatened species survey	No	No
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	V	-	On site habitat assessment. Literature review has identified roost habitat present within the nearby Balickera Tunnel.	Not present within subject land or development footprint. Roost habitat present in Balickera Tunnel. Balickera Tunnel does not provide breeding habitat (EcoLogical Australia 2021).	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Breeding)	V	-	On site habitat assessment. Literature review has identified roost habitat present within the nearby Balickera Tunnel.	Not present within subject land or development footprint. Roost habitat present in Balickera Tunnel. Balickera Tunnel does not provide breeding habitat (EcoLogical Australia 2021).	No
<i>Ninox connivens</i>	Barking Owl (Breeding)	V	-	Targeted threatened species survey	No	No
<i>Ninox strenua</i>	Powerful Owl (Breeding)	V	-	Targeted threatened species survey	Species observed / no breeding habitat recorded	No
<i>Petauroides volans</i>	Greater Glider	E	V	Targeted threatened species survey	No	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Targeted threatened species survey	Yes	Yes
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	Targeted threatened species survey	Yes	Yes
<i>Phascolarctos cinereus</i>	Koala	E	E	Targeted threatened species survey	Yes	Yes
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	V	V	Targeted threatened species survey	No	No
<i>Turnix maculosus</i>	Red-backed Button-quail	V	-	Targeted threatened species survey	No	No
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	V	-	Targeted threatened species survey	No	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
<p><i>^South-eastern subspecies Calyptorhynchus lathami lathami</i></p> <p>Key to BC Act / EPBC Act Listing Status</p> <p>V = vulnerable, E = endangered, CE = critically endangered.</p>						

### 5.2.2.2 Species Credit Threatened Fauna Observation Details

Observation details are provided for the following species credit threatened fauna:

#### a. Squirrel Glider Observation Details

This species was recorded during baited remote camera surveys on 2 February 2018, as a probable level identification. Several photographic records for the closely related Sugar Glider were also obtained during surveys. The Squirrel Glider is a species assessed based on area of suitable habitat and its habitat is associated in the TBDC with all plant community types present. A photograph of the Squirrel Glider captured during surveys is provided as **Photo 5.2**.

#### b. Brush-tailed Phascogale Observation Details

This species was recorded during baited remote camera surveys. This species is assessed based on area of suitable habitat and its habitat is associated in the TBDC with all plant community types present, except PCT 1716. A remote camera photograph of a Brush-tailed Phascogale captured during surveys is provided as **Photo 5.3**.

#### c. Koala Observation Details

This species was recorded in baited remote camera surveys (1 location during 2018 and 2 locations during 2022) and during spotlighting surveys (1 location in 2022). This species is assessed based on area of suitable habitat and its habitat is associated in the TBDC with all plant community types present. A remote camera photograph of a Koala captured during surveys is provided as **Photo 5.4**.



**Photo 5.2**      **Camera Trap Image of Squirrel Glider**



**Photo 5.3** Camera Trap Image of Brush-Tailed Phascogale



**Photo 5.4 Camera Trap Image of Koala**

d. Little Bent-winged Bat Observation Details

Definite recordings of this species were obtained during surveys, however this species is a dual credit entity and only impacts to breeding habitat and within a 100m buffer of breeding habitat require species credits. The nearest roost habitat is located within the Balickera Tunnel which has openings approximately 330 m to the west and 450 m to the south of the development footprint.

e. Large Bent-winged Bat Observation Details

Probable recordings of this species were obtained during surveys, however this species is a dual credit entity and only impact to breeding habitat and within a 100 m buffer of breeding habitat require species credits. The nearest roost habitat is located within the Balickera Tunnel which has openings approximately 330 m to the west and 450 m to the south of the development footprint.

f. Southern Myotis Observation Details

This species was identified from potential recordings from an undifferentiated species group which included *Myotis macropus*, *Nyctophilus geoffroyi* and *Nyctophilus gouldi*. These species are difficult to separate without good quality calls and the presence of this species has been assumed. Despite this the

Project will not impact any waterbodies with pools or stretches 3 m in width or wider, therefore no species credits are required. The nearest breeding habitat is located within the Balickera Tunnel which has openings approximately 330 m to the west and 450 m to the south of the development footprint.

g. Eastern Cave Bat Observation Details

This species was identified as potentially occurring due to recording from an undifferentiated species group which included *Chalinolobus morio*, *Vespadelus pumilus*, *Vespadelus vulturnus* and *Vespadelus troughtoni*. Positive recordings of both *Chalinolobus morio* and *Vespadelus pumilus* were obtained. There is no identified breeding habitat on the subject land or within 2 km that consists of caves, scarps, cliffs, rock overhangs or disused mines. The species was also not recorded within the Balickera Tunnel as part of surveys for a Species Impact Statement prepared by Eco Logical Australia (2021). This species is not associated with any of the plant community types present and therefore species credits are not required.

h. Powerful Owl Observation Details

This species was recorded during call playback surveys on 19 March and 28 March 2018, no active nest trees have been identified within the subject land. Additional stag watching surveys of hollow bearing trees which provide suitable breeding habitat for this species will be undertaken during the 2023 breeding season.

i. Grey-headed Flying-fox Observation Details

This species was observed foraging within the subject land during surveys. The National Flying Fox Monitoring Viewer (DCCEEW 2023) identifies that there is a historical camp site within the Wallaroo State Forest within the vicinity of the subject land, however no Flying-foxes have been observed there for >10 years. The nearest active camp sites are at Moffatts Swamp and Tocal. No species credits are proposed as no active roost or breeding habitat is present.

## 5.3 Threatened Species Surveys

A summary of the targeted surveys completed for candidate threatened flora species is provided in **Table 5.6**, further details of the threatened flora surveys completed, and guidelines applied are provided in **Section 2.3** of this Report.

**Table 5.6 Summary of Species Credit Threatened Flora Surveys Completed**

Scientific Name	Common Name	Threatened Flora species surveys			Present?	Further assessment required
		Survey Method	Timing of survey within recommender period?	Survey effort		
<i>Angophora inopina</i>	Charmhaven Apple	Parallel field traverses	<input checked="" type="checkbox"/> Yes July 2022	36 person hrs completed over 3 days by 2 people	No	No

Scientific Name	Common Name	Threatened Flora species surveys			Present?	Further assessment required
		Survey Method	Timing of survey within recommender period?	Survey effort		
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Parallel field traverses	<input checked="" type="checkbox"/> Yes October 2018 & 2022	October 2018 – 63 person hrs completed over 5 days by 2 people  October 2022 130.5 person hrs completed over 7 days by up to 4 people	No	No
<i>Corybas dowlingii</i>	Red Helmet Orchid	Parallel field traverses	N/A – further surveys to be undertaken during 2023 as agreed with BCD	N/A	N/A	Determination of further assessment requirements pending outcome of additional surveys.
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Parallel field traverses	<input checked="" type="checkbox"/> Yes July 2022	36 person hrs completed over 3 days by 2 people	No	No
<i>Eucalyptus glaucina</i>	Slaty Red Gum	Parallel field traverses	<input checked="" type="checkbox"/> Yes July 2022	36 person hrs completed over 3 days by 2 people	No	No
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Parallel field traverses	<input checked="" type="checkbox"/> Yes October 2018 & 2022	October 2018 – 63 person hrs completed over 5 days by 2 people  October 2022 130.5 person hrs completed over 7 days by up to 4 people	No	No

Scientific Name	Common Name	Threatened Flora species surveys			Present?	Further assessment required
		Survey Method	Timing of survey within recommender period?	Survey effort		
<i>Maundia triglochoides</i>		Parallel field traverses	<input checked="" type="checkbox"/> Yes Initial parallel transect completed out of season to detect non fruiting plants. Follow-up targeted surveys of suitable habitat completed in November 2022	October 2022 130.5 person hrs completed over 7 days by up to 4 people. November 2022 - <01hr searching watercourse areas and soaks	No	No
<i>Pterostylis chaetophora</i>	Rusty Greenhood	Parallel field traverses	<input checked="" type="checkbox"/> Yes October 2017, 2018 & 2022	October 2017 – 54 person hrs completed over 3 days by 2 people October 2018 – 63 person hrs completed over 5 days by 2 people October 2022 130.5 person hrs completed over 7 days by up to 4 people	Yes	Yes
<i>Rhodamnia rubescens</i>	Scrub Turpentine	Parallel field traverses	<input checked="" type="checkbox"/> Yes July 2022	36 person hrs completed over 3 days by 2 people	No	No
<i>Rhodomyrtus psidioides</i>	Native Guava	Parallel field traverses	<input checked="" type="checkbox"/> Yes July 2022	36 person hrs completed over 3 days by 2 people	No	No
<i>Rutidosis heterogama</i>	Heath Wrinklewort	Parallel field traverses	<input checked="" type="checkbox"/> Yes October 2022	October 2022 130.5 person hrs completed over 7 days by up to 4 people	No	No

Scientific Name	Common Name	Threatened Flora species surveys			Present?	Further assessment required
		Survey Method	Timing of survey within recommender period?	Survey effort		
<i>Tetratheca juncea</i>	Black-eyed Susan	Parallel field traverses	<input checked="" type="checkbox"/> Yes October 2017, 2018 & 2022	October 2017 – 54 person hrs completed over 3 days by 2 people October 2018 – 63 person hrs completed over 5 days by 2 people October 2022 130.5 person hrs completed over 7 days by up to 4 people	No	No

A summary of the targeted surveys completed for candidate threatened fauna species is provided in **Table 5.7**, further details of the threatened fauna surveys completed, survey timing and guidelines followed are provided in **Section 2.4** of this Report.

**Table 5.7 Summary of Species Credit Threatened Fauna Surveys Completed**

Common Name	Scientific Name	Threatened Fauna species surveys			Present / Further assessment required
		Survey method	Timing of survey within recommended period?	Survey effort (hours & no people)	
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Diurnal census / breeding activity / nest hollow survey	<input checked="" type="checkbox"/> Yes	99.5 hrs over 5 days (2-3 people)	No
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	Diurnal census / breeding activity / nest hollow survey	<input checked="" type="checkbox"/> Yes	121 hrs over 10 days (2 people)	No
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Spotlighting and baited remote camera surveys	<input checked="" type="checkbox"/> Yes	Spotlighting: 7hrs x 4 nights (2 people) Jan.-Mar 2018: 315 trap nights (8 cameras) Nov-Dec 2022: 600 trap nights (20 cameras)	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Ultrasonic call recording and breeding habitat searches	<input checked="" type="checkbox"/> Yes	Ultrasonic call recording 90 recording nights over 8 units (4 nights using 2 units during Jan 2018, 10 nights using 2 units during Nov – Dec 2022, 76 nights using 4 units during Jan-Feb 2023)	No
<i>Erythrotriorchis radiatus</i>	Red Goshawk	Diurnal census	<input checked="" type="checkbox"/> Yes	287 hrs over 21 days (2-4 people)	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Diurnal census / breeding activity / nest tree survey	<input checked="" type="checkbox"/> Yes	287 hrs over 21 days (2-4 people)	No
<i>Hieraetus morphnoides</i>	Little Eagle	Diurnal census / breeding activity / nest tree survey	<input checked="" type="checkbox"/> Yes	147.5 hrs over 8 days (2-4 people)	No
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	Diurnal census during breeding period	<input checked="" type="checkbox"/> Yes	16.3 hrs over 6 nights (2 people)	No
<i>Lophoictinia isura</i>	Square-tailed Kite	Diurnal census during breeding period	<input checked="" type="checkbox"/> Yes	142.5 person hours over 9 days (2-4 people)	No

Common Name	Scientific Name	Threatened Fauna species surveys			Present / Further assessment required
		Survey method	Timing of survey within recommended period?	Survey effort (hours & no people)	
<i>Litoria aurea</i>	Green and Golden Bell Frog	Nocturnal aural / visual and call playback surveys /transects	<input checked="" type="checkbox"/> Yes	33.3 hrs over 8 nights x 2 people	No
<i>Ninox connivens</i>	Barking Owl (Breeding)	Diurnal surveys: habitat searches and hollow-bearing tree assessment Nocturnal surveys: Quiet listening, Stag watching, Call playback and spotlighting	<input checked="" type="checkbox"/> Yes	Breeding season spotlighting, Call playback, stag watching: 26.3 hrs x 7 nights (2 people)	No breeding records have been obtained for the subject land, however further stag watching surveys will be completed during the 2023 breeding season.
<i>Ninox strenua</i>	Powerful Owl (Breeding)	Diurnal surveys: habitat searches and hollow-bearing tree assessment Nocturnal surveys: Quiet listening, Stag watching, Call playback and spotlighting	<input checked="" type="checkbox"/> Yes	Breeding season spotlighting, Call playback, stag watching: 24.3 hrs x 6 nights (2 people)	No breeding records have been obtained for the subject land, however further stag watching surveys will be completed during the 2023 breeding season.
<i>Petauroides volans</i>	Greater Glider	Baited remote camera surveys and spotlighting	<input checked="" type="checkbox"/> Yes	Spotlighting: 31.3hrs x 10 nights (2 people)	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	Baited remote camera surveys and spotlighting	<input checked="" type="checkbox"/> Yes	Spotlighting: 44.6hrs over 13 nights (2 people) Camera trapping: Jan.-Mar 2018: 315 trap nights (8 cameras) Nov-Dec 2022: 600 trap nights (20 cameras)	Yes

Common Name	Scientific Name	Threatened Fauna species surveys			Present / Further assessment required
		Survey method	Timing of survey within recommended period?	Survey effort (hours & no people)	
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Baited remote camera surveys and spotlighting	<input checked="" type="checkbox"/> Yes (includes spotlighting surveys outside of peak detection period)	Spotlighting: 7hrs x 4nights (2 people) Jan.-Mar 2018: 315 trap nights (8 cameras) Nov-Dec 2022: 600 trap nights (20 cameras)	Yes
<i>Phascolarctos cinereus</i>	Koala	Remote camera surveys and spotlighting	<input checked="" type="checkbox"/> Yes	Spotlighting: 44.6hrs over 13 nights (2 people) Jan.-Mar 2018: 315 trap nights (8 cameras) Nov-Dec 2022: 600 trap nights (20 cameras)	Yes
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	Diurnal breeding habitat search	<input checked="" type="checkbox"/> Yes (includes nocturnal foraging surveys outside of breeding season)	Diurnal search: 165.5 hrs over 11 visits (2-4 people) Foraging surveys: 31.3hrs x 10 nights (2 people)	No
<i>Turnix maculosus</i>	Red-backed Button-quail	Diurnal census Nocturnal spotlighting and call playback	<input checked="" type="checkbox"/> Yes	Diurnal search: 74 hrs over 5 days (2 people) Spotlighting: 7hrs x 4nights (2 people)	No
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	Diurnal surveys: habitat searches and hollow-bearing tree assessment Nocturnal surveys: Quiet listening, Stag watching, Call playback and spotlighting	<input checked="" type="checkbox"/> Yes	Breeding season spotlighting, Call playback, stag watching: 24.3 hrs x 6 nights (2 people)	No breeding records have been obtained for the subject land, however further stag watching surveys will be completed during the 2023 breeding season.

### 5.3.1 Expert Reports and Use of More Appropriate Local Data

No expert reports were utilised in place of targeted surveys for the purposes of this assessment. This assessment has also not relied upon alternative data (more appropriate local data) to assess habitat suitability.

### 5.3.2 Area or Count, and Location of Suitable Habitat for a species Credit Species (a Species Polygon)

#### 5.3.2.1 Results for BC Act Listed Species Credit Entities

The following BC Act listed threatened species were observed during surveys and require species polygons:

- Rusty Greenhood (*Pterostylis chaetophora*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Koala (*Phascolarctos cinereus*)
- Potential calls of the Southern Myotis (*Myotis macropus*) were also recorded and the species is known to roost and breed in the Balickera Tunnel.

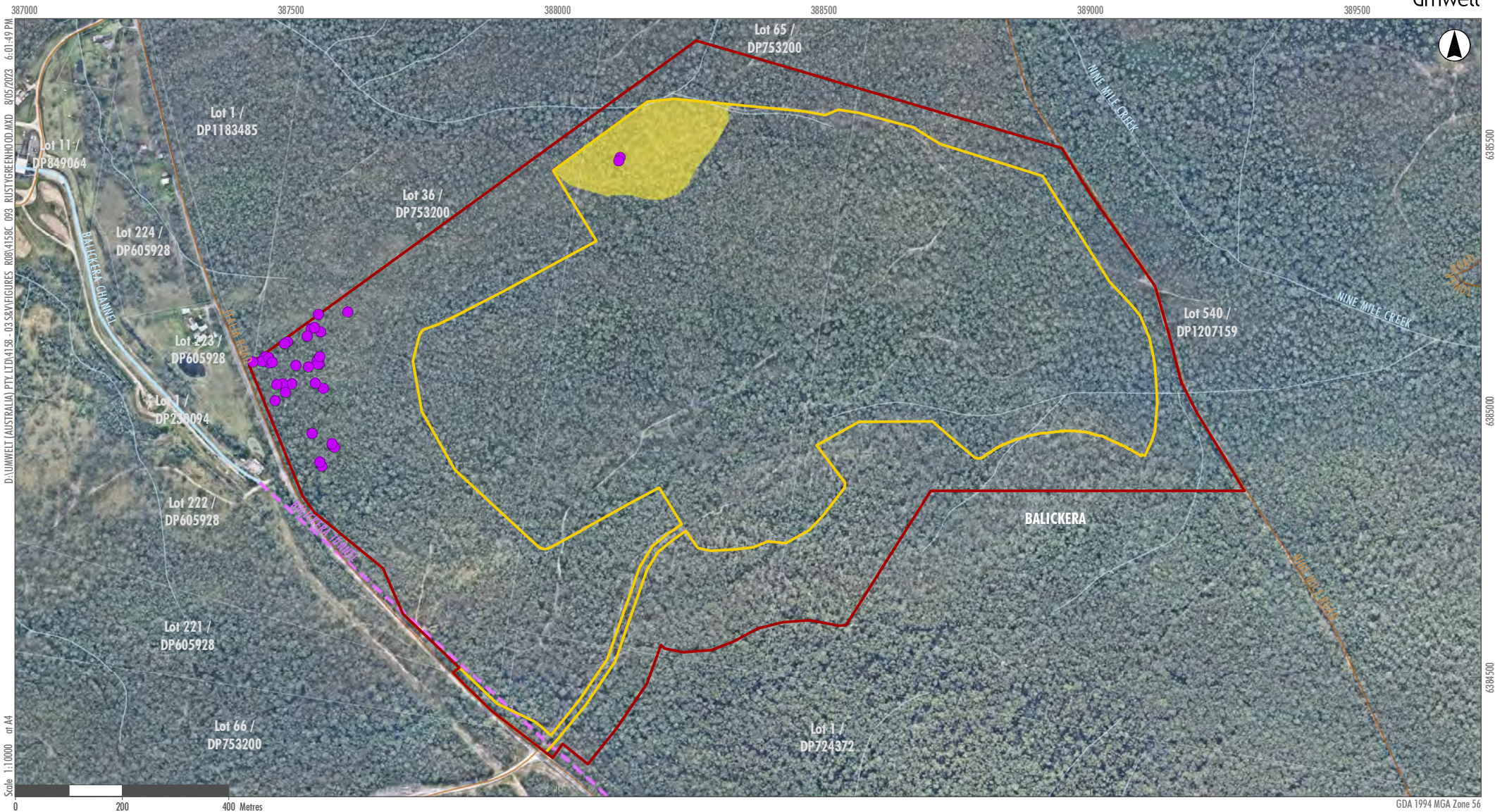
The details of the species polygons generated for each species are provided as follows.

#### 5.3.2.2 Rusty Greenhood (*Pterostylis chaetophora*) Species Polygon

This species is required in the TBDC to be assessed based on area of suitable habitat present within the development footprint. This species was recorded within PCT 1716 only and this PCT has been used as the species polygon. The species polygon details are provided in **Table 5.8** and the species polygon is mapped in **Figure 5.1**.

**Table 5.8 Rusty Greenhood Species Polygon Details**

Information Required	Species Polygon Details
Biodiversity Risk Weighting	2
SAll Entity	No
Habitat constraints / microhabitats present on the Subject Land / vegetation zone	Not applicable
Extent of suitable habitat present within development footprint	PCT 1716 = 3.91 ha
TBDC species specific recommendations	Use flowering material to identify to species. Flowers Sep - early Nov.
Habitat condition (vegetation integrity score for each vegetation zone in the species polygon)	PCT 1716 Regenerating VI Score= 76.4



Legend

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line
- Species Polygon for Rusty Greenhood (*Pterostylis chaetophora*)
- Rusty Greenhood (*Pterostylis chaetophora*) Observation Location

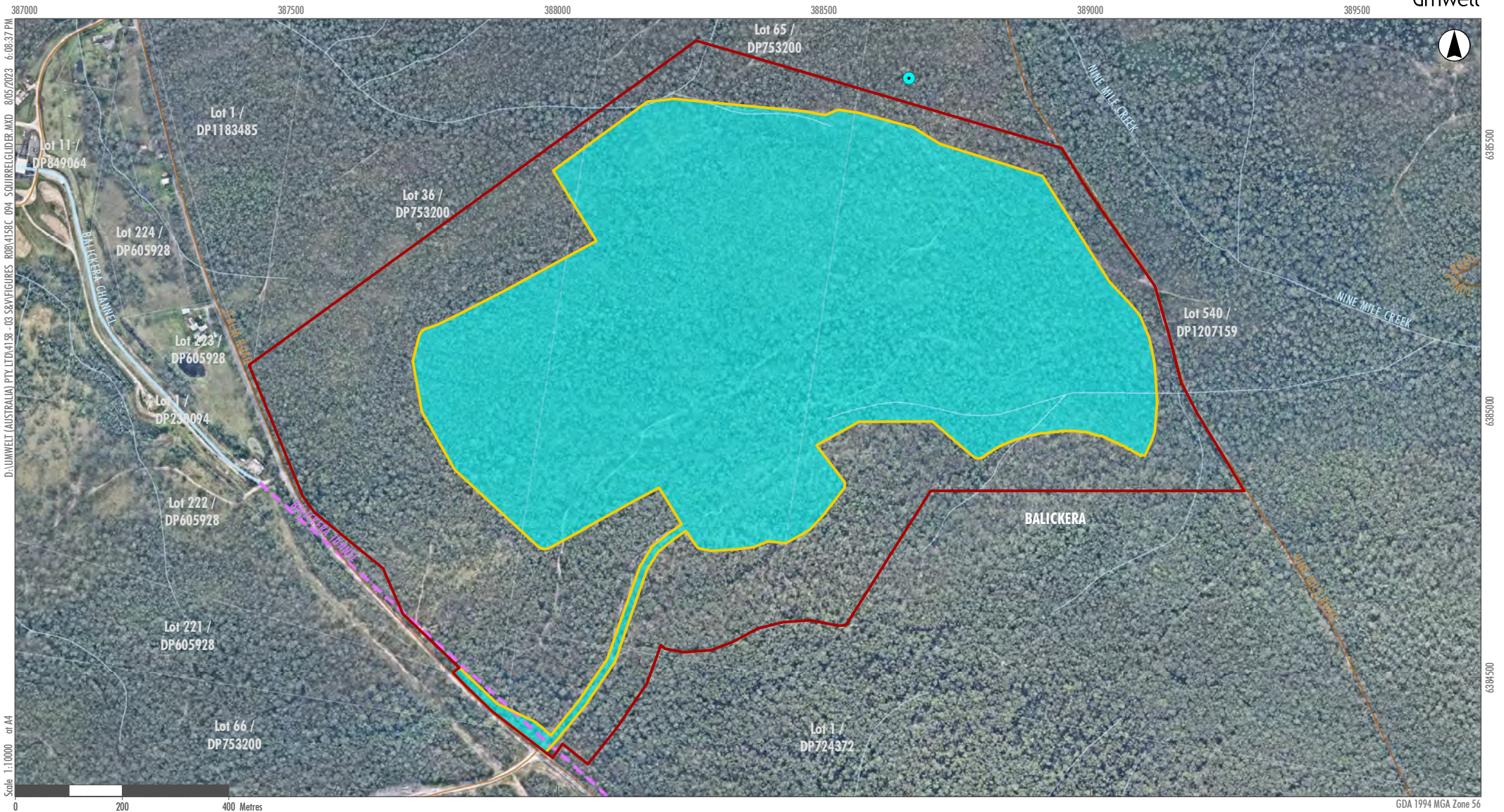
FIGURE 5.1  
 Rusty Greenhood (*Pterostylis chaetophora*)  
 Species Polygon

### 5.3.2.3 Squirrel Glider (*Petaurus norfolcensis*) Species Polygon

The species polygon details for the Squirrel Glider are provided in **Table 5.9** and the species polygon is mapped in **Figure 5.2**.

**Table 5.9 Squirrel Glider Species Polygon Details**

Information Required	Species Polygon Details
Biodiversity Risk Weighting	2
SAIL Entity	No
Habitat constraints / microhabitats present on the Subject Land / vegetation zone	Not applicable
Extent of suitable habitat present within development footprint	PCT 762 Intact = 0.33 ha PCT 1590 Intact = 45.63 ha PCT 1618 Intact = 0.88 ha PCT 1619 Intact Apple Variant = 19.52 ha PCT 1619 Intact Apple/Ironbark Variant = 8.75 ha PCT 1716 Regenerating = 3.91 ha Total = 79.02 ha
TBDC species specific recommendations	Not applicable
Habitat condition (vegetation integrity score for each vegetation zone in the species polygon)	PCT 762 Intact VI Score = 78.8 PCT 1590 Intact VI Score = 74.1 PCT 1618 Intact VI Score = 78.1 PCT 1619 Intact Apple Variant VI Score = 70.7 PCT 1619 Intact Apple/Ironbark Variant VI Score = 80.5 PCT 1716 Regenerating VI Score = 76.4



Legend



-  Project Area (Subject Land)
-  Disturbance Area (Development Footprint)
-  Road
-  Balickera Tunnel
-  Drainage Line
-  Species Polygon for Squirrel Glider (*Petaurus norfolcensis*)
-  Squirrel Glider Observation Location (Remote Camera Record)

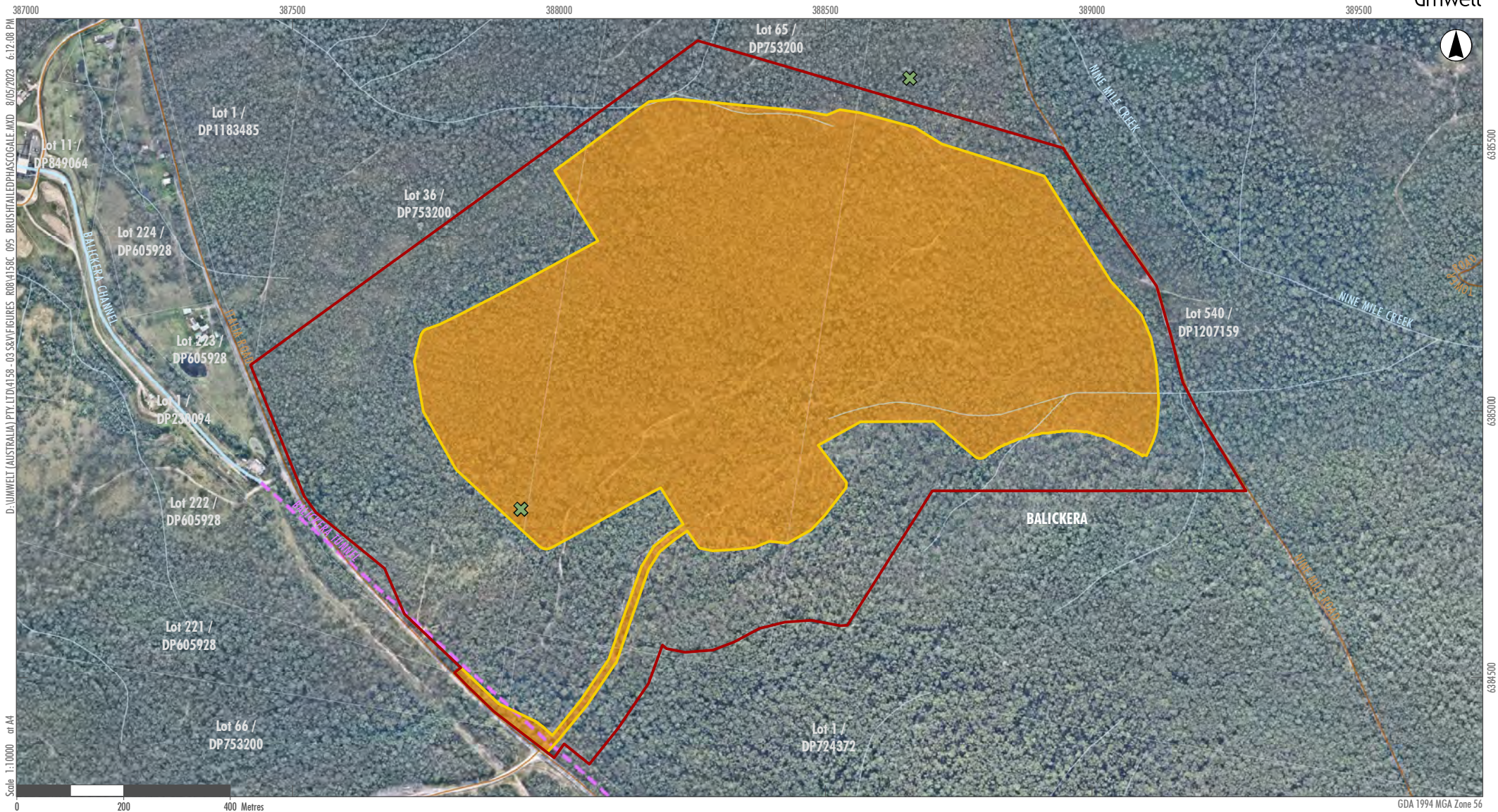
FIGURE 5.2  
Squirrel Glider (*Petaurus norfolcensis*)  
Species Polygon

### 5.3.2.4 Brush-Tailed Phascogale (*Phascogale tapoatafa*) Species Polygon

The species polygon details for the Brush-tailed Phascogale are provided in **Table 5.10** and the species polygon is mapped in **Figure 5.3**.

**Table 5.10 Brush-Tailed Phascogale Species Polygon Details**

Information Required	Species Polygon Details
Biodiversity Risk Weighting	2
SAll Entity	No
Habitat constraints / microhabitats present on the Subject Land / vegetation zone	Not applicable
Extent of suitable habitat present within development footprint	PCT 762 Intact = 0.33 ha PCT 1590 Intact = 45.63 ha PCT 1618 Intact = 0.88 ha PCT 1619 Intact Apple Variant = 19.52 ha PCT 1619 Intact Apple/Ironbark Variant = 8.75 ha PCT 1716 Regenerating = 3.91 ha Total = 79.02 ha
TBDC species specific recommendations	Not applicable
Habitat condition (vegetation integrity score for each vegetation zone in the species polygon)	PCT 762 Intact VI Score = 78.8 PCT 1590 Intact VI Score = 74.1 PCT 1618 Intact VI Score = 78.1 PCT 1619 Intact Apple Variant VI Score = 70.7 PCT 1619 Intact Apple/Ironbark Variant VI Score = 80.5 PCT 1716 Regenerating VI Score = 76.4



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Road
- Balickera Tunnel
- Drainage Line
- Species Polygon for Brush-tailed Phascogale (*Phascogale tapoatafa*)
- ✕ Brush-tailed Phascogale (*Phascogale tapoatafa*) Observation Location

**FIGURE 5.3**  
**Brush-tailed Phascogale (*Phascogale tapoatafa*) Species Polygon**

### 5.3.2.5 Koala (*Phascolarctos cinereus*) Species Polygon

The species polygon details for the Koala are provided in **Table 5.11** and the species polygon is mapped in **Figure 5.4**.

**Table 5.11 Koala Species Polygon Details**

Information Required	Species Polygon Details
Biodiversity Risk Weighting	2
SAIL Entity	No
Habitat constraints / microhabitats present on the Subject Land / vegetation zone	Not applicable
Extent of suitable habitat present within development footprint	PCT 762 Intact = 0.33 ha PCT 1590 Intact = 45.63 ha PCT 1618 Intact = 0.88 ha PCT 1619 Intact Apple Variant = 19.52 ha PCT 1619 Intact Apple/Ironbark Variant = 8.75 ha PCT 1716 Regenerating = 3.91 ha Total = 79.02 ha
TBDC species specific recommendations	Under the BAM (NSW DPIE 2020a) and the Koala BAM Survey Guide (DPE 2022b), suitable habitat is habitat where the target species is expected to occur or periodically use and for the koala includes associated PCTs with a minimum of one koala use tree present.  Koala use tree species are present within each of the PCTs within the development footprint and all PCTs present are associated with the species.  The Koala BAM Survey Guide (DPE 2022b) identifies that the species polygon for the koala is determined by mapping the vegetation zone in which the species was detected and any vegetation zones that are continuous with suitable habitat.
Habitat condition (vegetation integrity score for each vegetation zone in the species polygon)	PCT 762 Intact VI Score = 78.8 PCT 1590 Intact VI Score = 74.1 PCT 1618 Intact VI Score = 78.1 PCT 1619 Intact Apple Variant VI Score = 70.7 PCT 1619 Intact Apple/Ironbark Variant VI Score = 80.5 PCT 1716 Regenerating VI Score = 76.4



- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Road
  - Balickera Tunnel
  - Drainage Line
  - Species Polygon for Koala (*Phascolarctos cinereus*)
  - ✕ Koala (*Phascolarctos cinereus*) Observation Location

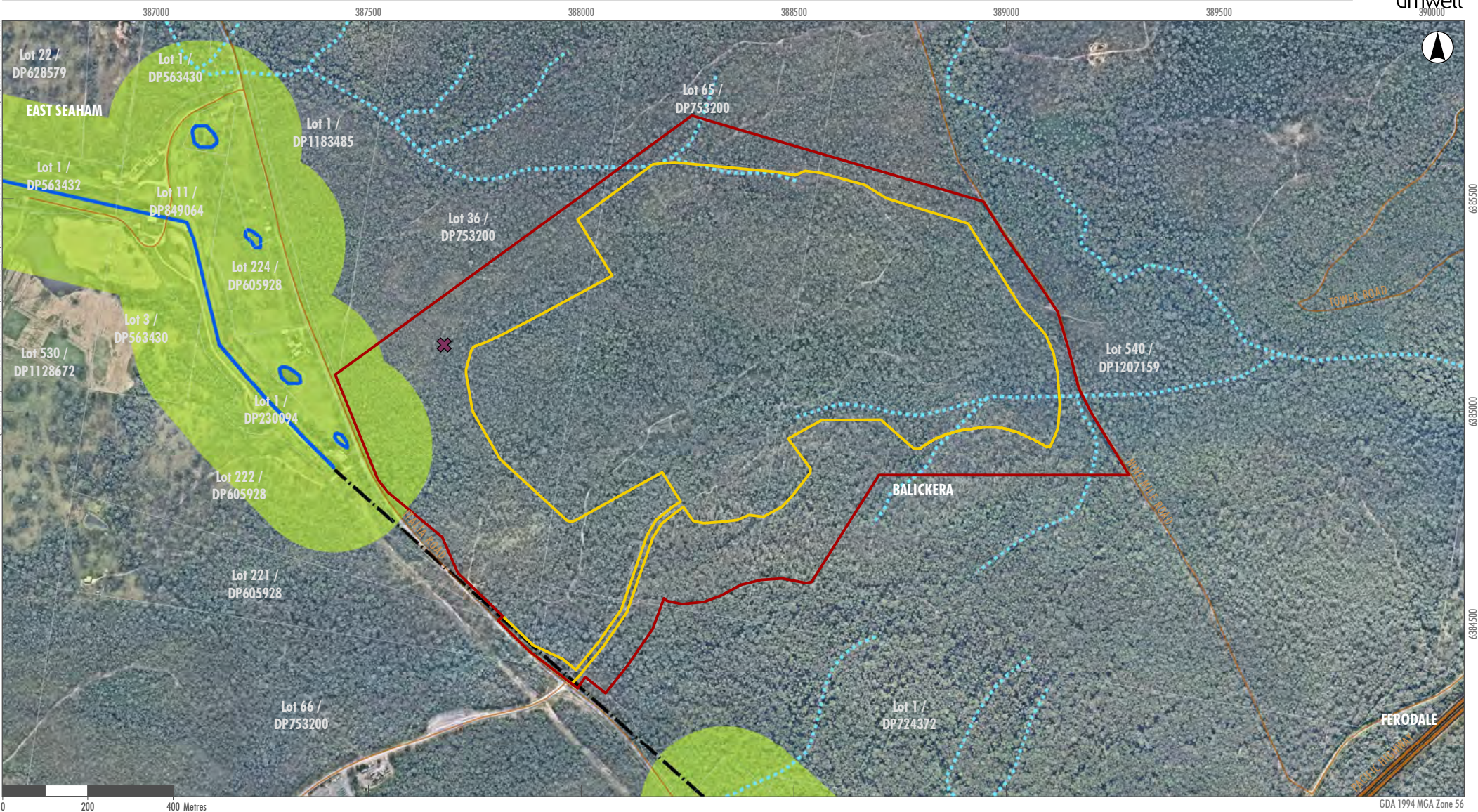
**FIGURE 5.4**  
**Koala (*Phascolarctos cinereus*) Species Polygon**

### 5.3.2.6 Southern Myotis (*Myotis macropus*) Species Polygon

The species polygon details for the Southern Myotis are provided in **Table 5.12** and the species polygon is mapped in **Figure 5.5**.

**Table 5.12 Southern Myotis Species Polygon**

Information Required	Species Polygon Details
Biodiversity Risk Weighting	2
SAll Entity	No
Habitat constraints / microhabitats present on the Subject Land / vegetation zone	The range of PCTs associated with the species (as per the TBDC) within 200 meters of any medium to large permanent creeks, rivers, lakes or other waterways (i.e. with pools/ stretches 3m or wider)
Extent of suitable habitat present within development footprint	The development footprint is >200m from permanent creeks with pools or stretches 3m or wider.
TBDC species specific recommendations	Not applicable
Habitat condition (vegetation integrity score for each vegetation zone in the species polygon)	Not applicable



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Pacific Highway
- Road
- Non-permanent watercourses (do not meet habitat constraints requirement)
- Permanent waterbodies & watercourses > 3m wide
- Balickera Tunnel (contains Southern Myotis breeding habitat)
- ✕ Southern Myotis (*Myotis macropus*)
- Species Polygon for Southern Myotis (*Myotis macropus*)

Image Source: Nearmap (2022) Data source: NSW FSDF (2022), Umwelt (2023), NSW OEH (2018)

GDA 1994 MGA Zone 56

**FIGURE 5.5**  
**Southern Myotis (*Myotis macropus*)**  
**Species Polygon**

### 5.3.3 Results for BC Act Listed Ecosystem Credit Species

The following ecosystem credit species were observed within the subject land and/or development footprint during surveys:

- i. Little Lorikeet (*z*)

This species was heard calling and was observed flying over the development footprint during multiple surveys. It is considered that the development footprint provides foraging habitat for this species.

- ii. Varied Sitella (*Daphoenositta chrysoptera*)

This species was observed foraging within the development footprint on 9 November 2022.

- iii. White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

One immature White-bellied Sea-Eagle was observed perched on a tree within the development footprint on 25 October 2022. No nest trees were observed during surveys.

- iv. Little Bent-winged Bat (*Miniopterus australis*)

This species was recorded during ultrasonic call recording surveys during January 2018, December 2022, January 2023 and February 2023 foraging within the subject land. No breeding habitat for this species is present within the development footprint.

- v. Large Bent-winged Bat (*Miniopterus orianae oceanensis*)

- Probable recordings of this species foraging within the subject land were recorded during December 2023.
- Observation locations for all ecosystem credit species observed are mapped in **Figure 5.6**.

### 5.3.4 Results for EPBC Act Listed Species

The DCCEEW have identified that the Project is likely to have a significant impact on the following threatened species:

- Koala (*Phascolarctos cinereus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

The DCCEEW have identified that the Project may have a significant impact on the following additional threatened species:

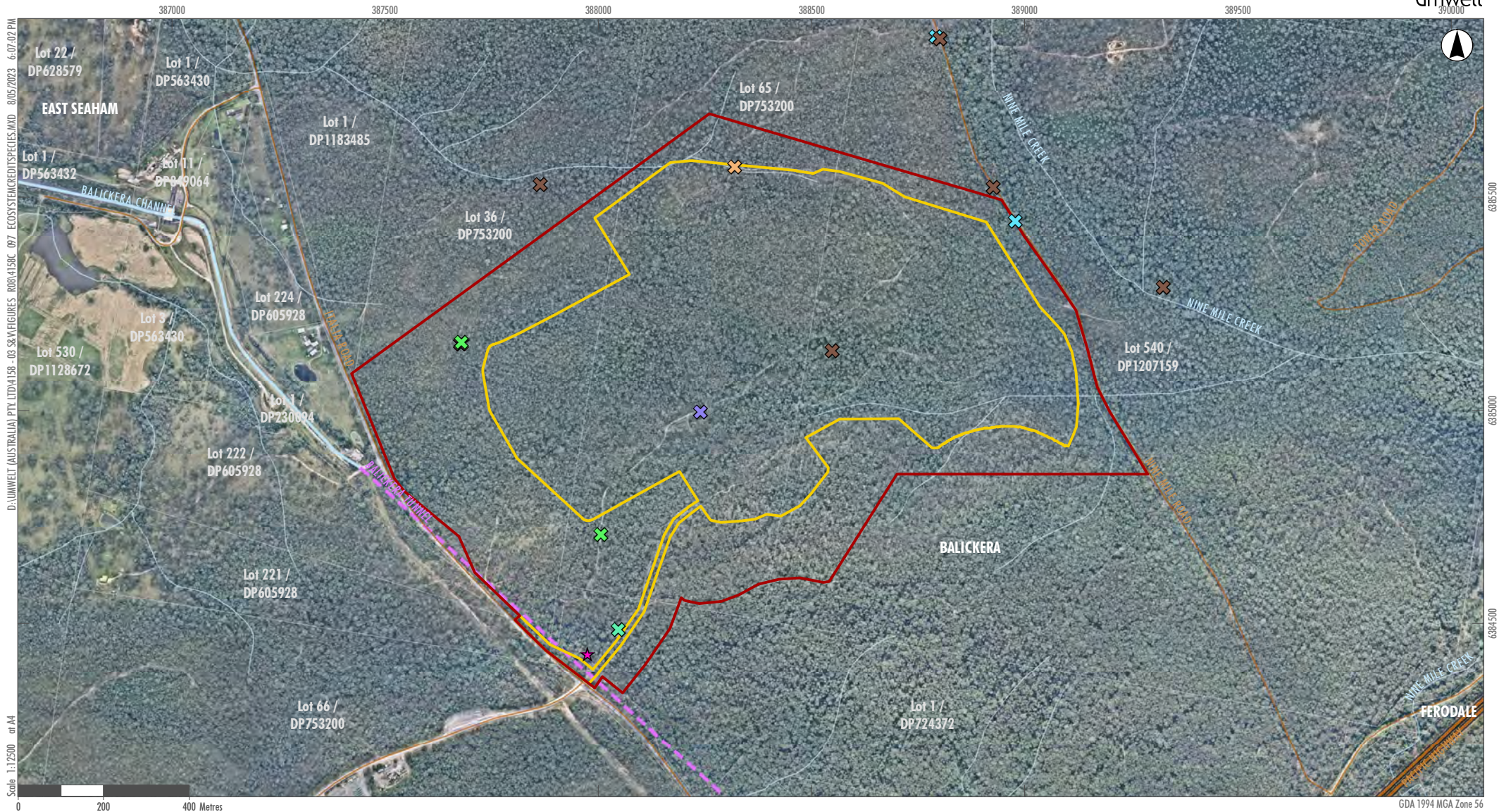
- Swift Parrot (*Lathamus discolor*)
- Spotted-tailed Quoll (southeastern mainland population) (*Dasyurus maculatus maculatus*)
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)
- New Holland Mouse (*Pseudomys novaehollandiae*)

- South-eastern Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*).

Details of the EPBC Act listed threatened species observed during surveys or assumed to occur are described in **Table 5.13**.

**Table 5.13 Results for EPBC Act Listed Species Present (Recorded within the Development Footprint)**

Common name	Scientific name	EPBC Act Status	Extent (ha) of suitable habitat present within development footprint
Koala	<i>Phascolarctos cinereus</i>	Endangered	This species was observed during surveys and is associated with all PCTs present. The extent of suitable habitat proposed for removal is 79.02 ha.
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	This species was observed foraging within the subject land during surveys. The National Flying Fox Monitoring Viewer (DCCEEW 2023) identifies that there is a historical camp site within the Wallaroo State Forest within the vicinity of the subject land, however no Flying-foxes have been observed there for >10 years. The nearest active camp sites are at Moffatts Swamp and Tocal. No species credits are proposed as no active roost or breeding habitat is present.
Rufous Fantail	<i>Rhipidura rufifrons</i>	Migratory	One individual was observed within PCT 1716 on 16 November 2022. The extent of this PCT within the development footprint is 0.33 ha.



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Pacific Highway
- Road
- Balickera Tunnel
- Drainage Line

**Ecosystem Credit Species**

- ✕ Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- ✕ Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- ✕ Grey-headed Flying-fox (*Pteropus paliocephalus*)
- ✕ Little Bent-winged Bat (*Miniopterus australis*)
- ✕ Little Lorikeet (*Glossopsitta pusilla*)

**EPBC Act Migratory Species**

- ✕ Powerful Owl (*Ninox strenua*)
- ✕ Southern Myotis (*Myotis macropus*)
- ✕ Varied Sittella (*Daphoenositta chrysoptera*)
- ✕ White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- ✕ Yellow-bellied Shearwater (*Scolopax flaviventris*)

**EPBC Act Migratory Species**

- ★ Rufous Fantail (*Rhipidura rufifrons*)

GDA 1994 MGA Zone 56

**FIGURE 5.6**  
Ecosystem Credit Species and EPBC Act Migratory Species Observation Locations

# 6.0 Identifying Prescribed Impacts

## 6.1 Prescribed Impact Assessment

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing native vegetation. Clause 6.1 of the *BC Regulation* defines *Prescribed Impacts* as ‘The impacts of development on the following habitat of threatened species or ecological communities:

- karst, caves, crevices, cliffs and other geological features of significance,
- rocks,
- human made structures,
- non-native vegetation,
- the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,
- the impacts of development on movement of threatened species that maintains their lifecycle,
- the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence resulting from underground mining or other development),
- the impacts of wind turbine strikes on protected animals,
- the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.’

An assessment which identifies the prescribed impacts which are likely to occur as a result of the proposed development are assessed in **Table 6.1** and a map of prescribed impact features is provided as **Figure 6.1**.

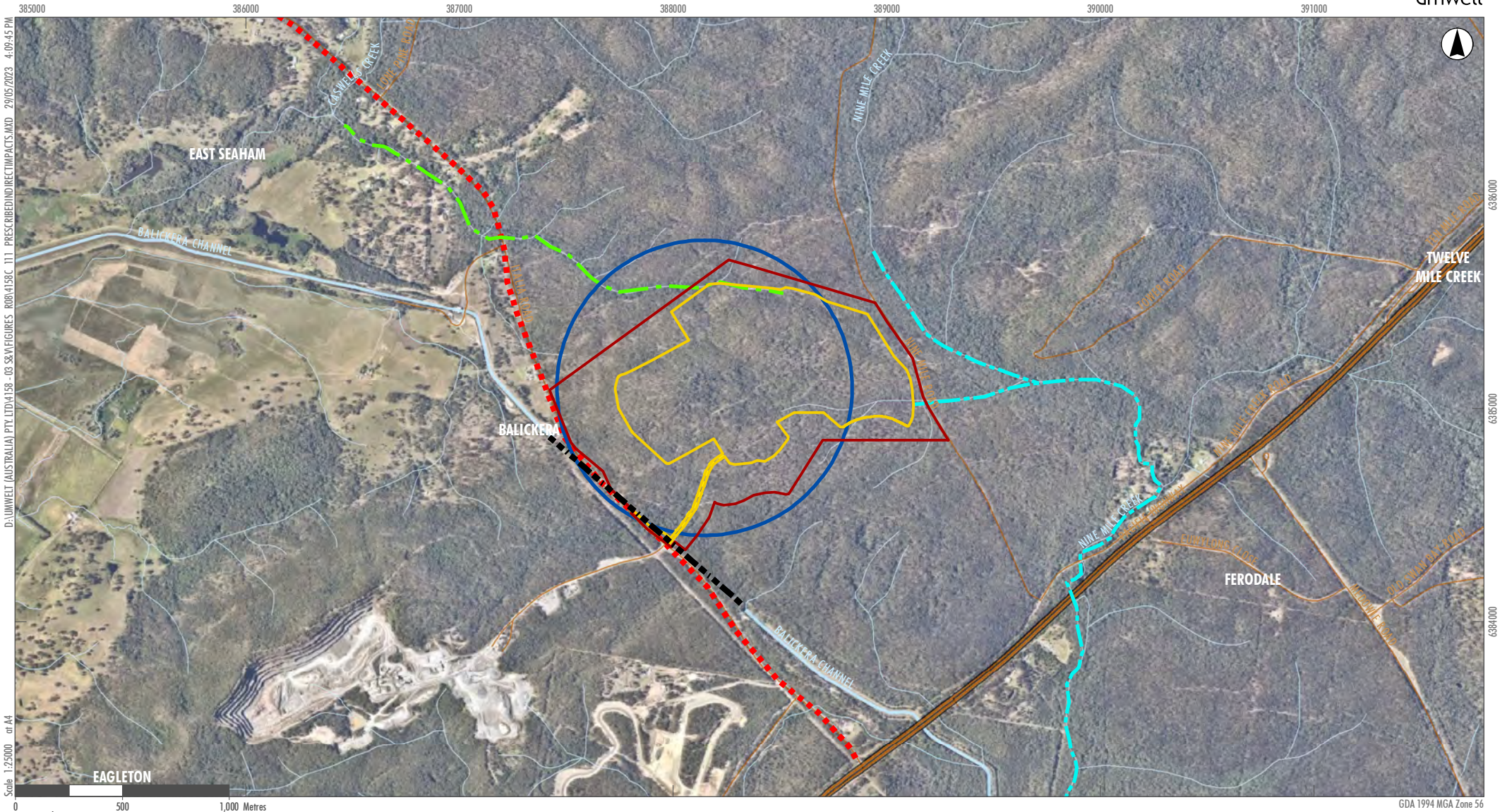
**Table 6.1 Prescribed Impacts Identified**

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	<input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	<p>There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within the development footprint.</p> <p>There are areas of exposed surface rock with minor rock outcropping, however these areas do not provide any habitat of significance for threatened species.</p>	<p>Based on the results of the surveys completed it is considered that there will be no known threatened entities using the features identified.</p>

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Human-made structures	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	<p>No human-made structures are present within the development footprint. The development footprint is located in proximity to the southern entrance of the Balickera Tunnel and Canal which lies under the western edge and access to the development footprint.</p>	<p>Eco Logical Australia (2021) have identified that the Balickera tunnel provides important habitat for the following threatened microbat species:</p> <ul style="list-style-type: none"> <li>• Eastern Coastal Free-tailed Bat</li> <li>• Eastern False Pipistrelle</li> <li>• Large Bent-winged Bat</li> <li>• Little Bent-winged Bat</li> <li>• Southern Myotis.</li> </ul> <p>The tunnel provides suitable breeding habitat which is assumed to be of importance for the Southern Myotis.</p> <p>It is considered that there is potential that vibration from blasting and heavy vehicle traffic may disrupt microbat roosting behaviour in the Balickera Tunnel, as assessed in the Blasting Assessment in in Appendix 6 and 7 of the EIS.</p> <p>The Blasting Impact Assessments have identified that no damage to the tunnel structure would result and impacts expected at the highest predicted levels of 27mm/s are only likely to induce falling of accumulated dust to the floor and potentially displace small loose pieces of rock. There would only be 1-2 blasts per fortnight and any disturbance associated with vibration impacts would be therefore limited in frequency and unlikely to have a significant constant disturbance effect on roosting bats. Bats roosting in the tunnels would not be impacted by overpressure effects.</p>
Non-native vegetation	<input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	<p>No areas of non-native vegetation are mapped within the development footprint.</p>	<p>Not applicable.</p>

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Habitat connectivity	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	<p>The development footprint is located on the western edge of the Wallaroo State Forest and forms a small part of a larger habitat patch. The development footprint provides a suitable connection point to habitat further west of Italia Road. Some habitat connectivity will be retained along the Italia Road interface, however the width of the connecting vegetation will be reduced and is already limited for terrestrial species by the Balickera Channel.</p>	<p>Habitat connectivity will be reduced, but still maintained for the Koala, Squirrel Glider and Brush-tailed Phascogale. The threatened entities observed during surveys that are highly mobile species, capable of traversing around or flying over the areas proposed for development are not likely to be affected through lifecycle impacts or impacts to movement patterns.</p>
Waterbodies, water quality and hydrological processes	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	<p>The development footprint supports ephemeral tributaries of Caswells Creek and Nine Mile Creek. The northern part of the development footprint contains first and second order tributaries of Caswells Creek. The south-eastern part of the development footprint contains first and second order tributaries of Nine Mile Creek. An unmapped ephemeral watercourse is also present in the south-western section of the Project Area. All watercourses within the development footprint will be directly impacted by clearing and quarry operations.</p>	<p>The ephemeral watercourses present are part of the habitat which comprises the Subtropical Coastal Floodplain Forest and River-flat Eucalypt Forest on Coastal Floodplain EECs which will be directly removed by the Project.</p> <p>No threatened entities were observed using the watercourses present, however the threatened fauna species which will be impacted by the Project may utilise these areas for nourishment.</p> <p>Threatened species and ecological communities downstream of the development footprint may also be impacted by altered flow regimes and/or water quality. Surface Water impacts and suitable mitigation measures are further documented with the Surface Water Impact Assessment (SWIA) provided as Appendix 10 of the EIS. Hydrological impacts are further discussed in Section 7.2.1.2 and 8.3.6.1.</p>

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Groundwater Dependant Ecosystems	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	<p>Probable Terrestrial GDEs, including high probability GDEs, have been mapped within the northern extent of the predicted area of groundwater drawdown and incremental drawdown within these areas would likely reduce the water table in these areas by up to 5 metres. The GIA (Appendix 11 of EIS) identifies that the current average depth to groundwater within and around the Project varies between 7.31 and 23.3 m below ground level. No aquatic ecosystems in the area of potential drawdown have been mapped as being a High Ecological Value Aquatic Ecosystem (HEAVE). The GIA (Appendix 11 of EIS) identifies that the nearest high priority GDEs are located near the Williams River, approximately eight and five kilometres from the Project, to the west and north-west. Further assessment is provided in Section 8.3.7.</p>	<p>It is considered that areas of the River-flat Eucalypt Forest on Coastal Floodplain and Subtropical Coastal Floodplain Forest EECs are potentially groundwater dependant, particularly areas mapped as high probability GDEs along the watercourse which intersects the northern part of the subject land. The ecosystem credit species predicted to occur and species credit entities observed have potential to use the PCTs identified as potential GDEs. Further impact assessment is provided in Section 8.3.7.</p>
Wind turbine strikes (wind farm development only)	<input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No	<p>This assessment is not a wind farm development.</p>	<p>Not applicable</p>
Vehicle strikes	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	<p>Vehicle movements will occur within the impact footprint. The Project is also likely to increase traffic on local roads</p>	<p>No threatened entities are likely to be affected by vehicle strikes within the development footprint, as vehicle movements will be at relatively low speed and largely limited to daylight hours when there is good visibility and reduced movement from nocturnal species. Potential for vehicle strikes outside of development footprint will be limited by the operational hours of the quarry and related to increase traffic, particularly heavy vehicles transporting quarry product. Adherence to local traffic requirements and a complaints register will also be required to manage traffic. The Koala is the most likely species with potential to be impacted by increased day time traffic volumes.</p>



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Scale 1:25000 at A4

- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Pacific Highway
  - Road
  - Drainage Line
- Prescribed and Indirect Impacts**
- Balickera Tunnel Location / Threatened Microbat Roosting Area
  - Italia Road / Location of increased traffic and fauna strike risk
  - Site access haul road / Location of increased traffic and fauna strike risk
  - Downstream section of Caswels Creek with potential to be indirectly impacted
  - Downstream section of Nine Mile Creek with potential to be indirectly impacted
  - Modelled extent of drawdown in Stage 7 and 8:  $K_{max} = 3.5 \times 10^{-2}$

Image Source: Nearmap (2023) Data source: NSW FSDP (2022), Umwelt (2023)

**FIGURE 6.1**  
**Prescribed and Indirect Impacts**

## 7.0 Avoid and Minimise Impacts

### 7.1 Avoid and Minimise Direct and Indirect Impacts

#### 7.1.1 Project Location

##### 7.1.1.1 Location of Surface works in Areas with No or Low Biodiversity values

As the resource to be quarried is location specific, the extraction of this quarry resource cannot avoid disturbing areas with no or low biodiversity values. **Figure 7.1** shows the changes in proposed development footprint between earlier Project layout designs and the proposed development footprint. The existing entry track from Italia Road will be utilised as part of the site access. The other areas where surface works are proposed or required contain biodiversity values and no areas with no or low biodiversity values are present. As shown in **Figure 7.1**, the locations of surface works have been modified to avoid areas with biodiversity values that had previously proposed as being disturbed.

##### 7.1.1.2 Location of Sub-Surface Works in Areas with No or Low Biodiversity Values

The proposed quarry will consist of an open pit and will not require any substantial sub-surface works other than the quarry itself.

##### 7.1.1.3 Avoidance of Wildlife Corridors

The development footprint is located on the western edge of the Wallaroo State Forest and forms a small part of a larger habitat patch. The development footprint provides a suitable connection point to habitat further west of Italia Road. The width of the connecting vegetation will be reduced, however areas which provide suitable wildlife corridors around the development footprint and along the Italia Road interface, will be retained.

##### 7.1.1.4 Location of Works to Minimise Interactions with Threatened Entities

The development footprint has been situated based on the presence of the hard rock resource to be quarried. As discussed in **Section 5.2.1.2** the Project disturbance footprint has been reduced to avoid the main areas of occupied habitat for the threatened orchid species, *Pterostylis chaetophora*. The refined development footprint further minimises impacts to plant community types and threatened species habitats generally, including habitats for the threatened fauna species recorded.

The Project will initially remove suitable habitat for threatened fauna entities, however ongoing interactions with threatened fauna entities are likely to be minimal within the cleared parts of the development footprint and will be managed through a Biodiversity Management Plan which is proposed to be prepared following approval of the Project.

##### 7.1.1.5 Location of Works to Avoid Impacts on Waterbodies and Hydrological Processes

The first and second order ephemeral watercourses present within the development footprint will be impacted by the Project. The SWIA in Appendix 10 of the EIS identifies that the Project is located within the Grahamstown Dam drinking water catchment and strict water quality controls will be implemented to mitigate potential impacts to hydrological processes and downstream waterbodies.

#### **7.1.1.6 Alternative Routes Considered**

The Project has been designed to make use of the existing access track from Italia Road and is located to reduce the extent of excavation required to access the proposed quarry areas. It is considered that the use of other routes is not likely to result in further impact minimisation or avoidance.



- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Previous Disturbance Area
  - Pacific Highway
  - Road
  - Balickera Tunnel
  - Drainage Line
  - Lot Boundaries

FIGURE 7.1

Impact Avoidance and Minimisation Areas

### 7.1.1.7 Alternative Sites within the Subject Land Considered

The previous and current development footprints associated with the Project are shown in **Figure 7.1**. The current development footprint within the approved lease area has been substantially refined twice. The first refinement resulted in the avoidance of the main areas of occupied habitat for the threatened orchid species, *Pterostylis chaetophora*. The second refinement was undertaken to consolidate the Project footprint to areas with the target resource and further minimise impacts to plant community types and threatened species habitats generally, including habitats for the threatened fauna species recorded.

Alternative sites within the approved lease would not be likely to achieve the objectives of the Project due to the lack of suitable resource for extraction.

### 7.1.1.8 Alternative Project Locations

The Proponent has identified that they have undertaken a detailed assessment and extensive constraints analysis of other potential high quality resource opportunities in the region. Several sites with favourable attributes were identified and subsequently subjected to preliminary field investigations. None of the sites investigated, however, had either the necessary resource quality or quantity to warrant a commitment to further investigation. The Proponent has identified that the Project presents a rare opportunity for them within the Lower Hunter Region to develop a large tonnage, greenfield quarry operation on geology demonstrated to be favourable for production of the full range of high-quality quarry products, with close proximity to key markets and existing State road infrastructure. The proponent has identified that the Project represents an ideal site to meet medium and long term demand for high quality aggregates in the region.

## 7.1.2 Project Design and Planning

### 7.1.2.1 Alterations to the Development Footprint

Investigations within the approved licence area identified an initial development footprint which has been successively refined in an iterative process to avoid impacts to biodiversity features on the Subject Land. The current and previous development footprints associated with the Project are shown in **Figure 7.1**.

The refinement to the development footprint resulted in the avoidance of the main areas of occupied habitat for the threatened orchid species, *Pterostylis chaetophora* and minimises impacts to plant community types and habitats for the threatened fauna species observed during surveys relative to earlier Project designs.

The extent of impact avoidance which has been achieved for plant community types and species credit entities, as a result of alterations to the development footprint, is documented in **Table 7.1**.

**Table 7.1 Extent of Impact Avoidance Achieved for PCTs and Species Credit Entities**

Entity	Extent within Original Development Footprint Investigated (ha)	Extent within Final Reduced Development Footprint Proposed (ha)	Extent of Impact Avoidance Achieved (ha)
Condition Zone 1 PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast - Moderate to good <i>River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC.</i>	4.54	0.33	4.21
Condition Zone 2 PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Moderate to good	72.69	45.63	27.06
Condition Zone 3 PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast - Moderate to good <i>Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC</i>	1.15	0.88	0.27
Condition Zone 4 PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands - Moderate to good / Apple variant	21.45	19.52	1.93
Condition Zone 5 PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands - Moderate to good / Apple-Ironbark Forest variant	30.09	8.75	21.34
Condition Zone 6 PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast – Regenerating <i>Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC</i>	9.80	3.91	5.89
Rusty Greenhood ( <i>Pterostylis chaetophora</i> )	9.8 ha / 58 individuals	3.91 ha / 2 individuals	5.89 ha / 56 individuals
Squirrel Glider ( <i>Petaurus norfolcensis</i> )	139.72	79.02	60.7
Brush-tailed Phascogale ( <i>Phascogale tapoatafa</i> )	139.72	79.02	60.7
Koala ( <i>Phascolarctos cinereus</i> )	139.72	79.02	60.7
Native forest and woodland habitats (all vegetation zones)	139.72	79.02	60.7

### **7.1.2.2 Design Measures**

The site access has been designed to take advantage of the existing vehicle track from Italia Road, which has reduced the impacts to understorey vegetation associated with the site access. The current development footprint also reflects a redesign of the Project layout to consolidate impact areas and minimise the area of native vegetation and habitat proposed for removal.

### **7.1.2.3 Location of Ancillary Facilities in Areas with No Biodiversity Values, or in Areas of Poorest Habitat**

The ancillary features include the processing and stockpile areas, detention basins, weight bridge, site sheds, parking and haul and access roads (refer to **Figure 1.3**).

The Subject Land does not contain areas with no biodiversity values or areas in poor condition.

### **7.1.2.4 Location of Ancillary Facilities to avoid Habitat of Threatened Entities**

Ancillary features have been located and designed to minimise the impact footprint and where possible utilise areas which will be progressively quarried.

### **7.1.2.5 Actions that Provide for Ecological rehabilitation, Restoration and/or Maintenance or Retained Areas**

The proponent has committed to the investigation of the establishment of a Biodiversity Stewardship Site in retained areas of the Wallaroo State Forest. This will provide potential for the rehabilitation, restoration and/or maintenance of retained areas, located near the development footprint.

### **7.1.2.6 Alternative Modes or Technologies Considered**

Alternative modes or technologies are not of relevance to the proposed development.

### **7.1.2.7 Project Design Constraints**

The Project design is primarily constrained by the location of the available target resource and the access to Italia Road.

## **7.2 Avoid and Minimise Prescribed Impacts**

Prescribed Impacts are additional impacts which require assessment; however, they are not impacts which require consideration when calculating the number and classes of biodiversity credits required. Prescribed impacts for this Project are identified in **Section 6.0** of this Report. The main prescribed impacts with potential to result from the Project include:

- impacts to habitat connectivity
- impacts to waterbodies, water quality and hydrological processes
- vehicle strikes.

A consideration of impact avoidance and minimisation for prescribed impacts is provided as follows.

## 7.2.1 Project Location

### 7.2.1.1 Habitat Connectivity

The development footprint is located on the western edge of the Wallaroo State Forest and forms a small part of a larger habitat patch. The development footprint provides a suitable connection point to habitat further west of Italia Road. The width of the connecting vegetation will be reduced, however areas which provide suitable wildlife corridors around the development footprint and along the Italia Road interface, will be retained.

### 7.2.1.2 Hydrological Impacts

Clearing for the development footprint will result in impacts to first and second order ephemeral streams and associated hydrological processes. The SWIA (Appendix 10 of the EIS) has identified *potential* impacts including:

- a reduction in Grahamstown Dam catchment yield due to the capture of surface runoff within the Project Water Management System (WMS)
- degradation of downstream water quality as a result of ground disturbing activities leading to erosion and transport of sediment and nutrients to downstream water users and watercourses, including Grahamstown Dam, in water discharged from the Project WMS
- changes in catchment hydrology resulting in changes to receiving watercourse flow regimes.
- impacts on stream stability associated with quarry discharges.

The SWIA identifies measures to manage the potential water quality impacts and a requirement for monitoring of the potential stream stability impacts and adaptive management in the form of scour protection and discharge flow limits. The SWIA identifies that the reduction on catchment yield is likely to be limited to Stage 1 and during dry years in Stage 9 and an increase in yield is predicted on average during the intermediate and latter operational stages. The SWIA describes the overall impact on the Grahamstown Dam catchment as negligible and identifies that the Project satisfies the 'neutral or beneficial effects' (NorBE) test in terms of changes to the quality of water flowing into Grahamstown dam catchment.

The nature and extent of these impacts would likely vary between locations, however, would still be likely to occur in an alternative project location.

### 7.2.1.3 Vehicle Strikes

The potential for vehicle strikes has been minimised through the location of the development footprint close to the access point at Italia Road. The Project is also located in an ideal location to take advantage of the proximity to the Pacific Highway, which is already a busy traffic route.

## 7.2.2 Project Design

### 7.2.2.1 Habitat Connectivity

The Project design has been refined to minimise impacts to habitat connectivity, through reductions in the overall area of clearing proposed. The existing level of habitat connectivity will be reduced but still

maintained. It is considered that additional designed features to further minimise impacts associated with habitat connectivity are not warranted.

### **7.2.2.2 Hydrological Impacts**

Due to the location and characteristics of the target resource, an open quarry pit design is required for extraction of the target resource. Erosion and sediment control and on-site water storage will be undertaken to minimise prescribed impacts to waterbodies and hydrological processes specifically associated with this type of project.

### **7.2.2.3 Vehicle Strikes**

The Project has been designed to minimise the length of the site access from Italia Road. It is considered that due to the quarry operation hours and proximity to existing high traffic public roads, there is only a low potential for vehicle strikes to occur.

## **7.3 Other Measures Considered**

### **7.3.1 Do Nothing Option**

The 'Do nothing' option was considered as part of environmental impact assessment for this Project. This identified that the supply of high-quality aggregates to the construction sector in the Lower Hunter and Central Coast areas in the medium term is characterised by quarries that are generally in the latter stages of their development lives, and/or operations with either comparatively short resource lives and/or sub-optimal resource quality. Consequently, if no new resources are identified and brought to market, the growth areas of the Lower Hunter and Central Coast will experience significant supply-side pressure for high-quality quarry products, with negative flow-on to costs throughout the entire construction sector value chain.

The 'do nothing option' would avoid the environmental impacts associated with the construction, operation and decommissioning of the Project, such as biodiversity impacts, construction noise, traffic and dust and hydrology impacts. However, these impacts are considered to be manageable through the implementation of the management and mitigation measures and biodiversity offsetting proposed.

The 'do nothing option' is not considered to be a preferred option for the Proponent.

## **7.4 Summary of Measures to Avoid and Minimise Impacts**

A summary of the measures proposed to avoid and minimise direct, indirect and prescribed impacts associated with the Project is provided in **Table 7.2**.

**Table 7.2 Avoidance and Minimisation Measures for Direct, Indirect and Prescribed Impacts**

Action	Outcome	Timing	Responsibility
Preliminary biodiversity constraints analysis	Preliminary assessment of biodiversity constraints to inform project design and minimise impacts to areas with high biodiversity values.	Project design	Project Ecologist, Planning Team and Proponent
Location and design of works in existing disturbed areas where possible	The site access has been aligned to an existing access track through the Wallaroo State Forest.	Project design	Project Ecologist, Planning Team and Proponent
Reduction of Subject Land boundary / development footprint	The development footprint has been reduced through an iterative process to achieve the current area of proposed disturbance.	Project design	Proponent
Workforce education and training	Environmental awareness for workforce.	Pre-construction and during construction and operation	Site Manager
Implement Construction Environmental Management Plan	Management and minimisation of potential environmental impacts.	Project construction	Site Manager
Implementation of vegetation protection zones for areas to be retained	Protect retained habitats.	During construction phase	Project Ecologist and Site Manager
Ecologist pre-clearance surveys and supervision of works	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Construction / site clearing phase	Project Ecologist and Site Manager
Fencing and access control	Site access controls and fencing will be implemented to prevent unauthorised site access and disturbance.	Construction and operational phases	Site Manager
Erosion and sedimentation control	Minimise erosion and sedimentation within the site and downstream habitats through installation and maintenance of erosion and sediment controls and water quality infrastructure.	Construction and operational phases	Site Manager
Weed management	Prevent weed incursions and spread.	During construction, site clearing and operational phases	Site Manager

# 8.0 Impact Assessment

## 8.1 Direct Impacts

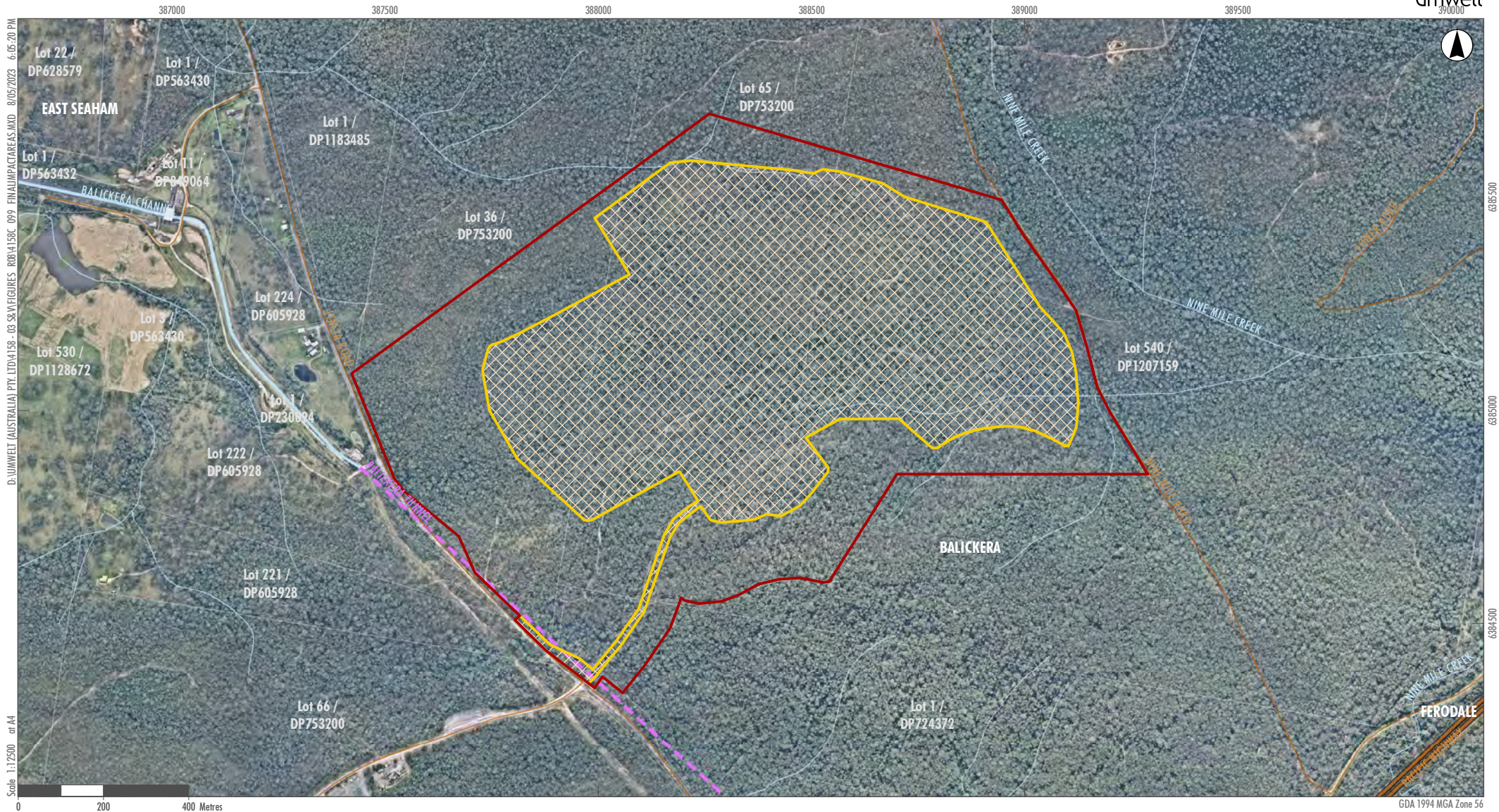
### 8.1.1 Residual Direct Impacts

The development footprint which will be impacted by the Project is mapped in **Figure 8.1**. **Table 8.1** summarises the extent of proposed residual direct impacts to plant community types and threatened entities observed or assumed to be present.

**Table 8.1 Summary of Residual Direct impacts**

Direct impact	BC Act status	EPBC Act status	Potential SAIL entity	Project phase/timing of impact	Extent (ha)
Condition Zone 1 PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast - Moderate to good	REFCF EEC	SEFFW EEC	No	Progressive staged clearing	0.33
Condition Zone 2 PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest - Moderate to good	Not listed	Not listed	No	Progressive staged clearing	45.63
Condition Zone 3 PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast - Moderate to good	REFCF EEC	SEFFW EEC	No	Progressive staged clearing	0.88
Condition Zone 4 PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands - Moderate to good / Apple variant	Not listed	Not listed	No	Progressive staged clearing	19.52
Condition Zone 5 PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands - Moderate to good / Apple-Ironbark Forest variant	Not listed	Not listed	No	Progressive staged clearing	8.75

Direct impact	BC Act status	EPBC Act status	Potential SAI entity	Project phase/timing of impact	Extent (ha)
Condition Zone 6 PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast – Regenerating	SCFF EEC	SEFFW EEC	No	Progressive staged clearing	3.91
Rusty Greenhood ( <i>Pterostylis chaetophora</i> )	Vulnerable	Not listed	No	Progressive staged clearing	2 individuals / 3.91 ha of suitable habitat
Squirrel Glider ( <i>Petaurus norfolcensis</i> )	Vulnerable	Not listed	No	Progressive staged clearing	79.02
Brush-tailed Phascogale ( <i>Phascogale tapoatafa</i> )	Vulnerable	Not listed	No	Progressive staged clearing	79.02
Koala ( <i>Phascolarctos cinereus</i> )	Endangered	Endangered	No	Progressive staged clearing	79.02



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Final Development Footprint)
- Final Impact Area Requiring Offsets – Ecosystem and Species Credits
- Balickera Tunnel
- Drainage Line
- Pacific Highway
- Lot Boundaries
- Road

GDA 1994 MGA Zone 56

**FIGURE 8.1**  
**Final Impact Areas on the Subject Land**

## 8.1.2 Change in Vegetation Integrity Score

For each vegetation zone the change in vegetation integrity is based on the development impacting to zero during construction. There are no vegetation integrity scores above zero after development and there would be no management actions required to maintain any remaining vegetation as it has been assumed that impact will occur to all vegetation within the vegetation zones.

**Table 8.2 Impacts to Vegetation Integrity**

PCT and Vegetation Condition Zone	Management zone	Area (ha)	Before development				After development				Change in VI score
			Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	
1 – PCT 762 Intact	Impact Footprint	0.33	88.3	74.8	74.1	78.8	0	0	0	0	-78.8
2- PCT 1590 Intact	Impact Footprint	45.63	97	62.7	66.9	74.1	0	0	0	0	-74.1
3 – PCT 1618 Intact	Impact Footprint	0.88	87.9	76.7	70.7	78.1	0	0	0	0	-78.1
4 – PCT 1619 Intact Apple Variant	Impact Footprint	19.52	80.8	69	63.5	70.7	0	0	0	0	-70.7
5 – PCT 1619 Intact Apple-Ironbark Variant	Impact Footprint	8.75	89.3	81.8	71.5	80.5	0	0	0	0	-80.5
6 – PCT 1716 Regenerating	Impact Footprint	3.91	90.3	78.6	62.8	76.4	0	0	0	0	-76.4

## 8.2 Indirect Impacts

**Table 8.3** summarises the extent of the proposed residual indirect impacts to plant community types and threatened entities observed or assumed to be present within the development footprint. A map of the predictable indirect impacts associated with the Project is provided as **Figure 6.1**.

**Table 8.3 Summary of Residual Indirect Impacts**

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
Increased site occupation	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened fauna species assessed as present in <b>Table 5.5</b> .	High	Frequent/ Ongoing	Construction and operation	Likely to occur, consequences are likely to include reduction in habitat suitability for threatened fauna in immediately adjoining areas.

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
Connectivity and corridors	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened fauna species assessed as present in <b>Table 5.5</b> .	Low	Frequent / Ongoing	Staged construction, operation and once decommissioned	Will occur, consequences include reduced wildlife connectivity. Wildlife connectivity will be maintained through retention of suitable corridor areas.
Light spill impacts	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened fauna species assessed as present in <b>Table 5.5</b> .	Low	Frequent/ Ongoing	Operation	Will occur, consequences likely to include minor alteration to fauna behaviours including avoidance of light and opportunistic utilisation of light spill areas.
Noise impacts	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened fauna species assessed as present in <b>Table 5.5</b> .	Moderate	Frequent / Ongoing	Construction and operation	Will occur, consequences likely to include reduction in suitability of retained and close adjoining habitats for noise sensitive fauna species.
Air quality impacts	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened species assessed as present in <b>Table 5.5</b> .	Low to moderate	Frequent / Ongoing	Construction and operation	Potential to occur within the immediate vicinity of the quarry pit and access road, but likely to be managed by appropriate dust suppression. Consequences include physical injury to airways of fauna species and short term reduced photosynthetic capacity for

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
					impacted flora. Controls for human health will also be applied to the Project.
Vibration impacts	<p>Eco Logical Australia (2021) have identified that the Balickera tunnel provides habitat for the following threatened microbat species:</p> <ul style="list-style-type: none"> <li>• Eastern Coastal Free-tailed Bat</li> <li>• Eastern False Pipistrelle</li> <li>• Large Bent-winged Bat</li> <li>• Little Bent-winged Bat</li> <li>• Southern Myotis.</li> </ul>	Low	Frequent / Ongoing for the life of the Project	Operation	<p>The tunnel provides roosting habitat particularly for microbats and known breeding habitat for the Southern Myotis (ELA 2021). It is considered that there is potential that vibration from blasting and heavy vehicle traffic may disrupt microbat roosting behaviour in the Balickera Tunnel, however the impacts of blasting on the tunnel structure have been assessed in the Blasting Impact Assessment, provided as Appendix 8 of EIS.</p> <p>The Blasting Impact Assessments (Appendix 6 and 7 of EIS) identified that no damage to the tunnel structure would result. Infrequent impacts at the</p>

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
					<p>highest predicted levels of 27mm/s are only expected to induce falling of accumulated dust to the floor and potentially displace small loose pieces of rock.</p> <p>It is considered that there is a low likelihood that the Project would reduce or deplete the quality of the existing roosting habitat within the Balickera Tunnel.</p>
Water impacts	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened species assessed as present in <b>Table 5.5</b> .	Moderate	Infrequent (during and following rainfall events) / long term	Construction, and operation and ongoing once decommissioned	Likely to occur but limited. Consequences include removal of catchment and small sections of first and second order ephemeral streams in upper catchments. Reduced flows to downstream environments. Impacts managed through appropriate erosion and sediment controls and retention and treatment of runoff and intercepted water. Discharge of water controlled and will be managed

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
					to avoid downstream scouring.
Weed invasion	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened species assessed as present in <b>Table 5.5</b> .	Low	Infrequent / long term	Construction, and operation and ongoing once decommissioned	Potential to occur, particularly in edge areas adjoining disturbed areas. Consequences include introductions of weeds, reduction in habitat suitability and competition with native species. Managed through proactive site weed management.
Pest animal species	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened species assessed as present in <b>Table 5.5</b> .	Low	Infrequent / long term	Construction and operation	Feral animals are already present. Low potential for increased impacts, consequences include reduced habitat suitability and predation, grazing and/or trampling of threatened species.
Security fencing	Ecosystem credit species retained for assessment in <b>Table 5.1</b> and species credit threatened fauna species assessed as present in <b>Table 5.5</b> .	Low	Frequent / Long term	Construction and operation	Likely to occur. Consequences include reduction in habitat connectivity.

## **8.3 Prescribed Impacts**

Prescribed impacts associated with the Project are identified in **Section 6.0** of this report and are further documented below.

### **8.3.1 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance**

#### **8.3.1.1 Nature and Extent**

The Project is not likely to impact caves, crevices, cliffs or geological features of significance.

Impacts are likely to occur to minor areas of rock outcropping which do not contain habitat structure for threatened species. These impacts are likely to be long-term and permanent.

#### **8.3.1.2 Duration**

This is likely to be one-off, permanent impact for the life of the Project which will occur during staged construction, site clearing and quarrying works.

#### **8.3.1.3 Consequences**

No threatened species have been recorded utilising these habitats and no significant consequences are predicted to occur.

### **8.3.2 Human Made Structures**

#### **8.3.2.1 Nature and Extent**

No human made structures will be directly impacted by the project. It is considered that there is potential that vibration from blasting and heavy vehicle traffic may disrupt microbat roosting behaviour in the Balickera Tunnel, however the impacts of blasting on the tunnel structure have been assessed in Appendix 6 and 7 of the EIS as low.

#### **8.3.2.2 Duration**

Vibration associated with blasting and heavy vehicle movements is likely to be detectable within the Balickera Tunnel. The Blasting Impact Assessments (Appendix 6 and 7 of EIS) identified that no damage to the tunnel structure would result and impacts expected at the highest predicted levels of 27mm/s are only likely to induce falling of accumulated dust to the floor and potentially displace small loose pieces of rock.

#### **8.3.2.3 Consequences**

It is considered that there is potential that vibration from blasting and heavy vehicle traffic may disrupt microbat roosting behaviour in the Balickera Tunnel, however the impacts of blasting on the tunnel structure have been assessed in Appendix 6 and 7 of the EIS as low.

### **8.3.3 Non-Native Vegetation**

No areas of non-native vegetation are present. Areas of non-native vegetation will not be impacted by the project.

### **8.3.4 Excluded Areas – Category 1 Land**

No Excluded Areas of Category 1 Land are present. Areas of Excluded Category 1 Land will not be impacted by the project.

### **8.3.5 Habitat Connectivity**

#### **8.3.5.1 Nature and Extent**

The development footprint is located on the western edge of the Wallaroo State Forest and forms a small part of a larger habitat patch. Due to the size of the intact habitat to the north, no significant impact to connectivity is anticipated in an east west direction north of Italia Road. There is potential for habitat connectivity impacts in relation to movement from the south, particularly to the Koala, Brush-tailed Phascogale and Squirrel Glider. There is a suitable connection point across Italia Road to the west of the development footprint noting that this corridor is already partly constrained to the west of Italia Road by the Boral Seaham Quarry. The project has potential to reduce but not totally remove habitat connectivity for flora and fauna species, particularly between the Wallaroo State Forest and areas to the west of Italia Road where an approximately 250 m wide corridor of native vegetation will not be impacted. The areas of proposed habitat clearing primarily consist of native vegetation, however, it is considered that no connectivity or associated genetic impacts to populations of the Koala, Brush-tailed Phascogale or Squirrel Glider are likely to occur as a result of the project.

In relation to cumulative impacts to connectivity, the potential impact areas associated with the Kings Hill Urban Release Area and the M1 Motorway Extension to Raymond Terrace, occur to the south-west of Italia Road. At the time of writing no development applications for the Kings Hill Urban Release Area had been approved. The loss of connectivity discussed above would not be further impacted by this development to south.

It is considered that the proposal would not contribute to an adverse cumulative impact to habitat connectivity across the M1 Motorway, however would contribute to the cumulative reduction in habitat patch size and crossing width within the vicinity of Italia Road and the existing Boral Seaham Quarry.

#### **8.3.5.2 Duration**

This will be a one-off, permanent impact for the life of the project that will occur during construction and site operation. Ongoing impacts may also occur following decommissioning during the rehabilitation phase.

#### **8.3.5.3 Consequences**

The consequences include reduced wildlife connectivity, however areas of important habitat connectivity have been maintained. Due to the nature and layout of the site, which is surrounded by undeveloped land, there will be no significant changes to landscape connectivity for wildlife movement.

### **8.3.6 Waterbodies, Water Quality and Hydrological Processes**

#### **8.3.6.1 Nature and Extent**

The development footprint supports ephemeral tributaries of Caswells Creek and Nine Mile Creek. The northern part of the development footprint contains first and second order tributaries of Caswells Creek which flow into the western section of Balickera Channel. Water from the Western part of Balickera

Channel is pumped east into the Balickera tunnel and flows to the Grahamstown Dam. The south-eastern part of the development footprint contains first and second order tributaries of Nine Mile Creek which flows directly to Grahamstown Dam. An unmapped drainage line is also present in the south-western section of the development footprint.

All streams within the development footprint will be directly impacted by clearing and quarry operations, including clearing and terrain alteration for the development footprint which will impacts to first and second order ephemeral streams and associated hydrological processes. Water currently flowing down these watercourses following rain events will instead be intercepted by the quarry water management system with excesses volumes discharged to the Nine-Mile creek catchment when required. The SWIA (Appendix 10 of EIS), has identified *potential* impacts including:

- a reduction in Grahamstown Dam catchment yield due to the capture of surface runoff within the Project Water Management System (WMS)
- degradation of downstream water quality as a result of ground disturbing activities leading to erosion and transport of sediment and nutrients to downstream water users and watercourses, including Grahamstown Dam, in water discharged from the Project WMS
- changes in catchment hydrology resulting in changes to receiving watercourse flow regimes.
- impacts on stream stability associated with quarry discharges.

The SWIA (Appendix 10 of the EIS) identifies measures to manage the potential water quality impacts and a requirement for monitoring of the potential stream stability impacts and adaptive management in the form of scour protection and discharge flow limits. The SWIA identifies that treatment is proposed for any water being discharged to ensure that it satisfies the NorBE requirements applicable to the Grahamstown Dam catchment.

### **8.3.6.2 Duration**

The reduction on catchment yield is likely to be limited to Stage 1 and during dry years in Stage 9 and an increase in yield is predicted on average during the intermediate and latter operational stages. The overall impact on the Grahamstown Dam catchment is described as negligible. Measures to neutralise impacts on water quality in the downstream environment are identified in the SWIA.

### **8.3.6.3 Consequences**

The SWIA (Appendix 10 of the EIS), predicts a loss of catchment yield during Stage 1 and during dry years of Stage 9, however on average yields are expected to increase due to the increased runoff potential of the developed quarry site. The reduced catchment area will reduce flows following rainfall events in the watercourses immediately downstream of the Development Footprint however significant impacts to the flow regimes of downstream higher order watercourses (i.e., Nine Mile Creek to the east and Caswells Creek to the northwest) associated with the capture of runoff and discharges as a result of the Project are considered unlikely. The proposed management measures are likely to be effective in terms of managing downstream water quality impacts and the Project has been assessed as being capable of satisfying NorBE requirements for controlled discharges through treatment of water prior to discharge. Impacts to downstream environments is therefore considered to be low.

## 8.3.7 Groundwater Dependant Ecosystems

### 8.3.7.1 Nature and Extent

The GIA (Appendix 11 of EIS) identifies that:

The maximum drawdown will occur immediately adjacent to the Main Pit where drawdown of up to 25 m is predicted. This drawdown is relative to the current depth to groundwater. The magnitude of drawdown decreases away from the pit in a cone shape, with areas at the maximum extent of the radius of drawdown experiencing zero drawdown. Drawdown impacts associated with the project are only predicted to commence in Stage 6, where drawdown impacts will be constrained to areas immediately adjacent to the Main Pit and the North-west Pit. As quarry operations in Main Pit progress deeper, the radius of drawdown will expand out and reach the maximum extent in Stage 8. After closure, the radius of drawdown will decline, as a pit lake forms in the final voids. Drawdown impacts from the North-west Pit are expected to be negligible compared with the impacts resulting from the depressurisation of the Main Pit. Dewatering from the Main Pit will effectively depressurise the strata in the North-west Pit area and therefore there will be no significant additional drawdown impact from the North-west Pit.

All vegetation within the development footprint will be removed and there will be approximately 8.36 ha of high probability GDEs, 46.77 ha of medium probability GDEs and 27.75 ha of low probability GDEs retained within the area of maximum predicted groundwater drawdown, as shown in **Figure 4.4** of this Report.

The GIA identifies that:

In the areas outside the development footprint, only the northern extent of drawdown has potential to impact areas of vegetation mapped as having a high probability of being a GDE. This vegetation is associated with the unnamed first and second order tributary of Caswells Creek. This tributary and associated riparian vegetation has not been mapped as a high ecological value aquatic ecosystem (HEVAE) by DPE-Water.

Average depth to groundwater at the project varies between 7.31 and 23.3 m below ground level. Groundwater levels in the area where the high probability GDEs are present (within the maximum extent of predicted drawdown) are between approximately 7 and 13 metres below ground level. Drawdown (assuming these most conservative drawdown prediction) in the area of the high probability GDEs would be in the order of 0 to 5 m. However, it is noted that the drawdown predictions relate to drawdown within the bedrock and weathered layer resource, and it is likely that in colluvial/alluvial systems (which are likely associated with the vegetation in this area) groundwater availability for terrestrial vegetation would be more influenced by localised recharge effects from the creeks and rainfall. The terrestrial vegetation in these areas that have groundwater dependence would therefore be less impacted by drawdown induced in the bedrock and weathered layers. Even if drawdowns in the regional water table of up to five metres occurred, it would be unlikely to have a material impact on vegetation associated with the colluvial and alluvial systems, which are primarily influenced by rainfall and surface flow recharge.

### 8.3.7.2 Duration

The GIA identifies that:

Drawdown impacts associated with the project are only predicted to commence in Stage 6, where drawdown impacts will be constrained to areas immediately adjacent to the Main Pit and the North-west

Pit. As quarry operations in Main Pit progress deeper, the radius of drawdown will expand out and reach the maximum extent in Stage 8. After closure, the radius of drawdown will decline, as a pit lake forms in the final voids. Drawdown impacts from the North-west Pit are expected to be negligible compared with the impacts resulting from the depressurisation of the Main Pit. Dewatering from the Main Pit will effectively depressurise the strata in the North-west Pit area and therefore there will be no significant additional drawdown impact from the North-west Pit.

### **8.3.7.3 Consequences**

Potential impacts to GDEs include alterations in species composition and richness related to both the increased depth and reduced quality of available groundwater.

The GIA identifies that the Project is not expected to cause any significant change in groundwater quality and shows an area where groundwater drawdown may occur. The GIA also identifies that areas of high probability GDEs are likely to be reliant on colluvial/alluvial systems where groundwater availability for terrestrial vegetation would be more influenced by localised recharge effects from the creeks and rainfall.

It is recommended that additional survey and investigation work be undertaken to determine the nature and extent of groundwater dependency of vegetation within the zone of predicted drawdown and updated predictions of groundwater drawdown are developed prior to quarry activities progressing below the water table (i.e. Stage 5). A GDE monitoring and management plan should be developed in accordance with the recommendations of the GIA, prior to Stage 5 based on the updated information. The monitoring plan should be designed to identify the extent and magnitude of drawdown as quarry operations in North Pit and Main Pit progress below the interpolated water table and any additional vegetation monitoring required to assess potential impacts. The existing and additional bores should be used as monitoring locations to set triggers for additional monitoring of vegetation conditions in the areas mapped as high probability GDEs. Bores outside of the area of predicted drawdown should be used as reference points to inform both triggers and management responses.

## **8.3.8 Vehicle Strikes**

### **8.3.8.1 Nature and Extent**

Vehicle movements will occur within the impact footprint. The project is also likely to increase traffic on local roads.

### **8.3.8.2 Duration**

The potential for increase vehicle strikes will occur for the life of the project.

### **8.3.8.3 Consequences**

The consequences include mortality of threatened fauna species. The project has been designed to minimise the length of the site access from Italia Road. It is considered that due to the quarry operation hours and proximity to existing high traffic public roads, there is only a low potential for vehicle strikes to occur.

### **8.3.9 Prescribed Impact Data Limitations, Predictions and Assumptions**

The assessment of prescribed impacts provided is predominantly a qualitative assessment. Where quantitative data and studies have been relied upon, suitable references to the source material have been provided.

## **8.4 Mitigating Residual Impacts – Management Measures and Implementation**

The following management measures are proposed to mitigate the residual impacts (direct, indirect and prescribed) associated with the project. The impact mitigation measures proposed for residual impacts are also further summarised in **Table 8.4**, with implementation details provided in **Table 8.5**.

### **8.4.1 Workforce Education and Training**

The development of education packages and training can help to mitigate anthropogenic impacts on biodiversity resulting from the construction and operation of the project. The ability of non-ecological personnel to identify key threatened species or key ecological threats can help to mitigate impacts on threatened species. The following mitigation actions will be implemented for the project to develop a greater understanding and awareness of biodiversity issues in non-ecological trained personnel:

- Inductions for the workforce will be undertaken to make them aware of the key ecological issues present in the Subject Land to aid in their understanding of their role and responsibilities in the protection and/or minimisation of impacts to all native biodiversity.
- Inductions will identify the location of sensitive flora and fauna, including any defined exclusion / no-go areas, and the policies being implemented to protect the biodiversity values of such areas.
- Responsibilities with respect to weed management and biosecurity.

### **8.4.2 Implementation of Vegetation Protection Zones for Areas to be Retained**

During construction, temporary exclusion fencing or other form of suitable marking measure, will be used to demarcate disturbance areas in locations where necessary to avoid accidental damage to areas of vegetation outside of the development footprint. Access control is an important feature in protecting and demarcating areas outside the development footprint from vehicle access, human access, and accidental disturbance. Proposed measures include:

- Appropriate temporary fencing (or other form of suitable marking measures) and signposting of areas to prevent the uncontrolled entry of people, accidental disturbance and to minimise vehicular and human traffic.
- Clear and visible signage is to be appropriately located to inform the workforce and others of the restricted access or otherwise of areas outside the Development footprint.
- Worker education and awareness of exclusion areas, including as delivered through site induction information.

- The use of GPS enabled machinery (where available) to help prevent accidental disturbance of exclusion areas.

### **8.4.3 Ecologist Pre-Clearance Surveys and Supervision of Works**

Pre-clearance surveys and tree felling supervision will be undertaken by an appropriately qualified and experienced ecologist to minimise potential impacts to fauna species, particularly hollow-dependent fauna. A detailed tree-felling supervision protocol is to be developed and documented as part of the Construction Environmental Management Plan for the project and should include:

- Pre-clearing relocation surveys for fauna.
- Staged clearing works with under-scrubbing prior to tree removal.
- Management of koalas to prevent harm during clearing works.
- Ecologist supervision of all hollow tree felling to manage hollow dependant fauna, including the Brush-tailed Phascogale and Squirrel Glider.
- Nest box installation within the licence area to compensate for hollows removed.

### **8.4.4 Erosion and Sedimentation Control**

Erosion Sediment Control measures will be implemented for the project. Recommended measures include:

- minimising the area of disturbance (as far as practicable)
- diverting clean run-off water around disturbed areas where possible
- installation and ongoing maintenance of temporary erosion and sediment controls (e.g., sediment fencing) throughout the duration of the construction of the project
- design, implementation, and ongoing maintenance of permanent operational phase controls (e.g. catch drains) during the operational phase of the project
- stabilisation (i.e., landscaping and revegetation) of all disturbed areas not required for the operation of the project, to reduce the potential for future erosion.

### **8.4.5 Weed Management**

Weed species could be inadvertently brought into the Subject Land or surrounding habitats with imported materials, on vehicles and mobile plant, or could invade naturally through removal of native vegetation and the creation of a suitable growth medium. The presence of weed species has the potential to decrease the value of vegetation for native species, particularly threatened species.

Weed management controls will include:

- The survey and treatment of invasive weed species prior to the disturbance of topsoil within the development footprint to prevent exacerbation of the outbreak and / or the spread of the subject species to previously unaffected areas within the development footprint.

- Ongoing environmental inspections and treatment of outbreaks of invasive weed species as required within the development footprint during the construction and operation of the project.
- All machinery and equipment will be cleaned thoroughly prior to entering the Subject Land. Cleaning must include the removal of all mud and plant matter (inside and out), followed by washing with high pressure water.

### 8.4.6 Preparation and Implement of Construction Environmental Management Plan

A Construction Environmental Management Plan will be prepared to document the environmental impact mitigation, performance targets and monitoring requirements for the construction and operational phases of the project.

**Table 8.4 Summary of Proposed Mitigation and Management Measures for Residual Impacts (Direct, Indirect, and Prescribed)**

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Workforce education and training	Environmental awareness for construction and operational site workers	Construction and operation	For all new contractors and employees as part of the general site induction	Site Manager	Measure is likely to achieve intended outcome
Identification of approved disturbance areas and implementation of vegetation protection zones for areas to be retained	Temporary delineation of the development footprint until permanent fencing is installed.	Construction / site clearing	Prior to and during site clearing and construction Permanent fencing to remain for the life of the development	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome
Ecologist pre-clearance survey of disturbance footprint prior to clearing and construction works and supervision of works	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Prior to construction works and during site clearing	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Erosion and sedimentation control	Installation and maintenance of appropriate erosion and sediment controls and work practices.	Prior to and during clearing works until permanent controls such as sediment basins are installed and established.	Temporary erosion and sediment controls would be installed prior to commencement of construction and permanent measures such as stormwater detention basins would be maintained for the life of the development.	Site Manager	Measure is likely to achieve intended outcome
Weed management	Targeted spraying and/or grazing to suppress weed invasion	All stages of the development	As needed	Site Manager / Project Ecologist	Measure is likely to achieve intended outcome
Fencing, Access Control and Fauna exclusion	Installation of a permanent security fence	During operation	For the life of the development	Site Manager	Measure is likely to achieve intended outcome
Preparation and Implement of Construction Environmental Management Plan	Develop plan to adequately manage environmental impacts during construction including dam dewatering controls, fencing and access control, weed management and erosion and sediment control.	To prepared prior to the commencement of works and implemented for all construction works and for the life of the development as necessary	For the life of the development	Proponent / Site Manager	Measure is likely to achieve intended outcome

Implementation details for the proposed impact mitigation and management measures are provided in **Table 8.5.**

**Table 8.5 Implementation Details for Proposed Impact Mitigation and Management Measures**

Measure/action	Monitoring and evaluation strategy	Performance criteria	Adaptive management threshold	Adaptive management response
Workforce education and training	Completion and maintenance of a site induction register.	Induction of all construction workers.	Failure of Site manager to induct workers.	Breach to be reported in annual compliance reporting. Suspension of the relevant works until construction workers are inducted.
Implementation of vegetation protection zones for areas to be retained	Monitoring to be undertaken by the Project Ecologist prior to commencement and monthly during construction works.	Protection of retained vegetation and habitats.	Breach of vegetation protection zones / damaged to retained habitats.	Breach to be reported in annual compliance reporting. Suspension of the relevant works until appropriate protection measures are implemented and appropriate remedial actions to remedy any adverse impacts are completed.
Ecologist pre-clearance surveys and supervision of works	Reporting on pre-clearance surveys and works supervision to be undertaken by Project Ecologist.	Completion of proposed works.	Completion of clearing works without project ecologist supervision.	Breaches to be reported in annual compliance reporting to DPE.
Erosion and sedimentation control	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Temporary erosion and sediment controls to be installed prior to works. Permanent controls to be maintained for the life of the development.	Monitoring detects lack or failure of required temporary or permanent erosion and sediment controls.	Breaches to be reported in annual compliance reporting to DPE.
Weed management	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Weed growth to be continually suppressed within the development footprint.	Monitoring detects increasing weed infestations which are not being suppressed.	Alternative methods or herbicides to be used to achieve success.

Measure/action	Monitoring and evaluation strategy	Performance criteria	Adaptive management threshold	Adaptive management response
Fencing, Access Control and Fauna exclusion	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Exclusion of all target fauna species.	Repair or upgrade to fencing.	Fencing design to be improved to achieve effectiveness.
Preparation and Implement of Construction Environmental Management Plan	Implementation to be supervised by Project Ecologist or suitable environmental consultant.	Completion of all proposed environmental protection works and monitoring inspections.	Monitoring detects breach or failure to implement Construction Environmental Management Plan.	Breach to be included in annual compliance reporting to DPE.

## 8.5 Adaptive Management Strategy for Uncertain Impacts (Where Relevant)

It is considered that the potential impacts associated with the project are predictable and known however there is a level of uncertainty in regard to modelled impacts which cannot be directly calculated before the impact occurs. Impacts which have been assessed by modelling include surface water impacts, groundwater drawdown and vibration and blasting. Adaptive strategies for impact mitigation measures are provided in **Table 8.6**.

**Table 8.6 Adaptive Management Strategy Details for Uncertain Impacts**

Impact Description	Base Line Data Required and Monitoring Method	Monitoring Frequency and Reporting Schedule	Performance Indicators for Management Intervention	Management Response	Risk of Monitoring Failure
Changes to vegetation structure and floristic composition resulting from modifications to the hydrological regime	BAM Vegetation Integrity Plots in retained potential areas of impact	Annual	>30% reduction in vegetation integrity score sustained over 3 consecutive years, attributable to the Project	Provision of BAM credits proportional to the vegetation integrity loss over the area affected.	Low
Changes to vegetation structure and floristic composition resulting from groundwater drawdown	BAM Vegetation Integrity Plots in retained potential areas of impact and additional survey and investigation work to determine nature and extent of GDE groundwater dependency in the drawdown zone prior to Stage 5.	Annual (to be commenced at least 2 years prior to predicted drawdown impacts outside the Disturbance Footprint)	To be developed in accordance with the recommendation of the GIA and any approval conditions. Suggest >30% reduction in vegetation integrity score sustained over 3 consecutive years, attributable to the Project.	Provision of BAM credits proportional to the vegetation integrity loss over the area affected.	Low
Modifications to habitat suitability resulting from blasting and vibration	BAM Vegetation Integrity Plots in retained potential areas of impact and Species Credit Threatened Fauna Population Monitoring for the Koala, Squirrel Glider and Brush-tailed Phascogale	Annual	Lack of species presence within retained areas over 5 consecutive years, attributable to the project.	Provision of species credits for the affected blast area	Moderate potential for false negative results.

## 8.6 Other Relevant Biodiversity Impact Assessment Legislation

### 8.6.1 Environment Protection and Biodiversity Conservation Act

An assessment of Matters of National Environmental Significance listed under the EPBC Act is provided in **Appendix B** of this Report.

The assessment has identified that the project is likely to have a significant impact on the following MNES entities:

- Koala (*Phascolarctos cinereus*)

### 8.6.2 State Environmental Planning Policy (Biodiversity and Conservation 2021) Chapter 3 Koala Habitat Protection

The project is a State significant development and therefore the provisions of State Environmental Planning Policy (SEPP) (Biodiversity and Conservation 2021) Chapter 3 Koala Habitat Protection, do not apply.

If the SEPP was applicable, a consideration as to whether the land contains potential and/or core koala habitat would be required and for core koala habitat any development approved would need to be consistent with the Port Stephens Comprehensive Koala Plan of Management (PSC 2002).

One Koala feed tree species listed within Schedule 1 of SEPP (Biodiversity and Conservation 2021), *Eucalyptus tereticornis*, was observed within the subject land during surveys. It was recorded at a density of at least 15% within plot 7 in PCT 1716, plot 12B in PCT 1618 and plot 22 in PCT 762. It is therefore considered that potential koala habitat (as defined under Chapter 3 of the SEPP) is present.

Core koala habitat under Chapter 3 of the SEPP means an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population. Based on the koala records obtained during surveys completed by Umwelt and a review of Bionet Atlas records, it is considered that the subject land contains both recent sightings and historical records of a koala population.

The Port Stephens Koala Habitat Planning Map identifies that the subject land (comprising the Project Disturbance Area) contains mostly marginal koala habitat within small areas of preferred koala habitat and buffer and linking habitats over marginal habitat, mostly concentrated around the site access. Approximately 94% of the Project Disturbance Area is mapped as marginal koala habitat.

The Port Stephens CKPOM (Part 1 Appendix 4) provides performance criteria for development applications within the LGA for sites that contain or are adjacent to Preferred or Supplementary Habitat, Habitat Buffers or Habitat Linking Areas. The CKPOM identifies that the Guidelines for Koala Habitat Assessments are relevant for rezoning proposals and development applications under Part 4, of the EP&A Act. The performance criteria within the CKPOM is not relevant to state significant development, because SEPP (Biodiversity and Conservation 2021) Chapter 3 Koala Habitat Protection does not apply.

In compliance with the assessment requirements of the BAM (DPIE 2020a) and the Koala BAM Survey Guide (DPE 2022b), the entire subject land has been included within the species polygon determined for the koala.

### **8.6.3 Fencing, Access Control and Fauna Exclusion**

Security fencing is unlikely to impact fauna and a koala exclusion fence would limit access to the quarry pit and prevent koala access to operational areas.

## 9.0 Serious and Irreversible Impacts

### 9.1 Assessment for Serious and Irreversible Impacts on Biodiversity Values

The determination of a serious and irreversible impact on biodiversity values is to be made by the decision maker in accordance with the principles set out in the BC Regulation 2017. Under Clause 6.7 (2) of the BC Regulation 2017, 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 of one of the following four principles:

- Principle 1: The impact 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, or
- Principle 2: the impact 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, or
- 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, or
- 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.

No potential Serious and Irreversible Impact Entities were observed during surveys.

Breeding habitat for the Eastern Cave Bat, Little Bent-winged Bat and the Eastern Bent-winged Bat is a potential SAll entity. Confirmed calls of the Little Bent-winged Bat and Eastern Bent-winged Bat were recorded during surveys. A potential, although unlikely call for the Eastern Cave Bat was also obtained. Both species of the Bent-winged Bats are known to roost in the Balickera Tunnel, however the females are reported as absent during summer indicating that the tunnel is not used as breeding habitat (Eco Logical Australia 2021). The tunnel has also not been reported as providing roost or breeding habitat for the Eastern Cave Bat.

# 10.0 Impact Summary

## 10.1 Determining an Offset Requirement for Impacts

### 10.1.1 Impacts on Native Vegetation and TECs (Ecosystem Credits)

There are no PCTs which do not require an offset (as per BAM Subsection 9.2.1(3.)). The PCTs which require ecosystem credits are listed in **Table 10.1**. Biodiversity Credit Reports are provided as **Appendix F**.

**Table 10.1 Impacts that Require an Offset – Ecosystem credits**

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
PCT 762 - Intact	Cabbage Gum open forest or woodland on flats of the North Coast	Yes	0.33	78.8	0	-78.8	2	13
PCT 1590 - Intact	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	No	45.63	74.1	0	-74.1	1.5	1268
PCT 1618 - Intact	Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast	Yes	0.88	78.1	0	-78.1	2	34
PCT 1619 - Intact / Apple variant	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	No	19.52	70.7	0	-70.7	1.5	518

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
PCT 1619 - Intact / Apple-Ironbark Forest variant	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	No	8.75	80.5	0	-80.5	1.5	264
PCT 1716– Regenerating	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	Yes	3.91	76.4	0	-76.4	1.75	131
<b>Total ecosystem credits</b>								<b>2228</b>

### 10.1.2 Impacts on Threatened Species and Their Habitat (Species Credits)

Table 10.2 provides a summary of the species credit threatened that require an offset (as per BAM Subsection 9.2.2(2.)) and identifies the amount of credits required. Species polygons are mapped in Figure 5.1 to Figure 5.4.

**Table 10.2 Impacts that Require an Offset – Species Credits**

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Rusty Greenhood	<i>Pterostylis chaetophora</i>	V	-	3.9 ha	2	149
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-	79.02 ha	2	2929
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	-	79.02 ha	2	2929
Koala	<i>Phascolarctos cinereus</i>	E	E	79.02 ha	2	2929
<b>Total species credits</b>						<b>8936</b>

### **10.1.3 Indirect and Prescribed Impacts**

No offsets are required or proposed for indirect and prescribed impacts.

## **10.2 Impacts that Do Not Need Further Assessment**

Areas within the development footprint that do not contain native vegetation do not need to be assessed for ecosystem credits (as per BAM Section 9.3(1–2.)). There were no areas of non-native vegetation identified within the development footprint or Subject Land.

Potential calls of the Southern Myotis (*Myotis macropus*) and the Eastern Cave Bat (*Vespadelus troughtoni*) were recorded during surveys. There are no plant community types present which are associated with the Eastern Cave Bat and the required habitat constraints (within 200 m of waterbodies with pools/stretchers greater than 3m wide). Therefore, no credits are required to be generated for these species credit entities.

# 11.0 Biodiversity Credit Obligations

Biodiversity Credit Reports which identify the like-for-like and variation credit requirements are provided in **Appendix F**. Further details on the biodiversity credit requirements for the project are provided as follows.

## 11.1 Ecosystem Credits

The ecosystem credit requirements and those that could be retired in accordance with the offset rules are listed in **Table 11.1**. It is noted that there are mismatches between TEC determinations made within this Report based on the relevant NSW Scientific Committee Final Determinations and the results of site surveys, and TECs selectable in BAM-C which are documented in **Table 11.1**.

For PCT 762 the BAM-C TEC association selectable is Subtropical Coastal Floodplain Forest, but the TEC association determined through surveys is River-flat Eucalypt Forest on Coastal Floodplain. For PCT 1716, no TEC association is not selectable, despite the PCT within the development footprint being associated with the Subtropical Coastal Floodplain Forest TEC.

**Table 11.1 Ecosystem Credit Class and Matching Credit Profiles**

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast  13 credits	Like for Like	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion. This includes PCT's: 621, 686, 761, 762, 837, 848, 852, 971, 1062, 1091, 1092, 1106, 1215, 1227, 1230, 1333, 1588,	Coastal Valley Grassy Woodlands	Grassy Woodlands	Yes	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion EEC (Assessed as part of River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and	No	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 km of the outer edge of the impacted site.

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
		1594, 1598  3087, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046				South East Corner Bioregions (EEC)		
	Variation			Grassy Woodlands		Tier 3 or higher threat status	No	NSW North Coast or Any IBRA subregion that is within 100km of the outer edge of the impacted site.
PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest  1268 credits	Like for Like	715, 904, 922, 1178, 1215, 1588, 1589, 1590, 1591, 1592, 1593, 1600, 1601, 1602, 1608, 1612, 1626, 1748  3431, 3432, 3433,	Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	No	Hunter-Macleay Dry Sclerophyll Forests - < 50% cleared group (including Tier 4 or higher threat status).	Yes	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. Or any IBRA subregion that is within 100 km of the outer edge of the impacted site.

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
		3434, 3435, 3436, 3437, 3438, 3439, 3441, 3442, 3443, 3444, 3445, 3446, 3447						
	Variation			Dry Sclerophyll Forests (Shrub/grass sub-formation)		Tier 4 or higher threat status	Yes	NSW North Coast or any IBRA subregion that is within 100 km of the outer edge of the impacted zone.
PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast  34 credits	Like for Like	686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794  3135, 3181, 3185, 3188, 3192, 3285, 3328, 4024, 4025,	Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. Or any IBRA subregion that is within 100 km of the outer edge of the impacted site.

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
		4039, 4041, 4058, 4138						
	Variation			Dry Sclerophyll Forests (Shrubby sub-formation)		Tier 3 or higher threat status	No	NSW North Coast or any IBRA subregion that is within 100 km of the outer edge of the impacted zone.
PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands -Intact Apple Variant 518 credits	Like for Like	1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787, 3579, 3580,	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	No	Sydney Coastal Dry Sclerophyll Forests - < 50% cleared group (including Tier 4 or higher threat status).	Yes	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. Or any IBRA subregion that is within 100 km of the outer edge of the impacted site

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
		3581, 3582, 3583, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598,						
	Variation			Dry Sclerophyll Forests (Shrubby sub-formation)		Tier 4 or higher threat status	Yes	NSW North Coast or any IBRA subregion that is within 100 km of the outer edge of the impacted zone.
PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands -Intact Apple / Ironbark Variant	Like for Like	1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643,	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	No	Sydney Coastal Dry Sclerophyll Forests - < 50% cleared group (including Tier 4 or higher threat status).	No	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. Or any IBRA subregion that is within 100 km of the outer edge of the impacted site

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
264 credits		1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787 3579, 3580, 3581, 3582, 3583, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598,						
	Variation			Dry Sclerophyll Forests (Shrubby sub-formation)		Tier 4 or higher threat status	No	NSW North Coast or any IBRA subregion that is within 100 km of the outer edge of the impacted zone.
PCT 1716 Prickly-leaved Paperbark Forest on Coastal	Like for Like	837, 839, 926, 971, 1064, 1092, 1227, 1230,	Coastal Swamp Forests	Forested Wetlands	Yes	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW	No	Upper Hunter, Ellerston, Hunter, Karuah Manning,

Ecosystem credit	Rule Type	Attributes shared with matching credits							
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion	
Lowlands of the Central Coast and Lower North Coast  131 credits		1231, 1232, 1235, 1649, 1715, 1716, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057.					North Coast, Sydney Basin and South East Corner Bioregions (Assessed as Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion)		Mummel Escarpment and Tomalla. Or any IBRA subregion that is within 100 km of the outer edge of the impacted site
	Variation			Forested Wetlands		Tier 3 or higher threat status	No	NSW North Coast or any IBRA subregion that is within 100 km of the	

Ecosystem credit	Rule Type	Attributes shared with matching credits						
		PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC	Offset trading group	Hollow bearing trees present?	IBRA subregion
								outer edge of the impacted zone.

## 11.2 Species Credits

The species credit requirements and those that could be retired in accordance with the offset rules are listed in **Table 11.2**.

**Table 11.2 Species Credit Class and Matching Credit Profiles**

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
Rusty Greenhood ( <i>Pterostylis chaetophora</i> )  149 credits	Variation Rules: Any species with same or higher category of listing under Part 4 of the BC Act  Like for Like Rules: <i>Pterostylis chaetophora</i>	Flora	Vulnerable	Not listed	Variation Rules: Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.  Like for like rules: Any in NSW
Squirrel Glider ( <i>Petaurus norfolcensis</i> )  2929 credits	Variation Rules: Any species with same or higher category of listing under Part 4 of the BC Act  Like for Like Rules: Squirrel Glider	Fauna	Vulnerable	Vulnerable	Variation Rules: Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  Or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.  Like for like rules: Any in NSW

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
Brush-tailed Phascogale ( <i>Phascogale tapoatafa</i> )  2929 credits	Variation Rules: Any species with same or higher category of listing under Part 4 of the BC Act  Like for Like Rules: Brush-tailed Phascogale	Fauna	Vulnerable	Not listed	Variation Rules: Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site. Like for like rules: Any in NSW
Koala ( <i>Phascolarctos cinereus</i> )  2929	Variation Rules: N/A - Offsets required to meet like-for-like rules under EPBC Act  Like for Like Rules: Koala	Fauna	Endangered	Endangered	Variation Rules: Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site. Like for like rules: Any in NSW.

### 11.3 Biodiversity Offset Strategy

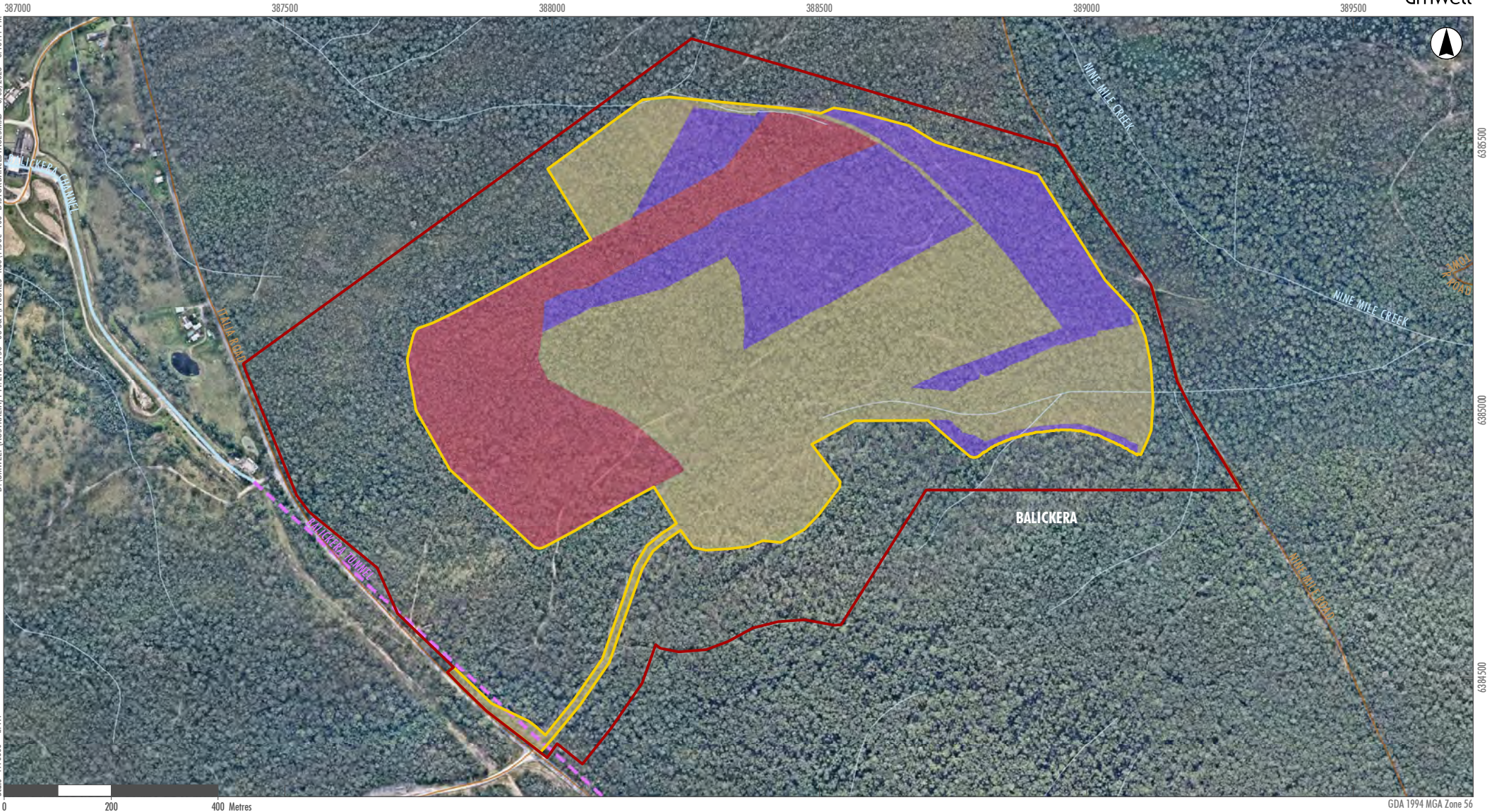
The retirement of biodiversity credits is proposed to be undertaken within the following three phases, based on the vegetation removal and overburden phases mapped in **Figure 11.1**:

- Phase 1 - 38.74 ha (Stages 0–2)
- Phase 2 - 21.43 ha (Stages 3-5)
- Phase 3 -18.86 ha (Stages 6-9).

The proposed staged credit retirement will match the areas of staged impacts to entities requiring credits, as shown in **Table 11.3**. At present there is no specific proposal to fund a biodiversity conservation action or conduct ecological rehabilitation to generate biodiversity credits for the Project. Notwithstanding, the proponent will be consulting with relevant local stakeholders during preparation of the Biodiversity Offset

Strategy to determine opportunities relating to biodiversity conservation actions / ecological rehabilitation in the local area.

In addition, the Proponent has committed to further investigate the retirement of biodiversity credits through the establishment of a Biodiversity Stewardship Site within the Wallaroo State Forest. Where credits are not generated and retired within the Wallaroo State Forest they will be purchased from the market or a payment will be made to the Biodiversity Conservation Fund. The like-for-like credit rules will be followed for nationally listed entities which require credits. The like-for-like or variation rules will be followed for all other entities which require credits.



- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Road
  - Balickera Tunnel
  - Drainage Line
- Stage**
- Phase 1 (Stages 0-2)
  - Phase 2 (Stages 3-5)
  - Phase 3 (Stages 6-9)

**FIGURE 11.1**  
**Vegetation Removal and Overburden stripping Stages**

**Table 11.3 Proposed Staged Credit Retirement Details**

Entity and Total Credits Required	Total Credits Required	Stage No.	Area of Impact on Entity per Stage (ha)	Credits to be retired per stage
PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast	13	1	0.33	13
		2	-	-
		3	-	-
PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	1268	1	12.39	344
		2	15.42	429
		3	17.82	495
PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - <i>Melaleuca sieberi</i> shrubby open forest on lowlands of the lower North Coast	34	1	0.88	34
		2	-	-
		3	-	-
PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	782	1	22.24	615
		2	5	138
		3	1.03	29
PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast	131	1	2.9	97
		2	1.02	34
		3	-	-
Rusty Greenhood ( <i>Pterostylis chaetophora</i> )	149	1	2.9	110
		2	1.02	39
		3	-	-
Squirrel Glider ( <i>Petaurus norfolcensis</i> )	2929	1	38.7	1436
		2	21.43	794
		3	18.86	699
Brush-tailed Phascogale ( <i>Phascogale tapoatafa</i> )	2929	1	38.7	1436
		2	21.43	794
		3	18.86	699
Koala ( <i>Phascolarctos cinereus</i> )	2929	1	38.7	1436
		2	21.43	794
		3	18.86	699

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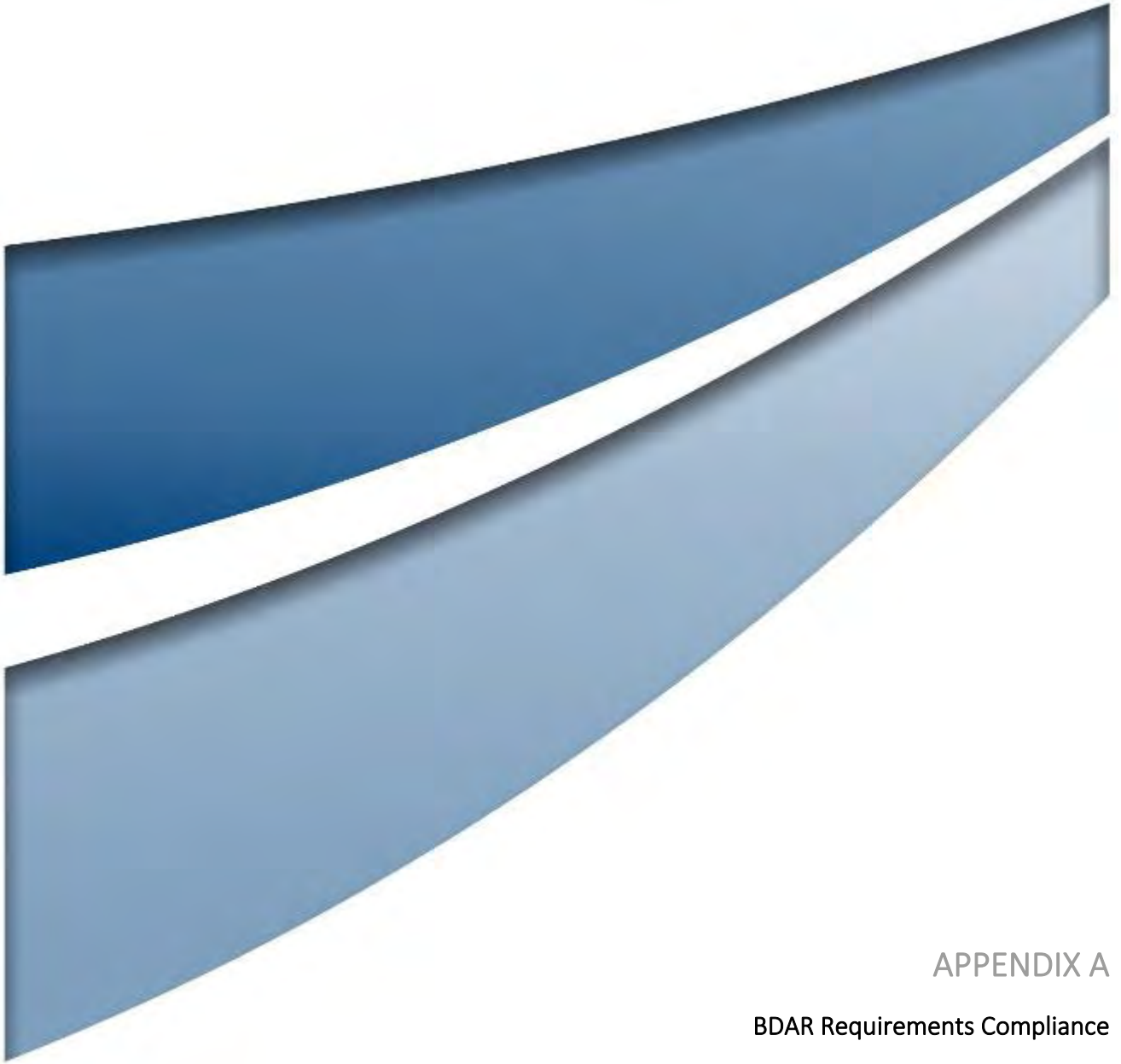
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APPENDIX A

**BDAR Requirements Compliance**

# SEARS & BDAR Compliance Requirements

# 1.0 SEARS Requirements Compliance Details

Compliance with the SEARs Biodiversity Assessment Requirements for the project is documented in **Table A1.1**.

**Table A 1.1 Biodiversity Assessment Requirements for the project**

Relevant Agency	Requirements	Comments
NSW DPIE SEARs	Accurate predictions of any vegetation clearing on site;	Vegetation clearing totals for each Plant Community Type (PCT) have been calculated using GIS software, in accordance with the requirements of the BAM. Vegetation clearing totals are provided in <b>Table 8.2</b> of the BDAR.
	A detailed assessment of the likely biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems, undertaken in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report;	This Report provides an assessment of the likely biodiversity impacts associated with the project, in accordance with the requirements of the BAM. Groundwater dependant ecosystems are addressed in <b>Section 4.6</b> and <b>Section 6.1, Table 6.1</b> of the BDAR.
	A strategy to offset any residual impacts of the development in accordance with the Biodiversity Offsets Scheme;	A proponents biodiversity offset strategy is summarised in <b>Section 11.3</b> of the BDAR.
SEARS Agency Advice - DPIE – Hunter Central Coast Branch - Biodiversity and Conservation Division	Biodiversity impacts related to the proposed development (SSD 10432) are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	This BDAR has been prepared in accordance with the BC Act, the BC Regulation, the Biodiversity Assessment Method, the NSW DPIE BDAR template associated Guidance for the Biodiversity Development Assessment Report Template documentation (DPIE 2022). The BDAR minimum information compliance requirements are addressed in <b>Section 2</b> of this Appendix.
	The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Impact avoidance and minimisation measures are addressed in <b>Section 7</b> . Direct impacts are documented in <b>Section 8.1</b> . of the BDAR. Indirect Impacts are documented in <b>Section 8.2</b> of the BDAR. Prescribed Impact are documented in <b>Section 8.3</b> of the BDAR.

Relevant Agency	Requirements	Comments
	<p>The BDAR must include details of the measures proposed to address the offset obligation as follows;</p> <ul style="list-style-type: none"> <li>• The total number and classes of biodiversity credits required to be retired for the development/project;</li> <li>• The number and classes of like-for-like biodiversity credits proposed to be retired;</li> <li>• The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules;</li> <li>• Any proposal to fund a biodiversity conservation action;</li> <li>• Any proposal to conduct ecological rehabilitation (if a mining project);</li> <li>• Any proposal to make a payment to the Biodiversity Conservation Fund.</li> </ul>	<p>The Biodiversity Offset Strategy for the project is documented in <b>Section 11.3</b> of the BDAR.</p>
	<p>If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.</p>	<p>There is currently no proposal to use the variation rules.</p>
	<p>The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.</p>	<p>Details of the project team and accredited assessor are included in the Declarations page at the front of the BDAR.</p>
<p>Port Stephens Council</p>	<p>The BDAR must include the following:</p>	
	<p>A detailed assessment of the potential indirect impacts (including noise and vibration impacts) on any threatened species, populations, endangered ecological communities or their habitats, as well as groundwater dependent ecosystems must be made.</p>	<p>Addressed in <b>Section 8.2</b> of the BDAR.</p>
	<p>A detailed habitat and genetic connectivity assessment for Koala and Brush-tailed Phascogale to assess connectivity of the local population(s) north and south of the Balickera Canal to accurately assess potential impacts and to inform mitigation and offset strategies.</p>	<p>A description of the existing habitat connectivity is provided in <b>Section 3.2.3</b> of the BDAR. Impacts to habitat and genetic connectivity are addressed in <b>Section 8.3.5</b> of the BDAR.</p>

Relevant Agency	Requirements	Comments
	<p>A detailed cumulative impact assessment must be undertaken for the EIS and BDAR in accordance with the BAM, with particular consideration given to biodiversity, namely fauna habitat connectivity for threatened species including Brush-tailed Phascogale and the Koala.</p> <p>All projects in the locality with potential for cumulative impacts must be assessed, including but not limited to: Kings Hill Urban Release Areas and its associated critical infrastructure, adjacent quarry expansions and the proposed M1 motorway extension.</p>	<p>An assessment of the potential impacts to habitat connectivity is provided in <b>Section 8.2</b> of the BDAR.</p> <p>Impacts to habitat connectivity are addressed in <b>Section 8.3.5</b> of the BDAR.</p>
	<p>An assessment of the project against the Port Stephens Council Comprehensive Koala Plan of Management must be undertaken, including assessment against the performance criteria provided in Appendix 4 of the Comprehensive Koala Plan of Management.</p>	<p>The application of the Port Stephens Comprehensive Koala Plan of Management to the project is addressed in <b>Section 8.6.2</b> of the BDAR.</p>
	<p>Consultation must be undertaken with Hunter Water for assessing impact to threatened microbats in relation to potential breeding habitat contained in the nearby Balickera Tunnel.</p>	<p>The Detailed Balickera Tunnel Remediation Works Species Impact Statement prepared for Hunter Water Corporation by Eco Logical (2021) was reviewed as part of the BDAR. This document provides comprehensive details on the importance of the Balickera Tunnel to microbat species.</p>
	<p>Should potential impacts to any threatened EPBC Act listed biodiversity be likely consideration of the EPBC Act significant impact guidelines must be undertaken, and an EBPC Act Referral undertaken should a significant impact be likely.</p>	<p>The proposal has been determined by DCCEW to be a controlled action.</p>
	<p>Details of weed management during construction and operation in accordance with existing State, regional or local weed management plans or strategies.</p>	<p>Weed management will be addressed as part of a Construction Environmental Management Plan prepared, subject to project approval.</p>
	<p>The following management plans should be prepared in support of the application:  A detailed statement of commitments for measures to be included in a Biodiversity Management plan including:</p> <ul style="list-style-type: none"> <li>o Compensatory hollows with a preference for augmented hollows</li> <li>o Site rehabilitation</li> <li>o Biodiversity Monitoring Plan</li> </ul>	<p>A commitment to the preparation of a Construction Environmental Management Plan is provided in <b>Section 8.4.7</b> of the BDAR.</p>
	<p>A commitment for satisfying the Biodiversity Offsetting requirements identified in the BDAR must be provided.</p>	<p>A Biodiversity Offsetting Strategy is provided in <b>Section 11.3</b> of the BDAR.</p>

Relevant Agency	Requirements	Comments
	A detailed site stabilisation plan must be provided as part of the EIS, along with a conceptual rehabilitation strategy and a conceptual final landform.	Rehabilitation details are provided separately to the BDAR as part of the EIS.
Australian Government – Department of Climate Change, Energy, the Environment and Water	Project Assessment Notes issued as part of the SEARS	Addressed in <b>Appendix B</b> as part of the Matters of National Environmental Significance Assessment Report

## 2.0 BDAR Requirements Compliance Details

Compliance with the BDAR minimum information requirements of the BAM is documented in **Table A1.2**.

**Table A1.2 Assessment of compliance with BDAR minimum information requirements**

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Introduction	Chapters 2 and 3	<b>Information</b>	
		Introduction to the biodiversity assessment including:	–
		<input checked="" type="checkbox"/> brief description of the proposal	<b>Section 1.2.1</b>
		<input checked="" type="checkbox"/> identification of subject land boundary, including: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> operational footprint</li> <li><input checked="" type="checkbox"/> construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure</li> </ul>	<b>Section 1.2.2 and Figures 1.1 and 1.2</b>
		<input checked="" type="checkbox"/> general description of the subject land	<b>Section 1.1.2</b>
		<input checked="" type="checkbox"/> sources of information used in the assessment, including reports and spatial data	<b>Section 1.6.</b> Also referenced in text and listed in the References Section
		<input checked="" type="checkbox"/> identification and justification for entering the BOS	<b>Section 1.1</b>
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	<b>Figure 1.1</b>

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Landscape	Sections 3.1 and 3.2, Appendix E	<b>Information</b>	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	Section 1.2.2
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 3.3 and Figure 1.2
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 3.2.1 and Figures 1.1 and 1.2
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 3.2.2 and Figure 1.1 and 1.2
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 3.2.2 and Figure 3.1
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 3.2.3
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	Section 3.2.4
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Section 3.2.5
		☒ any additional landscape features identified in any SEARs for the proposal	Section 3.2.7
		☒ NSW (Mitchell) landscape on which the subject land occurs	Section 3.2.6
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	Section 3.3
		<b>Maps and tables</b>	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	Figure 1.1

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

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Native vegetation	Chapter 4, Appendix A and Appendix H	<b>Information</b>	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Section 4.1 and Figure 4.1
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 4.1.2
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Section 2.2.1
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 2.2.3
		☒ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	Not applicable
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	Section 4.2.1, Table 4.1
		☒ vegetation class	Section 4.2.1, Table 4.1
		☒ extent (ha) within subject land	Section 4.2.1, Table 4.1
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	Section 4.2.2
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	Section 4.2.2
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 4.2.2, Section 4.3 and Appendix C
☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	Table 4.1		
Describe the vegetation integrity assessment of the subject land, including:	–		

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<input checked="" type="checkbox"/> identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Method provided in <b>Section 2.2</b> , Results provided in <b>Table 4.1, Figure 4.2</b> and <b>Section 4.2.2</b>
		<input checked="" type="checkbox"/> description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	<b>Section 4.2.2</b>
		<input checked="" type="checkbox"/> area (ha) of each vegetation zone	<b>Table 4.1</b>
		<input checked="" type="checkbox"/> assessment of patch size (as described in BAM Subsection 4.3.2)	<b>Table 4.1</b>
		<input checked="" type="checkbox"/> survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	<b>Table 2.1</b> and <b>Table 4.9</b>
		<input checked="" type="checkbox"/> use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	<b>Section 4.5.3</b>
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	–
		<input type="checkbox"/> identify the PCT or vegetation class for which local benchmark data will be applied <input type="checkbox"/> identify published sources of local benchmark data (if benchmarks obtained from published sources) <input type="checkbox"/> describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	Not applicable
		<input type="checkbox"/> provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	Not applicable
		<input type="checkbox"/> provide written confirmation from the decision-maker that they support the use of local benchmark data	Not applicable
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	<b>Figure 4.1</b>
		<input checked="" type="checkbox"/> Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	<b>Figure 4.2</b>
		<input checked="" type="checkbox"/> Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	<b>Figure 4.2</b>
		<input checked="" type="checkbox"/> Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	<b>Figure 2.1</b>

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<input checked="" type="checkbox"/> Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	<b>Figure 4.3 and Table 4.8</b>
		<input checked="" type="checkbox"/> Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Patch size not mapped and exceeds 100ha for all vegetation condition zones, as listed in <b>Table 4.9</b>
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	–
		<input checked="" type="checkbox"/> composition condition score <input checked="" type="checkbox"/> structure condition score <input checked="" type="checkbox"/> function condition score <input checked="" type="checkbox"/> presence of hollow bearing trees	<b>Table 4.10</b>
		<b>Data</b>	
		<input checked="" type="checkbox"/> All report maps as separate jpeg files	–
		<input checked="" type="checkbox"/> Plot field data (MS Excel format)	
		<input checked="" type="checkbox"/> Plot field datasheets	<b>Appendix D</b>
		Digital shape files of:	–
		<input checked="" type="checkbox"/> PCT boundaries within subject land	–
		<input checked="" type="checkbox"/> TEC boundaries within subject land	–
		<input checked="" type="checkbox"/> vegetation zone boundaries within subject land	–
		<input checked="" type="checkbox"/> floristic vegetation survey and vegetation integrity plot locations	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
<b>Threatened species</b>	<b>Chapter 5</b>	<b>Information</b>	
		Identify ecosystem credit species likely to occur on the subject land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	<b>Table 5.1</b>
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<b>Table 5.1</b>
		☒ justification for addition of any ecosystem credit species to the list	<b>Table 5.1 /</b> Justification for inclusion of additional Bionet Atlas species documented in <b>Section 2.4.2</b>
		Identify species credit species likely to occur on the subject land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	<b>Table 5.2 and Table 5.3</b>
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<b>Table 5.2 and Table 5.3</b>
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	<b>Table 5.2 and Table 5.3</b>
		☒ justification for addition of any species credit species to the list	<b>Table 5.2 and Table 5.3 /</b> Justification for inclusion of additional Bionet Atlas species documented in <b>Section 2.4.2</b>
From the list of candidate species credit species, identify:	–		

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<input checked="" type="checkbox"/> species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) <input checked="" type="checkbox"/> species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) <input checked="" type="checkbox"/> species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.)) <input checked="" type="checkbox"/> species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	<b>Table 5.4 and Table 5.5</b>
		Present the outcomes of species credit species assessments from:	–
		<input checked="" type="checkbox"/> threatened species survey (as described in BAM Section 5.2.4)	<b>Section 5.2.1 (flora) and Section 5.2.2 (fauna)</b>
		<input type="checkbox"/> expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	Not applicable
		Where survey has been undertaken include detailed information on:	–
		<input checked="" type="checkbox"/> survey method and effort (as described in BAM Section 5.3)	<b>Section 5.3</b>
		<input checked="" type="checkbox"/> justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department’s taxa-specific survey guides or where no relevant guideline has been published	<b>Section 2.7, Section 2.3.4 and Section 2.4.4.1</b>
		<input checked="" type="checkbox"/> timing of survey in relation to requirements in the TBDC or the department’s taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	<b>Table 5.6 and Table 5.7</b>
		<input checked="" type="checkbox"/> survey personnel and relevant experience	Project Team including survey personnel are listed in the preface of the report. CVs can be provided on request.
		<input checked="" type="checkbox"/> describe any limitations to surveys and how these were addressed/overcome	<b>Section 2.7</b>
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<input type="checkbox"/> justification of the use of an expert report <input type="checkbox"/> identify the expert, provide evidence of their expert credentials and departmental approval of expert status <input type="checkbox"/> all requirements of Box 3 have been addressed in the expert report	Not applicable
		Where use of local data is proposed (BAM Subsection 1.4.2):	–
		<input type="checkbox"/> identify relevant species <input type="checkbox"/> identify data to be amended <input type="checkbox"/> identify source of information for local data, e.g. published literature, additional survey data, etc. <input type="checkbox"/> justify use of local data in preference to VIS Classification or TBDC data	Not applicable
		<input type="checkbox"/> provide written confirmation from the decision-maker that they support the use of local data	Not applicable
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		<input checked="" type="checkbox"/> the unit of measure for each species is documented	<b>Section 5.3.2</b>
		for species assessed by area:	–
		<input checked="" type="checkbox"/> the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	<b>Section 5.3.2, Tables 5.8 to 5.11 and Figures 5.1 to 5.4</b>
		<input checked="" type="checkbox"/> a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	<b>Section 5.3.2</b>
		for species assessed by counts of individuals:	–
		<input checked="" type="checkbox"/> the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	<b>Section 5.3.2</b>
		<input checked="" type="checkbox"/> the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	<b>Section 5.3.2</b>
		<input checked="" type="checkbox"/> the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	<b>Section 5.3.2</b>
		<input checked="" type="checkbox"/> Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	<b>Section 5.3.2, Tables 5.8 to 5.11</b>

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	<b>Table 5.1</b>
		<input checked="" type="checkbox"/> the ecosystem credit species removed from the list	<b>Table 5.1</b>
		<input checked="" type="checkbox"/> the sensitivity to gain class of each species	<b>Table 5.1</b>
		<input checked="" type="checkbox"/> Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	<b>Table 5.2 and Table 5.3</b>
		<input checked="" type="checkbox"/> the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	<b>Table 5.2 and Table 5.3</b>
		<input checked="" type="checkbox"/> the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	<b>Table 5.4 and Table 5.5</b>
		<input checked="" type="checkbox"/> Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	<b>Section 5.3.2, Tables 5.8 to 5.11</b>
		<input checked="" type="checkbox"/> Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	<b>Figures 5.1 to 5.4</b>
		<b>Data</b>	
		<input checked="" type="checkbox"/> Digital shape files of suitable habitat identified for survey for each candidate species credit species	–
		<input checked="" type="checkbox"/> Survey locations including GPS coordinates of any plots, transects, grids	
		<input checked="" type="checkbox"/> Digital shape files of each species polygon including GPS coordinates of located individuals	–
		<input checked="" type="checkbox"/> Species polygon map in jpeg format	–
		<input type="checkbox"/> Expert reports and any supporting data used to support conclusions of the expert report	Not applicable
		<input type="checkbox"/> Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	Field data captured digitally

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
<b>Prescribed impacts</b>	<b>Chapter 6</b>	<b>Information</b>	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		<input checked="" type="checkbox"/> karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) <input checked="" type="checkbox"/> occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) <input checked="" type="checkbox"/> corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) <input checked="" type="checkbox"/> waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	<b>Table 6.1</b>
		<input type="checkbox"/> protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	Not applicable
		<input checked="" type="checkbox"/> where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	<b>Table 6.1</b>
		<input checked="" type="checkbox"/> Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	<b>Table 6.1</b>
		<input checked="" type="checkbox"/> Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	<b>Table 6.1</b>
		Where the proposed development is for a wind farm:	–
		<input type="checkbox"/> identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	Not applicable
		<input type="checkbox"/> provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	Not applicable
		<input type="checkbox"/> predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	Not applicable

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		Where the proposal may result in vehicle strike:	–
		<input checked="" type="checkbox"/> identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	<b>Table 6.1</b>
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	<b>Figure 6.1</b>
		<input checked="" type="checkbox"/> Map showing location of potential vehicle strike locations	<b>Figure 6.1</b>
		<input type="checkbox"/> Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	Not applicable
		<b>Data</b>	
		<input checked="" type="checkbox"/> Digital shape files of prescribed impact feature locations	–
		<input checked="" type="checkbox"/> Prescribed impact features map in jpeg format	–

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
<b>Avoid and minimise impacts</b>	<b>Chapter 7</b>	<b>Information</b>	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	<b>Section 7.1.2.6</b>
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	<b>Section 7.1.1.6</b>
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	<b>Section 7.1.1.1 to Section 7.1.1.5, Section 7.1.1.8</b>
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	<b>Section 7.1.1.7</b>
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	<b>Section 7.1.2.1 and Section 7.1.2.2</b>
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	<b>Section 7.1.2.7</b>
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	<b>Section 7.3</b>
		<b>Maps and tables</b>	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	<b>Table 7.1</b>
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	<b>Figure 7.1</b>
		☒ Maps demonstrating indirect impact zones where applicable	<b>Section 8.2</b>
		<b>Data</b>	
		Digital shape files of:	–
		☒ alternative and final proposal footprint	–
		☒ direct and indirect impact zones	–
☒ Maps in jpeg format	–		

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	<b>Information</b>	
		<input checked="" type="checkbox"/> Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 8.1
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	–
		<input checked="" type="checkbox"/> description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Section 8.2, Table 8.3
		<input checked="" type="checkbox"/> documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Section 8.2, Table 8.3
		<input checked="" type="checkbox"/> reporting any limitations or assumptions, etc. made during the assessment	Section 8.2, Table 8.3
		<input checked="" type="checkbox"/> identification of the threatened entities and their habitat likely to be affected	Section 8.2, Table 8.3
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–
		assessment of the nature, extent <b>frequency</b> , duration <b>and timing</b> of impacts on the habitat of threatened species or ecological communities associated with:	–
		<input checked="" type="checkbox"/> karst, caves, crevices, cliffs, rocks and other features of geological significance	Section 8.3.1
		<input checked="" type="checkbox"/> human-made structures	Section 8.3.2
		<input checked="" type="checkbox"/> non-native vegetation	Section 8.3.3
		<input checked="" type="checkbox"/> connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 8.3.5
		<input checked="" type="checkbox"/> movement of threatened species that maintains their life cycle	Section 8.3.5
		<input checked="" type="checkbox"/> water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 8.3.6
		<input type="checkbox"/> assessment of the impacts of wind turbine strikes on protected animals	Not applicable
<input checked="" type="checkbox"/> assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 8.3.7		
<input checked="" type="checkbox"/> evaluate the consequences of prescribed impacts	Section 8.3		

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		☒ describe impacts that are uncertain	Section 8.5
		☒ document limitations to data, assumptions and predictions	Section 8.3.8
		<b>Maps and tables</b>	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 10.1
		<b>Data</b>	
		N/A	–
<b>Mitigation and management of impacts</b>	<b>Chapter 8, Sections 8.4 and 8.5</b>	<b>Information</b>	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility	Table 8.3, Table 8.4
		☒ identify measures for which there is risk of failure	
		☒ evaluate the risk and consequence of any residual impacts	
		☒ document any adaptive management strategy proposed	Table 8.5
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Section 8.4
		☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	
		☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Table 8.5		
<b>Maps and tables</b>			
☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 8.4		
<b>Data</b>			
N/A	–		

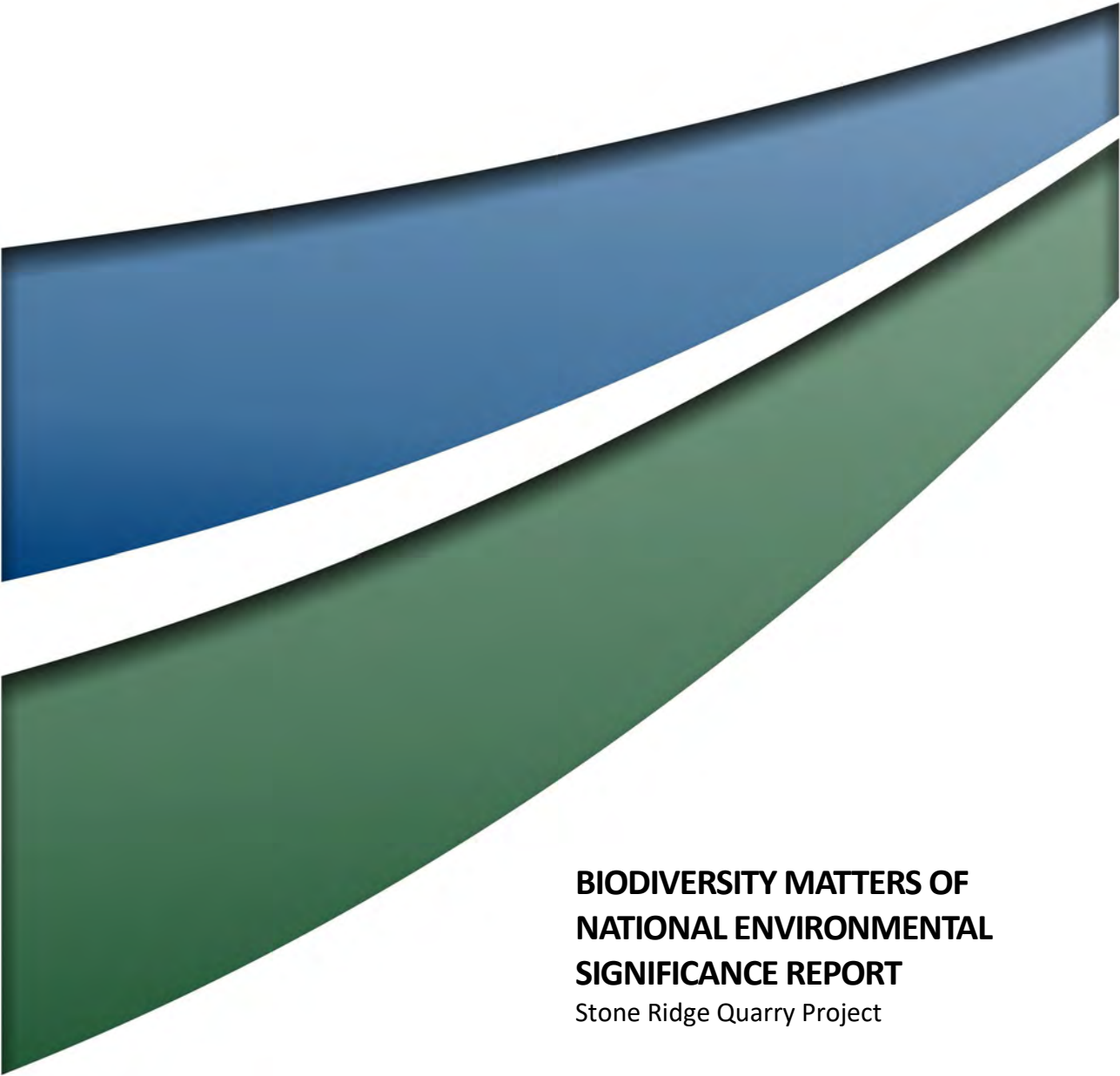
BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
Impact summary	Chapter 9	<b>Information</b>	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–
		<input checked="" type="checkbox"/> addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	<b>Section 9</b>
		<input type="checkbox"/> for each TEC, report the extent of the TEC in NSW	Not applicable
		<input checked="" type="checkbox"/> addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	<b>Section 9</b>
		<input checked="" type="checkbox"/> for each threatened species, report the population size in NSW	<b>Section 9</b>
		<input checked="" type="checkbox"/> documenting assumptions made and/or limitations to information	<b>Section 9</b>
		<input checked="" type="checkbox"/> documenting all sources of data, information, references used or consulted	
		<input checked="" type="checkbox"/> clearly justifying why any criteria could not be addressed	
		<input checked="" type="checkbox"/> Identification of impacts requiring offset in accordance with BAM Section 9.2	<b>Section 10.1 and Table 10.1, Section 10.2 and Table 10.2</b>
		<input checked="" type="checkbox"/> Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	<b>Section 10.1.1 – Not applicable</b>
		<input checked="" type="checkbox"/> Identification of areas not requiring assessment in accordance with BAM Section 9.3	<b>Section 10.2</b>
		<b>Maps and tables</b>	
		<input type="checkbox"/> Map showing the extent of TECs at risk of an SAII within the subject land	Not applicable
		<input type="checkbox"/> Map showing location of threatened species at risk of an SAII within the subject land	Not applicable
		Map showing location of:	–
		<input checked="" type="checkbox"/> impacts requiring offset	<b>Figure 8.1</b>
		<input type="checkbox"/> impacts not requiring offset	Not applicable
		<input type="checkbox"/> areas not requiring assessment	Not applicable
		<b>Data</b>	
Digital shape files of:	–		
<input type="checkbox"/> extent of TECs at risk of an SAII within the subject land	Not applicable		
<input type="checkbox"/> location of threatened species at risk of an SAII within the subject land	Not applicable		

BDAR section	BAM ref.	BAM requirement	Reference(s) in the BDAR
		<input checked="" type="checkbox"/> boundary of impacts requiring offset	–
		<input type="checkbox"/> boundary of impacts not requiring offset	Not applicable
		<input type="checkbox"/> boundary of areas not requiring assessment	Not applicable
		<input checked="" type="checkbox"/> Maps in jpeg format	–
<b>Impact summary</b>	Chapter 10	<b>Information</b>	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		<input checked="" type="checkbox"/> future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H)	<b>Table 10.1</b>
		<input checked="" type="checkbox"/> change in vegetation integrity score (BAM Subsection 8.1.1)	
		<input checked="" type="checkbox"/> number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	
		<input checked="" type="checkbox"/> biodiversity risk weighting for each	<b>Table 10.1 and Table 10.2</b>
		<input type="checkbox"/> number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	<b>Table 10.2</b>
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Table of PCTs requiring offset and the number of ecosystem credits required	<b>Table 10.1</b>
		<input checked="" type="checkbox"/> Table of threatened species requiring offset and the number of species credits required	<b>Table 10.2</b>
<b>Data</b>			
<input checked="" type="checkbox"/> Submitted proposal in the BAM Calculator	–		
<b>Biodiversity credit report</b>	Chapter 10	<b>Information</b>	
		<input checked="" type="checkbox"/> Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	<b>Table 11.1, Table 11.2</b>
		<input checked="" type="checkbox"/> BAM credit report in pdf format	<b>Appendix F</b>
		<b>Maps and tables</b>	
		<input checked="" type="checkbox"/> Table of credit class and matching credit profile	<b>Table 11.1</b>
		<b>Data</b>	
<input checked="" type="checkbox"/> BAM credit report in pdf format	<b>Appendix F</b>		



APPENDIX B

EPBC Act Matters of National Environmental Significance Report



**BIODIVERSITY MATTERS OF  
NATIONAL ENVIRONMENTAL  
SIGNIFICANCE REPORT**  
Stone Ridge Quarry Project

**FINAL**

May 2023

# **BIODIVERSITY MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE REPORT**

Stone Ridge Quarry Project

**FINAL**

Prepared by  
**Umwelt (Australia) Pty Limited**  
on behalf of  
**Australian Resource Development Group (ARDG)**

Project Director: David Holmes  
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Report No. 4158/R08/Appendix B  
Date: May 2023



QMS Certification Services

This report was prepared using  
Umwelt's ISO 9001 certified  
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### **Acknowledgement of Country**

*Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.*

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### Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	David Holmes	15/05/23	Penelope Williams	15/05/23

# Executive Summary

Australian Resource Development Group Pty Limited (ARDG) is seeking to develop a new hard rock quarry, known as Stone Ridge Quarry (the Project), located within Wallaroo State Forest at Balickera NSW, approximately 25 kilometres (km) north of Newcastle within the Port Stephens Local Government Area (LGA).

This Biodiversity Matters of National Environmental Significance (MNES) report has been prepared to support the EPBC Act Referral relating to the Project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with respect to relevant ecological MNES listed under the EPBC Act. The Project in its entirety constitutes the Project.

Following an extensive desktop and literature review and multiple biodiversity surveys undertaken over many years and seasons (which included detailed vegetation mapping and threatened ecological community delineation, targeted threatened flora transect searches and species-specific fauna surveys), a range of MNES were recorded or considered to have the potential to occur and therefore be impacted by the Project.

Following Assessments of Significance undertaken in accordance with the Significant Impact Guidelines 1.1, the Koala (*Phascolarctos cinereus*) is considered likely to be significantly impacted by the Project due to the proposed clearance of 79.02 ha of suitable koala habitat.

ARDG has sought to avoid and minimise potential impacts on the ecological values of the Development Footprint throughout the Project planning process. This included targeted avoidance and minimisation through:

- Reduction of the disturbance footprint to avoid impacts to areas of identified habitat for the NSW BC Act listed threatened orchid species *Pterostylis chaetophora*.
- Pre-clearance surveys and clearing supervision to minimise impacts on fauna.
- Reuse of topsoil and habitat resources.
- Weed, pest fauna and pathogen management.
- Fencing and access control.
- Bushfire management.
- Erosion and sediment, dust, light, water and noise control.
- Employee education and training regarding site environmental controls.

All residual impacts on biodiversity will be offset in accordance with the NSW Biodiversity Offsets Scheme. To meet offsets required for Commonwealth listed entities, ARDG will seek to:

- Retire biodiversity credits based on the like-for-like provisions in the *Biodiversity Conservation Regulation 2017* (NSW) through the establishment of land-based (stewardship) sites or purchase of credits on the market, and/or
- Fund biodiversity conservation actions that are listed in the Ancillary rules: Biodiversity conservation actions and directly benefit the threatened entity impacted, and/or
- Pay into the Biodiversity Conservation Fund. The Biodiversity Conservation Trust is required to meet the Commonwealth offset requirement component in a like-for-like manner. This is by retiring like-for-like credits, by funding conservation actions that are listed in the *Ancillary rules: Biodiversity conservation actions* (OEH 2017) approved by the NSW Minister for Environment that directly benefit the entity impacted.

# Abbreviations and Terms

Abbreviation	Definition
BAM	Biodiversity Assessment Method 2020
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BCD	NSW Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
EPBC	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
IBRA	IBRA Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
Project	The Project in its entirety
Development Footprint	The area that is the subject of the development application.
PCT	Plant Community Type
PMST	Protected Matters Search Tool
TSSC	Commonwealth Threatened Species Scientific Committee
VIS	Vegetation Information System

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# 1.0 Introduction

Australian Resource Development Group Pty Limited (ARDG) is seeking to develop a new hard rock quarry, known as Stone Ridge Quarry (the Project), located within Wallaroo State Forest at Balickera NSW, approximately 25 kilometres (km) north of Newcastle within the Port Stephens Local Government Area (LGA) (refer to Figure 1.1 of the BDAR).

On 8 December 2022, the Project was also determined to be a Controlled Action, requiring approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* due to its potential impact on listed threatened species and ecological communities. The Project will therefore be assessed under the bilateral agreement between the Commonwealth and NSW Governments. The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) has issued its assessment requirements which have been incorporated into the SEARs for the Project.

This Appendix consolidates the Department of Climate Change, Energy, the Environment and Water (DCCEEW) assessment requirements, as provided in the supplementary Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 19 January 2023 as part of the controlled action determination (EPBC 2022/09368 SSD 10432).

## 1.1 NSW and Commonwealth Bilateral Agreement

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

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

A Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the BAM, to assess the biodiversity related impacts associated with the Project. Relevant information and results obtained from site surveys associated with the BDAR preparation have been reviewed and incorporated into this report. Much of the information provided here is also included in the main body of the Stone Ridge Quarry Project BDAR (Umwelt 2023), and references to the appropriate sections are provided where applicable.

## 1.2 EPBC Act Referral Outcome and Advice

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) considers that there is likely to be a significant impact on the following threatened species and communities:

- Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian Capital Territory) – Endangered

- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland – Endangered.

The DCCEEW also note that the following species may be significantly impacted by the Project:

- Swift Parrot (*Lathamus discolor*) – Critically Endangered
- Spotted-tail Quoll (southeastern mainland population) (*Dasyurus maculatus maculatus*) – Endangered
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) – Vulnerable
- New Holland Mouse (*Pseudomys novaehollandiae*) – Vulnerable
- South-eastern Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*) – Vulnerable.

The DCCEEW notes the following as key risks associated with the Project from the Commonwealth perspective:

- Likely and potential significant impacts to EPBC listed threatened species and ecological communities resulting from the clearing of native vegetation and terrain manipulation in the Project footprint, and the potential for indirect impacts as a result of Project activities. The Department considers the Project will clear suitable foraging or breeding habitat that is critical to the survival of these threatened species and may fragment and functionally lose the Coastal Swamp Sclerophyll Forest endangered ecological community.

The Department notes that further information is required regarding the primary patch of Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (Coastal Swamp Sclerophyll Forest) located at the western limit of the Project area. This information is to include the total size of this patch and an assessment of patch quality according to Table 2 in the Coastal Swamp Sclerophyll Forest Conservation Advice. The Department considers that fragmentation due to the proposed access road has the potential to leave the rest of the patch isolated and functionally lost. Further information on indirect impacts, including making the smaller remnant patches more susceptible to invasion by exotic species of weeds and pest animals, or an overabundance of native species, is required on that isolated patch. DCCEEW also require details of mitigation and offset measures if that patch is functionally lost.

The Department assessment recommendations for the Project include the insertion of the following information outlined in **Table 1.1** for each of the EPBC-listed threatened species and ecological communities impacted by the Project.

**Table 1.1 Assessment Recommendations**

Recommendation	DCCEEW Comment	Section where addressed in this Report	BDAR Reference
Survey results including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements.	For ecological communities, this includes any condition thresholds provided in the listing advice or approved conservation advice.	Section 2	Section 2.3.4 and Section 2.4.4
A description and quantification of habitat in the Development Footprint (including suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival).	For the ecological communities, assessments should be targeted to determine if the vegetation patches conform to the EPBC listed threatened ecological communities.	Appendix 1 and summary provided in Section 7.3.2	Table 8.1
Information on proposed avoidance and mitigation measures to deal with the impacts of the Project, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.	-	Section 7.1 and Section 7.2	Section 8.4
A description of the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act listed species and communities and listed migratory species.	It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC listed species and community.	Section 6.3	Direct impacts are documented in Section 8.1, indirect impacts are described in Section 8.2 and prescribed impacts are described in Section 8.3
Quantification of the offset liability for each species and community significantly impacted, and information on the proposed offset strategy, including discussion of the conservation benefit for each species and community, how offsets will be secured, and the timing. It is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a Project i.e. 'like-for-like'.	Like-for-like includes protection of native vegetation that is the same ecological community or habitat being impacted (preferably in the same region where the impact occurs), or funding to provide a direct benefit to the matter being impacted e.g. threat abatement, breeding and propagation programs or other relevant conservation measures.	Section 7.3	Section 10.1 and Section 11

Recommendation	DCCEEW Comment	Section where addressed in this Report	BDAR Reference
<p>Further analysis of the impacts of the 2019-2020 bushfires on EPBC Act listed threatened species and communities should be undertaken during the assessment.</p>	<p>Further assessment will determine whether the remaining habitat within the Project area is of substantially greater importance to the survival of the listed threatened species following the fires and/or whether the population of the species in the area is considered an important population.</p> <p>This information, once obtained, can be considered when determining avoidance, mitigation and offset measures for these species.</p>	<p>Section 6.4</p>	<p>N/A</p>

## 2.0 Description of the Project

ARDG is seeking to access a high quality, hard rock resource suitable for producing a wide range of quarry products for the Lower Hunter, Central Coast and northern Sydney construction material markets. The Project would produce up to 1.5 million tonnes per annum (Mtpa) of saleable quarry product with approval sought for an initial 30-year quarrying period. The conceptual layout and vegetation disturbance area (referred to in this report as the Development Footprint) for the Project is illustrated in Figure 1.3 in the BDAR.

The Development Footprint is located on land managed by Forestry Corporation of New South Wales (FCNSW). ARDG holds a Deed of Agreement (Deed) for a Forest Materials Licence (FML) with FCNSW under section 42 of the Forestry Act. The Deed was executed by ARDG and FCNSW on 1 November 2018.

The construction phase of the Project will consist of earthworks and clearing of vegetation for site preparation to enable access to target resources and development of the quarry extraction area. Construction of a weighbridge and associated administrative buildings combined with the installation of on-site processing plant and associated equipment are also required to facilitate the Project. A site access point off Italia Road would also need to be constructed. A summary of the of key aspects is provided in **Table 2.1**.

The Project is a State significant development (SSD) under the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) as proposed extraction will exceed 500,000 tonnes per year. A development application (DA) is required to be submitted under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

**Table 2.1 Summary of Key Aspects**

Aspect	Proposed for the Project
<b>Project life</b>	30 years.
<b>Limits of production</b>	Up to 1.5 Mtpa of quarry product/sales per year.
<b>Project Area</b>	Approximately 139 ha (including extraction, processing and stockpiling area and buffers), with a disturbance footprint of approximately 79 ha.
<b>Extraction method</b>	Drill, blast and haul.
<b>Material processing</b>	Processing on site with provision for both mobile crushing and screening plant, as well as modular / fixed processing plant.
<b>Overburden management</b>	Overburden will be minimal and any topsoil and overburden will be stockpiled on site for use in rehabilitation.
<b>Product</b>	Concrete, asphalt and sealing aggregates, gabion and crushed rock, armourstone and roadbase.
<b>Product transport</b>	Road transport of up to 1.5 Mtpa of product via the Pacific Highway.
<b>Site access</b>	Single access point on Italia Road. No trucks will turn right out of the site onto Italia Road towards East Seaham. No trucks will turn right out of Italia Road onto the Pacific Highway.
<b>Employment</b>	Construction: 10 to 15 full time employees. Operation: Up to 10 full time employees, 3 to 5 part-time employees.
<b>Hours of operation</b>	<p>Construction:</p> <ul style="list-style-type: none"> <li>• 7.00 am to 6.00 pm Monday to Friday</li> <li>• 8.00 am to 1.00 pm Saturday</li> <li>• No work on Sunday or public holidays.</li> </ul> <p>Operation:</p> <ul style="list-style-type: none"> <li>• Quarrying and processing – 7.00 am to 6.00 pm Monday to Friday, and 7.00 am to 3.00 pm Saturdays</li> <li>• Truck loading, product transport and maintenance – 6.00 am to 10.00 pm Monday to Friday, and 7.00 am to 3.00 pm Saturdays.</li> </ul> <p>No operation on Sundays or Public Holidays apart from maintenance activities as required.</p>
<b>Rehabilitation and final landform</b>	Rehabilitation will be undertaken progressively where appropriate in the context of further resources remaining available in the Project Area at the end of the planned 30-year approval life. A conceptual final landform will be prepared for the Project.

## 3.0 Methods for Assessing MNES

Detailed methods undertaken for the assessment of the Project is provided in in Section 2.0 of the BDAR (Umwelt 2023), A summary of the survey methods as they relate to EPBC Act MNES is provided in the following sections.

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

### 3.1 Desktop Literature and Database Review

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

- Biodiversity Assessment Methodology 2020 (DPIE 2020a).
- NSW BioNet (incorporating the Bionet Atlas and Threatened Species Data Collection) (DPE 2022a), accessed April 2022.
- Vegetation Information System (VIS) Classification Database (DPE 2022b), accessed May 2022.
- Protected Matters Search Tool (PMST) (DAWE 2022a) for known/predicted EPBC Act-listed Threatened Ecological Communities (TECs), accessed April 2022.
- National Flying Fox Monitoring Viewer (DAWE 2022b) - <https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>, accessed April 2022.
- A review of Koala Habitat Assessment Criteria and Methods (Youngentob, Marsh & Skewes 2021).
- Published National Recovery Plans Listing and conservation advices and referral guidelines (where available) for Koala, Grey-headed Flying-Fox, Swift Parrot, Spotted-tailed Quoll, Yellow-Bellied Glider, New Holland Mouse, South-eastern Glossy Black Cockatoo and Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland available from the DCCEEW Species Profile and Threats (SPRAT) Database.

These reports and databases were reviewed to obtain information in relation to the Plant Community Types (PCTs), habitat constraints, microhabitats and previous site records for threatened species. A likelihood of occurrence assessment was completed for the nationally listed threatened species, migratory species and threatened ecological communities identified from the Protected Matters Search (DAWE 2022c) using the definitions provided in **Table 5.1**. The results of this assessment are provided in **Section 3.0**.

## 3.2 Plant Community Surveys

### 3.2.1 Vegetation Integrity and Floristic Plot Surveys

A stratified plot-based vegetation integrity and floristic survey of the Development Footprint was undertaken in accordance with Table 3 and Section 4.2.1 of the BAM to assess the expected environmental variation, and to address any gaps and verify the results of previous mapping and site information. A total of 18 BAM Plots were previously surveyed within the Project Area by Umwelt during 2018, however this plot data was not used for this assessment as the site was recovering from a bushfire and follow-up surveys in 2022 identified changes in the site vegetation due to regrowth. Consultation with the Biodiversity Conservation Division (BCD) Newcastle office in 2022 confirmed this approach.

An additional 20 updated BAM plots were sampled by Umwelt ecologists on the following dates:

- 12 October 2022
- 9 November 2022
- 16 November 2022.

The vegetation integrity survey of the Development Footprint was undertaken in accordance with Section 4.3.3 and Section 4.3.4 of the BAM for sampling of vegetation composition, structure and function attributes. Plots were sampled in locations to ensure that they captured attributes relevant to each vegetation zone. The locations of the plots sampled are mapped to scale and shown as BAM Plots in Figure 2.1 in the BDAR.

Plot surveys were completed prior to the refinement of the Development Footprint and therefore several plots are now situated outside of the Development Footprint boundary. This is due to the ongoing refinement of the proposed additional disturbance footprint throughout the assessment process. The surveys in these locations are considered representative of the vegetation zones within the Development Footprint. **Table 3.1** outlines the floristic plot survey effort and areas of PCT and associated condition zones identified in the preliminary mapping completed across the Development footprint.

**Table 3.1 Summary of Preliminary PCT Mapping within the Development Footprint**

Vegetation Condition Zone	PCT ID and Name Condition Class	Area in Development Footprint (ha)	Number of BAM Plots/Transects	
			Required (BAM 2020)	Plots Undertaken
1 PCT 762 Intact	762 - Cabbage Gum open forest or woodland on flats of the North Coast	0.33	1	2 Plots (Plot 17, Plot 22)
2 PCT 1590 - Intact	1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	45.63	4	6 Plots (Plot 8, Plot 9, Plot 10, Plot 16, Plot 20, Plot 21)

Vegetation Condition Zone	PCT ID and Name Condition Class	Area in Development Footprint (ha)	Number of BAM Plots/Transects	
			Required (BAM 2020)	Plots Undertaken
3 PCT 1618 - Intact	1618 - Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast	0.88	1	1 Plot (Plot 12B)
4 PCT 1619 - Intact (Apple Variant)	1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	19.52	3	4 Plots (Plot 11, Plot 13, Plot 15, Plot 24)
5 PCT 1619 – Intact (Apple – Ironbark Variant)	1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	8.75	3	3 Plots (Plot 12A, Plot 14, Plot 23)
6 PCT 1716 - Regenerating	1716 - Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.	3.91	2	2 Plots (Plot 07, Plot 19)
<b>Total</b>		<b>79.02</b>	<b>14</b>	<b>18</b>

### 3.2.2 Plant Community Type Mapping Techniques

Native vegetation and PCT mapping was undertaken using best-practice techniques to delineate vegetation communities across the Development Footprint. Plant Community Type mapping is provided in Figure 4.2 of the BDAR. The mapping involved the following key steps:

- review of aerial imagery to assess vegetation distribution patterns as dictated by change in canopy texture, tone and colour, as well as topography
- review of the modelled distribution of vegetation communities within broader scale regional based vegetation mapping prepared by Sivertsen *et al.* (2011)
- preparation of a draft PCT map based on interpretation of digital aerial imagery
- field-based ground-truthing of the draft PCT mapping
- confirmation of vegetation community floristic delineations based on plot data.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata. Slight variations in species composition are typical across the extent of a community and are often associated with microhabitats or ecotones with other communities.

### 3.2.3 Delineation of EPBC Act Listed Threatened Ecological Communities

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

- a list of nationally listed TECs potentially occurring within the Development Footprint was obtained through the completion of a Protected Matters Search using a 10 km buffer and review of the EPBC Act List of Ecological Communities
- full-floristic plot assessment, semi-quantitative rapid assessments and meandering surveys were completed initially to determine floristic composition and structure of each PCT
- for TECs with a potential occurrence within the Development Footprint, the TEC diagnostic characteristics and condition thresholds were analysed, as identified in the listing advice provided by the TSSC for the relevant candidate TECs assessed
- comparison was undertaken with published species lists, including lists of ‘important species’ as identified on the listing advice provided by the TSSC for potentially occurring nationally listed TECs
- comparison with habitat descriptions and distributions for potentially occurring nationally listed TECs was made
- assessments were completed for the nationally listed TECs potentially occurring using any relevant guidelines and recovery plans published by the Commonwealth.

## 3.3 Threatened Species Surveys

Biodiversity surveys have been undertaken by Umwelt in the Development Footprint between 2017 and 2023. The locations of surveys completed for listed threatened flora species are shown in Figure 2.2 in the BDAR and the locations of surveys completed for listed threatened and migratory fauna species are shown in Figure 2.3 in the BDAR.

Surveys were undertaken for the threatened species considered to have potential to occur in the Development Footprint based on database reviews, including the EPBC Act PMST (DAWE 2022a) and NSW BioNet Atlas (Atlas) (DPE 2022a). Surveys included species-specific surveys and on-ground searches in suitable habitat throughout the Development Footprint. Additionally, opportunistic surveys were undertaken for these species in conjunction with the plant community surveys described in **Section 2.2** of this report.

Targeted surveys for EPBC Act listed species-credit, ecosystem-credit and dual-credit species were undertaken over the dates provided in **Table 3.2** and **Table 3.3**.

**Table 3.2 Surveys Targeting Species-Credit, Ecosystem-Credit and dual-credit Fauna Species**

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Koala</b> <i>Phascolarctos cinereus</i>	E	E	Species	<ul style="list-style-type: none"> <li>• 23 January – 19 March 2018</li> <li>• 1 November – 1 December 2022</li> <li>• A total of 600 recording nights (20 cameras x 30 nights)</li> <li>• 19, 20, 22, March 2018</li> <li>• 9, 10, 11, 12 July 2018</li> <li>• 26 and 27 August 2019</li> <li>• 1, 2, 30 November 2022</li> <li>• 1 December 2022</li> </ul>	<ul style="list-style-type: none"> <li>• Nocturnal spotlighting and call playback surveys</li> </ul> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <p>Call playback was conducted with a period of quiet listening for approximately 5 minutes. Species calls were played using a 15 watt directional loud hailer for approximately four minutes, followed by a listening period of five minutes.</p> <ul style="list-style-type: none"> <li>• Remote baited camera surveys</li> <li>• At each site, a remote camera was mounted approximately one metre above the ground on a tree trunk and positioned towards a bait station containing peanut butter, honey and tuna. Cameras were set to take three photos in quick succession when movement was detected.</li> </ul>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia’s threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>○ Daytime searches for presence of potentially suitable habitat resources for nests and burrows, and signs of the species’ presence</li> <li>○ Stagwatching</li> <li>○ Spotlighting surveys in suitable vegetation types</li> <li>○ Call detection and/or call playback surveys</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Grey-headed Flying-Fox</b> <i>Pteropus poliocephalus</i>	V	V	Dual	<ul style="list-style-type: none"> <li>• 19, 20, 22, March 2018</li> <li>• 9, 10, 11, 12 July 2018</li> <li>• 26 and 27 August 2019</li> <li>• 1, 2, 30 November 2022</li> <li>• 1 December 2022</li> </ul>	<ul style="list-style-type: none"> <li>• Nocturnal spotlighting and call playback surveys</li> </ul> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <ul style="list-style-type: none"> <li>• Call playback was conducted with a period of quiet listening for approximately 5 minutes. Species calls were played using a 15 watt directional loud hailer for approximately four minutes, followed by a listening period of five minutes.</li> </ul>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia's threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>○ Sought information about the location of historic camps</li> <li>○ Comprehensive vegetation survey completed for the study area</li> <li>○ Clear assessment of the contribution of Project Area in terms of food plants, especially in relation to the broader region</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> <li>• National Recovery Plan for Grey-headed Flying Fox (DEW 2021)</li> <li>• National Flying-Fox Viewer.</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Swift Parrot</b> <i>Lathamus discolor</i>	E	CE	Dual	<ul style="list-style-type: none"> <li>9, 10, 11, 12 July 2018</li> <li>25, 26, 28, 29 July 2022</li> </ul>	<ul style="list-style-type: none"> <li>Timed Area Surveys</li> </ul> <p>A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded.</p>	<ul style="list-style-type: none"> <li>Survey guidelines for Australia's threatened birds (DEWHA 2010a) <ul style="list-style-type: none"> <li>Area searches or transect surveys for 20 hours for 8 days (in areas &lt; 50 ha)</li> <li>Targeted surveys for 20 hours for 8 days (targeting areas of heavily flowering eucalypts)</li> </ul> </li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> <li>Important habitat mapping for swift parrot (DPE).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Spotted-tailed Quoll</b> <i>Dasyurus maculatus</i>	V	E	Ecosystem	<ul style="list-style-type: none"> <li>23 January – 19 March 2018</li> <li>1 November – 1 December 2022</li> <li>A total of 600 recording nights (20 cameras x 30 nights)</li> <li>19, 20, 22, March 2018</li> <li>9, 10, 11, 12 July 2018</li> <li>26 and 27 August 2019</li> <li>1, 2, 30 November 2022</li> <li>1 December 2022</li> </ul>	<ul style="list-style-type: none"> <li>Nocturnal spotlighting surveys</li> </ul> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <p>Remote baited camera surveys</p> <ul style="list-style-type: none"> <li>At each site, a remote camera was mounted approximately one metre above the ground on a tree trunk and positioned towards a bait station containing peanut butter, honey and tuna. Cameras were set to take three photos in quick succession when movement was detected.</li> </ul>	<ul style="list-style-type: none"> <li>Survey guidelines for Australia's threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>Daytime searches for presence of potentially suitable habitat shelter resources and signs of the species' presence</li> <li>Spotlighting surveys in suitable habitat</li> <li>Observations conducted at potential shelter sites</li> <li>Camera traps</li> </ul> </li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>
<b>Yellow-bellied Glider</b> <i>Petaurus australis</i>	V	V	Ecosystem	<ul style="list-style-type: none"> <li>23 January – 19 March 2018</li> <li>1 November – 1 December 2022</li> <li>A total of 600 recording nights (20 cameras x 30 nights).</li> <li>19, 20, 22, March 2018</li> <li>9, 10, 11, 12 July 2018</li> </ul>	<ul style="list-style-type: none"> <li>Nocturnal spotlighting and call playback surveys</li> </ul> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified</p>	<ul style="list-style-type: none"> <li>Survey guidelines for Australia's threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>Daytime searches for presence of potentially suitable habitat resources for den hollows, and signs of the species' presence (sap feeding scars on trees)</li> </ul> </li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
				<ul style="list-style-type: none"> <li>• 26, 28, 29 July 2022</li> <li>• 26 and 27 August 2019</li> <li>• 14, 16 September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16, 30 November 2022</li> <li>• 1 December 2022</li> </ul>	<p>using 10 x 40 magnification binoculars or by call recognition.</p> <p>Call playback was conducted with a period of quiet listening for approximately 5 minutes. Species calls were played using a 15 watt directional loud hailer for approximately four minutes, followed by a listening period of five minutes.</p> <ul style="list-style-type: none"> <li>• Searches for hollow-bearing trees and nesting habitat</li> </ul> <p>Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable nest trees and stags were recorded and inspected for large nests.</p> <ul style="list-style-type: none"> <li>• Remote baited camera surveys</li> <li>• At each site, a remote camera was mounted approximately one metre above the ground on a tree trunk and positioned towards a bait station containing peanut butter, honey and tuna. Cameras were set to take three photos in quick succession when movement was detected.</li> </ul>	<ul style="list-style-type: none"> <li>○ Stagwatching</li> <li>○ Spotlighting surveys in suitable vegetation types</li> <li>○ Call detection and/or call playback surveys</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>New Holland Mouse</b> <i>Pseudomys gracilicaudatus</i>	-	V	Ecosystem	<ul style="list-style-type: none"> <li>• 23 January – 19 March 2018</li> <li>• 1 November – 1 December 2022</li> <li>• A total of 600 recording nights (20 cameras x 30 nights)</li> <li>• 23, 24, 25 January 2018.</li> <li>• 19, 20, 22, March 2018</li> <li>• 9, 10, 11, 12 July 2018</li> <li>• 26 and 27 August 2019</li> <li>• 26, 28, 29 July 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 14, 16 September 2022</li> <li>• 1, 2, 9, 16, 30 November 2022</li> <li>• 1 December 2022</li> </ul>	<ul style="list-style-type: none"> <li>• Nocturnal spotlighting surveys</li> </ul> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <ul style="list-style-type: none"> <li>• Remote baited camera surveys</li> <li>• At each site, a remote camera was mounted approximately one metre above the ground on a tree trunk and positioned towards a bait station containing peanut butter, honey and tuna. Cameras were set to take three photos in quick succession when movement was detected.</li> </ul>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia's threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>○ Daytime searches for presence of potentially suitable habitat resources for nests and burrows, and signs of the species' presence</li> <li>○ Collection of predator scats</li> <li>○ Pitfall trap surveys</li> <li>○ Hair sampling device surveys</li> <li>○ Elliot A trapping surveys</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>South-eastern Glossy Black Cockatoo</b> <i>Calyptorhynchus lathami</i>	V	V	Dual	<ul style="list-style-type: none"> <li>• 23, 24, 25 January 2018</li> <li>• 9, 10, 11, 12 July 2018.</li> <li>• 25, 26, 28, 29 July 2022</li> <li>• 14, 16, September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16 November 2022</li> </ul>	<b>Timed Area Surveys</b> A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded. <ul style="list-style-type: none"> <li>• Searches for hollow-bearing trees and nesting/roosting habitat</li> <li>• Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable nest trees and stags were recorded and inspected for suitable nests.</li> </ul>	<ul style="list-style-type: none"> <li>• No specific EPBC guidelines available. Surveys considered the survey recommendations in the NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)               <ul style="list-style-type: none"> <li>○ Land-based area searches for 5 hours for 1 day</li> <li>○ Targeted searches for 20 hours for 4 days (search for signs of feeding or nests)</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Regent Honeyeater</b> <i>Anthochaera phrygia</i>	CE	CE	Dual	<ul style="list-style-type: none"> <li>• 23, 24, 25 January 2018</li> <li>• 9, 10, 11, 12 July 2018.</li> <li>• 25, 26, 28, 29 July 2022</li> <li>• 14, 16, September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16 November 2022</li> </ul>	<p><b>Timed Area Surveys</b></p> <p>A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded.</p>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia’s threatened birds (DEWHA 2010a) <ul style="list-style-type: none"> <li>○ Area searches for 20 hours for 10 days (in areas &lt; 50 ha)</li> <li>○ Targeted searches for 20 hours for 5 days (targeting areas of heavily flowering trees and flocks of other blossom feeders)</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> <li>• Important habitat mapping for regent honeyeater (DPE).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Gang-gang Cockatoo</b> <i>Callocephalon fimbriatum</i>	V	E	Dual	<ul style="list-style-type: none"> <li>• 23, 24, 25 January 2018</li> <li>• 9, 10, 11, 12 July 2018.</li> <li>• 25, 26, 28, 29 July 2022</li> <li>• 14, 16, September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16 November 2022</li> </ul>	<p><b>Timed Area Surveys</b> A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded.</p> <p><b>Searches for hollow-bearing trees and nesting/roosting habitat</b> Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable nest trees and stags were recorded and inspected for suitable nests.</p>	<ul style="list-style-type: none"> <li>• No specific EPBC guidelines available. Surveys considered the survey recommendations in the NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Large-eared pied bat</b> <i>Chalinolobus dwyeri</i>	V	V	Species	<ul style="list-style-type: none"> <li>• 23 – 24 January 2018</li> <li>• 28 November – 2 December 2022</li> <li>• 24 January – 12 February 2023</li> <li>• 23, 24, 25 January 2018</li> <li>• 26, 28, 29 July 2022</li> <li>• 14, 16 September 2022</li> <li>• 17, 18, 19. 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16 November 2022</li> </ul>	<p><b>Echolocation Detection Surveys</b></p> <p>An anabat was positioned at an approximate 30 degree angle one meter above the ground. Each detector was positioned towards potential micro-bat flyaways along areas of suitable habitat. The Anabat detector was programmed to start recording from one hour before sunset to one hour after sunrise.</p> <p><b>Searches for hollow-bearing trees roosting habitat</b></p> <p>Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable stags were recorded and inspected.</p>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia’s threatened mammals (DSEWPC 2011b). A combination of techniques is recommended: <ul style="list-style-type: none"> <li>○ Unattended bat detectors for total of 16 detector nights at a minimum of 4 nights (area &lt; 50ha)</li> <li>○ Attended bat detectors for total of 6 detector nights for minimum of 3 nights (area &lt;50ha)</li> <li>○ Harp traps and/or mistnets total efforts of 16 trap or net nights with minimum of 4 nights (area &lt;50ha)</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> <li>• NSW Survey Guide for ‘Species-credit’ Threatened Bats (DPIE 2018)</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Red goshawk</b> <i>Erythrotriorchis radiatus</i>	CE	V	Species	<ul style="list-style-type: none"> <li>• 23, 24, 25 January 2018</li> <li>• 9, 10, 11, 12 July 2018.</li> <li>• 25, 26, 28, 29 July 2022</li> <li>• 14, 16, September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16 November 2022</li> </ul>	<p><b>Timed Area Surveys</b> A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded.</p> <p><b>Searches for hollow-bearing trees and nesting/roosting habitat</b> Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable nest trees and stags were recorded and inspected for large nests.</p>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia's threatened birds (DEWHA 2010a) <ul style="list-style-type: none"> <li>○ Area searches for 80 hours for 10 days</li> </ul> </li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>Green and Golden Bell Frog</b> <i>Litoria aurea</i>	E	V	Species	<ul style="list-style-type: none"> <li>19, 20, 22, March 2018</li> <li>9, 10, 11, 12 July 2018</li> <li>26 and 27 August 2019</li> <li>1, 2, 30 November 2022</li> <li>1 December 2022</li> </ul>	<p><b>Nocturnal spotlighting and call playback surveys</b></p> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <p>Call playback was conducted with a period of quiet listening for approximately 5 minutes. Species calls were played using a 15 watt directional loud hailer for approximately four minutes, followed by a listening period of five minutes.</p>	<ul style="list-style-type: none"> <li>Survey Guidelines for Australia's threatened frogs (DEWHA 2010) <ul style="list-style-type: none"> <li>Transect design Visual Encounter Surveys (VES)</li> <li>Static call surveys</li> </ul> </li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> <li>NSW Survey Guide for Threatened Frogs (DPIE 2020).</li> </ul>
<b>Greater Glider</b> <i>Petauroides volans</i>	E	V	Species	<ul style="list-style-type: none"> <li>23 January – 19 March 2018</li> <li>1 November – 1 December 2022</li> </ul> <p>A total of 600 recording nights (20 cameras x 30 nights)</p> <ul style="list-style-type: none"> <li>23, 24, 25 January 2018</li> <li>19, 20, 22, March 2018</li> <li>9, 10, 11, 12 July 2018</li> <li>26 and 27 August 2019</li> </ul>	<p><b>Nocturnal spotlighting and call playback surveys</b></p> <p>Spotlighting was undertaken at sites located in suitable habitat between 10-30 minutes and involved walking a meandering transect and recording any fauna species seen or heard calling. Species were visually identified using 10 x 40 magnification binoculars or by call recognition.</p> <p>Call playback was conducted with a period of quiet listening for approximately 5 minutes. Species calls were played using a 15 watt</p>	<ul style="list-style-type: none"> <li>Survey guidelines for Australia's threatened mammals (DSEWPC 2011b) <ul style="list-style-type: none"> <li>Daytime searches for presence of potentially suitable habitat resources for nests and burrows, and signs of the species' presence</li> <li>Stagwatching</li> <li>Spotlighting surveys in suitable vegetation types</li> </ul> </li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
				<ul style="list-style-type: none"> <li>• 26, 28, 29 July 2022</li> <li>• 14, 16 September 2022</li> <li>• 17, 18, 19, 25, 26, 31 October 2022</li> <li>• 1, 2, 9, 16, 30 November 2022</li> <li>• 1 December 2022</li> </ul>	<p>directional loud hailer for approximately four minutes, followed by a listening period of five minutes.</p> <p><b>Searches for hollow-bearing trees and nesting habitat</b></p> <p>Searches were undertaken across the Development Footprint. Where hollows were found, the tree species, hollow size and location (spout, trunk, branch) were recorded. Suitable nest trees and stags were recorded and inspected for large nests.</p> <p><b>Remote baited camera surveys</b></p> <p>At each site, a remote camera was mounted approximately one metre above the ground on a tree trunk and positioned towards a bait station containing peanut butter, honey and tuna. Cameras were set to take three photos in quick succession when movement was detected.</p>	<ul style="list-style-type: none"> <li>○ Call detection and/or call playback surveys</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species Name	Listing status		Credit Type	Surveys undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act				
<b>White-throated Needletail</b> <i>Hirundapus caudacutus</i>	-	V	Ecosystem	<ul style="list-style-type: none"> <li>23, 24, 25 January 2018.</li> <li>17, 18, 19, 25, 26, 31 October 2022</li> <li>1, 2, 9, 16 November 2022</li> </ul>	<b>Timed Area Surveys</b> A 15 to 20 minute survey with two observers using 10 x 40 magnification binoculars was completed at each site. All fauna species observed or heard were recorded.	<ul style="list-style-type: none"> <li>Survey guidelines for Australia's threatened birds (DEWHA 2010a) however so specific EPBC Act Survey guidelines have been prepared for this species.</li> <li>The species is a trans-equatorial migrant, breeding in the Northern Hemisphere and flying south for the boreal winter. Identify presence in Australia between late October to April as noted in the Conservation Advice (TSSC 2019)</li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d)</li> </ul>

**Table 3.3 Surveys Targeting Species-Credit Flora Species**

Species name	Listing status		Surveys Undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act			
<b>Charmhaven Apple</b> <i>Angophora inopina</i>	V	V	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>
<b>White-flowered Wax Plant</b> <i>Cynanchum elegans</i>	E	E	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species name	Listing status		Surveys Undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act			
<b>Slaty Red Gum</b> <i>Eucalyptus glaucina</i>	V	V	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>
<b>Small-flower Grevillea</b> <i>Grevillea parviflora subsp. parviflora</i>	V	V	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species name	Listing status		Surveys Undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act			
<b>Scrub Turpentine</b> <i>Rhodamnia rubescens</i>	CE	CE	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<b>Parallel Field Traverses</b>  Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.  Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>
<b>Native Guava</b> <i>Rhodomyrtus psidioides</i>	CE	CE	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<b>Parallel Field Traverses</b>  Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.  Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species name	Listing status		Surveys Undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act			
<b>Heath Wrinklewort</b> <i>Rutidosis heterogama</i>	V	V	<ul style="list-style-type: none"> <li>25, 26, 30, October 2017</li> <li>8, 9, 10, 11, 12 October 2018</li> <li>25, 26, 28 July 2022</li> <li>12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>
<b>Black-eyed Susan</b> <i>Tetradthea juncea</i>	V	V	<ul style="list-style-type: none"> <li>25, 26, 30, October 2017</li> <li>8, 9, 10, 11, 12 October 2018</li> <li>25, 26, 28 July 2022</li> <li>12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

Species name	Listing status		Surveys Undertaken	Survey Method	Relevant Guidelines and Resources
	BC Act	EPBC Act			
<b>Austral Toadflax</b> <i>Thesium australe</i>	V	V	<ul style="list-style-type: none"> <li>• 25, 26, 30, October 2017</li> <li>• 8, 9, 10, 11, 12 October 2018</li> <li>• 25, 26, 28 July 2022</li> <li>• 12, 17, 19, 20, 25, 26, 31 October 2022</li> <li>• 9,11 November 2022</li> </ul>	<p><b>Parallel Field Traverses</b></p> <p>Parallel field transverses at 10-metre intervals were undertaken to target threatened flora species. This interval can be varied in response to terrain and or vegetation densities.</p> <p>Sampling and opportunistic observations were undertaken during all floristic and vegetation plot surveys.</p>	<ul style="list-style-type: none"> <li>• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)</li> <li>• NSW Threatened Biodiversity Data Collection (TBDC) (DPE 2022d).</li> </ul>

## 4.0 Survey Results

### 4.1 Plant Community Types and Threatened Ecological Communities

The Plant Community Types (PCTs) identified in this assessment are based on the PCTs available prior to the release of the revised PCTs for eastern NSW and associated update to the BAM Calculator which occurred in February 2023. In-progress BAM-C assessments and projects with substantially progressed surveys are able to undertake this approach, in accordance with the transitional arrangements. **Table 4.1** lists all PCTs that have been observed within the Development Footprint during field surveys.

Detailed descriptions are provided for the PCTs are listed in Section 4.2.2 of the BDAR. The locations of PCTs are shown in Figure 4.2 in BDAR.

**Table 4.1 Plant Community Types Identified within the Development Footprint**

Current BAM-C PCT ID	PCT name	Vegetation Class	Vegetation Formation	Vegetation Condition Zone	Area within Development Footprint (ha)	EPBC TEC Associations
762	Cabbage Gum open forest or woodland on flats of the North Coast	Grassy Woodlands	Coastal Valley Grassy Woodlands	Z1 PCT 762 Intact	0.33	This PCT corresponds to the <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC</i> listed under the EPBC in October 2022.
1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	Z2 PCT 1590 - Intact	45.63	Consideration was given to the potential alignment of this PCT with the <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> . The presence of this CEEC was excluded based on lack of key diagnostic characteristics including lack of Permian geology and presence of high densities of <i>Eucalyptus fibrosa</i> (>2 trees per ha), a species which must be largely absent to meet the listing criteria.
1618	Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast	Dry Sclerophyll Forests (Shrubby Sub-formation)	Coastal Dune Dry Sclerophyll Forests	Z3 PCT 1618 - Intact	0.88	This PCT corresponds to the <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC</i> listed under the EPBC in October 2022.
1619	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	Z4 PCT 1619 - Intact (Apple Variant)	19.52	This PCT does not correspond to any TECs listed under the EPBC Act.

Current BAM-C PCT ID	PCT name	Vegetation Class	Vegetation Formation	Vegetation Condition Zone	Area within Development Footprint (ha)	EPBC TEC Associations
	Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	Z5 PCT 1619 – Intact (Apple – Ironbark Variant)	8.75	This PCT does not correspond to any TECs listed under the EPBC Act.
<b>1716</b>	Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast.	Forested Wetlands	Coastal Swamp Forests	Z6 PCT 1716 - Regenerating	3.91	This PCT corresponds to the <i>Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC</i> listed under the EPBC Act which was listed in October 2022.

## 4.2 EPBC Act Threatened Ecological Community Considerations

Appendix C of the BDAR includes detailed analyses of EPBC Act TECs potentially occurring in the Project Area which have been replicated here for ease of reference. The following TECs listed within the EPBC Act were considered to have *potential* to occur within the Project Area:

- Central Hunter Valley eucalypt forest and woodland
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.

The following analysis of the relevant approved conservation advice and key diagnostic characteristics published by the Australian Government is provided separately for each TEC in **Tables 4.2 to 4.4**.

**Table 4.2 Central Hunter Valley eucalypt forest and woodland**

Central Hunter Valley eucalypt forest and woodland- Key Diagnostic Characteristics from EPBC Act Threatened Species Scientific Committee (2015) Approved Conservation Advice	Consideration
It occurs in the Hunter River catchment (typically called the Hunter Valley region)	The Project Area occurs in the Hunter River Catchment
It typically occurs on lower hillslopes and low ridges, or valley floors in undulating country; on soils derived from Permian sedimentary rocks	Areas of drainage depressions and flats are present, however the Project Area does not occur on Permian sediments. The Project Area occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The geological characteristics for this EEC are not met within the Project Area.
It does not occur on alluvial flats, river terraces, aeolian sands, Triassic sediments, or escarpments	PCTs 1590 and 1619 do not occur in the landscape positions or substrates specified.  PCTs 762, 1618 and 1716 all occur in landscape positions associated with alluvial flats.
It is woodland or forest, with a projected canopy cover of trees of 10% or more; or with a native tree density of at least 10 native tree stems per 0.5 ha (at least 20 native tree stems/ha) that are at least one metre in height	The vegetation within the Project Area is mostly open forest.
The canopy of the ecological community is dominated by one or more of the following four eucalypt species: <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Corymbia maculata</i> (syn. <i>E. maculata</i> ) (Spotted Gum), <i>E. dawsonii</i> (slaty gum) and <i>E. moluccana</i> (grey box); or a fifth species, <i>Allocasuarina luehmannii</i> (Bulloak, Buloke) dominates in combination with one or more of the above four eucalypt species, in sites previously dominated by one or more of the above four eucalypt species.	PCT 1590 contains areas dominated by <i>Corymbia maculata</i> . <i>Corymbia maculata</i> also occurs within PCT 1716.

<b>Central Hunter Valley eucalypt forest and woodland- Key Diagnostic Characteristics from EPBC Act Threatened Species Scientific Committee (2015) Approved Conservation Advice</b>	<b>Consideration</b>
<p><i>Allocasuarina torulosa</i> (Forest Oak), <i>Eucalyptus acmenoides</i> (White Mahogany) and <i>E. fibrosa</i> (red/Broad-leaved Ironbark) are largely absent from the canopy of a patch</p>	<p><i>Allocasuarina torulosa</i> and <i>Eucalyptus fibrosa</i> are both present throughout PCT 1590.</p>
<p>A ground layer is present (although it may vary in development and composition), as a sparse to thick layer of native grasses and other native herbs and/or native shrubs</p>	<p>These ground layer conditions are met for the PCTs present.</p>
<p><b>Conclusion</b></p>	<p><b>The Central Hunter Valley eucalypt forest and woodland is not present within the Project Area and is excluded based on lack of key diagnostic features including the geological substrate and prominent occurrence of the negative diagnostic species.</b></p>

**Table 4.3 Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland**

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland - Key Diagnostic Characteristics from DAWE (2021) Approved Conservation Advice	Consideration
Occurs on the mainland and islands near to the coast (within 20 km) from South East Queensland to south-eastern NSW specifically within these IBRA Bioregions: South Eastern Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB) and the Bateman sub-region of the South East Corner (SEC).	The Project Area occurs within the NSW North Coast bioregion.
Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL.	Most of the Project Area is above 20m above sea level (ASL), however is entirely below 220m ASL.
Occurs on hydric soils with inundation patterns ranging from intermittent to episodic.	PCTs 762, 1618 and 1716 all meet this key diagnostic requirement.
The vegetation structure varies from tall closed to open forest to woodland, to dense (closed) shrubland or scrub forest. Minimum crown cover (see footnote 5, p. 4) is at least 10%, but it is more typically in the range 50% to 70%	The vegetation within the Project Area typically meets this requirement.
From South East Queensland to the Sydney Basin Bioregion, the canopy is typically dominated or co-dominated by <i>Melaleuca quinquenervia</i> and/or <i>Eucalyptus robusta</i> . In some areas, the canopy may be locally dominated by other melaleuca species including: <i>M. dealbata</i> (SEQ bioregion) (rarely); <i>M. biconvexa</i> (mid-NSW coast to south of Sydney); <i>M. decora</i> (north of Shoalhaven), frequently with <i>Parsonsia straminea</i> climbing on the trunks of canopy species. In the SEC bioregion, <i>M. ericifolia</i> may occur as a dominant canopy or sub-canopy species.	Floristic plot analysis completed during late 2022 has identified that there are no parts of the Project Area where <i>Melaleuca quinquenervia</i> or <i>Eucalyptus robusta</i> are dominant or co-dominant. Some areas, are dominated by other melaleucas, particularly PCT 1716 which is dominated by <i>Melaleuca nodosa</i> , however no areas are dominated by <i>M. dealbata</i> , <i>M. biconvexa</i> or <i>M. decora</i> .
Other tree species may occur in the canopy (or sub-canopy) in some areas, but they are not dominant across a patch, including <i>Casuarina glauca</i> , <i>Banksia</i> spp., <i>Callistemon salignus</i> , <i>Corymbia intermedia</i> (Pink Bloodwood), <i>E. tereticornis</i> , (Forest Red Gum/Queensland Blue Gum), <i>E. longifolia</i> (Woollybutt), <i>E. botryoides</i> (Southern Mahogany/Bangalay), <i>E. ovata</i> (Swamp Gum), <i>Livistona australis</i> and/or <i>Lophostemon</i> spp.	PCTs 762, 1618 ad 1716 all contain <i>Eucalyptus tereticornis</i> . This species is particularly dominant in PCT 762.
The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically <i>Gahnia</i> spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially <i>Imperata cylindrica</i> (Blady Grass)	These understorey conditions met within PCTs 762, 1618 ad 1716.

<b>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland - Key Diagnostic Characteristics from DAWE (2021) Approved Conservation Advice</b>	<b>Consideration</b>
<p>While they can occur regularly in the ground layer, the ecological community is not present if halophytic species, more typically associated with estuarine/saltmarsh areas, dominate the ground layer of a patch, for example, <i>Appium prostratum</i>, <i>Atriplex cinerea</i>, <i>Chenopodium glaucum</i>, <i>Rhagodia candolleianum</i> and <i>Samolus repens</i>.</p>	<p>Halophytic species were not observed.</p>
<p><b>Conclusion</b></p>	<p><b>It is noted that in the referral documentation submitted for this project, the potential presence of this EEC was acknowledged. However further site based floristic plot surveys and analysis have confirmed the absence of this EEC and the presence of the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions listed under the EPBC Act.</b></p>

**Table 4.4 Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions**

Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions - Key Diagnostic Characteristics from DCCEW (2022) Approved Conservation Advice	Consideration
It occurs in the New South Wales North Coast (NNC) and South Eastern Queensland (SEQ) IBRA2 bioregions, and on Curtis Island in the Brigalow Belt North IBRA Bioregion (BBN).	The Project Area occurs within the NSW North Coast bioregion.
It occurs in the catchments of the eastern watershed of the Great Dividing Range, typically in their lower reaches	The Project Area occurs within the catchment of the eastern watershed of the Great Dividing Range.
It occurs at elevations up to 250 m above sea-level (ASL), most typically below 50 m ASL.	The Project Area occurs below 250m ASL and areas with potential to correspond with this EEC typically occur below 50m ASL.
It occurs on alluvial landforms including river floodplains, riparian zones (e.g., along riverbanks, lake foreshores and creek lines), the floors of tributary gullies, floodplain pockets, alluvial flats, fans, terraces, and localised colluvial fans; as well as on localized depressions amongst low rises and on associated sites where water can pond.	PCTs 762, 1618 and 1716 all occur on alluvial landforms in association with riparian zones or localised depressions where water ponds.
It occurs on alluvial soils of various textures including silts, clay loams, sandy loams, gravel and cobbles	Detailed soil testing has not been undertaken PCTs 762, 1618 and 1716
It does not typically occur on soils that are primarily marine or aeolian sands, but may occur on such substrates after they have been modified by fluvial activity	The Project Area does not contain soils that are marine or aeolian sands.
It occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland (Specht 1970). The canopy has a crown cover of at least 20%	These structural requirements are satisfied for PCTs 762, 1618 and 1716.
It has a canopy dominated by one or a combination of Angophora, Corymbia, Eucalyptus, Lophostemon and/or Syncarpia tree species, but NOT dominated by <i>Eucalyptus robusta</i> (swamp mahogany). Other canopy tree species may be present, and in some areas rainforest trees may be prominent.	This floristic requirement is met for PCT 762, 1618 and 1716.
A mid-layer (including a sub-canopy, and/or shrub-layer) may be present, sparse or absent; and fauna may be abundant or rare.	Mid layer presence/absence and fauna abundance was not utilised as a diagnostic tool in this assessment.
<b>Conclusion</b>	<b>It is considered that PCTs 762, 1618 and 1716 all correspond to the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC listed under the EPBC Act.</b>

### 4.3 Threatened Flora Species

No threatened flora species listed under the EPBC Act have been observed within the Development Footprint.

## 4.4 Threatened Fauna Species

The following EPBC Act-listed threatened species have been recorded in the Development Footprint during the surveys undertaken for this assessment:

- Koala (*Phascolarctos cinereus*) – was recorded in baited remote camera surveys (1 location during 2018 and 2 locations during 2022) and during spotlighting surveys (1 location in 2022) (refer to Figure 5.4 in the BDAR). This species is assessed based on area of suitable habitat and its habitat is associated in the TBDC with all plant community types present.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) - was observed foraging within the Project Area during surveys.

No other threatened fauna species listed under the EPBC Act have been observed within the Development Footprint.

## 5.0 MNES Likelihood of Occurrence

A likelihood of occurrence assessment has been undertaken for Matters of National Environmental Significance in accordance with the rating definitions in **Table 5.1**.

**Table 5.2** contains an assessment of the likelihood of occurrence has been completed for threatened species, TECs and wetlands of international importance listed under the EPBC Act, identified from the DAWE PMST (DAWE 2022a) as well as additional species raised by DCCEEW in their Project Assessment Notes advice.

Migratory species listed under international agreements being the Bonn Convention (Bonn), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) with potential to occur in the Development Footprint have also been identified in **Table 5.3**, based on the results of the Protected Matters Search (DAWE 2022a). Species which primarily inhabit marine, pelagic and estuarine environments have been omitted from the assessment due to a lack of suitable habitat.

Those matters assessed as being a medium or high likelihood of occurrence in the Development Footprint are assessed further in **Section 6.0** of this Report. **Figure 5.1** shows the biodiversity MNES that have been recorded in and around the Development Footprint.

Key to abbreviations used:

- VEC – Vulnerable Ecological Community
- EEC – Endangered Ecological Community
- CEEC – Critically Endangered Ecological Community
- V – Vulnerable
- E – Endangered
- CE – Critically Endangered
- C – China-Australia Migratory Bird Agreement (CAMBA)
- J – Japan-Australia Migratory Bird Agreement (JAMBA)
- K – Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- B – Bonn Convention.

**Table 5.1**      **Definitions of likelihood of occurrence**

Likelihood of Occurrence	Definition
<b>Known</b>	Recent and reliable records of this matter exist within the Development Footprint.
<b>High</b>	Probable that the matter occurs in the Development Footprint, despite lack of records.
<b>Medium</b>	Suitable habitat is present for this matter however records of the matter are not known to occur in the immediate locality of the Development Footprint.
<b>Low</b>	There are no records for this matter, the matter was not recorded during targeted searches, habitat requirements are not met, or the normal distribution range of the matter does not coincide with the Development Footprint locality. Despite this, the matter may be present in rare circumstances.
<b>No</b>	There is no potential for the matter to occur within the locality of the Action.

**Table 5.2 MNES Recorded or with Potential to Occur within the Development Footprint**

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
<b>Wetlands of International Importance (Ramsar Wetlands)</b>					
Hunter Estuary Wetlands	-	Ramsar	Ramsar Wetlands - within 10 km of Ramsar site	<b>Not present</b> – Hunter Estuary Wetland Areas occur approximately 15 km to the southwest of the Development Footprint. Disturbances in the Development Footprint (including potential impacts on downstream surface water flows) are not expected to have any direct or indirect impact on the Hunter Estuary Wetlands Ramsar Site.	No
<b>Threatened Ecological Communities</b>					
Coastal Swamp Oak ( <i>Casuarina glauca</i> ) Forest of New South Wales and South East Queensland ecological community	EEC	EEC	Community likely to occur within area	<b>Not present</b> – canopy is not dominated by coastal swamp oak <i>Casuarina glauca</i> therefore a key diagnostic feature for the community is not satisfied.	No
Subtropical and Temperate Coastal Saltmarsh	-	VEC	Community likely to occur within area	<b>Not present</b> – not recorded within the Development Footprint despite targeted floristic surveys and unlikely to occur based on habitat requirements and known distributions.	No
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	EEC	EEC	Community known to occur within area	<b>Not present</b> - It is noted that in the referral documentation submitted for this Project, the potential presence of this EEC was acknowledged. However further site based floristic plot surveys and analysis have confirmed the absence of this EEC and the presence of the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions listed under the EPBC Act.	No
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	EEC	CECC	Community likely to occur within area	<b>Not present</b> – The Development Footprint does not occur within the Southeast Corner and Sydney Basin IBRA Bioregions, or in eastern Victoria, therefore a key diagnostic feature for the community is not satisfied.	No

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Central Hunter Valley eucalypt forest and woodland	EEC	CEEC	Community may occur within area	<b>Not present</b> – The Development Footprint does not occur on soils derived from Permian sedimentary rocks (Matthei 1995), therefore does not satisfy a key diagnostic feature of the vegetation community.	No
Lowland Rainforest of Subtropical Australia	EEC	CEEC	Community likely to occur within area	<b>Not present</b> – The Development Footprint does not occur on hydric soils (Matthei 1995), therefore does not satisfy a key diagnostic feature of the vegetation community. The approved conservation advice (TSSC 2021) stipulates the community is dominated or co-dominated by <i>Melaleuca quinquenervia</i> and/or <i>Eucalyptus robusta</i> , which is not consistent with the vegetation sampled within the Development Footprint.	No
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	EEC	EEC	Community likely to occur within area	<b>Present</b> – It is considered that PCTs 762, 1618 and 1716 all correspond to the EEC within the Development Footprint.	<b>Yes</b>
<b>Threatened Flora Species</b>					
Black-eyed Susan <i>Tetratheca juncea</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint despite targeted floristic surveys. Bionet Atlas results show no contemporary occurrence records within the locality.	No
Charmhaven Apple <i>Angophora inopina</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – this highly detectable species was not recorded within the Development Footprint despite targeted floristic surveys. Two non-contemporary records occur within the locality; the first record is situated approximately 2.3 km to the north east of the Development Footprint within Wallaroo State Forest (2000), the second record is situated approximately 4.8 km east of the Development Footprint within Wallaroo National Park (1999).	No

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Small-flower Grevillea <i>Grevillea parviflora subsp. parviflora</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint despite targeted floristic surveys. Bionet Atlas records show six occurrence records within the Project locality. The most proximate record (2006) is located 600 m southeast of the Development Footprint in the southern bounds of Wallaroo State Forest. The remaining records are gathered near the Pacific Highway, Karuah (Eagleton), all of which were obtained in 2005 and 2006.	No
<i>Euphrasia arguta</i>	CE	CE	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Scrub Turpentine <i>Rhodamnia rubescens</i>	CE	CE	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no contemporary Bionet Atlas records situated within the Development Footprint or locality.	No
a leek-orchid <i>Prasophyllum sp. Wybong (C.Phelps ORG 5269)</i>	-	CE	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Native Guava <i>Rhodomyrtus psidioides</i>	CE	CE	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There is a single Bionet Atlas record (2006) within the locality, approximately 1.5 km northwest of the Development Footprint along Italia Road.	No
Eastern Underground Orchid <i>Rhizanthella slateri</i>	V	E	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Dwarf Kerrawang <i>Commersonia prostrata</i>	E	E	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
White-flowered Wax Plant <i>Cynanchum elegans</i>	E	E	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Slaty Red Gum <i>Eucalyptus glaucina</i>	V	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Newcastle Doubletail <i>Diuris praecox</i>	V	V	Species likely to occur in buffer area only	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Biconvex Paperbark <i>Melaleuca biconvexa</i>	V	V	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Bluegrass <i>Dichanthium setosum</i>	V	V	Species likely to occur in buffer area only	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Camfield's Stringybark <i>Eucalyptus camfieldii</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Leafless Tongue-orchid <i>Cryptostylis hunteriana</i>	V	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Earp's Gum <i>Eucalyptus parramattensis subsp. Decadens</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Thick-lipped Spider-orchid <i>Caladenia tessellata</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Hairy-joint Grass <i>Arthraxon hispidus</i>	V	V	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Austral Toadflax <i>Thesium australe</i>	V	V	Species may occur in buffer area only	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Knotweed <i>Persicaria elatior</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Trailing Woodruff <i>Asperula asthenes</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during floristic surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
<b>Threatened Fauna Species</b>					
<b>Mammals</b>					
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint during surveys, however several records occur throughout the locality including within Wallaroo State Forest, 400 m from the Development Footprint. The exact dates of these sightings are not specified, though the most recent record appears to be from 2004. Across the wider area the species has been captured north of the Development Footprint within Wallaroo National Park in addition to several records along the Bucketts Way (10 km from the Development Footprint).	<b>Yes</b>

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Koala <i>Phascolarctos cinereus</i>	V	E	Species or species habitat known to occur within area	<b>Recorded</b> – species recorded within the Development Footprint during targeted surveys.	<b>Yes</b>
Yellow-bellied Glider (south-eastern) <i>Petaurus australis australis</i>	V	V	Species or species habitat known to occur within area	<b>Medium</b> – species not recorded within the Development Footprint during surveys. There is a single occurrence record from 2005 located 1.1 km to the southwest of the Development Footprint. DCCEEW stated in their controlled action decision that this species may be significantly impacted by the Project. As such an Assessment of Significance has been prepared to address this.	<b>Yes</b>
Long-nosed Potoroo (northern) <i>Potorous tridactylus tridactylus</i>	V	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality (DPE 2022a). Species habitat includes rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines which are not present within the Development Footprint.	No
Greater Glider <i>Petauroides volans</i>	-	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint or the surrounds during surveys and unlikely to occur based on known distribution in contiguous eucalypt forests at higher elevations.	No
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Roosting known to occur within area	<b>Recorded</b> – Species recorded within the Development Footprint during nocturnal spotlighting surveys No active camps were identified during any Umwelt survey period, however a flying-fox camp has been identified in proximity to the Development Footprint on the DAWE website (DAWE 2022b). Given the proximity of this record to the Development Footprint, it is recommended that further investigation be undertaken.	<b>Yes</b>

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Species or species habitat known to occur within area	<b>Medium</b> – No breeding habitat occurs on the site. Balickera Tunnel occurs to the south of the Development Footprint and is known as a roost site for some threatened bat species, however the large-eared pied bat has not been recorded roosting in this location (Eco Logical 2021). The species has been previously recorded foraging in adjacent habitats near the Eagleton Quarry approximately 1.3 km to the south of the Development Footprint.	<b>Yes</b>
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	Species or species habitat known to occur within area	<b>Medium</b> – species not recorded within the Development Footprint during surveys. There are six species records within the locality. These records are situated to the west of Wallaroo State Forest, and north of the Development Footprint, northwest of Wallaroo National Park. The most recent records are dated 2018, with the species recorded alongside the southern extent of Italia Road approximately 3.1 km from the Development Footprint.  DCCEEW stated in their controlled action decision that this species may be significantly impacted by the Project. As such an Assessment of Significance has been prepared to address this.  Included as a precaution only as this species was included in the BAM-C automatically populated list. This species is not associated with any PCTs within the Development Footprint.	<b>Yes</b>
<b>Birds</b>					
White-throated Needletail <i>Hirundapus caudacutus</i>	-	V	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint during surveys. However, there are several species records (11) within the locality, though no records directly within the Development Footprint.  This species is almost exclusively aerial recorded, most often above wooded areas (TSSC 2019) which occur within the Development Footprint.	<b>Yes</b>

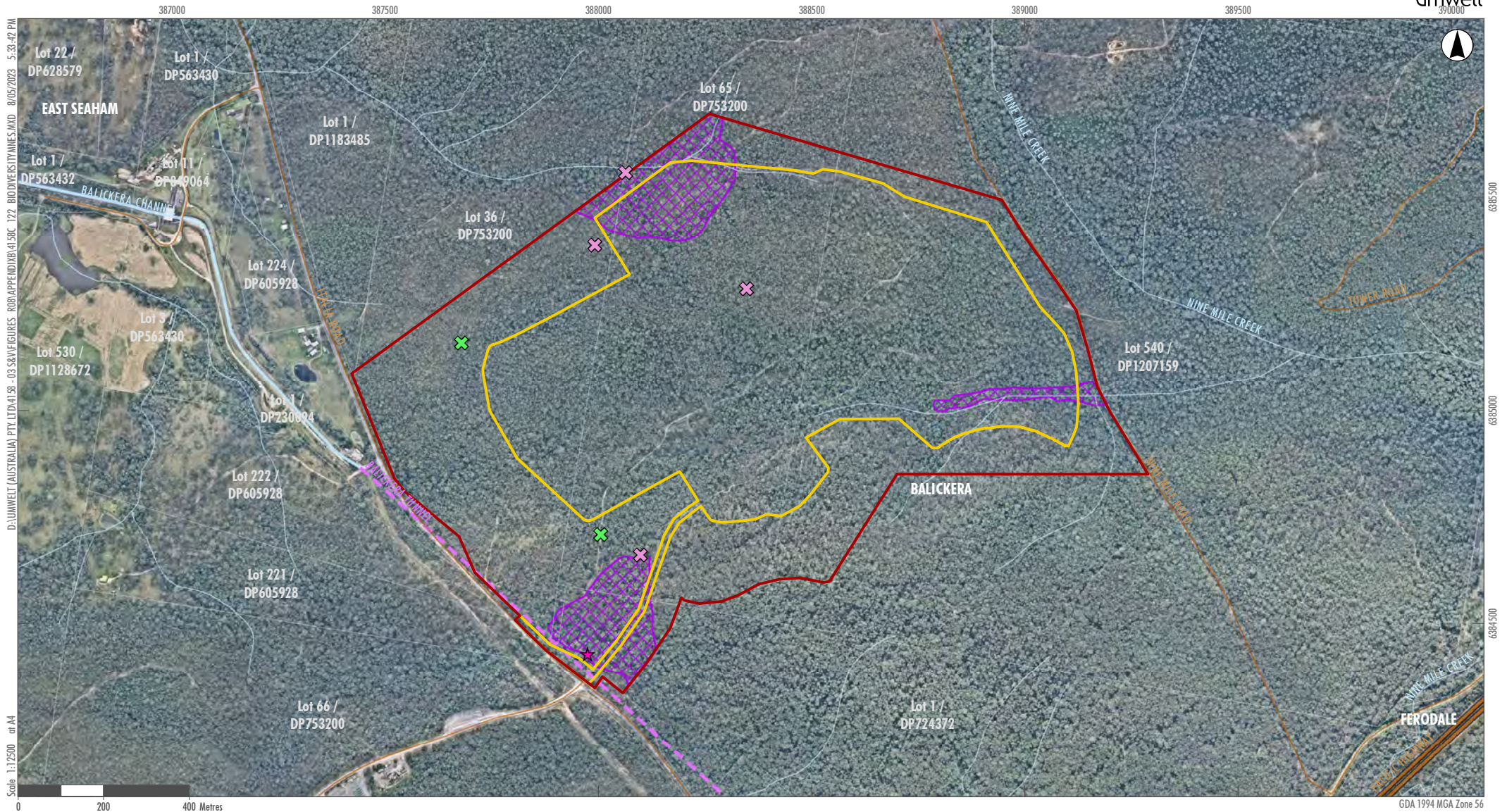
MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	CE	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint or the surrounds during surveys. Important Areas for the Regent Honeyeater mapped under the BAM do not occur on or near the Development Footprint (DPE 2022a).	No
Swift Parrot <i>Lathamus discolor</i>	E	CE	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint or the surrounds during surveys. However, the species has been recently (2020) recorded in the locality. The most recent sighting was in the eastern extent of Wallaroo National Park, approximately 4.9 km from the Development Footprint.  Mapped Swift Parrot Important Habitat Areas under the BAM, do not occur on or near the Development Footprint (DPE 2022a).	<b>Yes</b>
Australian Painted Snipe <i>Rostratula australis</i>	E	E	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	E	DCCEEW controlled action decision	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
South-eastern Glossy Black Cockatoo <i>Calyptorhynchus lathami lathami</i>	V	E	DCCEEW controlled action decision	<b>Medium</b> – Suitable habitat is present and DCCEEW have stated in the Controlled Action Decision that this species may be significantly impacted by the Project.	<b>Yes</b>
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	E	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no contemporary Bionet Atlas records situated within the Development Footprint or locality.	No
Painted Honeyeater <i>Grantiella picta</i>	V	V	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No

MNES Name	Status		PMST Notes	Likelihood to Occur within the Development Footprint	Assessment of Significance Required?
	BC Act	EPBC Act			
Pilotbird <i>Pycnoptilus floccosus</i>	-	V	Species may occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Grey Falcon <i>Falco hypoleucos</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Red Goshawk <i>Erythrotriorchis radiatus</i>	CE	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no BioNet Atlas records situated within the Development Footprint or locality.	No
<b>Frogs</b>					
Mahony's Toadlet <i>Uperoleia mahonyi</i>	E	E	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Stuttering Frog <i>Mixophyes balbus</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Giant Barred Frog <i>Mixophyes iteratus</i>	E	V	Species may occur in buffer area only	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V	Species likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No

**Table 5.3 Migratory Species Recorded or with Potential to Occur within the Development Footprint**

Species Name	EPBC - International Convention	PMST Notes	Likelihood to Occur within Development Footprint	Assessment of Significance
White-throated Needletail <i>Hirundapus caudacutus</i>	V – C, J, R	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint during surveys. However, there are several species records (11) within the locality, though no records directly within the Development Footprint. This species is almost exclusively aerial recorded, most often above wooded areas (TSSC 2019) which occur in the Development Footprint.	<b>Yes / assessment completed under the vulnerable species criteria</b>
Rufous Fantail <i>Rhipidura rufifrons</i>	B	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint during surveys. However, the species has been recorded in the locality on eight occasions, with the most recent recording from 2013 located along Barleigh Ranch Way, Eagleton NSW, approximately 1.4 km southwest of the Development Footprint. Although the remaining records are non-contemporary (i.e. not within the last 10 years) it is acknowledged that suitable habitat occurs throughout the Development Footprint. In its east and south-east Australian distributions, the species inhabits wet sclerophyll forests, often in gullies dominated by eucalypts with a dense understorey (DEH 2006a).	<b>Yes</b>
Oriental Cuckoo <i>Cuculus optatus</i>	C, J, R	Species or species habitat may occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Spectacled Monarch <i>Symposiachrus trivirgatus</i>	B	Species or species habitat likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Fork-tailed Swift <i>Apus pacificus</i>	C, J, R	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No

Species Name	EPBC - International Convention	PMST Notes	Likelihood to Occur within Development Footprint	Assessment of Significance
Black-faced Monarch <i>Monarcha melanopsis</i>	B	Species or species habitat known to occur within area	<b>High</b> – species not recorded within the Development Footprint during surveys. The species has been recorded in the locality on five occasions however, these records are non-contemporary i.e. not occurring after 1999. Suitable habitat for the species may remain within the Development Footprint and surrounds. The species is known to mainly inhabit rainforest communities (not present), though is sometimes found in nearby open eucalypt forests especially in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey (present) (DEH 2006b).	<b>Yes</b>
Osprey <i>Pandion haliaetus</i>	B	Species or species habitat likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality. Species is unlikely to occur based on known distribution in mainly coastal and wetland environments and lack of suitable habitat.	No
Satin Flycatcher <i>Myiagra cyanoleuca</i>	B	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No
Latham's Snipe <i>Gallinago hardwickii</i>	B, J, R	Species or species habitat known to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There is a single record from 2020 situated west of the Development Footprint along Balickera Canal near Italia Road. The Development Footprint does not contain any suitable habitat for the species, i.e. permanent or ephemeral wetlands, therefore it is considered unlikely that the species would occur within the Development Footprint.	No
Yellow Wagtail <i>Motacilla flava</i>	C, J, R	Species or species habitat likely to occur within area	<b>Low</b> – species not recorded within the Development Footprint during surveys. There are no Bionet Atlas records situated within the Development Footprint or locality.	No



**Legend**

- Project Area (Subject Land)
- Disturbance Area (Development Footprint)
- Pacific Highway
- Road
- Balickera Tunnel
- Drainage Line
- ✕ Vulnerable EPBC Act  
Grey-headed Flying-fox (*Pteropus poliocephalus*)
- ✕ Endangered EPBC Act  
Koala (*Phascolarctos cinereus*)
- ✕ Migratory EPBC Act  
Rufous Fantail (*Rhipidura rufifrons*)
- ★ Rufous Fantail (*Rhipidura rufifrons*)

**FIGURE 5.1**  
**Biodiversity MNES Observed within the Project Area**

## 6.0 Assessment of Impacts on MNES

### 6.1 Direct Project Impacts

The Project will result in direct impacts on biodiversity values within the Development Footprint. Direct impacts include the loss of native vegetation and fauna habitats as a result of clearing works for surface infrastructure in the quarry footprints as shown in Figure 1.3 of the BDAR. For impact assessment purposes, it is assumed that all vegetation within the 79.02 ha Development Footprint will be removed.

Direct Impacts associated with the Project will result in the following impacts on MNES:

- Disturbance to a total of **79.02 hectares** of native vegetation that comprise potential habitat for MNES of which all areas are woodland/forest habitat.
- Disturbance to **5.12 hectares** of Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions CEEC.

### 6.2 Indirect Project Impacts

The Project is not expected to result in any substantial indirect impacts or edge effects on the biodiversity values of surrounding lands, however it is acknowledged that some indirect impacts and edge effects associated with increased site occupation, connectivity and corridors, fugitive light emissions, dust, noise, vibrations, water, weeds and feral animals, security fencing, and increased vehicle movements may occur during the construction and operational phases. This is further discussed in the sections below.

#### 6.2.1 Increased Site Occupation

Increased site occupation is anticipated to occur during the construction and operation phases of the Project. This indirect impact is considered likely to occur, with consequences likely to include reduction in habitat suitability for threatened fauna in adjoining areas.

#### 6.2.2 Impacts on Connectivity

The Project is situated in a contiguous patch within the Wallaroo State Forest which adjoins several other areas managed for conservation include the Wallaroo National Park, Karuah National Park and Medowie State Conservation Area (refer to Figure 1 in Attachment 1 of the Referral). Given the extent of forested areas surrounding the Development Footprint, the removal of vegetation is not likely to largely impact dispersal, migration and movement ability of fauna species across the wider landscape.

This indirect impact will occur during the staged construction, operation and once decommissioned, with consequences including reduced wildlife connectivity. Wildlife connectivity will however be maintained through retention of suitable corridor areas. Furthermore, in the long term, most of the Development Footprint will be rehabilitated with native vegetation communities that will reinstate the connectivity currently present.

### **6.2.3 Fugitive Light Emissions on Adjacent Habitat**

Fugitive light emissions resulting from the construction and operation of the Project may result in adverse impacts on adjacent habitats and fauna species, particularly birds and bats. Potential impacts may include:

- a reduction in the navigational signal ability for some nocturnal animals
- delaying bats from emerging from roost access points and shortening the amount of time available to them for foraging.

Appropriate lighting controls to minimise impacts will be implemented as part of the Project as necessary (providing that these actions do not compromise site safety issues).

### **6.2.4 Noise Impacts on Adjacent Habitats**

Construction and operational noise impacts have the potential to adversely impact native species. Potential impacts include:

- noise disturbing the roosting and foraging behaviour of fauna species
- noise reducing the occupancy of areas of suitable habitat.

Noise mitigation measures to minimise noise impacts will be implemented as part of the Project.

### **6.2.5 Dust Impacts on Adjacent Habitats**

Construction and operational dust impacts have the potential to adversely impact native species during ground disturbing works, including site clearing, blasting and as a result of vehicle movements. Potential impacts include dust covering vegetation thereby potentially reducing vegetation health, growth and suitability as fauna habitat.

The design of the Project will include measures to minimise the potential for adverse dust impacts. These include:

- progressive rehabilitation and stabilisation of disturbed land
- dust suppression to reduce vehicle-generated dust emissions.

### **6.2.6 Vibration Impacts**

Eco Logical Australia (2021) have identified that the Balickera tunnel provides habitat for microbat species, but none of which are EPBC Act listed.

It is considered that there is potential that vibration from blasting and heavy vehicle traffic may disrupt microbat roosting behaviour in the Balickera Tunnel, however the impacts of blasting on the tunnel structure have been assessed as low in the Blasting Impact Assessment, provided as Appendix 8 of EIS.

The vibration impacts are considered to have a potential to occur during the operational phase of the Project. The Blasting Impact Assessments (Enviro Strata Consulting P/L 2022; 2023) identified that no damage to the tunnel structure would result. Infrequent impacts at the highest predicted levels of 27mm/s are only expected to induce falling of accumulated dust to the floor and potentially displace small loose pieces of rock. It is considered that vibration associated with the Project is not likely to impact MNES.

### **6.2.7 Water Impacts**

Impacts to water are considered likely to occur during construction and operation as well as ongoing following decommissioning. Water impacts from the Project are likely to include loss of existing first and second order ephemeral watercourses within the site and altered hydrology and potential sedimentation of downstream environments.

These implications are to be managed through appropriate erosion and sediment controls and retention and treatment of runoff and intercepted water. Impacts to water quality in the downstream environment are predicted to satisfy the 'neutral or Beneficial Effect' (NorBE) requirements applicable to developments within the Grahamstown Dam catchment under NSW legislation.

### **6.2.8 Weed and Feral Animal Encroachment**

Weed species could be inadvertently brought into the Development Footprint with imported materials or could invade into other areas naturally through removal of native vegetation. The invasion of weed species is considered a possible impact of the construction and operation of the Project as well as ongoing once decommissioned. The presence of weed species within the Development Footprint encroaching into other land has the potential to decrease the value of extant vegetation to native species, including threatened species. Mitigation measures outlined in **Section 7.2** will be implemented to minimise the potential for weed encroachment into areas surrounding the Development Footprint.

Populations of feral fauna species such as foxes, rabbits, pigs, dogs and cats can increase and quickly populate new areas without programs in place. Feral animals are already present within the Project Area. The operation and construction of the Project is considered to have a low potential for increased impacts to occur during the. Consequences of feral animal encroachment could result in a reduced habitat suitability and predation, grazing and/or trampling of threatened species. Mitigation measures outlined in **Section 7.2** will minimise the potential for feral animal spread and impacts into surrounding areas around the Development Footprints.

### **6.2.9 Security Fencing**

Security fencing is likely to be erected during the construction and operational phases of the Project. Consequences of this indirect impact include the potential reduction in habitat connectivity while the fencing is in place.

### **6.2.10 Increase Vehicle Movements**

The Project will result in the increased movement of light and heavy vehicles traveling along Italia Road, Balikera NSW, as well as some minor adjoining roads. Mortality by vehicle strike is a significant threat to Koalas and is particularly prevalent along transportation routes which occur in proximity to Koala habitat (DAWE 2022d). The likelihood of Koala mortalities resulting from vehicle strikes as a result of the Project is considered high based on densities of species records in the Development Footprint locality.

Mortality by vehicle strike is a threat to many fauna species, threatened or otherwise; however, the threats are not as well documented. **Section 7.2** documents the traffic control mitigation measures proposed to minimise potential mortality by vehicle strikes.

### **6.3 Assessments of Significance Summary for MNES**

Assessments of significance were prepared for those species identified in **Table 5.2** as present or considered to have a medium to high potential to occur within the Development Footprint, and therefore with potential to be impacted. The Commonwealth SEARs provided by DCCEW also listed seven nationally listed threatened species (refer to **Section 1.0**) that they considered important to include in the Assessment of Significance, and these species are all considered to have a medium or higher probability of occurring within the Development Footprint and have been assessed further. There is also one endangered ecological community, Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions, listed under the EPBC Act which is considered to be present and has been assessed. These assessments of significance are provided in **Appendix B** of this Report

The following **Table 6.1** provides a summary of the nature and quantum of impacts on the MNES considered in the Assessments of Significance.

**Table 6.1 Summary of Impact Assessment for MNES**

EPBC Act Entity	EPBC Act Status	Nature & Consequence of impact (direct and indirect)	Duration of impact (e.g. construction operation, life of project)	Quantum of impact	Consequence of impact at local, state and national scale	Level of impact (is an offset required?)
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered Ecological Community	<b>Direct Impacts:</b> Habitat removal within Development Footprint. <b>Indirect Impacts:</b> Fragmentation of south-western patch by access road. Project also has potential to result in reduction in quality of retained areas directly adjoining the Development Footprint due to light spill, operations noise and vibration, weed invasion and some limited and managed water and air quality impacts.	Permanent	5.12 ha	Entity assessed as significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements for 178 ecosystem credits (associated with PCTs consistent with the EEC), following like-for-like offsetting rules.
Spotted-tailed Quoll (southeastern mainland population)  <i>Dasyurus maculatus maculatus</i>	Endangered	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.
Koala <i>Phascolarctos cinereus</i>	Endangered	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of known habitat	Entity assessed as significantly impacted under the EPBC Act. Impact is likely to be of significance	Species observed during surveys and assessed as a species credit entity under the BAM. Impacts to species will be offset through retirement of

EPBC Act Entity	EPBC Act Status	Nature & Consequence of impact (direct and indirect)	Duration of impact (e.g. construction operation, life of project)	Quantum of impact	Consequence of impact at local, state and national scale	Level of impact (is an offset required?)
		noise, blasting and vibration, weed invasion and limited water and air quality impacts.			at local and regional scales.	2929 species credits, following like-for-like offsetting rules.
Yellow-bellied Glider (south-eastern) <i>Petaurus australis australis</i>	Vulnerable	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Vulnerable	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of known foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	Vulnerable	Species not detected during surveys <b>Potential direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Potential Indirect Impacts:</b> Reduced habitat suitability for directly	Potential direct impacts will be permanent, indirect impacts will be for the life of the Project.	Species not detected during surveys. Extent of suitable habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is not likely to be of significance at	Under the NSW BAM, the Large-eared Pied-bat is a full species credit entity. This species was surveyed for and no records were found, therefore

EPBC Act Entity	EPBC Act Status	Nature & Consequence of impact (direct and indirect)	Duration of impact (e.g. construction operation, life of project)	Quantum of impact	Consequence of impact at local, state and national scale	Level of impact (is an offset required?)
		adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.		impacted is 79.02 ha.	local, regional or national scales.	no species credits were generated. No offsetting through species credits are required.
New Holland Mouse <i>Pseudomys novaehollandiae</i>	Vulnerable	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.
White-throated Needletail <i>Hirundapus caudacutus</i>	Vulnerable / Migratory	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is unlikely to be of consequence at local, regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.

EPBC Act Entity	EPBC Act Status	Nature & Consequence of impact (direct and indirect)	Duration of impact (e.g. construction operation, life of project)	Quantum of impact	Consequence of impact at local, state and national scale	Level of impact (is an offset required?)
Swift Parrot <i>Lathamus discolor</i>	Critically Endangered	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.
South-eastern Glossy Black Cockatoo <i>Calyptorhynchus lathami lathami</i>	Endangered	<b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint. <b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	79.02 ha of suitable foraging habitat	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Non-significant impact. No offset required under EPBC Act. Offset to be provided under BC Act requirements through retirement of 2228 ecosystem credits (associated PCTs), following like-for-like offsetting rules.

EPBC Act Entity	EPBC Act Status	Nature & Consequence of impact (direct and indirect)	Duration of impact (e.g. construction operation, life of project)	Quantum of impact	Consequence of impact at local, state and national scale	Level of impact (is an offset required?)
Rufous Fantail <i>Rhipidura rufifrons</i>	Migratory	<p><b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint.</p> <p><b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.</p>	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	5.12 ha of suitable foraging habitat (PCTs 762, 1618 and 1716).	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Species not observed during surveys and non-significant impact predicted. No offset required under EPBC Act. Impacts to species habitats will be indirectly offset through retirement of 2228 ecosystem credits.
Black-faced Monarch <i>Monarcha melanopsis</i>	Migratory	<p><b>Direct Impacts:</b> Clearing of suitable foraging habitat within the Development Footprint.</p> <p><b>Indirect Impacts:</b> Reduced habitat suitability for directly adjoining retained areas associated with site occupation, light spill, operations noise, blasting and vibration, weed invasion and limited water and air quality impacts.</p>	Direct impacts will be permanent, indirect impacts will be for the life of the Project.	5.12 ha of suitable foraging habitat (PCTs 762, 1618 and 1716).	Entity assessed as not significantly impacted under the EPBC Act. Impact is likely to be of local significance but unlikely to be of consequence at regional or national scales.	Species not observed during surveys and non-significant impact predicted. No offset required under EPBC Act. Impacts to species habitats will be indirectly offset through retirement of 2228 ecosystem credits. .

## 6.4 Assessment of 2019-2020 Bushfires

An assessment of the impacts of the 2019-2020 bushfires on EPBC Act listed threatened species and communities present or with a medium or greater potential to occur is provided in **Table 6.2**. This assessment provides information on whether the remaining habitat within the Project Area is of greater importance to the survival of the listed threatened species MNES following the 2019/2020 fires.

**Table 6.2 Assessment of the 2019-2020 Bushfires on Threatened Species and Ecological Communities**

Species Name	Listing status		Assessment of the 2019-2020 Bushfires
	BC Act	EPBC Act	
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	E	E	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, but may occur elsewhere in this bioregion.</li> <li>Mega-fires, such as those experienced in the 2019–2020 fire season, can burn a significant proportion of an ecological community and the surrounding vegetation in a single event, which compounds these detrimental impacts.</li> <li>It is estimated that the current extent of the ecological community as 277,000 ha; with an estimated 70% reduction from its original extent (of 937,000 ha, prior to European settlement). According to the Conservation Advice for the community (DCCEEW 2022) almost 15% of the ecological community was burnt in 2019–20, based on the Australian Google Earth Engine Burnt Area Map (DAWE 2020).</li> <li>The Project Area, including the 5.12 ha of Subtropical eucalypt floodplain forest and woodland, expected to be impacted by the Project was not burnt in the 2019-2020 bushfires. The Project Area was burnt in 2016.</li> </ul>
Spotted-tailed Quoll (southeastern mainland population)  <i>Dasyurus maculatus maculatus</i>	V	E	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>It is considered that a large proportion of the suitable habitat for this species within NSW was burnt during the 2019-2020 bushfires, with Conservation Advice (Threatened Species Scientific Committee 2020) identifying that 29 percent of the Spotted-tailed Quoll’s distribution range overlaps with the fire-affected extent. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>

Species Name	Listing status		Assessment of the 2019-2020 Bushfires
	BC Act	EPBC Act	
Koala <i>Phascolarctos cinereus</i>	E	E	<ul style="list-style-type: none"> <li>The Subject Land was not burnt in the 2019-2020 bushfires.</li> <li>The National Recovery Plan for the Koala (DAWE 2022c) identifies that the 2019-2020 bushfires killed, injured or affected an estimated 61,000 Koalas and burnt 3,659,625 ha (9%) of the area within which the listed Koala and its habitat are known or likely to occur. The listing status of this species under the EPBC Act was subsequently upgraded to endangered following this fire event.</li> <li>This species was recorded within the Development Footprint during surveys.</li> </ul>
Yellow-bellied Glider (south-eastern) <i>Petaurus australis australis</i>	V	V	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires and this species was not observed within the Project Area during surveys.</li> <li>The Conservation Advice for this species estimates that 41% of this species distribution was burnt by the 2019-2020 bushfires and was one of the reasons for the listing for this species under the EPBC Act.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>The National Recovery Plan for this species (DAWE 2021) identifies that although several of the impacts have not been quantified, preliminary analysis indicates that the associated impact of the fires on this species are likely to be significant in relation to foraging habitat, but only minor in relation to impacts at camp sites.</li> <li>This species was observed foraging within the subject land during surveys. The National Flying Fox Monitoring Viewer (DCCEEW 2023) identifies that there is a historical camp site within the Wallaroo State Forest within the vicinity of the subject land, however no Flying-foxes have been observed there for &gt;10 years. The nearest active camp sites are at Moffatts Swamp and Tocal.</li> </ul>

Species Name	Listing status		Assessment of the 2019-2020 Bushfires
	BC Act	EPBC Act	
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>The Conservation Advice for this species estimates that 26.6% of the species habitat occurs within areas affected by the 2019-2020 wildfires (DAWE 2021). The impact of these fires is yet to be thoroughly assessed. Individuals congregate to roost and raise young which places a reasonable proportion of a local population at a single locality. Most known cave roosts are in shallow caves or in the outer reaches of deeper mines or caves. As such, individuals are potentially susceptible to direct mortality from heat and smoke from fires. Mortality can be expected to be higher during high intensity fires or where fires occur on a regular basis. Mortality is potentially higher for creched young unable to escape smoke as adults may be able to. The longer-term impacts of fire frequency and intensity on the Large-eared Pied Bat are unknown.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>No species information on this species in relation to the 2019-2020 bushfires could be found. The New Holland Mouse is thought to shelter in burrows during fires and is a species which favours early to mid stages of vegetation succession three to five years after fire.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>
White-throated Needletail <i>Hirundapus caudacutus</i>	-	V / Migratory	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>There is currently no data surrounding the impacts of the 2019-2020 bushfires on this species.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>

Species Name	Listing status		Assessment of the 2019-2020 Bushfires
	BC Act	EPBC Act	
Swift Parrot <i>Lathamus discolor</i>	E	CE	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>The 2019/20 mega fire event that impacted the east coast of Australia represent a significant pulse impact on the quality of the habitat for the Swift Parrot. The Draft National Recovery Plan estimates that between 10-30 percent of the distribution range of the Swift Parrot was impacted to some extent, with increasing likelihood of future similar fire events as a result of climate change (AGDAWE 2021a).</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>
South-eastern Glossy Black Cockatoo <i>Calyptorhynchus lathami lathami</i>	V	V	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>The approved conservation advice for this species identifies that a large proportion of this species range was affected by the 2019-2020 bushfires, including 10% burnt in high to very high severity fire, and a further 15% burnt in low to moderate severity fire.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>
Rufous Fantail <i>Rhipidura rufifrons</i>	-	Migratory (Bonn)	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>There is currently no data surrounding the impacts of the 2019-2020 bushfires on this species.</li> <li>This species was recorded within the Project Area during surveys.</li> </ul>
Black-faced Monarch <i>Monarcha melanopsis</i>	-	Migratory (Bonn)	<ul style="list-style-type: none"> <li>The Project Area was not burnt in the 2019-2020 bushfires.</li> <li>There is currently no data surrounding the impacts of the 2019-2020 bushfires on this species.</li> <li>This species was not recorded within the Project Area during surveys.</li> </ul>

## 7.0 Avoid, Minimise, Offset

The proposal has been assessed using the NSW BAM which requires the application of an avoid, minimise and offset hierarchy. The Commonwealth Government supports the use of the BAM as the underpinning methodology for calculating biodiversity credit requirements under the Assessment Bilateral Agreement (further discussed in **Section 7.3**).

The following sections summarise the Project's strategy to avoid and minimise impacts on biodiversity and then offset the residual impacts associated with the Project.

### 7.1 Avoidance

Impact avoidance is documented in Section 7 of the BDAR. The Proponent has sought to avoid impacts to MNES by ensuring that the areas of proposed disturbance are aligned within the geological resource proposed for extraction. The Disturbance Footprint has been refined over multiple iterations to reduce areas of proposed impacts to threatened species. Impacts to native vegetation and threatened species habitats have been reduced by 60.7 ha from an initial footprint of 139.72 ha to the current Development Footprint of 79.02 ha as a result of the Project refinements.

### 7.2 Impact Mitigation and Minimisation Measures

#### 7.2.1 Techniques, timing, frequency and responsibility of feasible mitigation measures

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

- workforce education and training
- implementation of vegetation protection zones for areas to be retained
- ecologist pre-clearance surveys and supervision of works
- erosion and sedimentation control
- weed management
- fencing, access control and fauna exclusion
- preparation and implementation of a Construction Environmental Management Plan.

The impact mitigation measures proposed for residual impacts are also further summarised in **Table 7.1**, with implementation details provided in **Table 7.2**.

**Table 7.1 Summary of Proposed Mitigation and Management Measures for Residual Impacts (Direct, Indirect, and Prescribed)**

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Workforce education and training	Environmental awareness for construction and operational site workers	Construction and operation	For all new contractors and employees as part of the general site induction	Site Manager	Measure is likely to achieve intended outcome
Implementation of vegetation protection zones for areas to be retained	Temporary delineation of the Development Footprint until permanent fencing is installed.	Construction / site clearing	Prior to and during site clearing and construction Permanent fencing to remain for the life of the development	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome
Ecologist pre-clearance surveys and supervision of works	-Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Prior to and during site clearing	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome
Erosion and sedimentation control	Installation and maintenance of appropriate erosion and sediment controls and work practices.	Prior to and during clearing works until permanent controls such as sediment basins are installed and established.	Temporary erosion and sediment controls would be installed prior to commencement of construction and permanent measures such as stormwater detention basins would be maintained for the life of the development.	Site Manager	Measure is likely to achieve intended outcome
Weed management	Targeted spraying and/or grazing to suppress weed invasion	All stages of the development	As needed	Site Manager / Project Ecologist	Measure is likely to achieve intended outcome

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Fencing, Access Control and Fauna exclusion	Installation of a permanent security fence	During operation	For the life of the development	Site Manager	Measure is likely to achieve intended outcome
Preparation and Implement of Construction Environmental Management Plan	Develop plan to adequately manage environmental impacts during construction including dam dewatering controls, fencing and access control, weed management and erosion and sediment control.	To prepared prior to the commencement of works and implemented for all construction works and for the life of the development as necessary	For the life of the development	Proponent / Site Manager	Measure is likely to achieve intended outcome
Monitoring and additional offsetting for uncertain impacts, such as changes to vegetation structure and composition resulting from groundwater drawdown, hydrological impacts and habitat suitability reduction from blasting and vibration,	Direct monitoring of vegetation and Koala and Brush-tailed Phascogale populations	Baseline surveys to be completed before commencement of works and ongoing for the life of the development.	Annual	Proponent / Project Ecologist	Measure is likely to achieve intended outcome

Implementation details for the proposed impact mitigation and management measures are provided in **Table 7.2**.

**Table 7.2 Implementation Details for Proposed Impact Mitigation and Management Measures**

Measure/action	Monitoring and evaluation strategy	Performance criteria	Adaptive management threshold	Adaptive management response
Workforce education and training	Completion and maintenance of a site induction register.	Induction of all construction workers.	Failure of Site manager to induct workers.	Breach to be reported in annual compliance reporting.  Suspension of the relevant works until construction workers are inducted.
Implementation of vegetation protection zones for areas to be retained	Monitoring to be undertaken by the Project Ecologist prior to commencement and monthly during construction works.	Protection of retained vegetation and habitats.	Breach of vegetation protection zones / damaged to retained habitats.	Breach to be reported in annual compliance reporting.  Suspension of the relevant works until appropriate protection measures are implemented and appropriate remedial actions to remedy any adverse impacts are completed.
Ecologist pre-clearance surveys and supervision of works	Reporting on pre-clearance surveys and works supervision to be undertaken by Project Ecologist.	Completion of proposed works.	Completion of clearing works without project ecologist supervision.	Breaches to be reported in annual compliance reporting to DPE.
Erosion and sedimentation control	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Temporary erosion and sediment controls to be installed prior to works. Permanent controls to be maintained for the life of the development.	Monitoring detects lack or failure of required temporary or permanent erosion and sediment controls.	Breaches to be reported in annual compliance reporting to DPE.
Weed management	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Weed growth to be continually suppressed within the Development Footprint.	Monitoring detects increasing weed infestations which are not being suppressed.	Alternative methods or herbicides to be used to achieve success.

Measure/action	Monitoring and evaluation strategy	Performance criteria	Adaptive management threshold	Adaptive management response
Fencing, Access Control and Fauna exclusion	Monitoring to be undertaken in accordance with requirements of Construction Environmental Management Plan.	Exclusion of all target fauna species.	Repair or upgrade to fencing.	Fencing design to be improved to achieve effectiveness.
Preparation and Implement of Construction Environmental Management Plan	Implementation to be supervised by Project Ecologist or suitable environmental consultant with regular reporting to DPE during construction.	Completion of all proposed environmental protection works and monitoring inspections.	Monitoring detects breach or failure to implement Construction Environmental Management Plan.	Breach to be included in annual compliance reporting to DPE.

### 7.2.2 Measures for which there is risk of failure

The mitigation measures for the Project require adaptive management and any failures would be addressed through monitoring and corrective actions.

### 7.2.3 Risk and consequence of any residual impacts

Appropriate environmental management measures will be included as part of the operations to minimise the potential for indirect and residual impacts including:

- water management systems that seek to minimise the potential for damage to flora and fauna and their habitats from erosion, sedimentation and unnatural flooding events
- noise control systems to minimise noise impacts
- dust control measures to minimise dust impacts
- lighting controls to minimise night time light impacts, and
- blasting controls to minimise blast overpressure and vibration impacts.
- employee education and training.

### 7.2.4 Adaptive management strategy proposed to monitor and respond to impacts

It is considered that the potential impacts associated with the project are predictable and known. Adaptive strategies for impact mitigation measures are provided in **Table 7.2**. Further adaptive management strategies will be provided in the Construction Environmental Management Plan for the project.

## 7.3 Biodiversity Offset Strategy

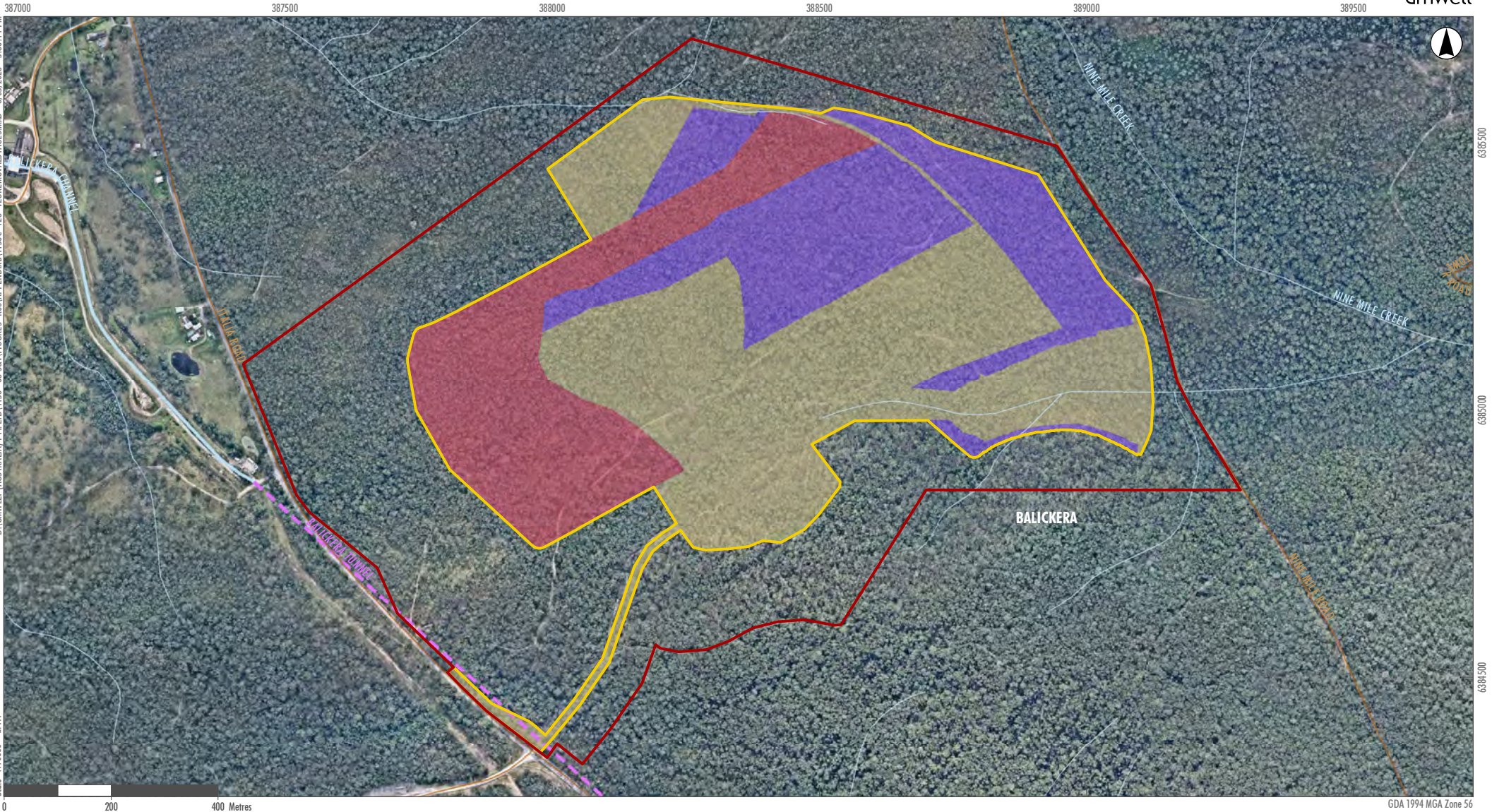
### 7.3.1 Staged Biodiversity Offset Strategy

The retirement of biodiversity credits is proposed to be undertaken within the following three phases, based on the vegetation removal and overburden phases mapped in **Figure 7.1**:

- Phase 1 - 38.74 ha (Stages 0–2)
- Phase 2 - 21.44 ha (Stages 3-5)
- Phase 3 - 18.85 ha (Stages 6-9).

The PCTs and threatened species that require offsetting and the proposed staged credit retirement per impact stage area is shown in **Table 7.3**. There is no proposal to fund a biodiversity conservation action or conduct ecological rehabilitation to generate biodiversity credits for the project.

The Proponent has committed to further investigate the retirement of biodiversity credits through the establishment of a Biodiversity Stewardship Site within the Wallaroo State Forest. Where credits are not generated and retired within the Wallaroo State Forest they will be purchased from the market or a payment will be made to the Biodiversity Conservation Fund. The like-for-like credit rules will be followed for nationally listed entities which require credits.



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- Legend**
- Project Area (Subject Land)
  - Disturbance Area (Development Footprint)
  - Road
  - Balickera Tunnel
  - Drainage Line
  - Stage**
  - Phase 1 (Stages 0-2)
  - Phase 2 (Stages 3-5)
  - Phase 3 (Stages 6-9)

**FIGURE 7.1**  
**Vegetation Removal and Overburden Stripping Stages**

**Table 7.3 Proposed Staged Credit Retirement Details**

Entity and Total Credits Required	Stage No.	Area of Impact on Entity per Stage (ha)	Credits to be retired per stage
PCT 762 Cabbage Gum open forest or woodland on flats of the North Coast 13 Credits	1	0.33	13
	2	-	-
	3	-	-
PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest 1268 Credits	1	12.39	344
	2	15.42	429
	3	17.82	495
PCT 1618 Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast 34 Credits	1	0.88	34
	2	-	-
	3	-	-
PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands 782 Credits	1	22.24	615
	2	5	138
	3	1.03	29
PCT 1716 Prickly-leaved Paperbark Forest on Coastal Lowlands of the Central Coast and Lower North Coast 131 Credits	1	2.9	97
	2	1.02	34
	3	-	-
	2	21.43	794
	3	18.86	699
Koala ( <i>Phascolarctos cinereus</i> ) 2929 Credits	1	38.7	1436
	2	21.43	794
	3	18.86	699

## 7.3.2 Details of how biodiversity offsets correlate to the MNES impacts

The offsetting requirements for each MNES impacted by the Project are summarised in **Table 7.4**.

### 7.3.2.1 Species Credits

One nationally listed threatened species, the Koala, requires offsets through the provision of species credits being 2929 credits.

There is one species credit entity, Large-eared Pied-bat, which was considered to have potential to occur but was not detected during surveys. No species credits are required for the Large-eared Pied-bat under the BAM.

### 7.3.2.2 Ecosystem Credits

A total of 2228 Ecosystem credits are required to offset the impacts of the proposal including the following MNES entities:

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (associated with three PCTs which require a total of 178 credits)
- Spotted-tailed Quoll (southeastern mainland population)
- Yellow-bellied Glider (south-eastern)
- Grey-headed Flying-fox (foraging habitat)
- New Holland Mouse
- White-throated Needle-tail
- Swift Parrot (foraging habitat)
- South-eastern Glossy Black Cockatoo.

### 7.3.2.3 Other Entities

The following EPBC Act listed migratory species are not directly covered by offsetting requirements under the BAM:

- Rufous Fantail
- Black-faced Monarch.

These species will be offset indirectly through the provision of ecosystem credits.

**Table 7.4 Summary of Offsets for Threatened Species and Ecological Communities Listed Under the EPBC Act**

Threatened species/community listed under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	762, 1618, 1716	5.12	178	Offsetting using ecosystem credits for associated PCTs
Koala ( <i>Phascolarctos cinereus</i> )	762, 1590, 1618, 1619, 1716	79.02	2,929	Offsetting like-for-like species credits
Spotted-tailed Quoll ( <i>Dasyurus maculatus</i> )	762, 1590, 1618, 1619, 1716	79.02	2,228	Offsets not required under EPBC Act as species not significantly impacted. Offset under BC Act requirements using ecosystem credits
Yellow-bellied Glider (south-eastern) ( <i>Petaurus australis australis</i> )	762, 1590, 1618, 1619	75.11	2,097	Offsets not required under EPBC Act as species not significantly impacted. Offset under BC Act requirements using ecosystem credits
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	762, 1590, 1618, 1619, 1716	79.02	2,228	Offsets not required under EPBC Act as species not significantly impacted. Offset under BC Act requirements using ecosystem credits
New Holland Mouse ( <i>Pseudomys novaehollandiae</i> )	1590, 1618, 1619, 1716	78.69	2,215	Offsets not required under EPBC Act as species not significantly impacted. Offset under BC Act requirements using ecosystem credits

Threatened species/community listed under EPBC Act	PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Impact (ha)	Credits Required	Offsetting Approach
White-throated Needletail ( <i>Hirundapus caudacutus</i> )	762, 1590, 1618, 1619, 1716	79.02	2,228	Offsetting using ecosystem credits
Swift Parrot ( <i>Lathamus discolor</i> ).	762, 1590, 1618, 1619, 1716	79.02	2,228	Offsets not required under EPBC Act as species not significantly impacted. Foraging habitat offset under BC Act requirements using ecosystem credits
South-eastern Glossy Black Cockatoo ( <i>Calyptorhynchus lathami lathami</i> )	762, 1590, 1618, 1619, 1716	79.02	2,228	Offsets not required under EPBC Act as species not significantly impacted. Foraging habitat offset under BC Act requirements using ecosystem credits
Rufous Fantail ( <i>Rhipidura rufifrons</i> )	N/A	79.02	No requirement although species will be indirectly offset through retirement of ecosystem credits.	Offsets not required under EPBC Act as species not significantly impacted. Indirect offsetting through retirement of ecosystem credits
Black-faced Monarch ( <i>Monarcha melanopsis</i> )	N/A	79.02	No requirement although species will be indirectly offset through retirement of ecosystem credits.	Offsets not required under EPBC Act as species not significantly impacted. Indirect offsetting through retirement of ecosystem credits

## 8.0 Summary

It is considered that the Project (in the absence of offsetting) is likely to have a significant impact on the endangered Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT), as listed under the EPBC Act. The Project is not predicted to have a significant impact on any other MNES.

A range of mitigation measures are proposed to reduce any potential impacts on MNES and a like-for-like biodiversity offsets will be delivered for the Project in accordance with relevant NSW and Commonwealth legislation and/or policies, as documented in **Section 7.0**. A summary of the proposed impacts on Matters of National Environmental Significance is provided in **Table 8.1**.

**Table 8.1 Summary of Impacts on Matters of National Environmental Significance**

MNES	Area of species impact	Significance of impact
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	5.12 ha	Not significant
Spotted-tailed quoll ( <i>Dasyurus maculatus maculatus</i> ) (SE mainland population)	79.02 ha	Not significant
Koala ( <i>Phascolarctos cinereus</i> ) (combined populations of Qld, NSW and the ACT)	79.02 ha	<b>Significant</b>
Yellow-bellied Glider (south-eastern) ( <i>Petaurus australis australis</i> )	79.02 ha	Not significant
Swift parrot ( <i>Lathamus discolor</i> )	79.02 ha	Not significant
Grey-headed flying-fox ( <i>Pteropus poliocephalus</i> )	79.02 ha	Not significant
White-throated needletail ( <i>Hirundapus caudacutus</i> )	79.02 ha	Not significant
Large-eared Pied Bat ( <i>Chalinolobus dwyeri</i> )	N/A not observed during surveys	Not significant
New Holland Mouse ( <i>Pseudomys novaehollandiae</i> )	79.02 ha	
White-throated needletail ( <i>Hirundapus caudacutus</i> ) (addressed under vulnerable species assessment)	79.02 ha	Not significant
South-eastern Glossy Black Cockatoo ( <i>Calyptorhynchus lathami lathami</i> )	79.02 ha	Not significant
Rufous fantail ( <i>Rhipidura rufifrons</i> )	79.02 ha	Not significant
Black-faced monarch ( <i>Monarcha melanopsis</i> )	79.02 ha	Not significant

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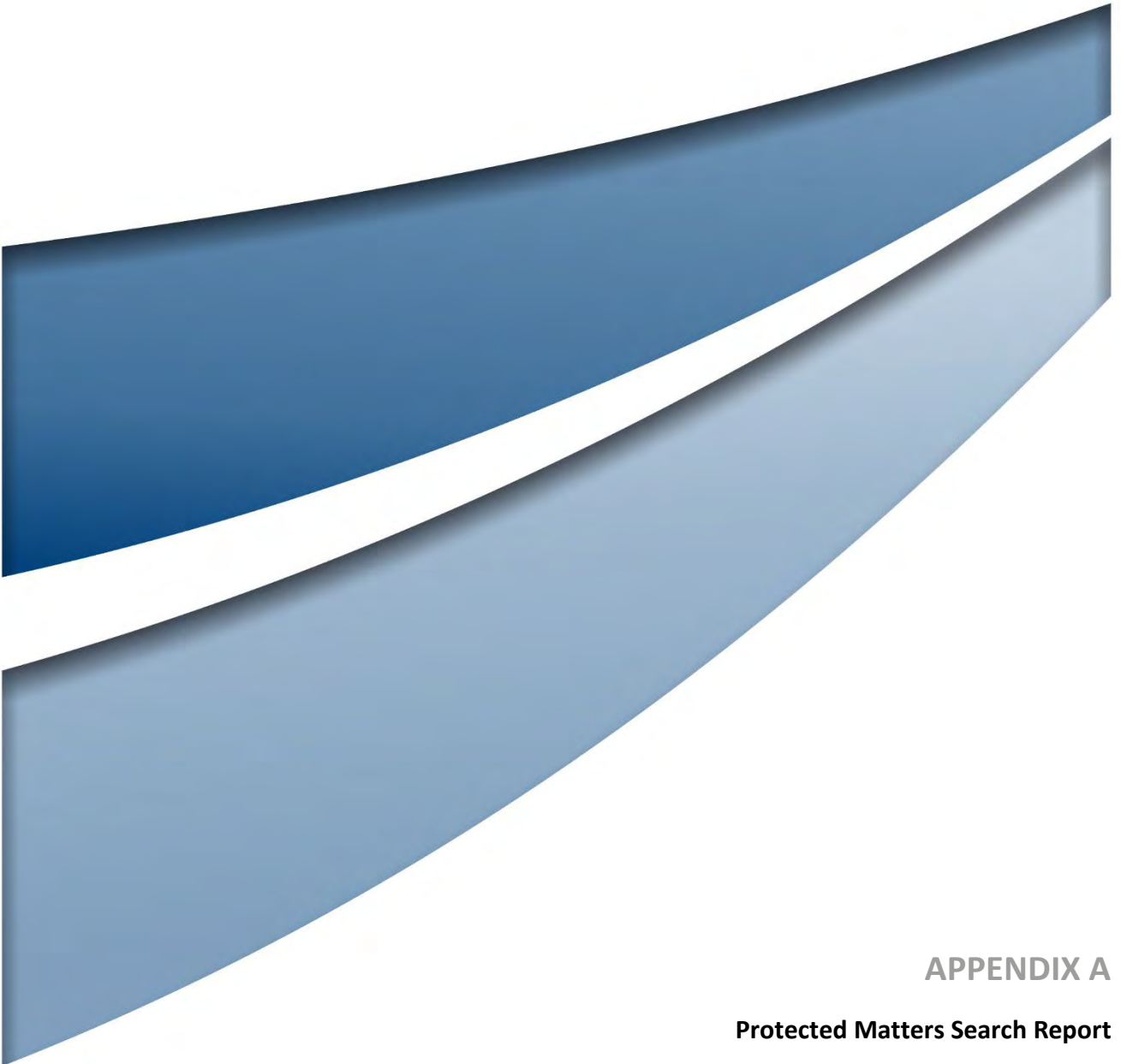
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APPENDIX A

**Protected Matters Search Report**



# EPBC Act Protected Matters Report

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

Report created: 19-Apr-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

# Summary

## Matters of National Environment Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance (Ramsar)</a>	1
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	6
<a href="#">Listed Threatened Species:</a>	75
<a href="#">Listed Migratory Species:</a>	43

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Lands:</a>	197
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	48
<a href="#">Whales and Other Cetaceans:</a>	1
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None
<a href="#">Habitat Critical to the Survival of Marine Turtles:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	10
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">EPBC Act Referrals:</a>	7
<a href="#">Key Ecological Features (Marine):</a>	None
<a href="#">Biologically Important Areas:</a>	None
<a href="#">Bioregional Assessments:</a>	1
<a href="#">Geological and Bioregional Assessments:</a>	None

# Details

## Matters of National Environmental Significance

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

Ramsar Site Name	Proximity	Buffer Status
<a href="#">Hunter estuary wetlands</a>	Within 10km of Ramsar site	In feature area

### Listed Threatened Ecological Communities [\[ Resource Information \]](#)

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Central Hunter Valley eucalypt forest and woodland</a>	Critically Endangered	Community may occur within area	In feature area
<a href="#">Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</a>	Endangered	Community likely to occur within area	In feature area
<a href="#">Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland</a>	Endangered	Community known to occur within area	In feature area
<a href="#">Lowland Rainforest of Subtropical Australia</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area	In buffer area only

### Listed Threatened Species [\[ Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>BIRD</b>			
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Callocephalon fimbriatum</a> Gang-gang Cockatoo [768]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea antipodensis gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Erythrotriorchis radiatus</a> Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Limosa lapponica baueri</a> Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Pycnoptilus floccosus</a> Pilotbird [525]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche bulleri platei</a> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<b>FISH</b>			
<a href="#">Epinephelus daemeli</a> Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thunnus maccoyii</a> Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
<b>FROG</b>			
<a href="#">Litoria aurea</a> Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Mixophyes balbus</a> Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Mixophyes iteratus</a> Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Uperoleia mahonyi</a> Mahony's Toadlet [89189]	Endangered	Species or species habitat likely to occur within area	In feature area
<b>MAMMAL</b>			
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Petauroides volans</a> Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Petaurus australis australis</a> Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Petrogale penicillata</a> Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Potorous tridactylus tridactylus</a> Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Pseudomys novaehollandiae</a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
<b>PLANT</b>			
<a href="#">Angophora inopina</a> Charmhaven Apple [64832]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Arthraxon hispidus</a> Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Asperula asthenes</a> Trailing Woodruff [14004]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Caladenia tessellata</a> Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Commersonia prostrata</a> Dwarf Kerrawang [87152]	Endangered	Species or species habitat known to occur within area	In buffer area only
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Cynanchum elegans</a> White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Dichanthium setosum</a> bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diuris praecox</a> Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Eucalyptus camfieldii</a> Camfield's Stringybark [15460]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Eucalyptus glaucina</a> Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Eucalyptus parramattensis subsp. decadens</a> Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Euphrasia arguta</a> [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Grevillea parviflora subsp. parviflora</a> Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Melaleuca biconvexa</a> Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Persicaria elatior</a> Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Prasophyllum sp. Wybong (C.Phelps ORG 5269)</a> a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Rhizanthella slateri</a> Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Rhodamnia rubescens</a> Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Rhodomyrtus psidioides</a> Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Syzygium paniculatum</a> Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Tetralochea juncea</a> Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In buffer area only

## REPTILE

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

## SHARK

<a href="#">Sphyrna lewini</a> Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
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## Listed Migratory Species [ [Resource Information](#) ]

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>Migratory Marine Birds</b>			
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Ardenna grisea</a> Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<b>Migratory Marine Species</b>			
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Mobula alfredi as Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
<a href="#">Mobula birostris as Manta birostris</a> Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Sousa sahalensis as Sousa chinensis</a> Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In buffer area only
<b>Migratory Terrestrial Species</b>			
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area	In feature area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
<a href="#">Symposiachrus trivirgatus as Monarcha trivirgatus</a> Spectacled Monarch [83946]		Species or species habitat likely to occur within area	In feature area
<b>Migratory Wetlands Species</b>			
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In buffer area only

## Other Matters Protected by the EPBC Act

### Commonwealth Lands

[\[ Resource Information \]](#)

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

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited Commonwealth Land - Australian Telecommunications Commission [11602]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11424]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian Telecommunications Commission [11440]	NSW	In buffer area only
<b>Defence</b>		
Defence - SALTASH AIR WEAPONS RANGE [10005]	NSW	In buffer area only
Defence - SALTASH AIR WEAPONS RANGE [10004]	NSW	In buffer area only
Defence - SALTASH AIR WEAPONS RANGE [10003]	NSW	In buffer area only
<b>Defence - Defence Housing Authority</b>		
Commonwealth Land - Defence Housing Authority [11543]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11544]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11545]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11546]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11547]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11548]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11558]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11559]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11565]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11564]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12928]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12929]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11442]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11567]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11447]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11566]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11446]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11561]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11445]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11560]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11541]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11540]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11587]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11449]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15484]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11562]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11563]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11569]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11568]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11426]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11576]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11571]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11570]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11425]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11573]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11443]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11572]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11542]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11427]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11583]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11581]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11580]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11428]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11585]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11584]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11451]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11459]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11450]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11577]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11574]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11575]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11578]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11579]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16308]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16309]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15442]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15443]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11588]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11464]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11465]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15444]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11490]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11493]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11492]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11554]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11494]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11497]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11496]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11491]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11555]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11495]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11552]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11550]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11551]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16313]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [16312]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11557]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11556]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11586]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16305]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16304]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15724]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15725]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16307]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16306]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11529]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11528]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15723]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15722]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11537]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11536]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11535]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11534]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11533]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11530]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11531]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11538]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11539]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11463]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11462]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11461]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11460]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11489]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11488]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11525]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11527]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11526]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11441]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11444]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11456]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11457]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11458]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11590]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11452]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11453]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11454]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11455]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11434]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11435]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11436]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15499]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11430]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11431]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11432]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11433]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11448]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11437]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16310]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11553]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [16311]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16315]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11439]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11438]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11589]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11498]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15501]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16314]	NSW	In buffer area only
Commonwealth Land - Director of War Service Homes [11487]	NSW	In buffer area only
Commonwealth Land - Director of War Service Homes [11486]	NSW	In buffer area only
Unknown		
Commonwealth Land - [15655]	NSW	In buffer area only
Commonwealth Land - [15629]	NSW	In buffer area only
Commonwealth Land - [16319]	NSW	In buffer area only
Commonwealth Land - [16318]	NSW	In buffer area only
Commonwealth Land - [15930]	NSW	In buffer area only
Commonwealth Land - [15936]	NSW	In buffer area only
Commonwealth Land - [11582]	NSW	In buffer area only
Commonwealth Land - [11429]	NSW	In buffer area only
Commonwealth Land - [16328]	NSW	In buffer area only
Commonwealth Land - [15710]	NSW	In buffer area only
Commonwealth Land - [11466]	NSW	In buffer area only
Commonwealth Land - [11467]	NSW	In buffer area only
Commonwealth Land - [16337]	NSW	In buffer area only
Commonwealth Land - [15627]	NSW	In buffer area only
Commonwealth Land - [15708]	NSW	In buffer area only
Commonwealth Land - [15656]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [11479]	NSW	In buffer area only
Commonwealth Land - [11471]	NSW	In buffer area only
Commonwealth Land - [11477]	NSW	In buffer area only
Commonwealth Land - [11476]	NSW	In buffer area only
Commonwealth Land - [11475]	NSW	In buffer area only
Commonwealth Land - [15707]	NSW	In buffer area only
Commonwealth Land - [15706]	NSW	In buffer area only
Commonwealth Land - [11478]	NSW	In buffer area only
Commonwealth Land - [11472]	NSW	In buffer area only
Commonwealth Land - [11473]	NSW	In buffer area only
Commonwealth Land - [11474]	NSW	In buffer area only
Commonwealth Land - [11469]	NSW	In buffer area only
Commonwealth Land - [11468]	NSW	In buffer area only
Commonwealth Land - [15623]	NSW	In buffer area only
Commonwealth Land - [11480]	NSW	In buffer area only
Commonwealth Land - [11481]	NSW	In buffer area only
Commonwealth Land - [15628]	NSW	In buffer area only
Commonwealth Land - [15923]	NSW	In buffer area only
Commonwealth Land - [16329]	NSW	In buffer area only
Commonwealth Land - [16323]	NSW	In buffer area only
Commonwealth Land - [16322]	NSW	In buffer area only
Commonwealth Land - [16321]	NSW	In buffer area only
Commonwealth Land - [16320]	NSW	In buffer area only
Commonwealth Land - [16327]	NSW	In buffer area only
Commonwealth Land - [16326]	NSW	In buffer area only
Commonwealth Land - [16325]	NSW	In buffer area only
Commonwealth Land - [16324]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [16330]	NSW	In buffer area only
Commonwealth Land - [16333]	NSW	In buffer area only
Commonwealth Land - [16336]	NSW	In buffer area only
Commonwealth Land - [16331]	NSW	In buffer area only
Commonwealth Land - [16316]	NSW	In buffer area only
Commonwealth Land - [16332]	NSW	In buffer area only
Commonwealth Land - [16334]	NSW	In buffer area only
Commonwealth Land - [16335]	NSW	In buffer area only
Commonwealth Land - [16338]	NSW	In buffer area only

### Listed Marine Species [ [Resource Information](#) ]

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>Bird</b>			
<a href="#">Actitis hypoleucos</a>			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Anous stolidus</a>			
Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Apus pacificus</a>			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Ardena grisea as Puffinus griseus</a>			
Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Bubulcus ibis as Ardea ibis</a>			
Cattle Egret [66521]		Breeding likely to occur within area overfly marine area	In feature area
<a href="#">Calidris acuminata</a>			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea antipodensis gibsoni as Diomedea gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Neophema chrysostoma</a> Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Rostratula australis as Rostratula benghalensis (sensu lato)</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Symposiachrus trivirgatus as Monarcha trivirgatus</a> Spectacled Monarch [83946]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche bulleri platei</a> as <a href="#">Thalassarche sp. nov.</a> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
<b>Reptile</b>			
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

### Whales and Other Cetaceans [\[ Resource Information \]](#)

Current Scientific Name	Status	Type of Presence	Buffer Status
<b>Mammal</b>			
<a href="#">Sousa sahalensis as Sousa chinensis</a> Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In buffer area only

### Extra Information

#### State and Territory Reserves [\[ Resource Information \]](#)

Protected Area Name	Reserve Type	State	Buffer Status
Columbey	National Park	NSW	In buffer area only
Karuah	National Park	NSW	In buffer area only
Medowie	State Conservation Area	NSW	In buffer area only
Medowie	Nature Reserve	NSW	In buffer area only
Moffats Swamp	Nature Reserve	NSW	In buffer area only
Port Stephens - Great Lakes	Marine Park	NSW	In buffer area only
Seaham Swamp	Nature Reserve	NSW	In buffer area only
Tilligerry	State Conservation Area	NSW	In buffer area only
Wallaroo	Flora Reserve	NSW	In buffer area only
Wallaroo	National Park	NSW	In buffer area only

#### Regional Forest Agreements [\[ Resource Information \]](#)

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
<a href="#">North East NSW RFA</a>	New South Wales	In feature area

#### Nationally Important Wetlands [\[ Resource Information \]](#)

Wetland Name	State	Buffer Status
<a href="#">Salt Ash Air Weapons Range</a>	NSW	In buffer area only

#### EPBC Act Referrals [\[ Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Controlled action</b>				
<a href="#">Gloucester Coal Seam Methane Gas Project</a>	2008/4432	Controlled Action	Post-Approval	In buffer area only
<a href="#">Port Site and Materials Handling Development</a>	2001/242	Controlled Action	Completed	In buffer area only
<b>Not controlled action</b>				
<a href="#">Green &amp; Golden Bell Frog Habitat Enhancement Project</a>	2004/1795	Not Controlled Action	Completed	In buffer area only
<a href="#">Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia</a>	2015/7522	Not Controlled Action	Completed	In feature area
<a href="#">Rural residential subdivision, Lot 30 Federation Drive, Medowie. NSW</a>	2013/7018	Not Controlled Action	Completed	In buffer area only
<a href="#">Tomago to Tomaree Electricity Supply Upgrade</a>	2003/1023	Not Controlled Action	Completed	In buffer area only
<b>Not controlled action (particular manner)</b>				
<a href="#">Rehabilitation of Hexham Swamp</a>	2003/1244	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

## Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Hunter	Northern Sydney Basin	<a href="#">BA website</a>	In buffer area only

# Caveat

## 1 PURPOSE

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

The report contains the mapped locations of:

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

## 2 DISCLAIMER

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

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

## 3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

## 4 LIMITATIONS

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

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

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

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

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

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

# Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

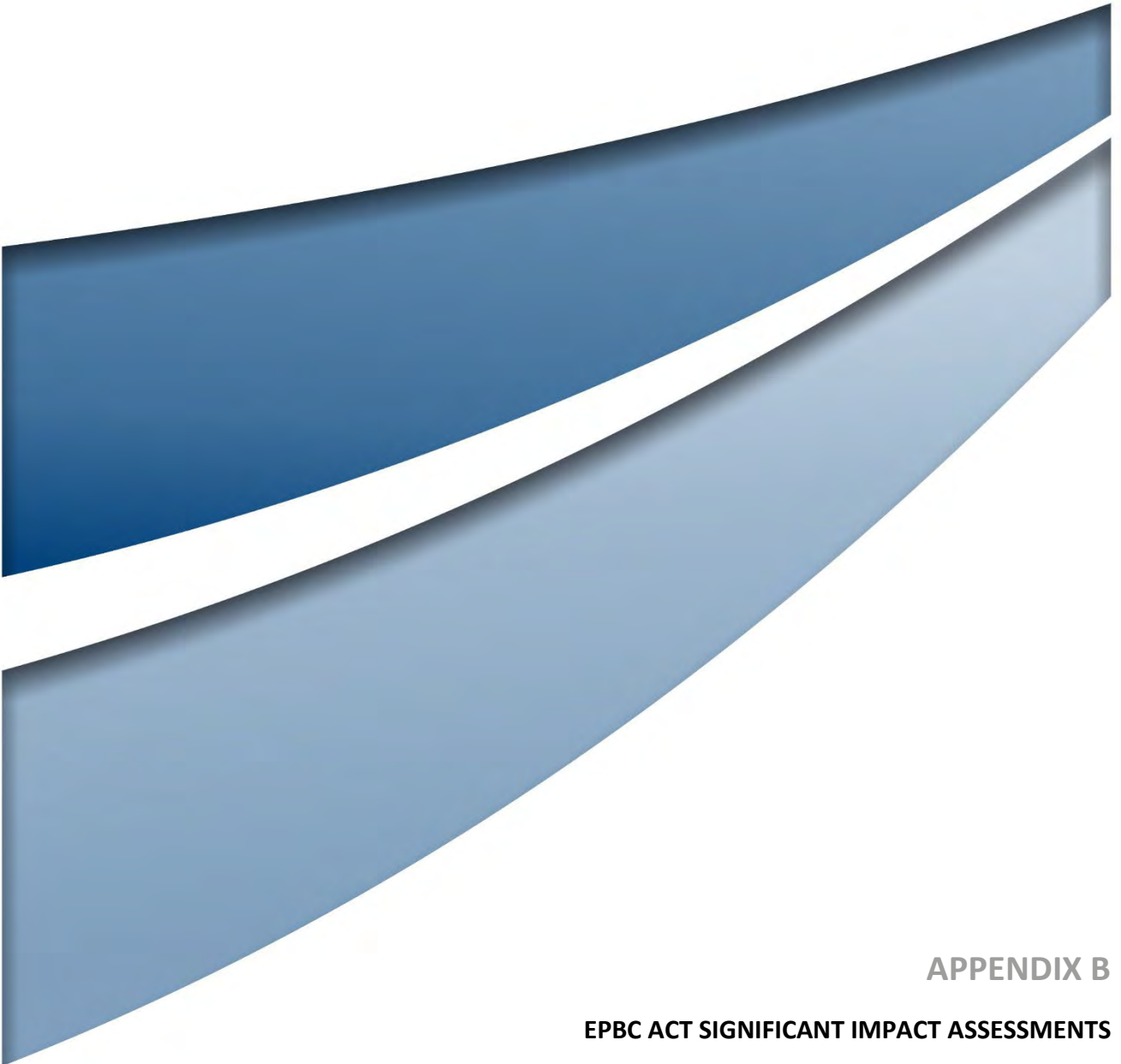
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## APPENDIX B

### EPBC ACT SIGNIFICANT IMPACT ASSESSMENTS

# 1.0 Assessments of Significance

## 1.1 Overview of EPBC Act Listed Entities Assessed

Significant impact assessments have been provided for the following nationally listed threatened species and ecological communities that are likely to be impacted by the Project, in accordance with the Australian Government Department of the Environment (DOE 2013) Matters of National Environmental Significance Significant Impact Guidelines 1.1 for the EPBC Act:

### Threatened Ecological Communities

- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions – Endangered

### Threatened Species

- Swift Parrot (*Lathamus discolor*)– Critically Endangered
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) (SE mainland population) - Endangered
- Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) – Endangered
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) – Vulnerable
- New Holland Mouse (*Pseudomys novaehollandiae*) – Vulnerable
- Yellow-bellied Glider (*Petaurus australis australis*) – Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable
- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable.

### Migratory Species Listed under International Conventions

- White-throated Needletail (*Hirundapus caudacutus*) (addressed under vulnerable species assessment)
- Rufous Fantail (*Rhipidura rufifrons*)
- Black-faced Monarch (*Monarcha melanopsis*).

## 1.2 Threatened Ecological Communities

The endangered ecological community Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions is present within the Development Footprint as it is considered that PCTs 762, 1618 and 1716 all correspond to the EEC.

The extent of this EEC within the Development Footprint is provided in **Table A1.1** below and the extent of this EEC is mapped in **Figure 5.1** of the MNES Report.

**Table A1.1 Summary of TECs within the Development Footprint**

Corresponding TEC name	EPBC Act Listing Status	Associated PCTs and vegetation condition zones within the Development Footprint	Area (ha)
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered Ecological Community Listed under the EPBC Act	PCT 762 Intact PCT 1618 Intact PCT 1716 Regenerating	5.12 ha

## 1.2.1 Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions

### 1.2.1.1 Significant Impact Assessment Criteria

The EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of the Environment (DOE) 2013b) significant impact criteria for critically endangered and endangered ecological communities has been addressed as follows to determine whether the Project will have, or is likely to have a significant impact on the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC.

- **reduce the extent of an ecological community**

The Project will remove approximately 5.12 ha of this ecological community. The Project is not likely to reduce the distributional extent of this community nationally.

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

The Project will fragment a small patch of this ecological community, however, the area which is proposed to be fragmented is relatively small and occurs at the western limit of a single patch.

- **adversely affect habitat critical to the survival of an ecological community**

The area to be removed is approximately 5.12 ha in area and is considered unlikely to provide habitat critical to the survival of the ecological community, due to the relatively small extent of the impact proposed.

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

The Project is not likely to result in impacts to abiotic factors necessary for the ecological community to survive and no substantial groundwater impacts have been predicted. The area has already been impacted historically by the construction of the Balickera Tunnel and canal, which has likely resulted in altered surface water drainage patterns.

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

The Project is not a type of development which is likely to result in a substantial change in species composition through decline or loss of functionally important species and appropriate mitigation measures will be implemented to minimise impacts to surrounding retained habitats.

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

– **assisting invasive species, that are harmful to the listed ecological community, to become established, or**

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

The Project is not likely to substantially reduce the quality or integrity of the retained areas of this ecological community, as appropriate management and mitigation measures will be implemented to minimise impacts to surrounding retained habitats.

- **interfere with the recovery of an ecological community.**

The area of habitat proposed to be removed is relatively small in area and is considered unlikely to significantly interfere with the recovery of this ecological community. Direct offsets will be provided to compensate for the proposed loss of habitat.

### 1.2.1.2 Additional DCCEEW TEC Assessment Requirements

The following additional assessment requirements were identified by DCCEEW in relation to EPBC Act listed EECs for the Project.

- **Total Size of the Patch**

The Subtropical eucalypt floodplain forest and woodland EEC occurs as three patches, which correspond to three PCTs mapped within the Project Area and the Development Footprint. Each patch extends beyond the Project Area, however the full patch extent has not been determined by field surveys.

- **Assessment of Patch Quality in accordance with the published conservation advice**

Each patch extends outside of the Project Area and is predicted based on regional mapping, GIS and aerial imagery analysis a large patch size, defined as >2ha. PCT 762 and PCT 1618 are likely to meet the criteria for Class 1A habitat having a large patch size with high quality understorey and many large native trees. Within the Project Area PCT 1716 has a reduced large tree cover and is likely to meet the definition of Class 2A habitat, having a large patch size, with good quality understorey, large native trees and evidence of many arboreal mammals which within the Project area which are likely to occur within the patch. The characteristics of each patch are summarised in **Table A1.2**.

**Table A1.2 Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions Patch Characteristics**

Patch Reference	PCT Association	Project Area Extent (ha)	Development Footprint Extent (ha)	Habitat Class
1	762	4.54	0.33	1A
2	1716	6.05	3.91	1A
3	1618	1.15	0.88	2A

- **Fragmentation of Individual Patches**

The Project will reduce the overall size of each of all three patches, however only patch 1 in the south-western section of the Project Area will be fragmented into separate areas. The area to be fragmented. Patch 3 will only be reduced by approximately 7% in area and the isolation distance between the patches will only be approximately 15 m wide.

- **Indirect impacts on fragmented areas**

There is already an informal vehicle access track intersecting this patch and the impacts will widen the existing track. The fragmented areas will continue to remain part of larger patches of contiguous vegetation to other aspects. It is expected that fragmentation impacts will be limited to increase light penetration along the road edges, weed invasion along edge areas and dust.

- **Mitigation and offset measures**

Mitigation measures are documented in Section 8.4 of the BDAR and include:

- weed management
- demarcation of approved Disturbance Footprint.

The like-for-like credit rules will be followed for offsetting nationally listed entities which require credits. For this EEC offsetting will be undertaken through the provision of ecosystem credits for associated PCTs.

## 1.3 Critically Endangered and Endangered Species

The following critically endangered or endangered species are considered in this assessment:

- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) (SE mainland population)
- Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian Capital Territory), and
- Swift Parrot (*Lathamus discolor*).

Species descriptions, in the Assessments of Significance below, are referenced from NSW and Commonwealth online threatened species profiles, unless otherwise noted. The extent and types of habitat proposed to be impacted for each species is listed in **Table A1.3**.

**Table A1.3 Critically Endangered and/or Endangered Listed Species Habitat Impacts**

Critically Endangered and/or Endangered MNES	Area of species impact	Type of Habitat Impacted
Spotted-tailed Quoll ( <i>Dasyurus maculatus maculatus</i> ) (SE mainland population)	79.02 ha	Foraging habitat
Koala ( <i>Phascolarctos cinereus</i> ) (combined populations of Qld, NSW and the ACT)	79.02 ha	Foraging and potential breeding and shelter habitat
Swift Parrot ( <i>Lathamus discolor</i> )	79.02 ha	Foraging habitat

### 1.3.1 Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In this case, a *population* means:

- a geographically distinct regional population, or collection of local populations, or
- a regional population, or collection of local populations, that occurs within a particular bioregion.

There are two records for the Spotted-tailed Quoll within the Wallaroo State Forest on the Bionet Atlas (DPE 2022a) the dates of these sightings are listed as between 1980 and 2006. These records are the most proximate to the Development Footprint occurring 0.4 km and 0.8 km from the Development Footprint. The species has been identified in Wallaroo National Park on three occasions approximately 5.0 km north of the Development Footprint, the date range of these records is between 1990 and 2006 (DPE 2022a). The closest record of this species occurred during Dan Lunney's Community Wildlife Survey in 2006 approximately 123 m southeast of the Development Footprint (DPE 2022a). The species has also been recorded on several occasions along the Bucketts Way, approximately 5.0 km east of the Development Footprint, and these records fall within a similar date range as the above (1989–2004) (DPE 2022a).

According to the National Recovery Plan (DELWP 2016), the Spotted-tailed Quoll is considered to have undergone a decline of 50–90 % since colonisation with extant populations now highly fragmented and declining. Home range estimates vary considerably according to location and habitat quality; however, females have been known to occupy home ranges up to 1,515 ha and males up to 5,512 ha, and both sexes

usually traverse their ranges along densely vegetated creek lines. The geographic distribution of the species is contracting, and its subpopulations are becoming increasingly fragmented.

The National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016) has identified that it is not possible to define or map habitat critical to the survival of the Spotted-tailed Quoll and identifies that all habitats within this species' current distribution that are known to be occupied are considered important.

All vegetation communities within the Disturbance Footprint as outlined are considered to provide suitable habitat for the Spotted-tailed Quoll.

action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population**

The Spotted-tailed Quoll has been recorded in habitat adjoining the Development Footprint in Wallaroo National Park and Wallaroo State Forest as well as vegetated areas within the locality to the west. All PCTs identified within the Development Footprint are likely to provide suitable habitat for the Spotted-tailed Quoll. The Development Footprint is not known to contain den or breeding sites for the species as none were recorded during extensive habitat surveys.

The Project is likely to remove 79.02 ha of suitable habitat for the Spotted-tailed Quoll. This species has a relatively large home range of several hundred to several thousand hectares in size (DELWP 2016).

There are larger areas of suitable habitat available for this species in the locality, including within the Wallaroo National Park (2,780 ha), the Karuah National Park (3,534 ha), the Medowie State Conservation Area (2,851 ha), the Karuah State Conservation Area (74 ha), the Medowie Nature Reserve (238 ha) and the Karuah Nature Reserve (824 ha).

The proposed reduction in habitat associated with the Project is considered unlikely to result in a long-term decrease in the size of the regional population or individuals from a collection of local populations.

- **reduce the area of occupancy of the species**

The Project will result in the removal of approximately 79.02 ha of suitable foraging and movement habitat for this species.

The impacts proposed are considered to be inconsequential to any regional populations or individuals from a collection of local populations.

- **fragment an existing *population* into two or more populations**

Considering the area of suitable habitat proposed for removal and the extent of vegetated lands surrounding the Development Footprint, it is considered that the Project will not fragment an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species**

The habitat critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium- sized mammalian prey (DELWP 2016). The

threshold densities of these critical habitat components to support quoll populations are currently unknown, meaning that the habitat critical to the survival of the species is not possible to define (DELWP 2016). Therefore, all habitats within the species current distribution that are known to be occupied are considered important (DELWP 2016).

The Spotted-tailed Quoll has not been recorded within the Development Footprint despite targeted surveys, however the species is likely to use this habitat for movement and foraging.

Due to the presence of larger areas of suitable habitats surrounding the Development Footprint, it is considered that the Project will not affect habitat critical to the survival of the species at a local or regional scale.

- **disrupt the breeding cycle of a population**

The Spotted-tailed Quoll generally dens in rock shelters, small caves, hollow logs or tree hollows and utilises numerous dens within its home range, being a highly mobile species. No den sites were observed within the Development Boundary and no breeding activity was detected during surveys.

It is therefore considered that the proposal is not likely to disrupt the breeding cycle of a population of the Spotted-tailed Quoll.

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

The Project will result in the removal of approximately 79.02 ha of suitable habitat for this species. There are larger areas of suitable habitat available for this species in the locality, including within the Wallaroo National Park (2,780 ha), the Karuah National Park (3,534 ha), the Medowie State Conservation Area (2,851 ha), the Karuah State Conservation Area (74 ha), the Medowie Nature Reserve (238 ha) and the Karuah Nature Reserve (824 ha). Therefore it is considered that the Project is not likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

The Project is not expected to result in invasive species that are harmful to the Spotted-tailed Quoll becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

The Project is not a type of development which is likely to introduce disease that may cause this species to decline.

- **interfere with the recovery of the species**

A National Recovery Plan for the Spotted-tailed Quoll (*Dasyurus maculatus*) (DELWP 2016) has been prepared. Any impacts to known habitat for the Spotted-tailed Quoll will likely contravene the objectives of the recovery plan, yet it is considered that the loss of habitat connectivity and foraging habitat associated with the Project is unlikely to significantly interfere with the recovery of the species.

- **Significant Impact Assessment Conclusion**

The Project is unlikely to result in a significant impact on the Spotted-tailed Quoll.

### 1.3.2 Koala (*Phascolarctos cinereus*)

In this case, a *population* means:

- a geographically distinct regional population, or collection of local populations; or
- a regional population, or collection of local populations, that occurs within a particular bioregion.

The koala is widely distributed across Australia and known to occur in eucalypt woodlands and forests from north-eastern Queensland, along the eastern coast of NSW, to the Eyre Peninsula in the south-east corner of South Australia. In NSW, koalas most often occur on the central and north coasts with a few populations to the west of the Great Dividing Range and are mostly found in forests and subhumid woodlands on the central and north coast, and to the west across the Western Plains and slopes, within Pilliga forest, low woodland and forested areas (TSSC 2012; Adams-Hosking et al. 2016; DAWE 2022d). The koala has been recorded within the Development Footprint and the adjoining areas of the Wallaroo State Forest and Wallaroo National Park on the Bionet Atlas (DPE 2022a). This species was also recorded by Umwelt on the site during remote camera surveys.

The Development Footprint is situated within the Central NSW Coast Koala Management Bioregion (Youngentob *et al.*, 2021) and contains several tree species identified as locally important to the koala.

All PCTs within the Development Footprint are considered to provide suitable habitat for the koala.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population**

The site is mapped as Marginal Habitat on the Koala Habitat Planning Map prepared by Port Stephens Council (2001). Under the BAM suitable Koala habitat is defined as habitat the species is expected to occur in or periodically use and is defined as the presence of a koala use tree species in any vegetation zone of a PCT associated with koala. Species polygons under the BAM are required to include the vegetation zone in which the species was detected and all continuous suitable habitat with the vegetation zone, which in this instance includes the entire area of the Development Footprint (DPE 2022d).

The Project will lead to a long-term decrease of approximately 79.02 ha of suitable koala habitat. The Project is not likely to result in an impact which will directly reduce the size of a population of the koala, however a population decrease may occur indirectly in association with the clearing of occupied koala habitat.

There are larger areas of suitable Koala habitat in the locality, including within the Wallaroo National Park (2,780 ha), the Karuah National Park (3,534 ha), the Medowie State Conservation Area (2,851 ha), the Karuah State Conservation Area (74 ha), the Medowie Nature Reserve (238 ha) and the Karuah Nature Reserve (824 ha).

- **reduce the area of occupancy of the species**

The Project involves the removal of 79.02 ha of known habitat for the koala. It is therefore considered that the proposal is likely to reduce the area of occupancy of this species.

- **fragment an existing *population* into two or more populations**

The Development Footprint is situated in a contiguous patch of forested area which adjoins several State Forests and National Parks, most proximately, Wallaroo State Forest and Wallaroo National Park, Karuah National Park and Medowie State Conservation Area. Considering the extent of the forested area in the surrounds, the removal of vegetation is not likely to fragment an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species**

The National Recovery Plan for the Koala (DAWE 2022c) identifies that the disturbance of habitat used by koalas for feeding or resting may adversely affect habitat critical to the survival of the species. The Development Footprint contains known koala habitat and has the potential to adversely affect habitat critical to the survival of the species.

- **disrupt the breeding cycle of a *population***

No koala breeding activity has been observed within the Development Footprint and it is therefore considered that the Project is not likely to disrupt the breeding cycle of an important population of this species.

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

The Project will result in the loss of approximately 79.02 ha of known koala habitat. It is considered that the Project will modify, destroy or isolate or decrease the availability or quality of habitat for this species and is likely to contribute to its decline.

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

The Project is not expected to result in invasive species that are harmful to the koala becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

The koala is known to be susceptible to pathogens and parasites which have resulted in population declines, such as *Chlamydia* and the koala retrovirus.

The Project is not a type of proposal which will introduce disease that may cause this species to decline.

- **interfere with the recovery of the species**

The overall goal as stated in the National Recovery Plan for the EPBC Act listed Koala (DAWE 2022c) is to stop the trend of decline in population size, by supporting resilient, connected and genetically healthy metapopulations across its range, and to increase the extent, quality and connectivity of habitat occupied.

The Project involves the removal of 79.02 ha of koala habitat which will reduce the extent of habitat occupied. Direct offsets will be provided for this impact.

### Significant Impact Assessment Conclusion

The Project is **likely** to have a significant impact on the koala in accordance with the criteria provided in the EPBC Act Significant Impact Guidelines.

#### 1.3.3 Swift Parrot (*Lathamus discolor*)

In this case, a *population* means:

- a geographically distinct regional population, or collection of local populations; or
- a regional population, or collection of local populations, that occurs within a particular bioregion.

The swift parrot occurs as a single population that migrates annually from breeding grounds in Tasmania to the winter foraging grounds on the coastal plains and slope woodlands of mainland eastern Australia (Saunders and Tzaros 2011).

As the species occurs as a single population in Australia, any record of the species would constitute a population as described above. The swift parrot has not been recorded within the Development Footprint or surrounds during surveys. Several species occurrence records are situated within the locality, with the most recent record from 2020, captured in the eastern extent of Wallaroo National Park, approximately 5.1 km from the Development Footprint. The closest record of this species was recorded in 2016, 2.7 km northwest of the Development Footprint. There have been few records of the species located within the Port Stephens LGA in the past few years with only one additional record from Medowie, NSW from 2020.

The swift parrot does not breed on mainland Australia, and as such the Development Footprint only represents potential foraging habitat for this species.

The Development Footprint contains the key foraging tree species, forest red gum (*Eucalyptus tereticornis*) and Spotted Gum (*Corymbia maculata*), as recognised in the National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

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

The swift parrot has not been recorded within the Development Footprint, however it has been recorded in areas in the adjoining Wallaroo National Park, Karuah National Park and in the surrounding suburbs of Karuah, Medowie and the Tilligerry Peninsula. It is likely that the species makes use of the open forest and woodland habitats of the Development Footprint, particularly during eucalypt flowering events in winter.

The Project will result in the loss of up to approximately 79.02 ha of habitat containing the key foraging resources including Spotted Gum *Corymbia maculata* and/or Forest Red Gum *Eucalyptus tereticornis* in the Development Footprint. It is considered that that scale of the impact proposed is not likely to lead to a long term decrease in the size of the swift parrot population.

- **reduce the area of occupancy of the species**

The swift parrot has not been recorded within the Development Footprint but has been occasionally recorded in the wider locality within Wallaroo National Park, Karuah National Park and various locations in the surrounding suburbs of Karuah, Medowie and the Tilligerry Peninsula. It is acknowledged that the Development Footprint does not provide any areas of Important Habitat mapped under the BAM for the swift parrot (DPE 2022a). To date, these areas include areas mapped in Raymond Terrace, approximately 9 km to the southwest of the Development Footprint, areas within the Tilligerry Peninsula, approximately 20 km south-southeast of the Development Footprint, areas within North Arm Cove, approximately 20 km east of the Development Footprint and areas within Williamtown, approximately 15 km south of the Development Footprint.

The Important Habitat mapping is published to assist assessments under the NSW Biodiversity Offset Scheme to determine where credits for the species are calculated. The Important Habitat Mapping for the swift parrot does not occur within, or in lands adjoining, the Development Footprint.

The Project will result in the loss of up to approximately 79.02 ha of vegetation containing Spotted Gum or Forest Red Gum winter foraging resources for the species. The Project will result in a minor reduction in the potential area of occupancy for the swift parrot in the Development Footprint, however this is unlikely to reduce the area of known occupancy in the wider locality or region.

- **fragment an existing *population* into two or more populations**

The swift parrot is a nomadic species capable of flying large distances over areas of unsuitable habitat.

It is considered that the proposal is not likely to fragment the existing swift parrot population into two or more populations.

- **adversely affect habitat critical to the survival of a species**

Habitat critical to the survival of the swift parrot includes those areas of priority habitat for which the species has a high level of site fidelity or areas that possess phenological characteristics likely to be of importance to the swift parrot (Saunders and Tzaros 2011). The Development Footprint does not provide any areas of Important Habitat mapped under the BAM for the swift parrot (DPE 2022a).

The swift parrot has not been recorded within the Development Footprint and has not shown site fidelity to the specific habitats of the Development Footprint, however has historically been recorded in nearby areas. The Project will not adversely affect habitat critical to the survival of the swift parrot.

- **disrupt the breeding cycle of a population**

The swift parrot breeds and nests exclusively in Tasmania and migrates to mainland Australia during the non-breeding season. There is no potential for breeding habitat to occur in the Development Footprint.

The Project is not expected to disrupt the breeding cycle of the *population* of swift parrot.

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

The Project will involve the removal of approximately 79.02 ha of habitat that contains key feed tree species for the swift parrot. It is considered unlikely that the Project would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the swift parrot would decline.

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

According to the National Recovery Plan for the species (Saunders and Tzaros 2011), swift parrots are less likely to occur at known foraging sites where there is an abundance of large, aggressive nectar feeders such as noisy miner (*Manorina melanocephala*). Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners was listed as a key threatening process under the EPBC Act in May 2014.

The Project is not expected to result in an increase in additional invasive species that are harmful to the swift parrot becoming further established in this habitat.

- **introduce disease that may cause the species to decline**

The Project is a resource extraction development and is not a type of Project that is likely to introduce disease that may cause the species to decline.

- **interfere with the recovery of the species**

Considering the scale of the Project, it is unlikely that it will substantially interfere with the recovery of the swift parrot, given that it will only result in the removal of a relatively small amount of vegetation containing suitable foraging resources.

- **Significant Impact Assessment Conclusion**

The swift parrot has not been observed within the Development Footprint and the Project is **unlikely** to result in a significant impact on the *population* of the swift parrot.

## 1.4 Vulnerable Species

The following vulnerable species are considered in this assessment:

- Yellow-bellied Glider (*Petaurus australis australis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- New Holland Mouse (*Pseudomys novaehollandiae*)
- White-throated needletail (*Hirundapus caudacutus*)
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*).

Species descriptions, in the Assessments of Significance below, are referenced from NSW and Commonwealth online threatened species profiles, unless otherwise noted. The extent and types of habitat proposed to be impacted for each species is listed in **Table A1.4**.

**Table A1.4 Vulnerable Listed Species Habitat Impacts**

Critically Endangered and/or Endangered MNES	Area of species impact	Type of Habitat Impacted
<b>Yellow-bellied Glider (south-eastern) (<i>Petaurus australis australis</i>)</b>	79.02 ha	Ecosystem species / potential foraging and den habitat
<b>Grey-headed flying-fox (<i>Pteropus poliocephalus</i>)</b>	79.02 ha	Ecosystem species / Foraging habitat
<b>Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)</b>	N/A not observed during surveys	Not observed during surveys
<b>New Holland Mouse (<i>Pseudomys novaehollandiae</i>)</b>	79.02 ha	Ecosystem species / Foraging and shelter habitat
<b>White-throated needletail (<i>Hirundapus caudacutus</i>)</b>	79.02 ha	Ecosystem species / Foraging and roost habitat
<b>South-eastern Glossy Black Cockatoo (<i>Calyptorhynchus lathami lathami</i>)</b>	79.02 ha	Ecosystem species / Foraging habitat but no detected breeding habitat use

### 1.4.1 Yellow-bellied Glider (*Petaurus australis australis*)

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**

- **populations that are near the limit of the species range.**

The Development Footprint is considered to comprise up to 79.02 ha of potential foraging habitat for this species, however the Yellow-bellied Glider was not observed during surveys and the Project Area is not at the limit of this species ranges.

The yellow-bellied glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. No direct observations of the species have been recorded within 10 km of the Project Area, the closest indirect observation record being approximately 1 km south west of the Project Area.

It is therefore considered that an *important population* of the Yellow-bellied Glider is not present within the Development Footprint.

**An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:**

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

Given that there is not considered to be an *important population* of the Yellow-bellied Glider present within the Development Footprint, the Project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population**

The Project will result in the loss of up to approximately 79.02 ha of potential foraging habitat for Yellow-bellied Glider. However, since the Development Footprint does not contain an *important population* of the Yellow-bellied Glider, the Project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing important population into two or more populations**

The Development Footprint does not contain an *important population* of the Yellow-bellied Glider, therefore the Project will not result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species**

Habitat critical to the survival of the yellow-bellied glider (south-eastern) may be broadly defined as areas containing the following attributes (noting that geographic areas containing habitat critical to survival needs to be defined by forest type on a regional basis):

- large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees
- areas identified as refuges under future climate change scenarios
- short or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas

- habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonization or movement away from threats. yellow-bellied gliders (south-eastern) have a glide ratio (horizontal distance/height dropped) of around 2.0, and corridors spanning gaps larger than the distance gliders are likely to be able to travel should be considered critical to the survival. There is not enough evidence to define the canopy and width characteristics of appropriate corridors. In the absence of such information, a precautionary approach should be taken to maximise dispersal by considering all habitat corridors in the species' range to be habitat critical to the survival; and
- areas in which some trees have evidence of use for sap extraction by yellow-bellied glider (south-eastern).

Based on the results of the surveys undertaken, the Development Footprint does not contain occupied habitat for this species. It is therefore considered that the Project will not adversely affect habitat critical to the survival of the Yellow-bellied Glider.

- **disrupt the breeding cycle of an *important population***

The Development Footprint does not contain an *important population* of the Yellow-bellied Glider, therefore the Project will not disrupt the breeding cycle of an important population.

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

As established above, the Project will result in the loss of up to approximately 79.02 ha of suitable habitat for the Yellow-bellied Glider, however this species has not been observed during comprehensive surveys undertaken over several years. It is therefore considered that the Project will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the Yellow-bellied Glider would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The Project is not expected to result in invasive species that are harmful to the Yellow-bellied Glider becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

No diseases that may cause the Yellow-bellied Glider to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species**

Considering the scale of the Project and associated impacts proposed, it is considered unlikely that the Project will interfere substantially with the recovery of this species.

### **Significant Impact Assessment Conclusion**

The Project is considered **unlikely** to result in a significant impact on the Yellow-bellied Glider.

## 1.4.2 Grey-headed Flying-Fox (*Pteropus poliocephalus*)

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The grey-headed flying-fox was identified within the Development Footprint during nocturnal spotlighting surveys in March 2018. Additionally, a desktop search of the National Flying-fox monitoring viewer (DAWE 2022b) has identified the presence of a historical roost site within the vicinity of the Development Footprint within Wallaroo National Park, although this has not been occupied for at least a decade.

Currently occupied camp sites for the grey-headed flying fox closest to the Development Footprint are located in Raymond Terrace approximately 13 km to the southwest and Glen William approximately 23 km to the northwest. Both camps are listed as Nationally Important Flying-fox Camps and foraging individuals recorded in the Development Footprint are likely to be from these camp sites. Equivalent camp number estimates were given for both the camp sites which are estimated to support between 16,000 and 49,999 individual grey-headed flying foxes. This data was obtained during the latest surveys in February 2022 (Raymond Terrace) and November 2021 (Glen William).

According to the Referral Guideline for Management Actions in Grey-headed and Spectacled Flying-Fox Camps (DoE 2015a) nationally important grey-headed flying-fox camps are recognised as any camps that have contained 10,000 individuals or greater in the last 10 years or have been occupied by 2,500 individuals or greater permanently or seasonally every year for the last 10 years. Therefore, the Development Footprint does not contain a nationally important grey-headed flying fox camp.

The Development Footprint is considered to comprise up to 79.02 ha of potential foraging habitat for this species but is unlikely to contain significant breeding and roosting habitat necessary for maintaining genetic diversity. The Development Footprint is not near the limit of the known range of this species. Therefore, the Development Footprint is unlikely to contain an *important population* of the grey-headed flying-fox.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

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

Given that there is not considered to be an *important population* of the grey-headed flying-fox present within the Development Footprint, the Project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population**

The Project will result in the loss of up to approximately 79.02 ha of potential foraging habitat for grey-headed flying-fox. However, since the Development Footprint does not contain an *important population* of the grey-headed flying-fox, the Project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing *important population* into two or more populations**

The Development Footprint does not contain an *important population* of the grey-headed flying-fox, therefore the Project will not result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species**

According to the National Recovery Plan for the Grey-headed Flying-fox (DAWE 2021), foraging habitat that contains important winter and spring flowering species is considered habitat critical to the survival of the species. The Development Footprint will impact approximately 79.02 ha of vegetation containing the identified winter and spring flowering species *Eucalyptus tereticornis*, *Eucalyptus fibrosa*, *Eucalyptus siderophloia*, *Corymbia maculata* and *Melaleuca styphelioides*.

- **disrupt the breeding cycle of an *important population***

An unoccupied camp was identified during surveys and was further examined using the National Flying-fox monitoring viewer (DAWE 2022b). The camp has been monitored across a 10-year period (2012 – present) and no individuals have been observed roosting within this period (DAWE 2022b). Thus, no current grey-headed flying-fox breeding populations or camps have been identified within the Development Footprint. **The Project is not expected to disrupt the breeding cycle of an *important population* of this species.**

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

As established above, the Project will result in the loss of up to approximately 79.02 ha of suitable foraging habitat for the grey-headed flying-fox. Areas of habitat will remain in Wallaroo National Park (2,780 ha), Karuah National Park (3,534 ha), Medowie State Conservation Area (2,851 ha), Karuah State Conservation Area (74 ha), Medowie Nature Reserve (238 ha) and Karuah Nature Reserve (824 ha).

There is a substantial area of high-quality remnant vegetation nearby to the Development Footprint and it is considered that the proposal is not likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the grey-headed flying-fox would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The Project is not expected to result in invasive species that are harmful to the grey-headed flying-fox becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

No diseases that may cause the grey-headed flying-fox to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species**

Considering the scale of the Project and associated impacts proposed, it is considered unlikely that the Project will interfere substantially with the recovery of this species.

## Significant Impact Assessment Conclusion

The Project is considered **unlikely** to result in a significant impact on the grey-headed flying-fox.

### 1.4.3 Large-eared Pied Bat (*Chalinolobus dwyeri*)

The EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of the Environment (DOE) 2013b) identify that in the case of a vulnerable species an “important population” is one that is necessary for a species’ long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **key source populations either for breeding or dispersal**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The site contains suitable foraging habitat for the Large-eared Pied Bat and this species has been recorded foraging within the locality. However, the subject population of this species has not been identified in a recovery plan, is not likely to form a key source population and is not likely to be necessary for maintaining genetic diversity. Furthermore, this species is not near the limit of its range within the site.

Therefore, it is considered that this species does not satisfy the criteria of an important population as identified by DOE (2013b).

In accordance with DOE (2013b), an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

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

The species has been previously recorded in adjacent habitats near the Eagleton Quarry approximately 1.3 km to the south of the Development footprint. Through interpretation of aerial imagery, the locality of this record appears to be within foraging habitat as there are permanent pools of water within the vicinity of the record. There are no recorded roosting sites and further interpretation of aerial imagery show no presence of rocky escarpments. It is considered that an important population of the large-eared pied bat does not inhabit the site and is not likely to be impacted to the extent that a long-term decrease would occur.

- **reduce the area of occupancy of an important population**

The Project will result in the removal of approximately 33.39 ha of suitable foraging habitat for this species, no areas of breeding habitat have been observed. An important population of this species is not likely to inhabit the site and the Project is not likely to reduce the area of an important population of this species.

- **fragment an existing important population into two or more populations**

This species is highly mobile and capable of traversing large areas of discontinuous and unsuitable habitat. The Project is not likely to fragment a population of this species.

- **adversely affect habitat critical to the survival of a species**

No, the site does not contain habitat critical to the survival of this species, such as a maternity site.

- **disrupt the breeding cycle of an important population**

The Balickera Tunnel which occurs adjacent to the southern boundary of the Development footprint provides suitable breeding habitat for this species. Extensive surveys of these tunnels by Eco Logical Australia (2021) did not identify any use by this species and the tunnel is not likely to be directly impacted by the proposal. Therefore, the Project is not likely to disrupt the breeding cycle of an important population of this species.

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

The Development footprint contains a relatively small area of suitable foraging habitat for this species and it is considered that the Project is not likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline.

- **result in invasive species that are harmful to a threatened species becoming established in the vulnerable species' habitat**

It is considered that the proposal will not result in invasive species that are harmful to this species becoming established in habitat suitable for this species. Suitable mitigation measures will be implemented to manage pest fauna species and weeds.

- **introduce disease that may cause a species to decline**

It is considered that the Project is not a type of development likely to introduce disease that may cause this species to decline.

- **interfere with the recovery of the species.**

The national recovery plan for this species, prepared by the Department of Environment and Resource Management (DERM) (2011), identifies the following specific recovery objectives:

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

It is considered that the Project is not likely to interfere with the actions required to implement the specific recovery objectives for this species.

## Significant Impact Assessment Conclusion

Based on the results of this assessment, it is considered that the Project is **unlikely** to result in a significant impact on the large-eared pied bat.

### 1.4.4 New Holland Mouse (*Pseudomys novaehollandiae*)

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

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 ranges from 0.44 ha to 1.4 ha. The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire.

The Development Footprint is considered to comprise up to 79.02 ha of potential habitat for this species, however the New Holland Mouse was not observed during surveys and the Project Area is not at the limit of this species ranges.

It is therefore considered that an *important population* of the New Holland Mouse is not present within the Development Footprint.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

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

Given that there is not considered to be an *important population* of the New Holland Mouse present within the Development Footprint, the Project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population**

The Project will result in the loss of up to approximately 79.02 ha of potential foraging habitat for New Holland Mouse. However, since the Development Footprint does not contain an *important population* of the New Holland Mouse, the Project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing important population into two or more populations**

The Development Footprint does not contain an *important population* of the New Holland Mouse, therefore the Project will not result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species**

Based on the results of the surveys undertaken, the Development Footprint does not contain occupied habitat for this species. It is therefore considered that the Project will not adversely affect habitat critical to the survival of the New Holland Mouse.

- **disrupt the breeding cycle of an *important population***

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

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

As established above, the Project will result in the loss of up to approximately 79.02 ha of suitable habitat for the New Holland Mouse, however this species has not been observed during comprehensive surveys undertaken over several years. It is therefore considered that the Project will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the New Holland Mouse would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The Project is not expected to result in invasive species that are harmful to the New Holland Mouse becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

No diseases that may cause the New Holland Mouse to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species**

Considering the scale of the Project and associated impacts proposed, it is considered unlikely that the Project will interfere substantially with the recovery of this species.

### **Significant Impact Assessment Conclusion**

The Project is considered **unlikely** to result in a significant impact on the New Holland Mouse.

### **1.4.5 White-throated Needletail (*Hirundapus caudacutus*)**

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The white-throated needletail is widespread in eastern and south-eastern Australia as part of its non-breeding territory. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. The species is almost exclusively aerial, from heights of less than 1 m up to more than 1,000 m above the ground. White-throated needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats.

Important habitat for the species is outlined in the Draft Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act (DoE 2015) which states that large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. They are found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces.

The white-throated needletail has not been identified within the Development Footprint during surveys. There are eleven (11) records for this species within the Development Footprint locality, though no records directly within the Development Footprint. This species is a nomadic aerial foraging species which may fly over the Development Footprint from time to time. The Development Footprint also provides a relatively small area of suitable roosting habitat for this species. It is considered that the Development Footprint does not contain a key source population, population necessary for maintaining genetic diversity or population which is near the limit of this species range. Therefore, it is considered unlikely that an *important population* of white-throated needletail occurs in the Development Footprint.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

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

This species is predominantly an aerial foraging species, and the Project is not likely to remove aerial foraging habitat for this species, however, it may modify the habitats present through the removal of approximately 79.02 ha of woodland and forest habitat which may be used for time to time for opportunistic roosting. The species breeds in the northern hemisphere so no breeding habitat will be impacted. The Project will impact a relatively small area of suitable habitat for this species and there are larger areas of habitat which will not be impacted by the Project within the locality. It is therefore considered that the Project will not lead to a long-term decrease in the size of an important population of the white-throated needletail.

- **reduce the area of occupancy of an *important population***

This species is predominantly an aerial foraging species, and it is considered that the removal of 94.3 ha terrestrial habitats within the site is not likely to reduce the area of occupancy of the white-throated needletail.

- **fragment an existing *important population* into two or more populations**

This species is a predominantly aerial foraging species which has rarely been recorded roosting and breeds in the northern hemisphere. The Project is not a type of development which is likely to fragment an existing important population of the white-throated needletail into two or more populations.

- **adversely affect habitat critical to the survival of a species**

This species is a predominantly aerial foraging species which has rarely been recorded roosting and breeds in the northern hemisphere. The Project will not directly impact aerial foraging habitats for this species and it is therefore considered that the Project is not likely to affect habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population**

The white-throated needletail does not breed in Australia. The Project will therefore not disrupt the breeding cycle of an *important population* of this species.

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

The Project will result in the loss of up to approximately 79.02 ha of terrestrial habitats for the white-throated needletail. Given the relatively small area of potential foraging habitat to be removed and the substantial areas of remnant vegetation in nearby areas including Wallaroo National Park (2,780 ha), Karuah National Park (3,534 ha), Medowie State Conservation Area (2,851 ha), Karuah State Conservation Area (74 ha), Medowie Nature Reserve (238 ha) and Karuah Nature Reserve (824 ha), the habitat within the Development Footprint is unlikely to be depended upon by the species.

It is considered that the Project is not likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the white-throated needletail would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The Project is not expected to result in invasive species that are harmful to the white-throated needletail becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

No diseases that may cause the white-throated needletail to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species**

The Approved Conservation Advice (TSSC 2019) for the species includes the following conservation priorities for recovery:

- work with governments in East Asia to minimise destruction of key breeding habitats
- important habitats in Australia are identified and protected.

The Project is unlikely to substantially interfere with the recovery of the white-throated needletail.

- **Significant Impact Assessment Conclusion**

The Project is **unlikely** to result in a significant impact on the white-throated needletail based on the lack of records of the species utilising the habitats within the Development Footprint and the extent of available habitat in the wider region.

#### 1.4.6 South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

South-eastern glossy black cockatoos feed almost exclusively on the seeds of sheoaks (*Allocasuarina* spp. and *Casuarina* spp.), usually relying on one or two species within a region. Additionally, the species also show strong preference to individual feed trees and will not feed on many other proximate trees of the same tree species. South-eastern glossy black cockatoos are hollow nesters, utilising large hollows in both living and dead eucalypt trees. Two indirect observation records have been documented within the Project Area, noting the presence of crushed cones. The closest direct observation record of this species is within approximately 1 km to the south of the Project Area.

The Development Footprint is considered to comprise up to 79.02 ha of potential foraging habitat for this species, however the Glossy Black-Cockatoo was not observed during surveys and the Project Area is not at the limit of this species ranges.

It is therefore considered that an *important population* of the Glossy Black-Cockatoo is not present within the Development Footprint.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

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

Given that there is not considered to be an *important population* of the Glossy Black-Cockatoo present within the Development Footprint, the Project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population**

The Project will result in the loss of up to approximately 79.02 ha of potential foraging habitat for New Holland Mouse. However, since the Development Footprint does not contain an *important population* of the Glossy Black-Cockatoo, the Project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing important population into two or more populations**

The Development Footprint does not contain an *important population* of the Glossy Black-Cockatoo, therefore the Project will not result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species**

Habitat critical to the survival of this species includes foraging habitat with feed tree species relevant to the region. South-eastern glossy black cockatoos rely on nine species of sheoaks (*Allocasuarina* spp. and *Casuarina* spp.) for feeding, with species used varying depending on the region. In south-east Queensland and north-east New South Wales, they show preference for black sheoak (*A. littoralis*) and forest sheoak (*A. torulosa*), although there are also records of them feeding on stringybark sheoak (*A. inophloia*), coastal sheoak (*C. equisetifolia*), and to a lesser extent river sheoak (*C. cunninghamiana*) and swamp sheoak (*C. glauca*) during limited times of the year.

Habitat critical to the survival of this species also includes breeding habitat with large nesting hollows, typically in relevant tree species to the region. In central New South Wales, the majority of the nesting hollows were in narrow-leaved ironbark (*Eucalyptus crebra*; 74%). Other species of trees used were the blue-leaved ironbark (*E. nubila*; 16%) and Blakely's red gum (*E. blakelyi*; 10%). South-eastern glossy black cockatoos are known to nest in river red gums (*E. camaldulensis*) along the Murrumbidgee River and other inland waterways in NSW. Trees may be living or dead. As a guide, potential nest hollows for the subspecies have the following traits:

- >8 m above ground
- located in branches >30 cm in diameter
- branch or stem no more than 45° from vertical, and
- minimum entrance diameter of >15 cm.

Based on the results of the surveys undertaken, the Development Footprint does not contain occupied habitat for this species. It is therefore considered that the Project will not adversely affect habitat critical to the survival of the Glossy Black-Cockatoo.

- **disrupt the breeding cycle of an *important population***

The Development Footprint does not contain an *important population* of the Glossy Black-Cockatoo, therefore the Project will not disrupt the breeding cycle of an important population.

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

As established above, the Project will result in the loss of up to approximately 79.02 ha of suitable habitat for the Glossy Black-Cockatoo, however this species has not been observed during comprehensive surveys undertaken over several year. It is therefore considered that the Project will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the Glossy Black-Cockatoo would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The Project is not expected to result in invasive species that are harmful to the Glossy Black-Cockatoo becoming established in the species habitat.

- **introduce disease that may cause the species to decline**

No diseases that may cause the Glossy Black-Cockatoo to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species**

Considering the scale of the Project and associated impacts proposed, it is considered unlikely that the Project will interfere substantially with the recovery of this species.

### **Significant Impact Assessment Conclusion**

The Project is considered **unlikely** to result in a significant impact on the Glossy Black-Cockatoo.

## **1.5 Migratory Species Listed under International Conventions**

The following migratory species are considered in this assessment:

- White-throated Needletail (*Hirundapus caudacutus*)
- Rufous Fantail (*Rhipidura rufifrons*)
- Black-faced Monarch (*Monarcha melanopsis*).

The Rufous Fantail has been observed within the Project Area during surveys. The Rufous Fantail and the Black-faced Monarch are known to occur in moist, dense habitats including wet sclerophyll and rainforest and mangroves. The dry sclerophyll forest habitats within the Development Footprint may provide movement corridors for these species. The following assessments are provided for each species.

### **1.5.1 White-throated Needletail (*Hirundapus caudacutus*)**

An area of important habitat is:

- **habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or**
- **habitat utilised by a migratory species which is at the limit of the species range, or**
- **habitat within an area where the species is declining.**

Important habitat for this species is defined under the Draft Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act (DoE 2015) as '*on-breeding habitat only: Found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces. Appears to have traditional roost sites.*'.

The suitable habitats within the Project Area for this species are part of larger tracts of native vegetation, however the Project area is not likely to solely support an ecologically significant proportion of the population of this species. It is considered that the Project Area does not contain an area of important habitat for the White-throated Needletail.

The Project is considered likely to result in a significant impact on migratory species if there is a real chance or possibility that it will:

- **substantially modify and/or destroy an area of important habitat for a migratory species;**
- **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species; and/or**
- **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.**

The Project Area is considered to not contain *important habitat* for this species and therefore the Project is not likely to substantially modify or destroy important habitat for this species. Similarly, the Project will not seriously disrupt the lifecycle of an ecologically significant proportion of the population of this species; or result in an invasive species that is harmful to this species becoming established within the Project Area.

### Conclusion

The Project is **unlikely** to result in a significant impact on the White-throated Needletail.

### 1.5.2 Rufous Fantail (*Rhipidura rufifrons*)

An area of important habitat is:

- **habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or**
- **habitat utilised by a migratory species which is at the limit of the species range, or**
- **habitat within an area where the species is declining.**

Important habitat for this species is defined under the Draft Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act (DoE 2015) as '*Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrubland's*'.

The suitable habitats within the Project Area for this species do not typically have a dense understorey, an ecologically significant proportion of the population of this species (1,100 individuals) is not likely to utilise the habitats present and the Project Area has not been identified as habitat where this species is declining.

It is considered that the Project Area does not contain an area of important habitat for the Rufous Fantail.

The Project is considered likely to result in a significant impact on migratory species if there is a real chance or possibility that it will:

- **substantially modify and/or destroy an area of important habitat for a migratory species;**
- **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species; and/or**

- **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.**

The Project Area is considered to not contain *important habitat* for this species and therefore the Project is not likely to substantially modify or destroy important habitat for this species. Similarly, the Project will not seriously disrupt the lifecycle of an ecologically significant proportion of the population of this species; or result in an invasive species that is harmful to this species becoming established within the Project Area.

## Conclusion

The Project is **unlikely** to result in a significant impact on the Rufous Fantail.

### 1.5.3 Black-faced Monarch

An area of important habitat is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilised by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

Important habitat for this species is defined under the Draft Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act (DoE 2015) as 'Wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs'.

The suitable habitats within the Project Area for this species do not contain an ecologically significant proportion of the population of this species (460 individuals) is not likely to utilise the habitats present and the Project Area has not been identified as habitat where this species is declining.

It is considered that the Project Area does not contain an area of important habitat for the Black-faced Monarch.

The Project is considered likely to result in a significant impact on migratory species if there is a real chance or possibility that it will:

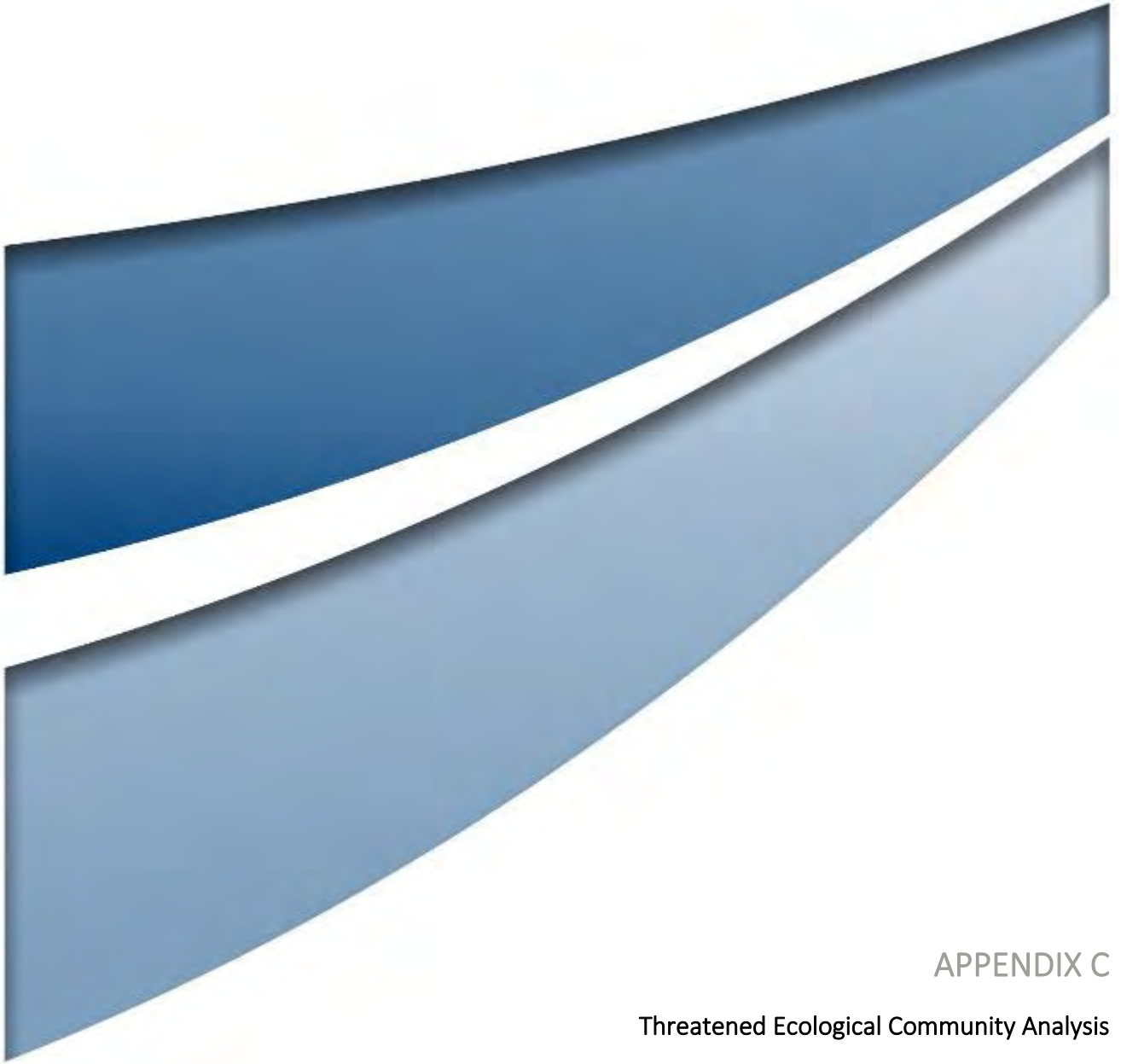
- **substantially modify and/or destroy an area of important habitat for a migratory species;**
- **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species; and/or**
- **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.**

The Project Area is considered to not contain *important habitat* for this species and therefore the Project is not likely to substantially modify or destroy important habitat for this species. Similarly, the Project will not seriously disrupt the lifecycle of an ecologically significant proportion of the population of this species; or result in an invasive species that is harmful to this species becoming established within the Project Area.

## Conclusion

The Project is **unlikely** to result in a significant impact on the Black-faced Monarch.





## APPENDIX C

### Threatened Ecological Community Analysis

# 1.0 Assessment of Threatened Ecological Communities listed under the BC Act

The following threatened ecological communities (TECs) are assessed in **Tables C1.1 to C1.8** with reference to the relevant characteristics described within the NSW Scientific Committee Final Determinations. The assessment has been undertaken to determine which TEC occur within the subject land.

**Table C1.1 Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions**

Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions endangered ecological community – Diagnostic Characteristics Summarised from NSW Scientific Committee (2010) Final Determination	Consideration
This EEC occurs principally on Permian sediments	The subject land does not occur on Permian sediments. The development footprint occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The development footprint occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations.
Central Hunter Grey Box – Ironbark Woodland typically forms a woodland (or open forest) dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Brachychiton populneus</i> subsp. <i>populneus</i> (Kurrajong) and <i>Eucalyptus moluccana</i> (Grey Box). Other tree species may be present and occasionally dominate or co-dominate, and include <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Callitris endlicheri</i> (Black Cypress Pine)	The subject land does not contain woodland or open forest dominated by <i>Eucalyptus crebra</i> , <i>Brachychiton populneus</i> subsp. <i>populneus</i> and <i>Eucalyptus moluccana</i> .
Central Hunter Grey Box – Ironbark Woodland has been recorded from the local government areas of Cessnock, Singleton and Muswellbrook but may occur elsewhere within the Sydney Basin Bioregion	The subject land is located within the Port Stephens LGA within the NSW North Coast Bioregion. The subject land is not within the Cessnock, Singleton or Muswellbrook LGAs.
<b>Conclusion</b>	<b>It is considered that the Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC does not occur within the subject land.</b>

**Table C1.2 Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions**

Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions endangered ecological community - Diagnostic Characteristics Summarised from NSW Scientific Committee (2010) Final Determination	Consideration
This EEC generally occurs on Permian sediments in the Hunter Valley.	The subject land does not occur on Permian sediments. The development footprint occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The geological characteristics for this EEC are not met within the subject land.
Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Corymbia maculata</i> (Spotted Gum) and <i>Eucalyptus moluccana</i> (Grey Box). Other tree species may be present and occasionally dominate or co-dominate, and include <i>Eucalyptus fibrosa</i> (Broad-leaved Ironbark) and <i>Eucalyptus tereticornis</i> (Forest Red Gum)	The subject land does not contain woodland or open forest dominated by <i>Eucalyptus crebra</i> , <i>Corymbia maculata</i> and <i>Eucalyptus moluccana</i> . PCT 1590 is dominated by <i>Corymbia maculata</i> with the <i>Eucalyptus fibrosa</i> and/or <i>Eucalyptus siderophloia</i> . <i>Eucalyptus moluccana</i> and <i>Eucalyptus tereticornis</i> occur occasionally but are not dominant or co-dominant. Due to the lack of dominance by <i>Eucalyptus moluccana</i> and <i>Eucalyptus crebra</i> , it is considered that the floristic characteristics for this EEC are not met.
Central Hunter Grey Box – Ironbark Woodland has been recorded from the local government areas of Cessnock, Singleton and Muswellbrook but may occur elsewhere within the Sydney Basin Bioregion	The subject land is located within the Port Stephens LGA within the NSW North Coast Bioregion. The subject land is not within the Cessnock, Singleton or Muswellbrook LGAs. The subject land is outside of the main distribution of this EEC, which reduces the likelihood of its presence.
<b>Conclusion</b>	<p><b>The subject land does not contain areas which correspond with the geological or floristic characteristics and typical distribution of this EEC.</b></p> <p><b>It is considered that the Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions endangered ecological community EEC does not occur within the subject land.</b></p>

**Table C1.3 Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions**

Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions - Diagnostic Characteristics Summarised from NSW Scientific Committee (2011) Final Determination	Consideration
This EEC generally occurs on floodplains and associated floodplain rises along the Hunter River and tributaries	The subject land is within the Grahamstown Dam catchment which drains to the Hunter River.
All sites are within the NSW North Coast and Sydney Basin Bioregions	The subject land is within the NSW North Coast Bioregion
Hunter Floodplain Red Gum Woodland typically forms a tall to very tall (18-35 m) woodland. Stands on major floodplains are generally dominated by <i>Eucalyptus camaldulensis</i> (River Red Gum) in combinations with <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Eucalyptus melliodora</i> (Yellow Box) and <i>Angophora floribunda</i> (Rough-barked Apple). Within the community stands of <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> (River Oak) and <i>Casuarina glauca</i> (Swamp Oak) can form a part of this community.	The subject land does not contain woodland dominated by <i>Eucalyptus camaldulensis</i> in combinations with <i>Eucalyptus tereticornis</i> , <i>Eucalyptus melliodora</i> and <i>Angophora floribunda</i> . It is considered that the floristic requirements for this EEC are not present within the subject land.
Hunter Floodplain Red Gum Woodland has been recorded from the local government areas of Maitland, Mid-Western, Muswellbrook, Singleton, and Upper Hunter but may occur elsewhere within the NSW North Coast and Sydney Basin Bioregions	The subject land is located within the Port Stephens LGA and is not located within the main extent of occurrence of this EEC.
<b>Conclusion</b>	<b>It is considered that this EEC is not present in the subject land as the PCTs present do not match floristically with this EEC and the subject land is located outside of the recorded extent of occurrence of this EEC.</b>

**Table C1.4 Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions**

Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions - Diagnostic Characteristics Summarised from NSW Scientific Committee (2011) Final Determination	Consideration
<p>Found on gentle slopes arising from depressions and drainage flats on Permian sediments of the Hunter Valley floor in the Sydney Basin and NSW North Coast Bioregions</p>	<p>Areas of drainage depressions and flats are present, however the subject land does not occur on Permian sediments. The development footprint occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The geological characteristics for this EEC are not met within the subject land.</p>
<p>Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions has been recorded from the local government areas of Maitland, Cessnock and Port Stephens (in the Sydney Basin Bioregion) and Muswellbrook and Singleton (in the NSW North Coast Bioregion) but may occur elsewhere in these bioregions</p>	<p>The subject land occurs within the Port Stephens LGA.</p>
<p>The Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions is generally an open forest with most common canopy trees species being <i>Eucalyptus tereticornis</i> and <i>Eucalyptus punctata</i> although other frequently occurring canopy species are <i>Angophora costata</i>, <i>Corymbia maculata</i>, <i>Eucalyptus crebra</i> and <i>Eucalyptus moluccana</i>, with a number of other eucalypts being less frequently recorded</p>	<p><i>Eucalyptus tereticornis</i> occurs on drainage depressions in PCTs 762, 1618 and 1716 however is typically in low densities in PCT 1618 and 1716.</p>
<p><b>Conclusion</b></p>	<p><b>It is considered that this EEC is not present in the subject land as the PCTs present do not match the geological or floristic requirements for this EEC.</b></p>

**Table C1.5 Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions**

Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions – Additional Information and Diagnostic Characteristics Summarised from the NSW Scientific Committee (2019) Final Determination	Consideration
<p>May occur outside the typical range of variation in the features described in Part 4 of the listing</p>	<p>Part 4 of the listing provides additional information about the ecological community. Part 4 of the Final Determination further identifies that this variation relates to natural variability and disturbance history.</p> <p>While occurrences of the community may occur outside of the typical range of features described, clear guidance is provided for exclusion of closely related map units / vegetation types which are not characteristic of the LHSGIF TEC.</p>
<p>Occurs in the lower Hunter Valley centered on the Cessnock-Beresfield area and approximately bounded by the towns of Paxton, Branxton, Clarence Town, Beresfield, Mt Vincent and the northern boundary of the Watagans National Park.</p>	<p>The development footprint occurs within the Lower Hunter Region (LGAs of Maitland, Cessnock, Port Stephens, Newcastle and Lake Macquarie), however it is located outside and to the east of the central distribution identified for this TEC. This is not a diagnostic feature and has not been relied upon in this assessment for determination of presence or absence of this TEC.</p>
<p>Permian substrates most commonly supporting the community belong to the Dalwood Group, the Maitland Group and the Greta and Tomago Coal Measures.</p> <p>Permian substrates most commonly supporting the community belong to the Dalwood Group, the Maitland Group and the Greta and Tomago Coal Measures.</p> <p>In the area of Paterson, Seaham and Clarence Town, the community occurs on Carboniferous sediments including the Wallaringa, Mt Johnstone and Seaham formations.</p>	<p>The development footprint occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The geological conditions for the presence of the TEC are at least partially met within the development footprint.</p>
<p>Strongly associated with yellow podsolic and solodic soils of the Lower Hunter soil landscapes of Aberdare, Branxton and Neath (although not restricted to these soils).</p>	<p>The development footprint is located on the Ten Mile Road and Ten Mile Road Variant A soil landscapes, these soil landscapes are not indicative of the presence of this EEC, however, do not conclusively rule out the presence of the TEC.</p>

Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions – Additional Information and Diagnostic Characteristics Summarised from the NSW Scientific Committee (2019) Final Determination	Consideration
<p>Dominated by <i>Corymbia maculata</i> and <i>Eucalyptus fibrosa</i> with <i>Eucalyptus punctata</i> occurring less frequently.</p> <p>Other species recorded infrequently are <i>Eucalyptus crebra</i>, <i>Eucalyptus moluccana</i>, <i>Eucalyptus agglomerata</i>, <i>Eucalyptus umbra</i>, <i>Corymbia gummifera</i>, <i>Syncarpia glomulifera</i>, <i>Eucalyptus globoidea</i>, <i>Eucalyptus paniculata</i> subsp. <i>paniculata</i>, <i>Eucalyptus sparsifolia</i>, <i>Angophora costata</i>, <i>Eucalyptus acmenoides</i>, <i>Eucalyptus fergusonii</i> subsp. <i>fergusonii</i>, <i>Eucalyptus nubila</i> and <i>Corymbia eximia</i> (none of these are characteristic of LHSGIF)</p>	<p>PCT 1590 is the only PCT present dominated by <i>Corymbia maculata</i> within all plots sampled. <i>Corymbia maculata</i> was also recorded outside of areas mapped as PCT 1590 in Plot 17 (PCT 762) and Plot 19 (PCT 1716). Plot 17 (PCT 762) has a mesic understorey and small tree layer with no ironbark species and Plot 19 contains <i>Eucalyptus siderophloia</i> as a co-dominant. Both Plots 17 and 19 are considered to not correspond to this TEC or a potentially associated PCT.</p> <p>For PCT 1590:</p> <ul style="list-style-type: none"> <li>- <i>Eucalyptus fibrosa</i> was observed in plots 16 and 20.</li> <li>- Plot 16 contained higher cover and abundance of <i>Eucalyptus umbra</i> (10% cover / 6 trees) compared to <i>Eucalyptus fibrosa</i> (5% cover / 5 trees) and also contained <i>Eucalyptus resinifera</i> at low cover and abundance (1% cover / 1 tree).</li> <li>- Plot 20 contained a higher cover and abundance of <i>Eucalyptus globoidea</i> (10% cover / 15 trees) compared to <i>Eucalyptus fibrosa</i> (1% cover / 2 trees) and also contained <i>Eucalyptus canaliculata</i> (0.3% cover / 2 trees).</li> <li>- None of the plots sampled were dominated by both <i>Corymbia maculata</i> and <i>Eucalyptus fibrosa</i> together.</li> </ul> <p>Species co-occurring with <i>Corymbia maculata</i> in plots where <i>Eucalyptus fibrosa</i> was not observed include <i>Eucalyptus canaliculata</i> and <i>Eucalyptus globoidea</i> (Plot 10), <i>Eucalyptus siderophloia</i> (plots 9 and 10) and <i>Eucalyptus umbra</i> (plots 8, 9, 10 and 21). <i>Eucalyptus fibrosa</i> was not observed to be dominant in any of the plots sampled and <i>Eucalyptus punctata</i> was not recorded.</p>

Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions – Additional Information and Diagnostic Characteristics Summarised from the NSW Scientific Committee (2019) Final Determination	Consideration
<p>The most frequently encountered shrub species include <i>Acacia parvipinnula</i>, <i>Bursaria spinosa</i>, <i>Daviesia ulicifolia</i>, <i>Lissanthe strigosa</i>, <i>Melaleuca nodosa</i> and <i>Persoonia linearis</i></p>	<p><i>Acacia parvipinnula</i> and <i>Lissanthe strigosa</i> were not observed within the plots sampled for this PCT. <i>Bursaria spinosa</i> was observed in plots 9 and 10 with relatively low cover of 0.1% and <i>Persoonia linearis</i> was observed within five of the seven plots sampled. <i>Melaleuca nodosa</i> was observed within plot 16 with a cover of 10%.</p> <p>The shrub species which were observed in highest density within the plots sampled included <i>Melaleuca nodosa</i>, <i>Pultenaea villosa</i>, <i>Hakea dactyloides</i>, <i>Leptospermum polygalifolium</i>, <i>Acacia longifolia</i>, <i>Hibbertia aspera</i>.</p> <p>Shrub species commonly encountered across the plots sampled included <i>Acacia falcata</i>, <i>Acacia implexa</i>, <i>Acacia longifolia</i>, <i>Acacia ulicifolia</i>, <i>Acrotriche divaricata</i>, <i>Boronia ledifolia</i>, <i>Breynia oblongifolia</i>, <i>Jacksonia scoparia</i>, <i>Leucopogon juniperinus</i>, <i>Notelaea longifolia</i>, <i>Persoonia linearis</i> and <i>Pultenaea villosa</i>.</p>
<p>Species frequently observed in the ground stratum include <i>Aristida vagans</i>, <i>Cheilanthes sieberi</i>, <i>Dianella revoluta</i>, <i>Entolasia stricta</i>, <i>Glycine clandestina</i>, <i>Hardenbergia violacea</i>, <i>Lepidosperma laterale</i>, <i>Lomandra filiformis</i>, <i>Lomandra multiflora</i>, <i>Macrozamia flexuosa</i>, <i>Microlaena stipoides</i>, <i>Panicum simile</i>, <i>Phyllanthus hirtellus</i>, <i>Pomax umbellata</i> and <i>Themeda triandra</i>.</p>	<p>Many of the ground cover species identified as frequently observed are present, however many of these are commonly encountered within many ecological communities. The ground stratum alone is not considered to be a strong diagnostic feature of the ecological community.</p>
<p>The Final Determination describes map units MU 67 and MU68 of Somerville (2009) as corresponding to the LHSGIF EEC.</p>	<p>MU 67 is described as having a canopy strongly dominated by <i>Corymbia maculata</i> and <i>Eucalyptus fibrosa</i>, often in association with <i>Eucalyptus punctata</i> and MU 68 is described as having a canopy strongly dominated by <i>Eucalyptus fibrosa</i> in association with <i>Corymbia maculata</i>.</p> <p>The canopy of the vegetation assigned to PCT 1590 within the development footprint is strongly dominated by <i>Corymbia maculata</i>, however this is in association with a range of other Eucalypt species, particularly, <i>Eucalyptus globoidea</i>, <i>Eucalyptus siderophloia</i>, <i>Eucalyptus umbra</i> and <i>Eucalyptus canaliculata</i>. It is considered that the PCT present corresponds to MU 65 of Somerville (2009).</p>

Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions – Additional Information and Diagnostic Characteristics Summarised from the NSW Scientific Committee (2019) Final Determination	Consideration
<p>The following Map Units of Somerville (2009) are identified by the NSW Scientific Committee as not forming part of Lower Hunter Spotted Gum Ironbark Forest (they are contra-indicative):</p> <ul style="list-style-type: none"> <li>• Map Unit 65</li> <li>• Map Unit 66</li> <li>• Map Unit 71</li> <li>• Map Unit 72</li> <li>• Map Unit 73</li> <li>• Map Unit 75</li> </ul>	<p>Map unit 65 is described as occurring in areas with similar edaphic properties but receiving a higher average annual rainfall. The development footprint is located at low elevation in a coastal area, which is likely to receive on average higher annual rainfall compared to the central distributional area described for this TEC. Map unit 65 is identified as having a canopy dominated by <i>Corymbia maculata</i> in association with <i>Eucalyptus umbra</i>, <i>Eucalyptus fibrosa</i>, <i>Eucalyptus siderophloia</i> and <i>Allocasuarina torulosa</i>. It is considered that this canopy composition generally accords with the floristics of the plots sampled within PCT 1590 with the addition of other eucalyptus such as <i>Eucalyptus globoidea</i> and <i>Eucalyptus canaliculata</i>. The shrub layer of map unit 65 is identified as having a more frequent occurrence of <i>Acacia ulicifolia</i>, <i>Breynia oblongifolia</i>, <i>Leucopogon juniperinus</i> and <i>Notelaea longifolia</i> and a less frequent occurrence of <i>Grevillea montana</i>, <i>Grevillea parviflora subsp. parviflora</i>, <i>Melaleuca decora</i>, <i>Melaleuca nodosa</i> and <i>Pultenaea spinosa</i>.</p> <p>In relation to the ground layer a mix of species including some more frequently recorded within the LHS GIF EEC and some more frequently recorded within MU65 were observed across the plots sampled.</p> <p>Map Unit 66 is described as being dominated by <i>Eucalyptus punctata</i> and <i>Angophora floribunda</i>, these species were not recorded, and it is considered that this map unit does not occur within the development footprint.</p> <p>Map Unit 71 occurs at very low elevations and is dominated by <i>Corymbia maculata</i> and <i>Eucalyptus fibrosa</i> in association with <i>Eucalyptus moluccana</i>, <i>Eucalyptus crebra</i> and <i>Eucalyptus tereticornis</i>. This map unit does not correspond with any of the plots sampled here.</p> <p>Map Units 72 and 75 have a co-dominance of <i>Eucalyptus crebra</i> and <i>Corymbia maculata</i> with lower frequency or absence of <i>Eucalyptus fibrosa</i>. Map Unit 73 occurs at higher elevations with higher rainfall and is dominated by <i>Corymbia maculata</i>, <i>Eucalyptus crebra</i> and less frequently <i>Eucalyptus tereticornis</i>. These map units do not correspond with any of the plots sampled here.</p> <p>It is considered that PCT 1590 matches the contra-indicative Map Unit 65 of Somerville (2009), and does not match a Somerville (2009) map unit associated with the Lower Hunter Spotted Gum Ironbark Forest EEC.</p>

<b>Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions – Additional Information and Diagnostic Characteristics Summarised from the NSW Scientific Committee (2019) Final Determination</b>	<b>Consideration</b>
<b>Conclusion</b>	<p>While it is acknowledged that the site has been influenced by historical disturbance including bushfires and logging, the current composition of the canopy and shrub stratum are aligned with Map Unit 65 of Somerville (2009). This is reflected in the composition of the canopy and shrub layers which may be related to soil properties and/or higher average annual rainfall closer to the coast, compared to the identified central distribution of this EEC.</p> <p><b>It is considered that the vegetation within the development footprint, mapped as PCT 1590, is not consistent with the Lower Hunter Spotted Gum Ironbark Forest EEC, as described by the NSW Scientific Committee (2019).</b></p>

**Table C1.6 River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions**

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions - Diagnostic Characteristics Summarised from the NSW Scientific Committee (2011) Final Determination	Consideration
<p>Occurs within the NSW North Coast, Sydney Basin and South East Corner bioregions known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eastern Capital City Regional, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions</p>	<p>The subject land is located within the Port Stephens LGA which is within the area of occurrence of this EEC.</p>
<p>Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains</p>	<p>The subject land contains periodically inundated alluvial flats and drainage lines associated with coastal floodplains. These landforms include areas of PCT 762, 1618 and 1716.</p>
<p>The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees</p>	<p>The subject land typically contains open forest vegetation.</p>
<p>While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. amplifolia</i> (cabbage gum), <i>Angophora floribunda</i> (rough-barked apple) and <i>A. subvelutina</i> (broad-leaved apple). <i>Eucalyptus baueriana</i> (blue box), <i>E. botryoides</i> (bangalay) and <i>E. elata</i> (river Peppermint) may be common south from Sydney, <i>E. ovata</i> (swamp gum) occurs on the far south coast, <i>E. saligna</i> (Sydney blue gum) and <i>E. grandis</i> (flooded gum) may occur north of Sydney, while <i>E. benthamii</i> is restricted to the Hawkesbury floodplain. Other eucalypts including <i>Eucalyptus longifolia</i> (Woollybutt), <i>E. moluccana</i> (grey box) and <i>E. viminalis</i> (ribbon gum) may be present in low abundance or dominant in limited areas of the distribution. A layer of small trees may be present, including <i>Melaleuca decora</i>, <i>M. styphelioides</i> (prickly-leaved teatree), <i>Backhousia myrtifolia</i> (grey myrtle), <i>Melia azedarach</i> (white cedar), <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> (river oak) and <i>C. glauca</i> (swamp oak). The combination of features that distinguish River-Flat Eucalypt Forest on Coastal Floodplains from other endangered communities on the coastal floodplains include: its dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus <i>Angophora</i> or the sections <i>Exsertaria</i> or <i>Transversaria</i> of the genus <i>Eucalyptus</i> (Hill 2002); the relatively low abundance or sub-dominance of</p>	<p>PCT 762 contains a canopy dominated by <i>Eucalyptus tereticornis</i> and a small tree layer composed of composed of <i>Melaleuca styphelioides</i>, <i>Melaleuca sieberi</i>, <i>Melaleuca decora</i>, <i>Melaleuca nodosa</i> and <i>Callistemon salignus</i>. It is considered that the floristics of this PCT correspond with this EEC. PCT 1618 is dominated by <i>Eucalyptus resinifera</i> in association with <i>Angophora costata</i>, <i>Eucalyptus fibrosa</i>, <i>Eucalyptus globoidea</i> and <i>Eucalyptus tereticornis</i>. <i>Eucalyptus resinifera</i> subsp. <i>resinifera</i> from the section <i>Transversaria</i> and <i>E. tereticornis</i> from the section <i>Exsertaria</i> are present. It is considered that this PCT aligns with this EEC. PCT 1716 contains a sparse eucalypt canopy composed <i>Eucalyptus tereticornis</i>, <i>Eucalyptus siderophloia</i> and <i>Corymbia maculata</i> to approximately 10m high with a dense sub-canopy of <i>Melaleuca nodosa</i>. While <i>E. tereticornis</i> belongs to the section <i>Exsertaria</i>, the other characteristic species present do not belong to the section <i>Exsertaria</i> or <i>Transversaria</i>. The mid storey is composed of a mix of <i>Melaleuca</i> species including <i>Melaleuca decora</i>, <i>Melaleuca linariifolia</i>, <i>Melaleuca nodosa</i> and <i>Melaleuca sieberi</i>. It is considered that this PCT does not align with the floristic characteristics of this EEC.</p>

<b>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions - Diagnostic Characteristics Summarised from the NSW Scientific Committee (2011) Final Determination</b>	<b>Consideration</b>
Casuarina and Melaleuca species; the relatively low abundance of <i>Eucalyptus robusta</i> ; and the prominent groundcover of soft-leaved forbs and grasses	
<b>Conclusion</b>	<p><b>The River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC is present within the subject land and development footprint.</b></p> <p><b>It is considered that PCTs 762 and 1618 both correspond with this EEC.</b></p> <p><b>It is considered that the floristic characteristics of PCT 1716 do not correspond with this EEC.</b></p>

**Table C1.7 Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion**

Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion - Diagnostic Characteristics Summarised from the NSW Scientific Committee (2011) Final Determination	Consideration
Associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains	The subject land contains periodically inundated alluvial flats and drainage lines associated with coastal floodplains. These landforms include areas of PCT 762, 1618 and 1716.
Generally occurs below 50 m, but may occur on localised river flats up to 250 m elevation in the NSW North Coast bioregion	The alluvial flats and drainage line areas within the subject land are typically below 50m elevation and the requirement for occurrence within the NSW North Coast bioregion is met.
The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees.	PCT 761 and 1618 form an open forest. PCT 1716 forms an open forest to scrub with scattered trees. Areas with scattered trees have likely been subject to historical disturbances associated with logging and bushfire.
Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, but may occur elsewhere in this bioregion	The subject land occurs with the Port Stephens LGA.
Characteristic species are identified in paragraph 1 of the final determination. The most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. siderophloia</i> (grey ironbark), <i>Corymbia intermedia</i> (pink bloodwood) and, north of the Macleay floodplain, <i>Lophostemon suaveolens</i> (swamp turpentine). Other trees may be scattered throughout at low abundance or locally common at few sites, particularly where there is an influence from lithic substrates upslope. These include <i>Eucalyptus moluccana</i> (grey box), <i>E. propinqua</i> (grey gum), <i>E. seeana</i> (narrow-leaved red gum), <i>Angophora subvelutina</i> (broad-leaved apple), <i>E. robusta</i> (swamp mahogany), <i>Eucalyptus resinifera</i> subsp. <i>hemilampra</i> (red mahogany), <i>E. acmenoides</i> (white mahogany), <i>Angophora woodsiana</i> , <i>A. paludosa</i> and rainforest trees such as <i>Ficus</i> spp. (figs) and <i>Cupaniopsis</i> spp (tuckeroos). A layer of small trees may be present, including <i>Allocasuarina torulosa</i> (forest oak), <i>Alphitonia excelsa</i> (red ash), <i>Glochidion ferdinandi</i> (cheese tree), <i>Callistemon</i> spp. (bottlebrushes), <i>Melaleuca</i> spp. (paperbarks) and <i>Casuarina glauca</i> (swamp oak).	<p><i>Eucalyptus tereticornis</i> occurs within PCT 762, 1618 and 1716 which each occur on landforms associated with coastal floodplains.</p> <p><i>E. tereticornis</i> is dominant within PCT 762, however other co-occurring eucalypts are not characteristic of this EEC.</p> <p><i>E. tereticornis</i> is not dominant within PCT 1618 and no other characteristic tree species for the EEC occur as dominant species there.</p> <p><i>E. tereticornis</i> occurs in tandem with <i>Eucalyptus siderophloia</i> in parts of PCT 1716, which also has a strong co-occurrence of <i>Corymbia maculata</i>.</p> <p>The other characteristic eucalypt species described for this EEC were not observed.</p> <p>A layer of small trees including several of the characteristic species for this EEC occurs within PCT 762, 1618 and 1716.</p>

Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion - Diagnostic Characteristics Summarised from the NSW Scientific Committee (2011) Final Determination	Consideration
<p>The combination of features that distinguish Subtropical Coastal Floodplain Forest from other endangered ecological communities on the coastal floodplains include: its dominance by a mixed eucalypt canopy, often with <i>Lophostemon suaveolens</i>; the presence of rainforest elements as scattered trees or understorey plants; the relatively low abundance or sub-dominance of Casuarina and Melaleuca species; the relatively low abundance of <i>Eucalyptus robusta</i>; and the prominent groundcover of soft-leaved forbs and grasses. It may occupy central or marginal parts of floodplains and sandy flats, including Pleistocene back-barrier flats (Pressey and Griffith 1992); habitats where flooding is periodic and soils are rich in silt and sand, sometimes humic, and show little influence of saline ground water.</p>	<p>PCT 762, 1618 and 1716 each contain a mixed eucalypt canopy. Rainforest elements as scattered trees or understorey plants are present. Melaleuca and Casuarina species are sub-dominant except for PCT 1716 where a prominent layer of <i>Melaleuca nodosa</i> occurs, presumably as a response to historical disturbance. <i>Eucalyptus robusta</i> was not observed. The ground cover is dominated by soft leaved forbs and grasses, however sedges also feature.</p> <p>The areas where these PCTs occur are typically drainage lines and flats on marginal parts of floodplains with no influence from likely saline ground water.</p>
<p><b>Conclusion</b></p>	<p><b>It is considered that PCT 1716 corresponds to a disturbed variant of this EEC. PCTs 762 and PCT 1618 display floristic characteristics which better align with the River-flat Eucalypt Forest on Coastal Floodplains EEC.</b></p>

**Table C1.8 Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions**

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Diagnostic Characteristics Summarised from the NSW Scientific Committee (2011) Final Determination	Consideration
Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains	The subject land contains periodically inundated alluvial flats and drainage lines associated with coastal floodplains. These landforms include areas of PCT 762, 1618 and 1716.
Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions	The alluvial flats and drainage line areas within the subject land are typically above 20m in elevation. The elevation of these areas is below 50m elevation and the requirement for occurrence within the NSW North Coast bioregion is met.
The structure of the community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent	PCTs 762, 1618 and 1716 are considered to correspond with the broad structural requirements of this EEC.
<p>Characteristic species are identified in paragraph 1 of the final determination.</p> <p>The combination of features that distinguish Swamp Sclerophyll Forest on Coastal Floodplains from other endangered ecological communities on the coastal floodplains include: its relatively dense tree canopy dominated by <i>Eucalyptus robusta</i>, <i>Melaleuca quinquenervia</i> or <i>E. botryoides</i>, the relatively infrequent occurrence of other eucalypts, <i>Casuarina glauca</i> or <i>Lophostemon suaveolens</i>; the occasional presence of rainforest elements as scattered trees or understorey plants; and the prominence of large sedges and ferns in the groundcover. It generally occupies small alluvial flats and peripheral parts of floodplains where they adjoin lithic substrates or coastal sandplains. The soils are usually waterlogged, stained black or dark grey with humus, and show little influence of saline ground water.</p>	<p>No PCTs within the subject land contain a canopy dominated or composed of <i>Eucalyptus robusta</i>, <i>Melaleuca quinquenervia</i> or <i>Eucalyptus botryoides</i>. All PCTs present have a canopy dominated by other eucalypt species.</p> <p>Furthermore areas with a very sparse or absent canopy with the structural formation of fernland, tall reedland or sedgeland are not present.</p> <p>PCT 1716 does contain a sparse eucalypt canopy in parts with a scrub mid stratum dominated by <i>Melaleuca nodosa</i>. The canopy species <i>E. tereticornis</i> and <i>E. siderophloia</i>, which occur within PCT 1716, align with the Subtropical Coastal Floodplain Forest and not this EEC. <i>Melaleuca nodosa</i> is also a characteristic species of the Subtropical Coastal Floodplain Forest and is not listed as a characteristic species within the final determination for this EEC.</p>
<b>Conclusion</b>	<b>It is considered that the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC does not occur within the subject land.</b>

## 2.0 Assessment of Threatened Ecological Communities listed under the EPBC Act

The following TECs listed within the EPBC Act were considered to have potential to occur within the subject land:

- Central Hunter Valley eucalypt forest and woodland
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.

The following detailed analysis of the relevant approved conservation advice and key diagnostic characteristics published by the Australian Government is provided separately for each TEC in **Tables C2.1 to 2.3**.

**Table C2.1 Central Hunter Valley eucalypt forest and woodland**

Central Hunter Valley eucalypt forest and woodland- Key Diagnostic Characteristics from EPBC Act Threatened Species Scientific Committee (2015) Approved Conservation Advice	Consideration
It occurs in the Hunter River catchment (typically called the Hunter Valley region)	The subject land occurs in the Hunter River Catchment
It typically occurs on lower hillslopes and low ridges, or valley floors in undulating country; on soils derived from Permian sedimentary rocks	Areas of drainage depressions and flats are present, however the subject land does not occur on Permian sediments. The subject land occurs on Carboniferous sediments of the Eagleton Volcanics and Mt Johnstone formations. The geological characteristics for this EEC are not met within the subject land.
It does not occur on alluvial flats, river terraces, aeolian sands, Triassic sediments, or escarpments	PCTs 1590 and 1619 do not occur in the landscape positions or substrates specified.  PCTs 762, 1618 and 1716 all occur in landscape positions associated with alluvial flats.
It is woodland or forest, with a projected canopy cover of trees of 10% or more; or with a native tree density of at least 10 native tree stems per 0.5 ha (at least 20 native tree stems/ha) that are at least one metre in height	The vegetation within the subject land is mostly open forest.
The canopy of the ecological community is dominated by one or more of the following four eucalypt species: <i>Eucalyptus crebra</i> (narrow-leaved ironbark), <i>Corymbia maculata</i> (syn. <i>E. maculata</i> ) (spotted gum), <i>E. dawsonii</i> (slaty gum) and <i>E. moluccana</i> (grey box); or a fifth species, <i>Allocasuarina luehmannii</i> (bulloak, buloke) dominates in combination with one or more of the above four eucalypt species, in sites previously dominated by one or more of the above four eucalypt species.	PCT 1590 contains areas dominated by <i>Corymbia maculata</i> . <i>Corymbia maculata</i> also occurs within PCT 1716.
<i>Allocasuarina torulosa</i> (forest oak), <i>Eucalyptus acmenoides</i> (white mahogany) and <i>E. fibrosa</i> (red/broad-leaved ironbark) are largely absent from the canopy of a patch	<i>Allocasuarina torulosa</i> and <i>Eucalyptus fibrosa</i> are both present throughout PCT 1590.
A ground layer is present (although it may vary in development and composition), as a sparse to thick layer of native grasses and other native herbs and/or native shrubs	These ground layer conditions are met for the PCTs present.
<b>Conclusion</b>	The Central Hunter Valley eucalypt forest and woodland is not present within the subject land and is excluded based on lack of key diagnostic features including the geological substrate and prominent occurrence of the negative diagnostic species.

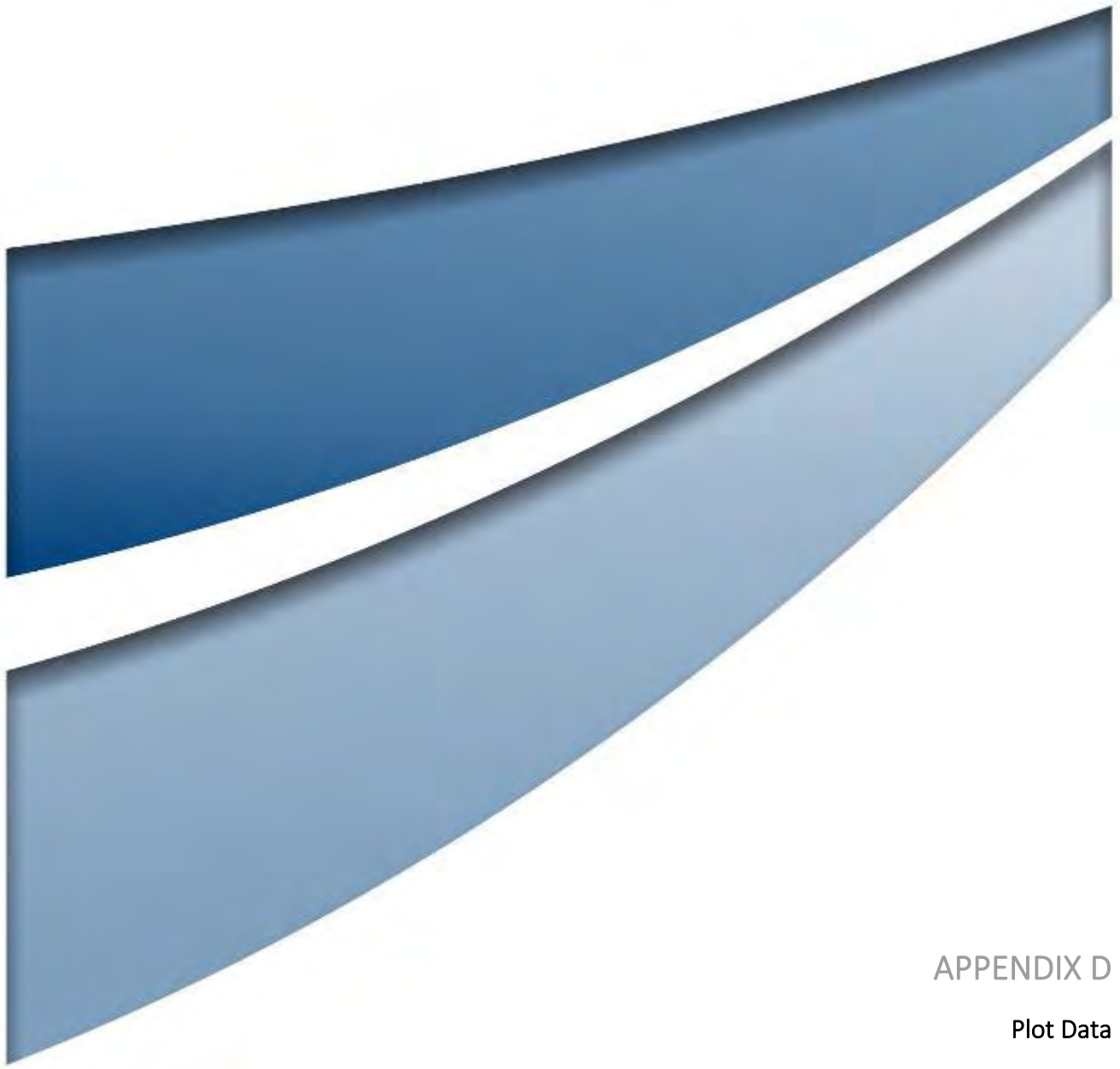
**Table C2.2 Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland**

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland - Key Diagnostic Characteristics from DAWE (2021) Approved Conservation Advice	Consideration
Occurs on the mainland and islands near to the coast (within 20 km) from South East Queensland to south-eastern NSW specifically within these IBRA Bioregions: South Eastern Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB) and the Bateman sub-region of the South East Corner (SEC).	The subject land occurs within the NSW North Coast bioregion.
Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL.	Most of the subject land is above 20m above sea level (ASL), however is entirely above 220m ASL.
Occurs on hydric soils with inundation patterns ranging from intermittent to episodic.	PCTs 762, 1618 and 1716 all meet this key diagnostic requirement.
The vegetation structure varies from tall closed to open forest to woodland, to dense (closed) shrubland or scrub forest. Minimum crown cover (see footnote 5, p. 4) is at least 10%, but it is more typically in the range 50% to 70%	The vegetation within the subject land typically meets this requirement.
From South East Queensland to the Sydney Basin Bioregion, the canopy is typically dominated or co-dominated by <i>Melaleuca quinquenervia</i> and/or <i>Eucalyptus robusta</i> . In some areas, the canopy may be locally dominated by other <i>melaleuca</i> species including: <i>M. dealbata</i> (SEQ bioregion) (rarely); <i>M. biconvexa</i> (mid-NSW coast to south of Sydney); <i>M. decora</i> (north of Shoalhaven), frequently with <i>Parsonsia straminea</i> climbing on the trunks of canopy species. In the SEC bioregion, <i>M. ericifolia</i> may occur as a dominant canopy or sub-canopy species.	Floristic plot analysis completed during late 2022 has identified that there are no parts of the subject land where <i>Melaleuca quinquenervia</i> or <i>Eucalyptus robusta</i> are dominant or co-dominant. Some areas, are dominated by other melaleucas, particularly PCT 1716 which is dominated by <i>Melaleuca nodosa</i> , however no areas are dominated by <i>M. dealbata</i> , <i>M. biconvexa</i> or <i>M. decora</i> .
Other tree species may occur in the canopy (or sub-canopy) in some areas, but they are not dominant across a patch, including <i>Casuarina glauca</i> , <i>Banksia</i> spp., <i>Callistemon salignus</i> , <i>Corymbia intermedia</i> (Pink Bloodwood), <i>E. tereticornis</i> , (Forest Red Gum/Queensland Blue Gum), <i>E. longifolia</i> (Woollybutt), <i>E. botryoides</i> (Southern Mahogany/Bangalay), <i>E. ovata</i> (Swamp Gum), <i>Livistona australis</i> and/or <i>Lophostemon</i> spp.	PCTs 762, 1618 ad 1716 all contain <i>Eucalyptus tereticornis</i> . This species is particularly dominant in PCT 762.
The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically <i>Gahnia</i> spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially <i>Imperata cylindrica</i> (Blady Grass)	These understorey conditions met within PCTs 762, 1618 ad 1716.

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland - Key Diagnostic Characteristics from DAWE (2021) Approved Conservation Advice	Consideration
<p>While they can occur regularly in the ground layer, the ecological community is not present if halophytic species, more typically associated with estuarine/saltmarsh areas, dominate the ground layer of a patch, for example, <i>Appium prostratum</i>, <i>Atriplex cineria</i>, <i>Chenopodium glaucum</i>, <i>Rhagodia candolleaus</i> and <i>Samolus repens</i>.</p>	<p>Halophytic species were not observed.</p>
<p><b>Conclusion</b></p>	<p><b>It is noted that in the referral documentation submitted for this project, the potential presence of this EEC was acknowledged. However further site based floristic plot surveys and analysis have confirmed the absence of this EEC and the presence of the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions listed under the EPBC Act.</b></p>

**Table C2.3 Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions**

Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions - Key Diagnostic Characteristics from DCCEEW (2022) Approved Conservation Advice	Consideration
It occurs in the New South Wales North Coast (NNC) and South Eastern Queensland (SEQ) IBRA2 bioregions, and on Curtis Island in the Brigalow Belt North IBRA Bioregion (BBN).	The subject land occurs within the NSW North Coast bioregion.
It occurs in the catchments of the eastern watershed of the Great Dividing Range, typically in their lower reaches	The subject land occurs within the catchment of the eastern watershed of the Great Dividing Range.
It occurs at elevations up to 250 m above sea-level (ASL), most typically below 50 m ASL.	The subject land occurs below 250m ASL and areas with potential to correspond with this EEC typically occur below 50m ASL.
It occurs on alluvial landforms including river floodplains, riparian zones (e.g., along riverbanks, lake foreshores and creek lines), the floors of tributary gullies, floodplain pockets, alluvial flats, fans, terraces, and localised colluvial fans; as well as on localised depressions amongst low rises and on associated sites where water can pond.	PCTs 762, 1618 and 1716 all occur on alluvial landforms in association with riparian zones or localized depressions where water ponds.
It occurs on alluvial soils of various textures including silts, clay loams, sandy loams, gravel and cobbles	Detailed soil testing has not been undertaken PCTs 762, 1618 and 1716
It does not typically occur on soils that are primarily marine or aeolian sands, but may occur on such substrates after they have been modified by fluvial activity	The subject land does not contain soils that are marine or aeolian sands.
It occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland (Specht 1970). The canopy has a crown cover of at least 20%	These structural requirements are satisfied for PCTs 762, 1618 and 1716.
It has a canopy dominated by one or a combination of Angophora, Corymbia, Eucalyptus, Lophostemon and/or Syncarpia tree species, but NOT dominated by <i>Eucalyptus robusta</i> (swamp mahogany). Other canopy tree species may be present, and in some areas rainforest trees may be prominent.	This floristic requirement is met for PCT 762, 1618 and 1716.
A mid-layer (including a sub-canopy, and/or shrub-layer) may be present, sparse or absent; and fauna may be abundant or rare.	Mid layer presence/absence and fauna abundance was not utilised as a diagnostic tool in this assessment.
<b>Conclusion</b>	<b>It is considered that PCTs 762, 1618 and 1716 all correspond to the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions EEC listed under the EPBC Act.</b>



## APPENDIX D

### Plot Data

**Table D1.2 Floristic Plot Data**

Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23				
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A					
	<b>Trees</b>																																							
Casuarinaceae	<i>Allocasuarina littoralis</i>					1	8			0.1	3	1	8	0.1	3	0.1	1			0.1	2																			
Myrtaceae	<i>Angophora costata</i>	15	5									5	3	5	3	15	12	15	15	10	12	1	1			2	1			5	3					5	5			
Myrtaceae	<i>Corymbia gummifera</i>											15	8	10	10	5	10			1	1					1	1			5	4					10	4			
Myrtaceae	<i>Corymbia maculata</i>			10	5	30	20	30	20	20	25												10	8	5	1			5	10			20	20	20	10				
Myrtaceae	<i>Eucalyptus canaliculata</i>									5	4					1	1	10	10			1	1	10	2	2	1													
Myrtaceae	<i>Eucalyptus fibrosa</i>	1	1															15	20			5	5			5	2	1	2							10	3			
Myrtaceae	<i>Eucalyptus globoidea</i>	1	1							1	1	5	2	5	3	5	1					15	15			1	1	10	15	5	3					10	3			
Myrtaceae	<i>Eucalyptus piperita</i>											5	2																											
Myrtaceae	<i>Eucalyptus resinifera</i>	10	3											15	20	15	12					2	1	1	1															
Myrtaceae	<i>Eucalyptus siderophloia</i>			1	1			5	3	5	3																					3	1	5	3					
Myrtaceae	<i>Eucalyptus tereticornis</i>	5	2	5	1																					10	8													
Myrtaceae	<i>Eucalyptus umbra</i>					1	1	8	4	10	10			1	1									10	6										5	3				
Oleaceae	<i>Notelaea longifolia</i>							0.1	1					0.1	1										0.1	2	0.1	1	1	5						0.1	1			
Phyllanthaceae	<i>Glochidion ferdinandi</i>	0.1	2											1	10	10	30	2	20						10	20	0.2	5	0.1	1			0	0			0.2	3		
	<b>Shrubs</b>																																							
Araliaceae	<i>Polyscias sambucifolia</i>									0.1	1			0.2	4	0.2	5																							
Dilleniaceae	<i>Hibbertia aspera</i>	0.1	2	0.5	20	5	20			0.2	10			1	50	0.1	10								0.1	1	0.5	10	2	25	0.2	10			0.2	3				
Dilleniaceae	<i>Hibbertia riparia</i>											0.1	5	0.2	20											0.1	1			1	25									
Ericaceae	<i>Acrotriche divaricata</i>	0.1	1	0.1	1	0.1	1	0.2	2	0.2	2			0.5	10			0.1	2							0.1	2	0.2	2	0.5	5	0.1	1	0.2	2	0.2	3			
Ericaceae	<i>Epacris pulchella</i>											0.1	3	0.5	50						0.1	20	0.1	20					0.2	35										
Ericaceae	<i>Leucopogon juniperinus</i>			0.1	5	0.1	5			0.1	5														0.1	3	1	10					0.1	1	0.1	3				
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>											0.1	1																											
Fabaceae (Faboideae)	<i>Daviesia acicularis</i>											0.1	3																											
Fabaceae (Faboideae)	<i>Dillwynia retorta</i>											0.1	1								1	20														3	100			
Fabaceae (Faboideae)	<i>Gompholobium latifolium</i>											0.1	5																											
Fabaceae (Faboideae)	<i>Indigofera australis</i>					0.1	3																						0.7	5										
Fabaceae (Faboideae)	<i>Jacksonia scoparia</i>					0.2	3	0.2	2																				0.5	3					0.3	3	0.1	1		
Fabaceae (Faboideae)	<i>Mirbelia rubiifolia</i>			0.1	10	0.1	10			0.1	5																													
Fabaceae (Faboideae)	<i>Platylobium formosum</i>									0.3	10			0.1	5						0.1	3																		
Fabaceae (Faboideae)	<i>Pultenaea euchila</i>											1	20	0.1	5						0.2	10								0.5	10			0.1	2	2	100			

Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23		
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A			
Fabaceae (Faboideae)	<i>Pultenaea paleacea</i>											0.3	20	2	50	1	50			5	200	0.1	5			0.1	2			0.5	10							
Fabaceae (Faboideae)	<i>Pultenaea retusa</i>	0.1	1	0.1	2																																	
Fabaceae (Faboideae)	<i>Pultenaea villosa</i>	0.1	1			5	10	0.2	10							2	20	5	20	1	15	10	30					0.7	3			0.3	5			10	100	
Fabaceae (Mimosoideae)	<i>Acacia falcata</i>	0.1	5					0.1	1																											0.1	1	
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>			0.1	1	0.1	3			0.5	8																											
Fabaceae (Mimosoideae)	<i>Acacia irrorata</i>	1	10																																			
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>													0.2	5									0.1	3													
Fabaceae (Mimosoideae)	<i>Acacia myrtifolia</i>											0.2	10																									
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>													0.2	5																							
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>							0.2	3	0.1	1											0.3	5			0.1	2	1	5									
Myrtaceae	<i>Callistemon salignus</i>			0.2	3											1	10							5	15													
Myrtaceae	<i>Leptospermum polygalifolium</i>	1	10	0.5	6			0.5	3	0.1	3	0.2	5	30	50	30	200			10	50	5	20	0.2	2	0.5	10			25	75							
Myrtaceae	<i>Leptospermum trinervium</i>											0.2	1	5	10																							
Myrtaceae	<i>Melaleuca decora</i>	5	20					0.1	1															10	5	5	10											
Myrtaceae	<i>Melaleuca linariifolia</i>	1	10																																			
Myrtaceae	<i>Melaleuca nodosa</i>	20	50	40	100									20	30								10	20			20	25			30	100						
Myrtaceae	<i>Melaleuca sieberi</i>	0.5	5											1	10	5	20					0.2	1			10	20											
Myrtaceae	<i>Sannantha crassa</i>	2	20																																			
Phyllanthaceae	<i>Breynia oblongifolia</i>			0.5	20	0.1	3	0.1	1	0.1	2			0.1	2								0.1	1	10	30	0.2	5						0.3	3	0.1	3	
Phyllanthaceae	<i>Phyllanthus hirtellus</i>					0.2	20	0.1	10	0.1	10	0.1	20	0.1	10			0.1	10	0.1	10	0.2	100					1	250	0.3	50	0.3	100	0.2	5	0.3	50	
Pittosporaceae	<i>Bursaria spinosa</i>							0.1	1	0.1	3							0.1	3																			
Pittosporaceae	<i>Pittosporum multiflorum</i>							0.1	2																				0.5	10								
Pittosporaceae	<i>Pittosporum revolutum</i>													0.1	2												0.1	2										
Proteaceae	<i>Banksia spinulosa</i>													0.2	3	0.5	6					0.5	4							0.7	10							
Proteaceae	<i>Banksia spinulosa var. collina</i>											2	5																									
Proteaceae	<i>Hakea dactyloides</i>					5	10																															
Proteaceae	<i>Isopogon anemonifolius</i>											0.1	2																									
Proteaceae	<i>Lambertia formosa</i>											1	10																									
Proteaceae	<i>Persoonia levis</i>											0.1	2																									

Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23		
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A			
Proteaceae	<i>Persoonia linearis</i>			0.1	1			0.2	10	0.1	5	0.5	5	2	10	0.1	5	0.1	3			0.1	2			0.1	1	0.5	2	0.5	5			0.1	1	0.5	20	
Rutaceae	<i>Boronia ledifolia</i>									0.1	6											0.1	5					0.3	100	0.1	25							
Sapindaceae	<i>Dodonaea triquetra</i>	0.1	2															5	30																			
Thymelaeaceae	<i>Pimelea linifolia</i>											0.1	10									0.5	50							0.3	10							
	<b>Grass and grass-like</b>																																					
Cyperaceae	<i>Bolboschoenus fluviatilis</i>	0.2	20																																			
Cyperaceae	<i>Carex appressa</i>															1	200																					
Cyperaceae	<i>Carex inversa</i>	5	100			1	100			0.1	10			1	100			0.1	10						10	200	0.7	50					0.1	20				
Cyperaceae	<i>Cyathochaeta diandra</i>							2	100					2	50	2	200				5	100							10	1000								
Cyperaceae	<i>Eleocharis sphacelata</i>	0.1	5																																			
Cyperaceae	<i>Lepidosperma laterale</i>			0.1	10	0.2	50	1	20	1	30	1	50			2	100			0.2	20	0.1	5			0.1	5	0.1	20	0.2	10	0.5	20	1	100	0.5	100	
Cyperaceae	<i>Lepidosperma spp.</i>															0.5	50																					
Cyperaceae	<i>Ptilothrix deusta</i>			10	500							25	1000			35	3000	2	100	20	2000	10	1000						45	1000	0.5	50			5	500		
Cyperaceae	<i>Schoenoplectus validus</i>	0.1	10																																			
Cyperaceae	<i>Schoenus apogon</i>	5	1000	5	1000											1	100			2	200	5	500			5	500			3	500	0.5	100					
Juncaceae	<i>Juncus usitatus</i>															0.1	3																					
Lomandraceae	<i>Lomandra filiformis</i>					1	50	5	250	5	200	0.1	5															1	50					0.5	500			
Lomandraceae	<i>Lomandra longifolia</i>			0.1	3									0.1	3	0.2	10	0.1	5			0.2	5	0.1	5	0.1	5					1	10	3	50			
Lomandraceae	<i>Lomandra multiflora subsp. multiflora</i>			0.5	50	0.1	20	1	50	1	20										0.1	3									0.1	10						
Lomandraceae	<i>Lomandra obliqua</i>											5	500	1	100			1	100	0.2	100								1	250					10	1000		
Poaceae	<i>Anisopogon avenaceus</i>											40	500																									
Poaceae	<i>Aristida vagans</i>					1	50																			1	100	2	250				3	500	0.5	100	0.3	20
Poaceae	<i>Austrostipa spp.</i>	1	100	1	100									5	500																							
Poaceae	<i>Dichelachne crinita</i>			1	100	5	100	5	100	1	100			5	500			5	200			5	500					5	250									
Poaceae	<i>Digitaria divaricatissima</i>					1	50																		1	100												
Poaceae	<i>Echinopogon caespitosus</i>	5	100					0.5	20					5	500			5	500			5	500	10	500	2	200			0.5	50							
Poaceae	<i>Echinopogon caespitosus var. caespitosus</i>							1	50																													
Poaceae	<i>Entolasia marginata</i>	10	500	5	500	5	100			5	100			5	500	10	2000	5	1000			1	50	35	3000	5	500	15	1000			2	100					
Poaceae	<i>Entolasia stricta</i>	40	1000			5	100	10	500	1	50	15	500	5	500	20	1000	10	2000	15	2000	5	500			5	200			10	500	10	1000	10	1000	10	500	
Poaceae	<i>Eragrostis spp.</i>			1	50																																	
Poaceae	<i>Imperata cylindrica</i>	5	100					10	50	15	500			1	100	5	500	15	1000			1	50			25	1000					10	1000			3	100	
Poaceae	<i>Microlaena stipoides var. stipoides</i>	10	200	5	500	5	100	1	50	5	100	5	500	5	500	1	200	5	200	20	3000	10	1000	20	1000					2	100	2	100	0.3	50			

Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23		
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A			
Poaceae	<i>Oplismenus aemulus</i>															1	50							20	2000	5	500	0.5	35					0.2	50			
Poaceae	<i>Panicum simile</i>	5	500	10	500	10	500	1	100					5	500			5	500	5	200	5	500						1	150	1	50	0.3	20	0.3	10		
Poaceae	<i>Poa affinis</i>					10	100	20	100	5	100							10	500																			
Poaceae	<i>Rytidosperma caespitosum</i>			0.1	10																																	
Poaceae	<i>Rytidosperma pallidum</i>							1	20											1	20													0.2	10	1	50	
Poaceae	<i>Sporobolus creber</i>					0.5	20																															
Poaceae	<i>Themeda triandra</i>			30	1000	10	100	40	1000	5	50	5	100	25	3000	10	500	5	500	5	200	10	500			1	20	40	1000	3	500	0.1	2			5	500	
Restionaceae	<i>Lepyrodia scariosa</i>													5	500																							
	<b>Forbs</b>																																					
Acanthaceae	<i>Brunoniella australis</i>	0.1	10			0.1	10	0.1	10	0.1	10	0.1	10															0.1	50					0.1	10	0.1	20	
Acanthaceae	<i>Pseuderanthemum variabile</i>					0.1	20																	1	200	0.1	10	0.3	100									
Apiaceae	<i>Centella asiatica</i>	0.1	50																					1	200			0.5	250									
Apiaceae	<i>Hydrocotyle laxiflora</i>	0.2	100					0.1	10							0.1	20						0.1	10	5	1000	0.2	500	0.1	50								
Asteraceae	<i>Brachyscome spathulata</i>									0.1	5																											
Asteraceae	<i>Cymbonotus lawsonianus</i>							0.1	10																													
Asteraceae	<i>Euchiton sphaericus</i>			0.1	10	0.1	5																															
Asteraceae	<i>Lagenifera stipitata</i>									0.1	10																0.1	10										
Asteraceae	<i>Sigesbeckia orientalis subsp. orientalis</i>					0.1	3																												0.1	1		
Asteraceae	<i>Vernonia cinerea</i>	0.1	20	0.2	50	0.1	5	0.1	5																	0.1	5	0.1	1			0.1	3	0.1	20			
Campanulaceae	<i>Lobelia purpurascens</i>	0.1	20	1	500	0.1	10	0.1	10	0.2	50			1	500	0.1	20	0.1	50	0.1	20	0.2	100	0.2	100	0.1	10	0.3	100			1	1000	1	1000	2	1000	
Campanulaceae	<i>Wahlenbergia communis</i>							0.1	10	0.1	10												0.1	20				0.2	100									
Clusiaceae	<i>Hypericum gramineum</i>							0.1	5														0.1	10														
Convolvulaceae	<i>Dichondra repens</i>	0.2	100					0.2	100	0.1	50														5	500	0.1	20										
Fabaceae (Faboideae)	<i>Desmodium rhytidophyllum</i>					0.1	20	0.1	10									0.1	1				0.1	2										0.1	5	0.3	50	
Fabaceae (Faboideae)	<i>Hovea linearis</i>											0.1	3																	0.1	1							
Goodeniaceae	<i>Brunonia australis</i>			0.1	20																																	
Goodeniaceae	<i>Goodenia heterophylla</i>	0.1	20																																			
Goodeniaceae	<i>Goodenia heterophylla subsp. heterophylla</i>															0.2	100	0.1	20				0.1	10												0.3	50	
Goodeniaceae	<i>Goodenia paniculata</i>			0.2	100							0.1	20	0.1	20					1	200	1	100															
Haloragaceae	<i>Gonocarpus teucroides</i>											0.1	50	0.1	20	5	1000	0.2	200	0.2	200	0.2	100			0.1	10			0.3	100	0.5	50			0.3	50	
Haloragaceae	<i>Haloragis heterophylla</i>			5	500																											0.1	20					
Iridaceae	<i>Patersonia sericea</i>											0.5	20																	0.1	5							

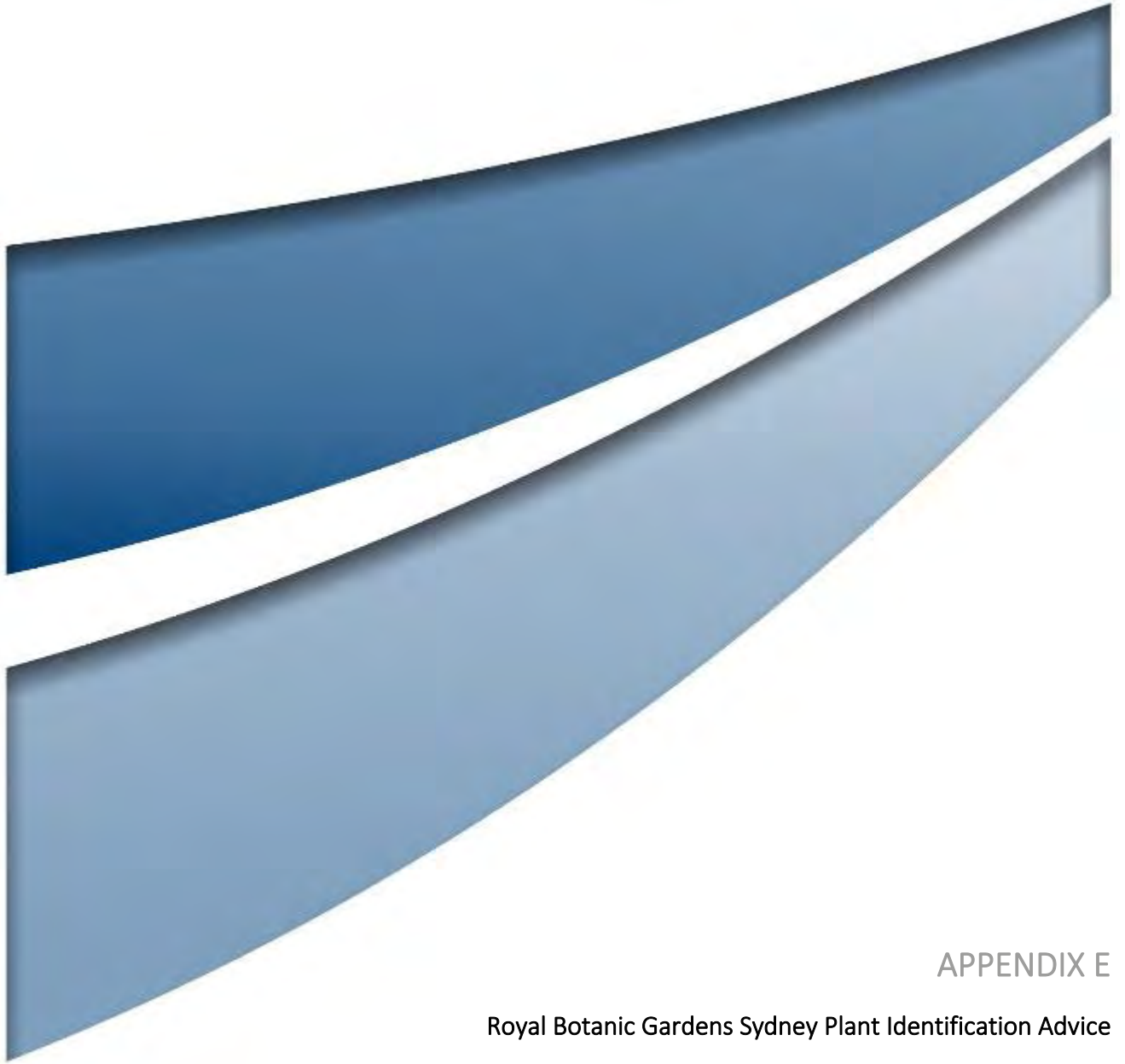
Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A		
Juncaginaceae	<i>Triglochin striata</i>	0.1	10																																		
Orchidaceae	<i>Cryptostylis subulata</i>															0.1	5									0.1	10										
Orchidaceae	<i>Microtis parviflora</i>							0.1	5																												
Oxalidaceae	<i>Oxalis perennans</i>													0.1	10					0.1	10																
Phormiaceae	<i>Dianella caerulea</i>	0.5	30	0.1	20	0.1	20	0.1	10	0.2	25	0.1	10	0.1	10			0.1	10	0.1	3			0.2	10												
Phormiaceae	<i>Dianella caerulea var. caerulea</i>															0.1	5																				
Rubiaceae	<i>Opercularia diphylla</i>			0.1	10	0.1	10	0.1	20	0.1	10	0.1	10	0.1	5								0.1	10													
Rubiaceae	<i>Pomax umbellata</i>							0.1	20																							0.3	50	0.1	20		
Violaceae	<i>Hybanthus monopetalus</i>											0.1	20			0.1	10			0.1	5							0.2	50						0.2	50	
	<b>Ferns</b>																																				
Dennstaedtiaceae	<i>Pteridium esculentum</i>													0.2	20																				0.1	2	
Lindsaeaceae	<i>Lindsaea linearis</i>													0.5	500													0.7	250								
Pteridaceae	<i>Cheilanthes sieberi</i>			0.1	10	0.1	20	0.1	50					0.1	10			0.1	20			0.1	10		0.1	10				0.2	100	0.1	50	0.1	20		
Pteridaceae	<i>Cheilanthes sieberi subsp. sieberi</i>									0.1	20																										
	<b>Other Native Plants</b>																																				
Apocynaceae	<i>Parsonsia straminea</i>	0.1	10	0.1	1	0.1	3	0.2	3																0.1	1					0.1	3					
Bignoniaceae	<i>Pandorea pandorana</i>							0.1	5	0.1	5			0.1	5										0.1	1						0.1	1				
Convolvulaceae	<i>Convolvulus erubescens</i>	0.1	10											0.1	5	0.1	5						0.1	10											0.2	100	
Fabaceae (Faboideae)	<i>Glycine clandestina</i>													0.1	5							0.1	5	0.1	10						0.1	20	0.2	20	0.1	20	
Fabaceae (Faboideae)	<i>Glycine tabacina</i>					0.1	10	0.1	10			0.1	10												0.1	5	0.1	25	0.1	5	0.1	3					
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>					0.1	10	0.1	10	0.1	5	0.1	5	0.1	2			0.1	5	0.1	5				0.1	1	0.3	35	0.3	35	0.2	3	0.2	10	1	50	
Lauraceae	<i>Cassytha glabella</i>	0.1	2							0.1	5			0.2	20							0.1	5		0.1	5			0.1	25							
Luzuriagaceae	<i>Eustrephus latifolius</i>			0.1	5	1	10	0.1	10					0.1	5	0.2	10					0.1	3		0.1	3	0.1	15			0.3	100	0.2	100	0.2	30	
Pittosporaceae	<i>Billardiera scandens</i>					0.1	3	0.1	5	0.1	3			0.5	20	0.1	10	0.1	3			0.1	5		0.1	5	0.2	15			0.1	3	0.2	10	0.2	50	
Smilacaceae	<i>Smilax glyciophylla</i>													0.1	1									0.2	5												
Xanthorrhoeaceae	<i>Xanthorrhoea latifolia</i>												5	30																							
	<b>High Threat Exotics</b>																																				
Asteraceae	<i>Bidens pilosa</i>					0.1	3	0.1	5															0.2	20			0.1	35				0.1	1			
Asteraceae	<i>Senecio madagascariensis</i>	0.1	2	0.1	2	0.1	3	0.1	3	0.1	10			0.1	2			0.1	3					0.1	10			0.1	3			0.1	10				
	<b>Other Exotics</b>																																				
Asteraceae	<i>Gamochaeta calviceps</i>			0.1	10																																
Asteraceae	<i>Sonchus oleraceus</i>					0.1	5	0.1	3																		0.1	1					0.1	10			

Family Name	Scientific Name	Plot 12B		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12A		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 22		Plot 20		Plot 24		Plot 19		Plot 21		Plot 23		
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A			
Rubiaceae	<i>Galium aparine</i>									0.1	10			0.1	20																							

Key: A = Abundance, C = Cover

**Table D1.2 Vegetation Integrity Data**

plot	pct	area	Patch size	Condition class	zone	easting	northing	bearing	Composition Data						Structure Data						Function Data														
									Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow trees	Litter C	Len Fallen Logs	Tree Stem 5to9 cm	Tree Stem 10to19 cm	Tree Stem 20to29 cm	Tree Stem 30to49 cm	Free Stem 50to79 cm	Tree Regen	High Threat Exotic				
12B	1618	0.88	100	Intact	56	389039	6385037.29	250	6	13	12	9	0	3	32.1	31.1	86.4	1.5	0.0	0.3	2	0	49.0	18.0	0	1	1	1	1	1	1	1	1	0.1	
7	1716	3.91	100	Regenerating	56	388208	6385537.58	230	3	11	13	8	1	2	16.0	42.3	68.8	6.8	0.1	0.2	0	0	44.0	12.5	1	1	1	1	1	0	1	1	0.1		
8	1590	45.63	100	Intact	56	388364	6385447.29	100	3	11	14	9	1	5	32.0	16.0	54.8	0.9	0.1	1.4	0	0	85.0	53.0	1	1	1	1	1	0	1	1	0.2		
9	1590	45.63	100	Intact	56	388358	6385285.69	270	4	12	14	13	1	6	43.1	2.1	98.5	1.4	0.1	0.7	0	0	52.0	60.0	1	1	1	1	1	0	1	1	0.2		
10	1590	45.63	100	Intact	56	388271	6385095.38	290	6	14	11	8	1	4	41.1	2.2	44.1	1.0	0.1	0.4	1	0	52.0	104.0	1	1	1	1	1	1	1	1	1	0.1	
11	1619	19.52	100	Intact_Apple	56	388963	6385215.2	290	5	18	8	9	0	3	31.0	6.4	96.1	1.4	0.0	5.2	2	0	74.0	25.0	1	1	1	1	1	1	1	1	1	0.0	
12	1619	8.75	100	Intact_Ironbark	56	388074	6384746.6	65	8	19	14	6	3	8	37.2	63.5	70.1	1.5	0.8	1.3	0	0	76.0	90.0	1	1	1	1	1	0	1	1	0.1		
13	1619	19.52	100	Intact_Apple	56	388517	6384985.22	65	7	9	14	7	0	3	51.1	39.9	88.8	5.7	0.0	0.4	2	1	79.0	26.0	1	1	1	1	1	1	1	1	1	0.0	
14	1619	8.75	100	Intact_Ironbark	56	388687	6384970.28	0	4	6	13	5	1	2	42.0	10.4	68.2	0.6	0.1	0.2	1	0	95.0	65.0	1	1	1	1	1	1	1	1	1	0.1	
15	1619	19.52	100	Intact_Apple	56	388806	6385095.3	90	5	11	11	9	0	1	28.1	18.4	73.5	1.9	0.0	0.1	1	0	88.0	70.0	1	1	1	1	1	1	1	1	1	0.0	
16	1590	45.63	100	Intact	56	388651	6385430.1	270	6	12	13	10	1	4	28.0	26.6	57.8	2.2	0.1	0.4	0	2	81.0	39.0	1	1	1	1	1	0	1	1	1	0.0	
17	762	0.33	100	Intact	56	388002	6384446.64	290	4	10	7	6	0	6	25.1	35.9	126.1	12.4	0.0	1.5	3	0	50.0	15.0	1	1	0	1	1	1	1	1	1	1.3	
18	Null	45.63	100	Intact	56	387872	6385300.62	50	6	10	14	9	1	4	52.0	12.8	64.2	1.5	0.1	0.5	0	0	0.0	43.0	1	1	1	1	1	0	1	1	0.2		
22	762	0.33	100	Intact	56	388043	6384627.59	120	8	14	13	11	1	8	21.3	38.0	80.2	1.3	0.1	0.9	0	0	7.4	76.0	0	1	1	1	1	0	0	0	0.1		
20	1590	45.63	100	Intact	56	387841	6384961.68	90	6	10	10	16	3	7	17.4	7.4	96.3	3.5	0.5	1.1	0	0	44.0	63.0	1	1	1	1	1	0	1	1	0.5		
24	1619	19.52	100	Intact_Apple	56	388497	6385080.1	58	4	12	9	9	1	4	15.7	29.8	73.7	1.7	0.7	0.8	2	0	70.0	5.0	1	1	1	1	1	1	1	1	1	0.0	
19	1716	3.91	100	Regenerating	56	388051	6385448.11	30	2	5	13	9	1	6	23.0	30.8	31.0	3.1	0.2	0.9	0	0	95.2	49.0	1	1	1	1	1	0	1	1	0.1		
21	1590	45.63	100	Intact	56	388059	6385279	70	5	12	11	8	1	5	30.8	5.6	20.8	2.8	0.1	0.9	2	1	93.0	94.0	1	1	1	1	1	1	1	1	1	0.2	
23	1619	8.75	100	Intact_Ironbark	56	388428	6384848.02	80	6	13	14	14	2	7	35.3	20.4	37.0	4.3	0.2	2.2	4	0	90.2	49.0	1	1	1	1	1	1	1	1	1	1	0.0



APPENDIX E

Royal Botanic Gardens Sydney Plant Identification Advice



*National Herbarium of New South Wales*

Ms Kate CONNOLLY  
Umwelt  
PO Box 838  
Toronto, NSW 2283  
AUSTRALIA

Enquiry No: 20341  
Botanical.Is@rbgsyd.nsw.gov.au  
Fax No: (02) 9251 1952  
Ph. No: (02) 9231 8111  
Date: 1 December 2017

Dear Ms CONNOLLY,

Thank you for your enquiry of 13-Nov-17. We are happy to provide the following information:

CL1 *Callistemon linearifolius* conf. P.G. Wilson 1 Dec 2017  
CL2 *Callistemon linearifolius* conf. P.G. Wilson 1 Dec 2017  
CL3 *Callistemon linearifolius* conf. P.G. Wilson 1 Dec 2017  
CL4 *Callistemon linearifolius* conf. P.G. Wilson 1 Dec 2017

An invoice for \$44.00 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Thank you for your enquiry.

Yours sincerely

Barbara Wiecek  
Identification Botanist  
Botanical Information Service



Go to our online Botanical Information Services at [plantnet.rbgsyd.nsw.gov.au](http://plantnet.rbgsyd.nsw.gov.au) to find out more about plants of New South Wales



The Botanical Information Email address is [Botanical.Is@rbgsyd.nsw.gov.au](mailto:Botanical.Is@rbgsyd.nsw.gov.au)  
Mrs Macquaries Road Sydney NSW 2000 Australia • Telephone (02) 9231 8111 • Fax (02) 9251 1952



National Herbarium of New South Wales

Jacob MANNERS  
Umwelt  
75 York Street  
Teralba, NSW 2284

BIS Enquiry No: 22140  
Botanical.Is@botanicgardens.nsw.gov.au  
Ph. No: (02) 4631 5135  
Date: 10 March 2023

Dear Jacob,

**Re: Plant identification – Job 4158**

Your plant specimens have been determined as the following:

1. DMTS01 - *Corybas* sp. - conf. A.E. Orme - 28 Feb 2023 – not retained
2. DMTS02 - *Callistemon acuminatus* or possibly *salignus* - det. P.G. Wilson - 7 Mar 2023 – not retained
3. DMTS03 - *Callistemon acuminatus* or possibly *salignus* - det. P.G. Wilson - 7 Mar 2023 - not retained
4. DMTS04 - *Callistemon acuminatus* or possibly *salignus* - det. P.G. Wilson - 7 Mar 2023 - not retained
5. DMTS05 - *Callistemon acuminatus* or possibly *salignus* - det. P.G. Wilson - 7 Mar 2023 - not retained
6. BLTS01 - *Grevillea humilis* subsp. *humilis* - det. A.E. Orme - 9 Mar 2023 – retained
7. BLTS02 - *Callistemon rigidus* - det. P.G. Wilson - 7 Mar 2023 - some of the younger leaves have characters which are *linearifolius*-like, so rather ambiguous. The presence of prominent glands on the leaves is also often associated with *C. linearifolius*. It is possible that P.G. Wilson did identify material like this (particularly if sterile) as *C. linearifolius* in the past. This specimen has been retained.
8. BLTS03 - *Grevillea humilis* subsp. *humilis* - det. A.E. Orme - 9 Mar 2023 - retained
9. JMG1 - *Grevillea humilis* subsp. *humilis* - det. A.E. Orme - 9 Mar 2023 – retained
10. JMC1 - *Callistemon acuminatus* or possibly *salignus* - det. P.G. Wilson - 7 Mar 2023 - not retained

An invoice for \$220.00 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Yours sincerely,

Andrew Orme  
Identification Technical Officer  
Botanical Identification Service

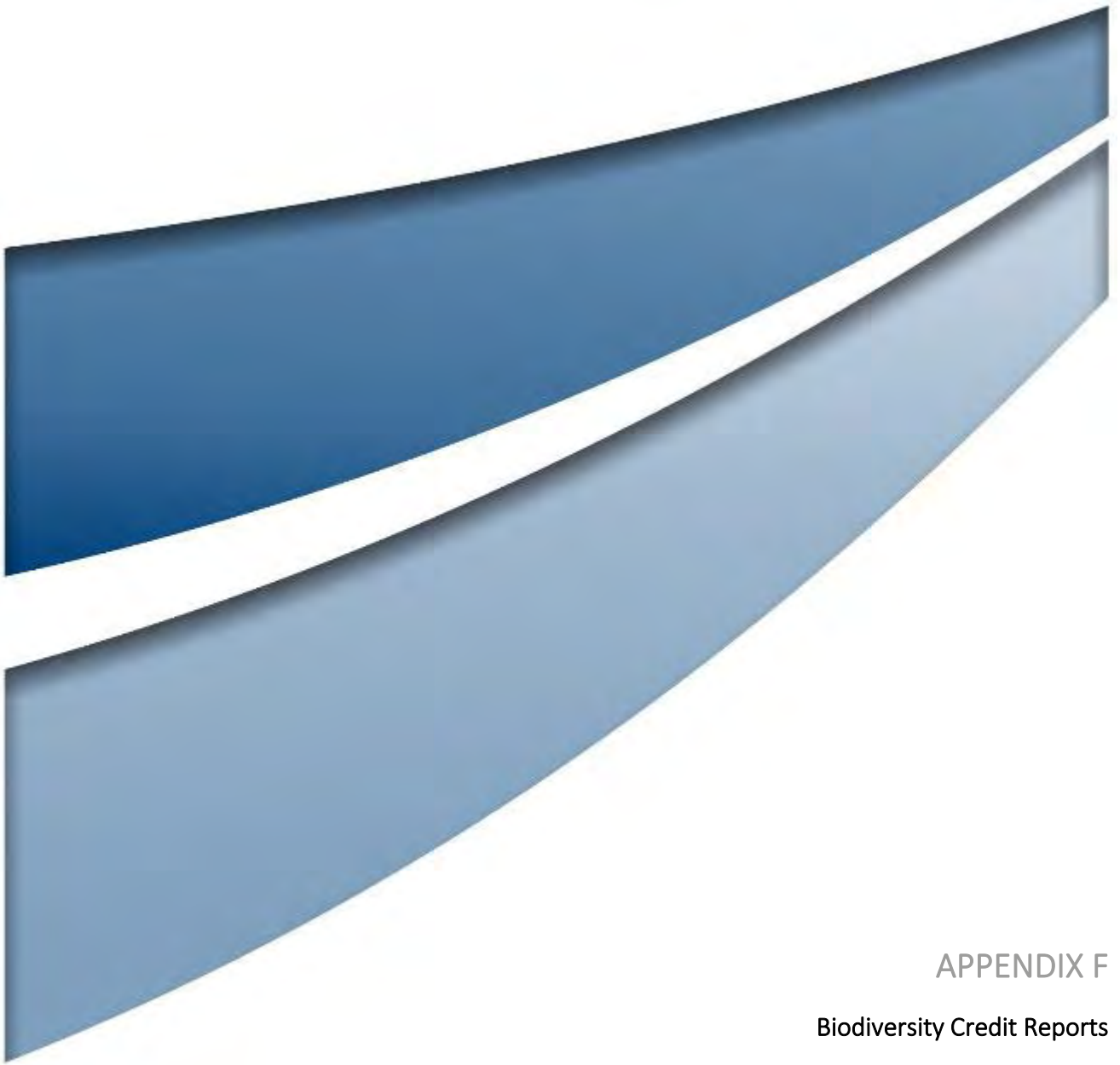


visit NSW Flora Online at [plantnet.rbgsyd.nsw.gov.au](http://plantnet.rbgsyd.nsw.gov.au)  
to help you identify the plants of New South Wales



Planning,  
Industry &  
Environment

The Botanical Identification Service email address is [Botanical.Is@botanicgardens.nsw.gov.au](mailto:Botanical.Is@botanicgardens.nsw.gov.au)  
Locked Bag 6002, Mount Annan, NSW 2567 • Telephone (02) 4631 5135 or (02) 4631 5136



## APPENDIX F

### Biodiversity Credit Reports

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00035143/BAAS17099/22/00035144	Stone Ridge Quarry	14/04/2023
Assessor Name	Report Created	BAM Data version *
Jacob Manners	30/05/2023	58
Assessor Number	BAM Case Status	Date Finalised
BAAS17099	Finalised	30/05/2023
Assessment Revision	Assessment Type	
0	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 SAI	Ecosystem credits
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<b>Cabbage Gum open forest or woodland on flats of the North Coast</b>												
6	762_Intact	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	78.8	78.8	0.33	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		13
										<b>Subtotal</b>	<b>13</b>	
<b>Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast</b>												
2	1716_Regenerating	Not a TEC	76.4	76.4	3.9	PCT Cleared - 66%	High Sensitivity to Gain			1.75		131
										<b>Subtotal</b>	<b>131</b>	
<b>Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands</b>												
4	1619_Intact_Apple	Not a TEC	70.7	70.7	19.5	PCT Cleared - 45%	High Sensitivity to Gain			1.50		518
5	1619_Intact_Ironbark	Not a TEC	80.5	80.5	8.8	PCT Cleared - 45%	High Sensitivity to Gain			1.50		264
										<b>Subtotal</b>	<b>782</b>	

Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast											
1	1618_Intact	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	78.1	78.1	0.88	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00	34
										<b>Subtotal</b>	<b>34</b>
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest											
3	1590_Intact	Not a TEC	74.1	74.1	45.6	PCT Cleared - 48%	High Sensitivity to Gain			1.50	1268
										<b>Subtotal</b>	<b>1268</b>
										<b>Total</b>	<b>2228</b>

## 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 SAI	Species credits

<i>Petaurus norfolcensis / Squirrel Glider ( Fauna )</i>										
1618_Intact	78.1	78.1	0.88	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		34
1716_Regenerating	76.4	76.4	3.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		149
1590_Intact	74.1	74.1	45.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		1691
1619_Intact_Apple	70.7	70.7	19.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		690
1619_Intact_Iron bark	80.5	80.5	8.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		352
762_Intact	78.8	78.8	0.33	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		13
									<b>Subtotal</b>	<b>2929</b>

<i>Phascogale tapoatafa / Brush-tailed Phascogale ( Fauna )</i>										
1618_Intact	78.1	78.1	0.88	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		34
1716_Regenerating	76.4	76.4	3.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		149
1590_Intact	74.1	74.1	45.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		1691
1619_Intact_Apple	70.7	70.7	19.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		690
1619_Intact_Iron bark	80.5	80.5	8.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		352
762_Intact	78.8	78.8	0.33	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False		13
									<b>Subtotal</b>	<b>2929</b>

<b><i>Phascolarctos cinereus / Koala ( Fauna )</i></b>										
1618_Intact	78.1	78.1	0.88	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False		34
1716_Regenerating	76.4	76.4	3.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False		149
1590_Intact	74.1	74.1	45.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False		1691
1619_Intact_Appl	70.7	70.7	19.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False		690
1619_Intact_Ironbark	80.5	80.5	8.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False		352

## BAM Credit Summary Report

762_Intact	78.8	78.8	0.33	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	13
								<b>Subtotal</b>	<b>2929</b>
<b><i>Pterostylis chaetophora / Pterostylis chaetophora ( Flora )</i></b>									
1716_Regenerating	76.4	76.4	3.9	Geographic Distribution	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	149
								<b>Subtotal</b>	<b>149</b>



# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00035143/BAAS17099/22/00035144	Stone Ridge Quarry	14/04/2023
Assessor Name	Assessor Number	BAM Data version *
Jacob Manners	BAAS17099	58
Proponent Names	Report Created	BAM Case Status
	30/05/2023	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	30/05/2023

\* 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
<b>Nil</b>		
Species		
<b>Nil</b>		

## Additional Information for Approval

PCT Outside Ibra Added



## BAM Biodiversity Credit Report (Like for like)

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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)



## BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1618-Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.9	0	34	34
1716-Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast	Not a TEC	3.9	0	131	131
1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Not a TEC	45.6	1268	0	1268
1619-Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Not a TEC	28.3	518	264	782
762-Cabbage Gum open forest or woodland on flats of the North Coast	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	0.3	0	13	13

**762-Cabbage Gum open forest or woodland on flats of the North Coast**

**Like-for-like credit retirement options**

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region



## BAM Biodiversity Credit Report (Like for like)

	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 686, 761, 762, 837, 848, 852, 971, 1062, 1091, 1092, 1106, 1215, 1227, 1230, 1333, 1588, 1594, 1598, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	762_Intact	No	13	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest</b>						
<b>Like-for-like credit retirement options</b>						
Class	Trading group	Zone	HBT	Credits	IBRA region	



## BAM Biodiversity Credit Report (Like for like)

	Hunter-Macleay Dry Sclerophyll Forests This includes PCT's: 715, 904, 922, 1178, 1215, 1588, 1589, 1590, 1591, 1592, 1593, 1600, 1601, 1602, 1608, 1612, 1626, 1748, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3441, 3442, 3443, 3444, 3445, 3446, 3447	Hunter-Macleay Dry Sclerophyll Forests <50%	1590_Intact	Yes	1268	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Like-for-like credit retirement options</b>						
<b>1618-Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast</b>	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region



## BAM Biodiversity Credit Report (Like for like)

	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794, 3145, 3181, 3185, 3188, 3192, 3258, 3328, 4024, 4025, 4039, 4041, 4058, 4138	-		1618_Intact	No	34	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>1619-Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands</b>	<b>Like-for-like credit retirement options</b>						
	Class		Trading group	Zone	HBT	Credits	IBRA region



## BAM Biodiversity Credit Report (Like for like)

	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598	Sydney Coastal Dry Sclerophyll Forests <50%	1619_Intact_Ap ple	Yes	518 Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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## BAM Biodiversity Credit Report (Like for like)

	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598	Sydney Coastal Dry Sclerophyll Forests <50%	1619_Intact_Iro nbark	No	264	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Like-for-like credit retirement options</b>						
<b>1716-Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast</b>	<b>Class</b>	<b>Trading group</b>	<b>Zone</b>	<b>HBT</b>	<b>Credits</b>	<b>IBRA region</b>



## BAM Biodiversity Credit Report (Like for like)

	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798, 3983, 3987, 3989, 3990, 3991, 3993, 3995, 3997, 3998, 4001, 4002, 4012	Coastal Swamp Forests >=50% and <70%	1716_Regenera ting	No	131	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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### Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
<b>Petaurus norfolcensis</b> / Squirrel Glider	<b>1618_Intact,</b> <b>1716_Regenerating,</b> <b>1590_Intact,</b> <b>1619_Intact_Apple,</b> <b>1619_Intact_Ironbark,</b> <b>762_Intact</b>	79.0	2929.00

## BAM Biodiversity Credit Report (Like for like)

<b>Phascogale tapoatafa</b> / Brush-tailed Phascogale	<b>1618_Intact, 1716_Regenerating, 1590_Intact, 1619_Intact_Apple, 1619_Intact_Ironbark, 762_Intact</b>	79.0	2929.00
<b>Phascolarctos cinereus</b> / Koala	<b>1618_Intact, 1716_Regenerating, 1590_Intact, 1619_Intact_Apple, 1619_Intact_Ironbark, 762_Intact</b>	79.0	2929.00
<b>Pterostylis chaetophora</b> / Pterostylis chaetophora	<b>1716_Regenerating</b>	3.9	149.00

### Credit Retirement Options

Like-for-like credit retirement options

<b>Petaurus norfolcensis</b> / Squirrel Glider	Spp	IBRA subregion
	<b>Petaurus norfolcensis</b> / Squirrel Glider	Any in NSW
<b>Phascogale tapoatafa</b> / Brush-tailed Phascogale	Spp	IBRA subregion
	<b>Phascogale tapoatafa</b> / Brush-tailed Phascogale	Any in NSW
<b>Phascolarctos cinereus</b> / Koala	Spp	IBRA subregion



## BAM Biodiversity Credit Report (Like for like)

	<b>Phascolarctos cinereus / Koala</b>	Any in NSW
<b>Pterostylis chaetophora / Pterostylis chaetophora</b>	Spp	IBRA subregion
	<b>Pterostylis chaetophora / Pterostylis chaetophora</b>	Any in NSW

## Proposal Details

<b>Assessment Id</b>	Proposal Name	BAM data last updated *
00035143/BAAS17099/22/00035144	Stone Ridge Quarry	14/04/2023
Assessor Name	Assessor Number	BAM Data version *
Jacob Manners	BAAS17099	58
Proponent Name(s)	Report Created	BAM Case Status
	30/05/2023	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	30/05/2023

\* 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
<b>Nil</b>		
Species		
<b>Nil</b>		

## Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

# BAM Biodiversity Credit Report (Variations)

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
1618-Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.9	0	34	34.00
1716-Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast	Not a TEC	3.9	0	131	131.00
1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Not a TEC	45.6	1268	0	1268.00
1619-Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	Not a TEC	28.3	518	264	782.00
762-Cabbage Gum open forest or woodland on flats of the North Coast	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	0.3	0	13	13.00

### 762-Cabbage Gum open forest or woodland on flats of the North Coast

#### Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

## BAM Biodiversity Credit Report (Variations)

	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion This includes PCT's: 621, 686, 761, 762, 837, 848, 852, 971, 1062, 1091, 1092, 1106, 1215, 1227, 1230, 1333, 1588, 1594, 1598, 3067, 3102, 3420, 3428, 3574, 3984, 4002, 4003, 4005, 4032, 4033, 4036, 4042, 4045, 4046	-	762_Intact	No	13	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Variation options</b>						
Formation	Trading group	Zone	HBT	Credits	IBRA region	
Grassy Woodlands	Tier 3 or higher threat status	762_Intact	No	13	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
<b>1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest</b>	<b>Like-for-like credit retirement options</b>					
	Class	Trading group	Zone	HBT	Credits	IBRA region

## BAM Biodiversity Credit Report (Variations)

	Hunter-Macleay Dry Sclerophyll Forests This includes PCT's: 715, 904, 922, 1178, 1215, 1588, 1589, 1590, 1591, 1592, 1593, 1600, 1601, 1602, 1608, 1612, 1626, 1748, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3441, 3442, 3443, 3444, 3445, 3446, 3447	Hunter-Macleay Dry Sclerophyll Forests <50%	1590_Intact	Yes	1268	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.												
<b>Variation options</b>																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Formation</th> <th style="width: 20%;">Trading group</th> <th style="width: 10%;">Zone</th> <th style="width: 10%;">HBT</th> <th style="width: 10%;">Credits</th> <th style="width: 17%;">IBRA region</th> </tr> </thead> <tbody> <tr> <td>           Dry Sclerophyll Forests (Shrub/grass sub-formation)         </td> <td>           Tier 4 or higher threat status         </td> <td>1590_Intact</td> <td>           Yes (including artificial)         </td> <td>1268</td> <td>           IBRA Region: NSW North Coast,            or            Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.         </td> </tr> </tbody> </table>							Formation	Trading group	Zone	HBT	Credits	IBRA region	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 4 or higher threat status	1590_Intact	Yes (including artificial)	1268	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Formation	Trading group	Zone	HBT	Credits	IBRA region													
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 4 or higher threat status	1590_Intact	Yes (including artificial)	1268	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.													
<b>1618-Smooth-barked Apple - White Stringybark - Red Mahogany - Melaleuca sieberi shrubby open forest on lowlands of the lower North Coast</b>	<b>Like-for-like credit retirement options</b>																	
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Class	Trading group	Zone	HBT	Credits	IBRA region													

## BAM Biodiversity Credit Report (Variations)

	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794, 3145, 3181, 3185, 3188, 3192, 3258, 3328, 4024, 4025, 4039, 4041, 4058, 4138	-	1618_Intact	No	34	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Variation options</b>						
Formation	Trading group		Zone	HBT	Credits	IBRA region
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status		1618_Intact	No	34	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>1619-Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands</b>	<b>Like-for-like credit retirement options</b>					
	Class	Trading group		Zone	HBT	Credits

## BAM Biodiversity Credit Report (Variations)

	<p>Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598</p>	<p>Sydney Coastal Dry Sclerophyll Forests &lt;50%</p>	<p>1619_Intact _Apple</p>	<p>Yes</p>	<p>518</p>	<p>Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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## BAM Biodiversity Credit Report (Variations)

	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598	Sydney Coastal Dry Sclerophyll Forests <50%	1619_Intact_Ironbark	No	264	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Variation options</b>						
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1619_Intact_Apple	Yes (including artificial)	518	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1619_Intact_Ironbark	No	264	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

## BAM Biodiversity Credit Report (Variations)

<b>1716-Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast</b>	<b>Like-for-like credit retirement options</b>					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798, 3983, 3987, 3989, 3990, 3991, 3993, 3995, 3997, 3998, 4001, 4002, 4012	Coastal Swamp Forests >=50% and <70%	1716_Regenerating	No	131	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	<b>Variation options</b>					
Formation	Trading group	Zone	HBT	Credits	IBRA region	
Forested Wetlands	Tier 3 or higher threat status	1716_Regenerating	No	131	IBRA Region: NSW North Coast, 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
<b>Petaurus norfolcensis</b> / Squirrel Glider	<b>1618_Intact, 1716_Regenerating, 1590_Intact, 1619_Intact_Apple, 1619_Intact_Ironbark, 762_Intact</b>	79.0	2929.00
<b>Phascogale tapoatafa</b> / Brush-tailed Phascogale	<b>1618_Intact, 1716_Regenerating, 1590_Intact, 1619_Intact_Apple, 1619_Intact_Ironbark, 762_Intact</b>	79.0	2929.00

## BAM Biodiversity Credit Report (Variations)

<b>Phascolarctos cinereus</b> / Koala	<b>1618_Intact, 1716_Regenerating, 1590_Intact, 1619_Intact_Apple, 1619_Intact_Ironbark, 762_Intact</b>	79.0	2929.00
<b>Pterostylis chaetophora</b> / Pterostylis chaetophora	<b>1716_Regenerating</b>	3.9	149.00

### Credit Retirement Options Like-for-like options

<b>Petaurus norfolcensis</b> / Squirrel Glider	Spp		IBRA region
	<b>Petaurus norfolcensis</b> /Squirrel Glider		Any in NSW
	<b>Variation options</b>		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
Fauna	Vulnerable	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
<b>Phascogale tapoatafa</b> / Brush-tailed Phascogale	Spp		IBRA region
	<b>Phascogale tapoatafa</b> /Brush-tailed Phascogale		Any in NSW
	<b>Variation options</b>		
	Kingdom	Any species with same or higher category of listing	IBRA region

## BAM Biodiversity Credit Report (Variations)

		under Part 4 of the BC Act shown below	
	Fauna	Vulnerable	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Phascolarctos cinereus/</b> Koala	Spp	IBRA region	
	<b>Phascolarctos cinereus/</b> Koala	Any in NSW	
	<b>Variation options</b>		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Pterostylis chaetophora/</b> Pterostylis chaetophora	Spp	IBRA region	
	<b>Pterostylis chaetophora/</b> Pterostylis chaetophora	Any in NSW	
	<b>Variation options</b>		

## BAM Biodiversity Credit Report (Variations)

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Upper Hunter, Ellerston, Hunter, Karuah Manning, Mummel Escarpment and Tomalla. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

