

EcoResolve



Environment & Design

Streamlined Biodiversity Development Assessment Report

Cooranbong Stockpile Extension Project (SSD-5145 Modification 4)

Cooranbong Entry Site, NSW



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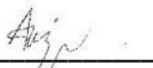




Declarations

Certification under clause 6.15 *Biodiversity Conservation Act 2016*.

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Date: 26/06/2026

BAM Assessor Accreditation no: BAAS 17065

This S-BDAR has been prepared to meet the requirements of BAM 2020. **Appendix A** provides an assessment of compliance with the minimum information requirements outlined in BAM **Appendix K**.

Conflicts of interest.

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

Signature: 

Date: 26/06/2026

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Abbreviations

Term	Description
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method (2020)
BAM-C	Biodiversity Assessment Method Calculator
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BC Regulation	<i>Biodiversity Conservation Regulation 2017</i> (NSW)
Centennial	Centennial Northern Coal Services Pty Limited
S-BDAR	Streamlined Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CES	Cooranbong Entry Site
CHP	Coal Handling Plant
DBH	Diameter at Breast Height over bark
EC	Ecological Community
EEC	Endangered Ecological Community
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Federal)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
HBT	Hollow-bearing Tree
HTW	High Threat Weed
IBRA7	Interim Biogeographic Regionalisation for Australia (version 7.0)
LGA	Local Government Area
LoO	Likelihood of Occurrence
LLS Act	<i>Local Land Services Act 2013</i> (NSW)
MNES	Matters of National Environmental Significance
NCS	Northern Coal Services
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
NSW	New South Wales
PCT	Plant Community Type
ROM	Run-of-mine
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VEC	Vulnerable Ecological Community
VI	Vegetation Integrity





Term	Description
VIS	Vegetation Integrity Score
Vegetation SEPP	State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (NSW)





Executive Summary

Centennial Northern Coal Services Pty Limited (Centennial) is the operator of the Northern Coal Services Project (NCS) located on the western side of Lake Macquarie, approximately 25 kilometres (km) south-west of Newcastle and 140 km north of Sydney. NCS comprises surface coal handling and processing facilities at the Newstan Colliery surface site and Cooranbong Entry Site (CES), as well as private haul roads connecting Newstan Colliery, Awaba Colliery, CES and Eraring Power Station.

Centennial propose the CES Stockpile Extension Modification (hereafter referred to as the 'Project') to increase the capacity of an existing coal stockpile from 100 kilotons (kt) to 400kt. This will require clearing of 2.93 ha of Plant Community Type (PCT) 3583, *Hunter Coast Lowland Scribbly Gum Forest* (**Figure 3**). The condition of this vegetation (Vegetation Integrity Score (VIS) = 63.6) is above the threshold requiring offsets (≥ 17 for non-Endangered Ecological Communities (EECs)) and the associated offset liability is 83 ecosystem credits (PCT 3583). This PCT is not considered to form part of any EECs listed under the *Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This assessment was conducted according to the streamlined module for small areas of the Biodiversity Assessment Method (BAM) 2020. Under this module, threatened species that are not considered at risk of Serious and Irreversible Impacts (SAIL species) and that are not recorded incidentally within the Modification Disturbance Area do not require specific assessment.

The surveys detected two threatened flora and six threatened fauna species (**Table 6**). Of the species detected, two of the Fauna species are listed SAIL species, however, these were dual credit species and their habitat constraint for species credits (breeding habitat) has not been identified and they were retained as ecosystem credit/predicted species only. Similarly, two more of the detected fauna were ecosystem credit species that were retained as predicted threatened species.

Of the above-mentioned species, six dual credit or species credit species were assumed present or were recorded incidentally during surveys as follows:

- *Petaurus norfolcensis* (Squirrel Glider) (species credit species) – assumed present based on local records and secondary observations.
- *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-Cockatoo) (dual credit species) – actual nesting trees not recorded but included precautionarily for both ecosystem and species credits.
- *Tyto novaehollandiae* (Masked Owl) (species credit species) – recorded on site.
- *Lathamus discolor* (Swift Parrot) (dual credit and SAIL species) - assumed present based on the important habitat map.
- *Grevillea parviflora subsp. parviflora* (Small-flowered Grevillea) (species credit species) – recorded on site.
- *Tetratheca juncea* (Black-eyed Susan) (species credit species) – recorded on site.

The above listed species have been considered likely to be impacted as part of the Project and species credit liabilities have been calculated for them. Of these species, the Swift Parrot (*Lathamus discolor*)





is listed as an SAI species, and it has been considered further against the relevant SAI criteria. This assessment concluded that although the species is in rapid decline, the small area of proposed foraging habitat loss on the peripheries of the mapped important habitat (only ~1.14 ha is mapped within the proposed 2.93 ha Modification Disturbance Area) is unlikely to cause a decline of the species in the locality.

The Swift Parrot (*Lathamus discolor*) is also listed as Critically Endangered under the EPBC Act and therefore, an assessment of significance has been conducted (**Appendix F**). This assessment resulted in a potential for a significant impact to the species as part of the Project.

The Project will require an offset consisting of up to **83** ecosystem (**Table E1**) and a total of **534** species credits for various species (**Table E2 & Table E3**).

Table E1 - Impacts that Require an Offset – Ecosystem Credits

Common name	Scientific name	BC Act status	EPBC Act status	Impact area (ha)	Current VIS	Future VIS	Change in VIS	Biodiversity risk weighting	Number of ecosystem credits required
PCT 3583	<i>Hunter Coast Lowland Scribbly Gum Forest</i>	-	-	2.93	63.6	0	-63.6	Ecosystem credit 1.75	83
Total									83

Table E2 - 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
Black-eyed Susan	<i>Tetradlea juncea</i>	V	V	2.93 ha	Species credit 2.00	96
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	2.93 ha	Species credit 2.00	96
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	2.93 ha	Species credit 2.00	96
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-	2.93 ha	Species credit 2.00	96
Total						384





Table E3 - Impacts that Require an Offset – Dual (species) Credit Species

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathamii lathamii</i>	V	V	2.93 ha	Dual credit species 2.00	96
Swift Parrot	<i>Lathamus discolor</i>	E	CE	1.14 ha	Dual credit species 3.00	54
Total						150





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1 Introduction

1.1 Overview

EcoResolve Environment & Design (EcoResolve) has been commissioned by Centennial Northern Coal Services Pty Limited (Centennial) to prepare a streamlined Biodiversity Development Assessment Report (S-BDAR) in accordance with the Biodiversity Assessment Method Order 2020 (State of NSW and Department of Planning, Industry and Environment, 2020) and the requirements of the NSW Biodiversity Conservation Act 2016 (BC Act). This report has been prepared to address Section 6.12 of the BC Act, which states that for the purposes of the biodiversity offsets scheme, a biodiversity development assessment report is a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that

- a) assesses in accordance with the BAM the biodiversity values of the land subject to the proposed development, activity or clearing,
- b) assesses in accordance with that method the impact of proposed development, activity or clearing on the biodiversity values of that land,
- c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing, and
- d) specifies in accordance with that method the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies.

Notwithstanding the limited extent of the subject land and the scale of proposed impacts, this assessment has been prepared within a streamlined small areas Biodiversity Development Assessment Report (S-BDAR) framework, reflecting the relatively small size of the impact area (2.93 ha). However, due to the proposed works forming part of a modification to an approved major project, the Biodiversity Assessment Method Credit Calculator (BAM-C) has been applied using the major project pathway in accordance with the Biodiversity Assessment Method requirements. Accordingly, this report adopts the format and streamlined structure of an S-BDAR.

1.2 Background

This S-BDAR has been prepared in association of the proposed modification Centennial is seeking for the Cooranbong Entry Site (CES) Stockpile Extension Modification (Northern Coal Services Project: SSD-5145 Modification 4), under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The BC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also apply.





Five modification applications have been made under the original SSD 5145 approval. Modifications 1, 3 and 5 have also been approved while Modification 2 was withdrawn and Modification 4, the subject of this BDAR, remains under assessment. Offset obligations were attached to the original SSD5145 proposal and Modification 5.

For the original proposal, Northern Coal Services was bound to implement the following compensatory measures to offset the potential ecological impacts of the Project:

- Prior to disturbance activities at the Newstan Colliery Surface Site, develop and implement a *T. juncea* translocation research program to build on the current knowledge regarding translocation of this species. The 376 clumps of *T. juncea* within the proposed disturbance area at Newstan Colliery Surface Site will be translocated and monitored in accordance with the proposed research program.
- Within 6 months following completion of vegetation clearing at the Newstan Colliery Surface Site and/or Hawkmount Quarry, nest boxes will be installed at a ratio of 1:1 (i.e. one nest box for every habitat hollow removed). The design and installation of nest boxes will draw on the information obtained from the five-year research program undertaken by Centennial Mandalong into the utilisation of different nest box designs and aspects.
- Within 12 months following development consent, fund the development and implementation of a research proposal to investigate genetic patterns among and within populations of *T. juncea* from a range of habitat types. The benefits of this research will assist in determining whether conservation and offsetting actions can protect the genetic diversity of *T. juncea*.

Modification 5 was approved with the following offsetting conditions:

- Prior to clearing any native vegetation, the Applicant must finalise a Biodiversity Offset Strategy, to compensate for the clearing of 2.13 ha of Coastal Foothills Spotted Gum – Ironbark Forest, 5.06 ha of Coastal Plains Smooth-barked Apple Woodland and 241 clumps of *Tetratheca juncea*. The Biodiversity Offset Strategy must:
 - (a) be finalised in consultation with BCD.
 - (b) include a suitable biodiversity offset area, and make arrangements to manage, protect and provide long-term security for the biodiversity offset area; and
 - (c) make other arrangements to offset vegetation clearing, such as research into genetic diversity of *Tetratheca juncea*, in consultation with BCD, to the satisfaction of the Secretary.

Approved plans for the fulfilment of these obligations are documented within the Northern Coal Services Biodiversity Management Plan (Centennial, 2025a) which includes a Biodiversity Offsets Strategy (Appendix J; Centennial, 2025b). A translocation plan for the 376 *T. juncea* plants will be developed prior to disturbance commencing. A nest box strategy will be developed and implemented when triggered by planning for the commencement of vegetation clearing. A *T. juncea* genetic study has been developed in conjunction with OEH (Appendix O, Centennial, 2025a). The approved offset strategy partly fulfils the conditions of Modification 5 approval. The proposed vegetation clearing has



not yet occurred and the investigation of potential offset sites and the further research into *Tetratheca juncea* genetics remains ongoing.

EcoResolve was engaged to produce the S-BDAR for Centennial for the proposed Cooranbong Stockpile Extension Project (the 'Project'). Initially, the disturbance area covered an area of >3 ha and therefore, candidate species surveys were undertaken to inform a BDAR. The *Biodiversity Conservation Regulation 2017* (BC Regulation) requires the application of the BAM. However, the disturbance area was subsequently reduced to approximately 2.93 ha. Clearing of ≤3 ha of native vegetation on land with a minimum lot size of 40 ha may be assessed using the small areas streamlined assessment module in **Appendix C** of the BAM (S-BDAR).

CES was originally developed as part of the Cooranbong Colliery in 1981. It comprises a coal handling plant (CHP), coal stockpiles, coal conveyors, mine entries for access to Mandalong Mine, workshop and administration buildings, car parking, water management structures and other associated infrastructure. Since 2015, CES has formed part of the coal handling and logistics activities authorised by SSD-5145 and is approved to operate 24 hours a day, seven days per week until the 31 December 2045.

1.3 Location

CES is located at the end of Gradwell's Road, Dora Creek NSW 2264. The Project area is west of the existing CES ROM coal stockpile (**Figure 1**).

1.4 The Project

Centennial are preparing an application under Section 4.55(2) of the EP&A Act (Northern Coal Services Project: SSD-5145 Modification 4) for:

- Development of the existing coal stockpile at CES to increase capacity from 100,000 tonnes to 400,000 tonnes; and
- Construction of infrastructure associated with the modified stockpile footprint. This will include access tracks, lighting towers, water sprays, fencing and water management infrastructure.

Project will require clearing of approximately 2.93 ha of native vegetation.

The Project assessed in this S-BDAR involved:

- Identifying the Disturbance Boundary of the proposed stockpile extension area (Modification Disturbance Boundary) (**Figure 1**).
- Surveying SAIL species and recording incidental observations of threatened species within the Modification Disturbance Boundary.

The Project footprint has been revised from its original size of 12.19 at the first revision phase, which included 9.45 ha of native vegetation.





The second revision saw another decrease in the footprint to 2.98 ha of native vegetation. With the exclusion of Lot DP755218, the final development footprint has been decreased further from 2.98ha to 2.93ha.

1.5 BAM Streamlined Assessment – Small Areas Module

The subject land lies within Lot 7306 DP1164232 on land zoned C2. The BAM 2020 **Appendix C** specifies clearing area limits based on the minimum lot size of the subject land, below which the small area module of the BAM may be applied. The minimum lot size of Lot 7306 is 40 ha. The applicable area limit for lots with minimum size less than 1000 ha but not less than 40 ha is ≤ 3 ha. The proposed Project footprint is 2.93 ha and therefore, the small areas module area was applied.

1.6 Biodiversity Offsets Scheme Entry

The Biodiversity Offset Scheme (BOS) applies to proposed developments that meet the following thresholds for significant impacts on biodiversity:

- Local development (assessed under Part 4 of the EPBC Act) that is likely to significantly affect threatened species. Local development is likely to significantly affect threatened species and require a S-BDAR (Section 7.7 of the BC Act) if impacts either:
 - exceed the Biodiversity Offsets Scheme threshold (BC Act, Section 7.4).
 - the threshold includes clearing on land within the Biodiversity Values Map or clearing of an area that exceeds the threshold; or
 - are carried out on an Area of Outstanding Biodiversity Value; or
 - are likely to significantly affect threatened species, ecological communities and their habitats according to the test in Section 7.3 of the BC Act.
- State significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning and Environment and the environment agency head determine that the Project is not likely to have a significant impact.

The Project requires clearing of approximately 2.93 ha of native vegetation and is a modification to an SSD (5145), triggering entry into the BOS.

1.7 Information Sources

The information sources consulted during this assessment include:

- BAM 2020.
- BAM Stage 1 and Stage 2 Operational Manuals.
- BioNet Threatened Biodiversity Data Collection (TBDC).
- BioNet Vegetation Identification System (VIS).





- Interim Biogeographic Regionalisation for Australia (IBRA) regional and subregional mapping.
- Mitchell Landscapes mapping and associated literature.
- Latest available high-resolution imagery.
- Available drainage and wetland mapping.
- Regional vegetation mapping from the NSW State Vegetation Type Map to identify Plant Community Types (PCTs) that may be occurring within the site.
- A review of existing vegetation mapping, habitat mapping and reports of relevance to the site and surrounding locality (e.g., 10km).
- Database searches to identify records of the threatened entities and Matters of National Environmental Significance (MNES) that may occur within 20 kilometres of the site, including:
 - NSW Government BioNET Atlas database.
 - Department of the Environment (DoE) Protected Matters Search Tool.
 - A Likelihood of Occurrence (LoO) analysis for all threatened species and communities identified through desktop research.

1.8 Other Documentation

The ecology in and around the CES surface facilities has previously been assessed by Hunter Eco in September 2010. The Hunter Eco assessment included vegetation community classification and mapping the spatial distribution of these communities. This report provided an endangered ecological communities assessment and identification of threatened species.

1.9 Matters of National Environmental Significance

Matters of national environmental significance (MNES) and their consideration are legislated under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). They include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed).
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).





- A water resource, in relation to coal seam gas development and large coal mining development.

No EPBC Act listed threatened ecological communities (TECs) were identified within the Modification Disturbance Boundary nor are any likely to be impacted by the Project.

A self-assessment process determined if any MNES likely or known to occur within the proposed action area was likely to be significantly impacted by the proposed action (refer to **Appendix F**). The assessment process considered both desktop and field survey results. Assessments of Significance (AoS) for MNES likely to be impacted were undertaken in accordance with the Significant Impact Guidelines 1.1 for MNES (DEWHA, 2013).

The proposed action is likely to have a significant impact upon two MNES species, *Grevillea parviflora* subsp. *parviflora* (Small Flowered Grevillea), and *Tetradlea juncea* (Black-eyed Susan), and may potentially impact a further nine MNES species, including four orchid species: *Corunastylis insignis* (syn. *Genoplesium insigne*) (Variable Midge Orchid), *Corunastylis* sp. Charmhaven (syn. *Genoplesium branwhiteorum*), *Rhizanthella slateri* (Eastern Underground Orchid), and *Thelymitra adorata* (Wyong Sun Orchid), and five fauna species: *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-Cockatoo), *Petaurus australis* (Yellow-bellied Glider), *Pteropus poliocephalus* (Grey-headed Flying Fox), *Lathamus discolor* (Swift Parrot), and *Phascolarctos cinereus* (Koala).

2 Landscape Context

The assessment area includes the Modification Disturbance Area and the area of land within a 1,500-metre buffer zone surrounding it (**Figure 2**). A summary of relevant landscape features identified within the Modification Disturbance Area and assessment area is detailed in **Table 1**.





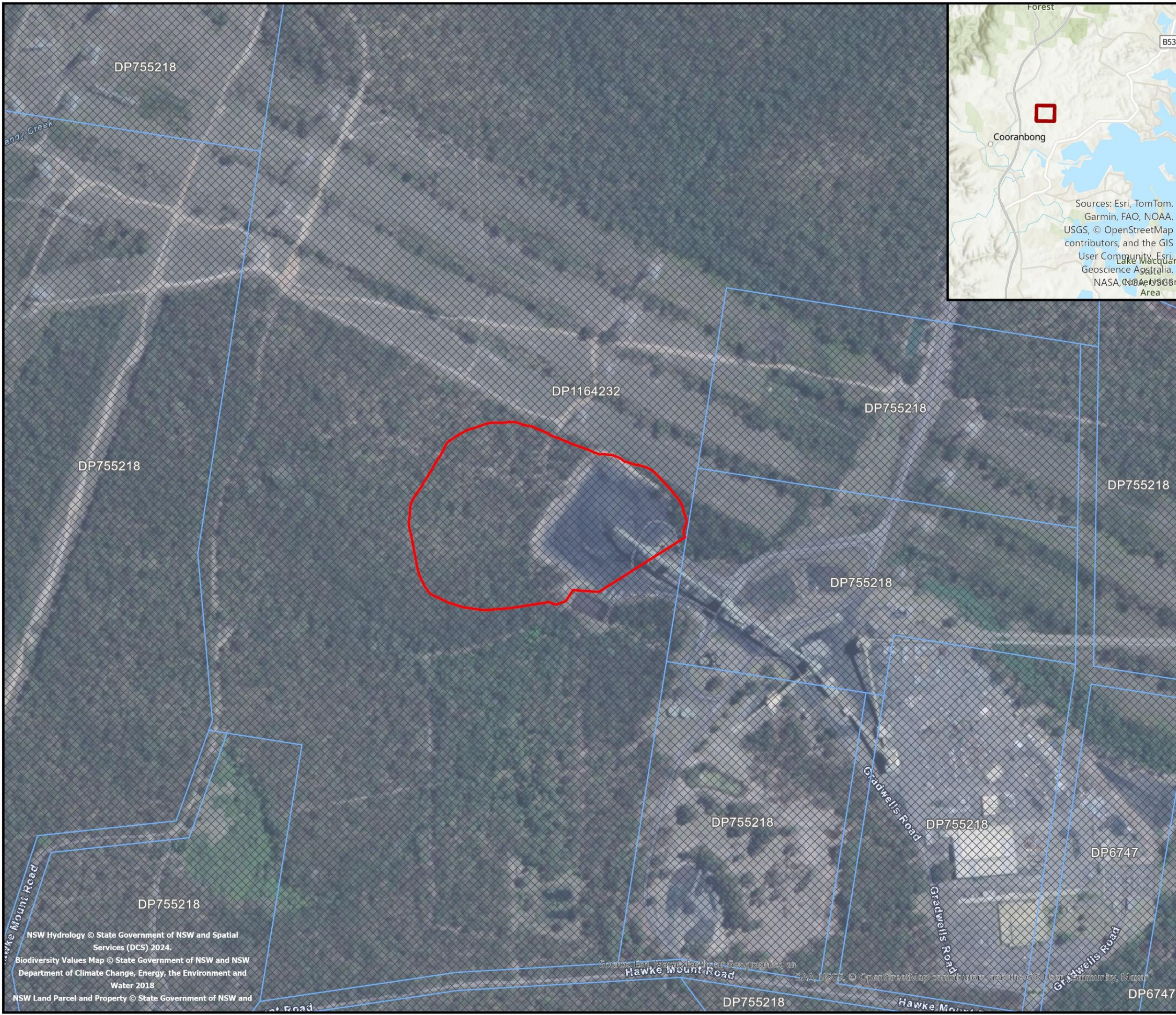
Table 1 - Landscape Assessment

Landscape	Modification Disturbance Area
IBRA7 region/subregion	Sydney Basin (SYB)/Wyong (SYB06)
Rivers, streams, estuaries and wetlands	None present within the subject land. There is an unnamed third order stream immediately to the south of the subject land boundary. It flows east. It has been modified and incorporated into the drainage system of the existing coal loader. There is a small dam just south of the subject land. The stream continues east of the coal loader within a modified rock-lined drainage channel before flowing into a damp area within the high voltage easement. Hydroline data suggest the subject land lies within a very small catchment isolated from surrounding watercourses. There are multiple creeks which flow through the subject land and broad assessment area, but these are all non-perennial and unnamed.
Habitat connectivity	Yes – the site is surrounded by bushland which connects to the Watagan's National Park. The major barriers to wildlife movement are likely to be fences and roads.
Karst, caves, crevices, cliffs, rocks, or other geological features of significance	None present
Conservation Area/National Park	Sugarloaf State Conservation Area is located ~ 7km to the north of the Subject land, while Watagans National Park is located ~7 km west-northwest of the Subject land. Olney State Forest and Jilby State Conservation Area are located ~13 km and ~11 km to the west and southwest of the subject land, respectively.
Areas of Outstanding Biodiversity Value (AOBV)	No area within the assessment area is mapped as an AOBV (BC Act, 2016). However, 347.5 ha of the assessment area is mapped as part of the biodiversity values map – 'habitat for threatened species with potential for SAIL' (SEED, 2023). 1.9 ha of this is within the subject land itself.
Mitchell Landscape (v3.1)	The Subject land and most of the broader assessment area are situated within Gosford - Cooranbong Coastal Slopes. A small section of the assessment area is within Sydney – Newcastle Coastal Alluvial Plains (~ 29.3 ha)
Native vegetation cover within the assessment area	The assessment area is ~ 867 ha in size, ~ 711 ha of which has native vegetation cover. Thus, the assessment area has ~82% native vegetation cover (>70% class).



Cooranbong Entry Site Stockpile Extension Project

Figure 1 Site Location



LEGEND

-  Subject Land Boundary
-  Cadastral Lot Boundaries

IBRA Region

- 
- Sydney Basin

IBRA Subregion

- ☐ Wyong



Scale:	1:3,900
Datum:	GDA 2020
Version:	D - A3
Date:	24/01/2025
Author:	AD
Reference:	ER092

EcoResolve



Environment & Design

**Streamlined Biodiversity
Development
Assessment Report
Cooranbong Entry Site
Stockpile Extension Project**

**Figure 2. Landscape
Assessment**

LEGEND

-  Subject Land Boundary
-  1500 m buffer

IBRA Region

-  Sydney Basin (SYB)

IBRA Subregion

-  Wyong

Hydrolines

-  Creeks and Streams

Mitchell Landscapes

-  Gosford - Cooranbong Coastal Slopes
-  Sydney - Newcastle Coastal Alluvial Plains

Biodiversity Values

-  Threatened species or communities with potential for serious and irreversible impacts

EcoResolve Vegetation Mapping

-  Native
-  Non-Native

SVTM Vegetation Mapping

-  Native
-  Non-Native

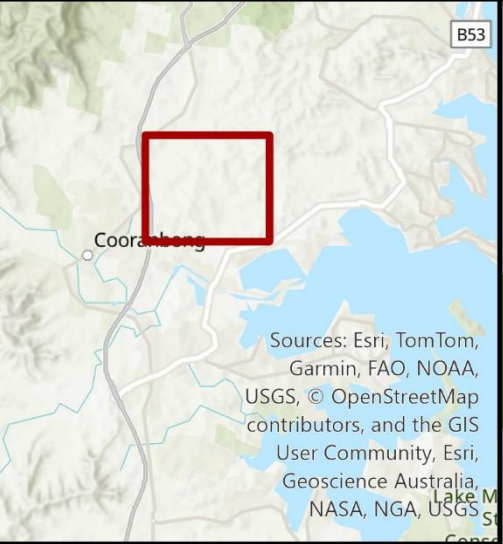
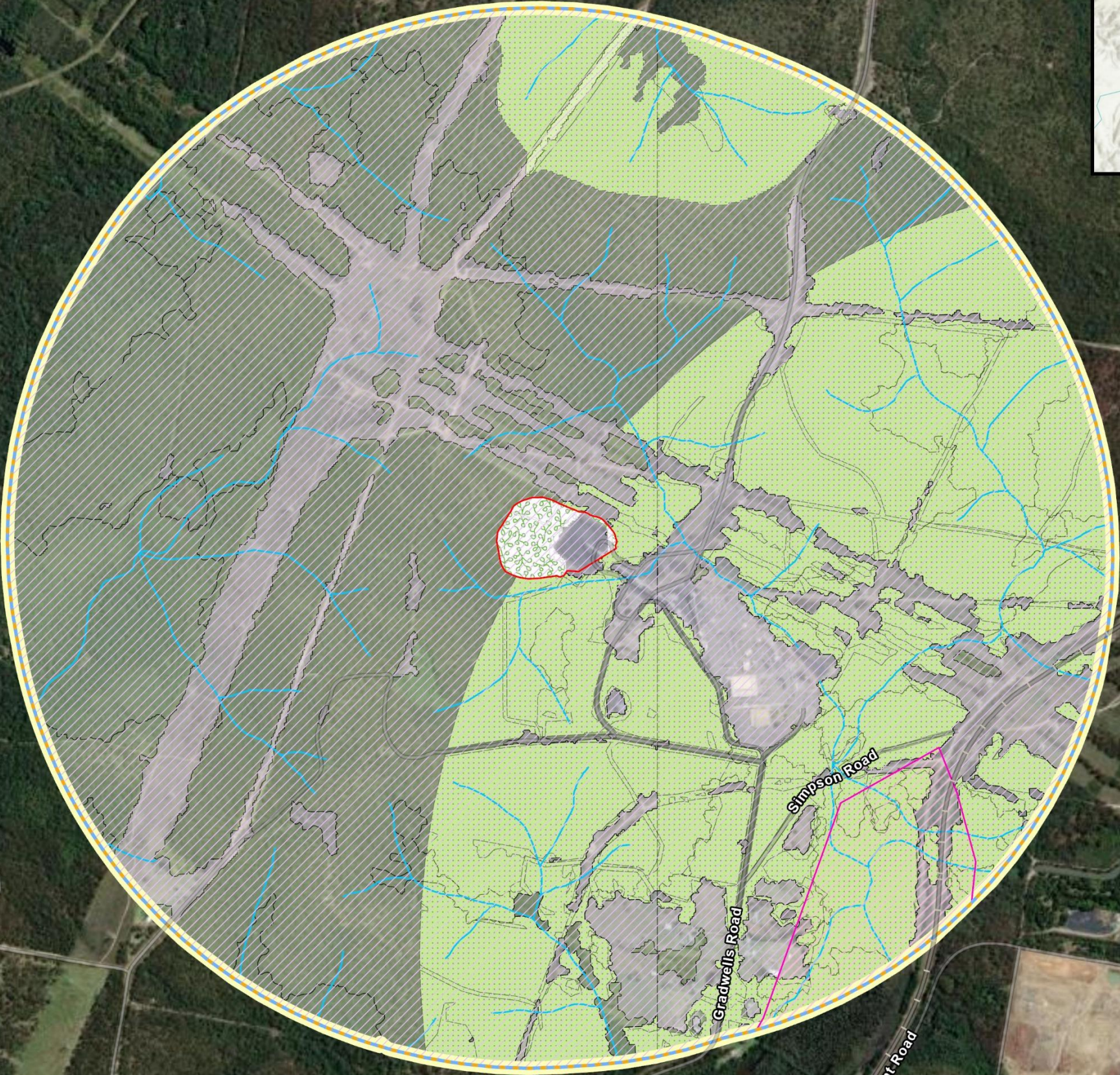


Scale:	1:14,900
Datum:	GDA 2020
Version:	C - A3
Date:	01/04/2026
Author:	AD
Reference:	ER092

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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, Geoscience Australia, NASA, NGA, USGS

3 Native vegetation

This section addresses the requirements set out in Sections 4.1 – 4.4 of the BAM in assessing native vegetation, threatened ecological communities and vegetation integrity (Chapter 4, DPIE, 2020). The identification and mapping of all PCTs and Threatened Ecological Communities (TECs) on the site have been categorised according to the NSW PCT classification as described in the BioNet Vegetation Information System (VIS).

3.1 Plot-Based Vegetation Survey

Vegetation surveys which included BAM plots were completed on 22/06/2023 and 8/08/2024. These surveys were completed in accordance with BAM. Further details are outlined below, and these surveys were used to inform preparation of a vegetation map of the Modification Disturbance Area (Figure 3).

Flora surveys included (Figure 4 – Figure 7):

- Delineation of the type and extent of native PCTs vegetation cover (including any EECs) and threatened species habitat.
- Collection of BAM plots.
- Targeted searches for candidate flora species identified during desktop research.
- Evaluation of the presence of EECs and, where present, mapping the EECs.
- Compilation of a flora species list identifying native and exotic plant species, including priority weeds listed under the NSW *Biosecurity Act 2015* within the Local Government Area (LGA).
- Habitat assessments including high concentrations hollow-bearing trees (HBT).
- Weed density and distribution mapping.

Three (3) vegetation integrity (VI) plots were undertaken in accordance with BAM to measure the VI (i.e., composition, structure and functional components) of the sites' native vegetation cover. BAM plots were placed in locations that were representative of the vegetation zones being assessed. That is, BAM plots were placed beyond the prescribed minimum distance from ecotones, tracks and other areas of disturbance.

Each plot included:

- One standard 20 x 20 m plot, to assess the vegetation composition and structure attributes, including trees, shrubs, grasses, forbs, ferns and other growth forms.
- One standard 20 x 50 m plot (1,000 m²) to assess the function attributes: number of large trees (i.e., > 50 cm DBH), stem size class, tree regeneration, length of fallen logs, high threat exotic vegetation cover and hollow-bearing trees.
- Five 1 m² sub-plots to assess average litter cover for the plots.

The vegetation community identified on site occurred in high condition, and vegetation zones were assigned accordingly. See **Appendix C** for vegetation survey data.



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community. Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

EcoResolve



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5/14 Honeysuckle Drive Newcastle NSW 2300

Author: AD | Version: A-A3 | Date: 31/03/2026

Figure 3. Vegetation Mapping

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

 BAM plots

Plant Community Type (PCT)

 3583

PCT Condition Class

 High

0 0.05 Kilometers



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100

3.2 Identification of Plant Community Types and Threatened Ecological Communities

The vegetation community present and considered to be the best fit for the vegetation on site was identified as PCT 3583, *Hunter Coast Lowland Scribbly Gum Forest* (**Figure 3**). This PCT is not considered to form part of any BC Act or EPBC Act listed EECs. **Appendix C** includes a list of the plant species which were identified during the site visits.

Table 2 - PCT Identification

Identification	Project site
PCT ID	3583
PCT name	Hunter Coast Lowland Scribbly Gum Forest
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Per cent cleared value (%)	100%
Extent within the Modification Disturbance Area (ha)	~2.93 ha (of native vegetation associated with PCT 3583)
Condition	High
Key diagnostic species	<i>Epacris pulchella</i> , <i>Ptilothrix deusta</i> , <i>Petrophile pulchella</i> , <i>Lomandra obliqua</i> , <i>Themeda australis</i> , <i>Lepyrodia scariosa</i> , <i>Aristida warburgii</i>
Description	Eucalypt dominated dry sclerophyll forest with a shrubby mid-stratum and a graminoid ground cover. The community occurs on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. The substrate is sandstone with moist sandy soils. Elevation is usually under 100m
Vegetation zones	3583_high

3.2.1 PCT Identification Justification

The SVTM maps the subject land as PCT 3583 *Hunter Coast Lowland Scribbly Gum Forest*. PCT 3583 is related to PCTs 3582 *Hunter Coast Lowland Apple-Bloodwood Forest* and 3581 *Hunter Coast Foothills Apple Forest* with which it intergrades depending on soil fertility and elevation. All three occur on the Central Coast and have the potential to occur within the subject land.

Both PCTs 3581 and 3582 have been sampled with *Angophora costata* present within almost all plots as the most frequently recorded canopy tree species, however this species only has a relative abundance of 41 within PCT 3583 plots (DCCEEW, 2026). *A. costata* was not recorded within BAM plot data collected within the subject land. *E. haemastoma* was most common within the subject land and *Corymbia gummifera* was next most abundant. These two species are the two most relatively abundant trees recorded in PCT 3583 plots, however, *E. haemastoma* has been far less frequently recorded in PCT 3581 and 3582 plots (relative abundance of 7 and 16, respectively). The abundance of canopy tree species recorded within the subject land supports alignment with PCT 3583 most strongly.

Shrub abundance within the subject land also supports alignment with PCT 3583. The shrubs *Epacris pulchella*, *Lambertia formosa*, *Hakea dactyloides* and *Banksia spinulosa* were found in all three plots within the subject land. These species are the second, third, eighth and 13th most abundant shrubs



recorded within PCT 3583 plots. *B. spinulosa* only has a relative abundance of 24 within PCT 3581 plots and the others are even less frequently recorded. *B. spinulosa* is the most frequently recorded shrub in PCT3582 plots, with *E. pulchella* the sixth, but *L. formosa* is 13th and *H. dactyloides* is 37th. The four species are more likely to be recorded together in PCT 3583 plots, supporting alignment with that PCT.

3.2.2 Threatened Ecological Communities

No TECs are associated with PCT 3583. The related PCTs 3581 and 3582 may form part of *Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion* (CE, BC Act) but only with Gosford LGA. Therefore, no TECs occur within the subject land.

3.2.3 Patch Size

Patch size was calculated according to Section 4.3.2 of the BAM 2020. Adjacent areas of planted native canopy trees were included if there were no roads separating them from the native vegetation on the Modification Disturbance Area. The patch size was in excess of 200 ha, placing it into the >100 ha class.

3.2.4 Calculation of Current Vegetation Integrity

PCT 3583 occurs on the Modification Disturbance Area in high condition, which is distinguished by the density of canopy species and woody vegetation. High condition areas have a relatively intact canopy layer that generally reflects the expected structure of vegetation from this formation. All native vegetation within the Modification Disturbance Area forms part of a contiguous tract extending throughout the surrounding landscape and the >100 ha patch size class was assigned to both vegetation zones.

Section 9.2.1 of the BAM establishes VI thresholds above which an offset for direct impacts to native vegetation are required (**Table 4**). The VI of the native vegetation is 64.9, therefore, an ecosystem credit offset is required.



Table 3 – Change in Vegetation Integrity Score

Vegetation zone	PCT ID	Management zone	Area (ha)	Before development				After development			Change	
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
3583_High	3583	1	2.93 ha	38.6	72.1	98.1	64.9	0	0	0	0	-64.9

Table 4 - Thresholds for Offsetting Direct Impacts to Native Vegetation (Section 9.2.1, BAM 2020).

Vegetation characteristics	VI threshold for offsetting
Where the PCT is representative of an EEC or a CEEC	≥15
Where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community	≥17
Where the PCT does not represent a TEC and is not associated with threatened species habitat.	≥20



4 Threatened Species

The streamlined assessment module for small areas allows assessors to forego assessment of non-SAI threatened species if they have not been detected incidentally within the Modification Disturbance Area. Only SAI species which may occur on the Modification Disturbance Area are required to be assessed using Steps 3–5 of Section 5.2 of the BAM. The full list of species generated by the BAM-C is presented in **Table 5**.

Four fauna species at risk of SAI were identified as having moderate to high likelihoods of occurring within the Modification Disturbance Area:

- *Anthochaera phrygia* (Regent Honeyeater),
- *Lathamus discolor* (Swift Parrot),
- *Miniopterus australis* (Little Bent-winged Bat) and
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat).

The Project site is not within an area mapped as important habitat for the *Anthochaera phrygia* (Regent Honeyeater), therefore it was not considered further. However, the Project site is within an area mapped as important habitat for the *Lathamus discolor* (Swift Parrot).

Furthermore, the two Bent-winged Bat species are dual credit species and require consideration of breeding habitat constraints as part of the surveys.

4.1 Review of Existing Information

Hunter Eco reported on the ecology in and around the CES surface facilities in 2010. Through their surveys, two threatened flora species were recorded: *Tetratheca juncea* (Black-eyed Susan) and *Grevillea parviflora subsp. parviflora* (Small-flower Grevillea). At the time, these species were listed as Vulnerable at the NSW State and Australian Commonwealth level. Their status remains the same for both the BC and EPBC Act.

EcoResolve used a Likelihood of Occurrence (LoO) analysis to compile a list of species with some likelihood of occurring on the Modification Disturbance Area and determine those with potential to be impacted by the Project. The LoO generates a list of potentially occurring species by cross-referencing the list of predicted and potential candidate species generated by the BAM-C, BioNet atlas records within 10 km of the Modification Disturbance Area and the results of a PMST search. Following site surveys, the LoO incorporates information about the suitability of habitat and the level of survey effort to produce a list of species which require further consideration. This process supports the BAM assessment.

The desktop assessment resulted in 90 threatened fauna and 34 threatened flora species being identified as having at least some LoO. The LoO assessment, which is presented in **Appendix B**, assessed the likelihood of occurrence of those 124 threatened species and of those, 65 were considered to have a moderate, high or known LoO.





Table 5 - Habitat Suitability Assessment for Predicted and Candidate Species

Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
PREDICTED SPECIES								
Fauna								
Black Bittern	<i>Ixobrychus flavicollis</i>	V	-	No	BioNet	NO	Habitat constraints not present (Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation)	NA
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	-	No	BioNet	YES	-	3583_high
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E	-	No	BioNet	NO	Habitat constraints not present (Swamps; Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps; Waterbodies; Shallow lakes, lake margins and estuaries within 300m of these waterbodies)	NA
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	V	No	BioNet	YES	-	3583_high
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	V	-	No	BioNet	YES	-	3583_high
Eastern Coastal Free-tailed Bat	<i>Micronomus norfolkensis</i>	V	-	No	BioNet	YES	-	3583_high
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V	-	No	BioNet	YES	-	3583_high
Eastern Osprey	<i>Pandion cristatus</i>	V	-	Yes	BioNet	YES	-	3583_high
Flame Robin	<i>Petroica phoenicea</i>	V	-	No	BioNet	YES	-	3583_high
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	E	Yes	BioNet	YES	-	3583_high





Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	V	Yes	BioNet	YES	-	3583_high
Golden-tipped Bat	<i>Phoniscus papuensis</i>	V	-	No	BioNet	YES	-	3583_high
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	-	No	BioNet	YES	-	3583_high
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	Yes	BioNet	YES	-	3583_high
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V	-	Yes	BioNet	YES	-	3583_high
Little Bent-winged Bat	<i>Miniopterus australis</i>	V	-	Yes	BioNet	YES	-	3583_high
Little Eagle	<i>Hieraetus morphnoides</i>	V	-	Yes	BioNet	YES	-	3583_high
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-	No	BioNet	YES	-	3583_high
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	-	V	No	BioNet	YES	-	3583_high
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	Yes	BioNet	YES	-	3583_high
Rose-crowned Fruit Dove	<i>Ptilinopus regina</i>	V	-	No	BioNet	YES	-	3583_high
Scarlet Robin	<i>Petroica boodang</i>	V	-	No	BioNet	YES	-	3583_high
Speckled Warbler	<i>Chthonicola sagittata</i>	V	-	No	BioNet	YES	-	3583_high
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	No	BioNet	YES	-	3583_high
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	Yes	BioNet	YES	-	3583_high
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Yes	BioNet	YES	-	3583_high
Turquoise Parrot	<i>Neophema pulchella</i>	V	-	No	BioNet	YES	-	3583_high





Common name	Scientific name	BC Act Listing Status	EPBC Act Listing Status	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-	No	BioNet	YES	-	3583_high
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	-	Yes	BioNet	NO	Habitat constraints not present (Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines)	NA
White-throated Needletail	<i>Hirundus caudacutus</i>	V	V	No	BioNet	YES	-	3583_high
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-	No	BioNet	YES	-	3583_high
CANDIDATE SPECIES								
Fauna								
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E	V	No	BioNet	NO	Habitat constraints not present (Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines)	NA
Bush Stone-curlew	<i>Burhinus grallarius</i>	E	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Cotton Pygmy-Goose	<i>Nettapus coromandelianus</i>	E	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present (Deep permanent fresh waters on floodplains with floating and submergent vegetation.)	NA





Common name	Scientific name	BC Act Listing Status	EPBC Act Listing Status	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
Eastern Osprey	<i>Pandion cristatus</i>	V	-	Yes	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present (Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)	NA
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	E	Yes	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	V	Yes	BioNet	YES	-	3583_high
Grey-headed Flying fox	<i>Pteropus poliocephalus</i>	V	V	Yes	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V	-	Yes	BioNet	YES	-	3583_high
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	E	E	Yes	BioNet	YES	-	3583_high
Little Bent-winged Bat	<i>Miniopterus australis</i>	V	-	Yes	BioNet	YES	-	3583_high





Common name	Scientific name	BC Act Listing Status	EPBC Act Listing Status	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-	Yes	BioNet	NO	Habitat constraints not present (Nest trees - live (occasionally dead) large old trees within vegetation.)	NA
Northern Long-nosed Potoroo	<i>Potorous tridactylus tridactylus</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present (Dense shrub layer or alternatively high canopy cover exceeding 70% (i.e. to capture populations inhabiting wet sclerophyll and rainforest))	NA
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	Yes	BioNet	NO	Subject land not within mapped Important Habitat	NA
Southern Myotis	<i>Myotis macropus</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present. Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site.	NA
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	Yes	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present (Nest trees)	NA





Common name	Scientific name	BC Act Listing Status	EPBC Act Listing Status	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	V	-	Yes	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. Habitat constraints not present (Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines)	NA
Wallum Froglet	<i>Crinia tinnula</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	V	E	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Stephens' Banded Snake	<i>Hoplocephalus stephensii</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Yes	BioNet	YES	-	3583_high
Green and Golden Bell Frog	<i>Litoria aurea</i>	E	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Hunter Valley Delma	<i>Delma vescolineata</i>	E	E	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally	NA





Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
							recorded within the Subject Land during field surveys.	
Stuttering Frog	<i>Mixophyes balbus</i>	E	V	No	BioNet	YES	-	3583_high
Giant Barred Frog	<i>Mixophyes iteratus</i>	E	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Barking Owl	<i>Ninox connivens</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Powerful Owl	<i>Ninox strenua</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-	No	BioNet	YES	-	3583_high
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Koala	<i>Phascolarctos cinereus</i>	E	E	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Common Planigale	<i>Planigale maculata</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally	NA





Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
							recorded within the Subject Land during field surveys.	
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	No	BioNet	YES	-	3583_high
Mahony's Toadlet	<i>Uperoleia mahonyi</i>	E	E	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAIL) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	-	No	BioNet	YES	-	3583_high
Flora								
Bynoe's Wattle	<i>Acacia bynoeana</i>	E	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAIL) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Charmhaven Apple	<i>Angophora inopina</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAIL) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Charmhaven Midge Orchid (previously listed as Corunastylis sp. Charmhaven)	<i>Genoplesium branwhiteorum</i> (previously listed as <i>Corunastylis</i> sp. Charmhaven)	CE	CE	No	BioNet	YES	-	3583_high
Netted Bottle Brush	<i>Callistemon linearifolius</i>	V	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAIL) entity and was not incidentally recorded within the Subject Land during field surveys.	NA





Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
Rough Doubletail	<i>Diuris praecox</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Leafless Tongue Orchid	<i>Cryptostylis hunteriana</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Camfield's Stringybark	<i>Eucalyptus camfieldii</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Eucalyptus parramattensis subsp. parramattensis	<i>Eucalyptus parramattensis subsp. parramattensis</i>	EP	-	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys.	NA
Variable Midge Orchid	<i>Genoplesium insigne</i>	CE	CE	No	BioNet	YES	-	3583_high
Small-flower Grevillea	<i>Grevillea parviflora subsp. parviflora</i>	V	V	No	BioNet	YES	-	3583_high
Eastern Australian Underground Orchid	<i>Rhizanthella slateri</i>	V	E	No	BioNet	YES	-	3583_high
Heath Wrinklewort	<i>Rutidosia heterogama</i>	V	V	No	BioNet	NO	The species is not listed as a Serious and Irreversible Impact (SAII) entity and was not incidentally recorded within the Subject Land during field surveys. However further surveys were conducted	NA





Common name	Scientific name	BC Act Listin g Statu s	EPBC Act Listin g Statu s	Dual credit species	Source	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
							and demonstrated that these species are unlikely to occur	
Black-eyed Susan	<i>Tetradlea juncea</i>	V	V	No	BioNet	YES	-	3583_high
Wyong Sun Orchid	<i>Thelymitra adorata</i>	CE	CE	No	BioNet	YES	-	3583_high



4.2 Expert Report

Three cryptic orchid species were identified as likely to occur within the subject land by the BAM-C, however, survey results were insufficient to confidently rule out their presence. They included:

- *Corunastylis* sp. *Charmhaven* (Syn. *Genoplesium* *branwhiteorum*)
- *Thelymitra* *adorata* (Wyong Sun Orchid)
- *Genoplesium* *insigne* (Variable Midge Orchid)

As per BioNet Atlas survey guidelines for the above three threatened orchid species, if reference populations are not checked prior to field survey, an expert report is required to rule out/in species presence within the subject land based on the presence of suitable habitat. BAM approved 'Species Expert' Brian Towle, from BJT Ecology, was commissioned by EcoResolve to prepare a report to determine whether these three orchid species are likely to occur within the subject land (Towle, 2026).

4.2.1 Expert Report Methods

In preparing the Expert Report, BJT Ecology conducted both a Desktop Assessment and Field Inspection of the subject land.

The Desktop Assessment involved review of existing information on the ecology and habitats of the three threatened orchids, including:

- Review of database records for the subject species from the NSW Department of Climate Change, Energy, the Environment and Water's (NSW DCCEEW) BioNet Atlas (NSW DCCEEW 2025), which holds data from multiple custodians. Data obtained 23 October 2025.
- Information on the species included within the BioNet Threatened Biodiversity Database Collection ('TBDC'; NSW DCCEEW 2026).
- Vegetation classification information as included within the BioNet Vegetation Classification (NSW DCCEEW 2026b).
- Existing vegetation mapping across the range of the subject species including Benson (1986), Bell (2019), Bell and Driscoll (2019) and the State Vegetation Type Map ('SVTM'; NSW DCCEEW 2025b).
- Vegetation mapping and survey results associated with the BDAR for the subject land (EcoResolve, 2025)
- Expert's own knowledge of the results of previous targeted surveys in proximity to the subject land

BJT Ecology conducted the Field Inspection on 23 February 2026, during the flowering time of one of the three orchids (*Corunastylis* sp. *Charmhaven*). The habitat present within the subject land was surveyed, with vegetation condition, dominant species, and overall habitat structure and floristics noted and recorded.

4.2.2 Export Report Findings

The Expert report firstly describes the ecology, life cycle and habitat requirements of the three threatened orchid species and then provides a description of the subject land. Finally, it makes an



assessment of the likelihood of the orchids' presence within the subject land, based on data collected during the Desktop Assessment and Field Inspection. The report found that:

- There is a **low likelihood** that the subject land currently represents habitat for *Corunstylis sp. Charmhaven* and that it is **unlikely** that the species is present within the Subject land
- There is a **low likelihood** that the Subject land currently represent habitat for *Genoplesium insigne* and that it is **unlikely** that the species is present within the Subject land
- There is a **low likelihood** that the Subject land currently represent habitat for *Thelymitra odorata* and that it is **unlikely** that the species is present within the Subject land

The Expert Report can be found in **Appendix H** of this BDAR.

4.3 Weather Conditions

Weather conditions are known to significantly affect the likelihood of detection of some threatened species. Fauna surveys were conducted at times when weather conditions were neutral, if not optimal for the detection of weather-sensitive species, and in accordance with relevant guidelines and recommendations. Data was obtained from the Bureau of Meteorology (BoM) website (station 061412). **Appendix D** details the timing and environmental conditions of flora and fauna surveys.

4.4 Field Surveys

A diverse range of threatened species were considered to have at least some likelihood of occurring within the Modification Disturbance Area (see **Appendix B**), and a variety of survey methods were used to investigate their presence. Flora and fauna surveys across the subject land were conducted with reference to current guidelines and accepted practices during October 2022 to January 2026. While **Table 5** identifies a number of species removed from further assessment on the basis of their SAI listings, additional survey effort relevant to some of these species was nevertheless undertaken during the evolution of the project scope and associated refinement of the disturbance footprint. These survey techniques are outlined below as well as shown in **Figure 7** to demonstrate the survey methods employed and their relevance to the broader assessment process.

4.4.1 Flora Surveys

Field surveys for candidate threatened flora species were conducted using a 5 m parallel transect survey as recommended in Surveying threatened plants and their habitats (DPIE, 2020). This is the finest grained approach used for plants of the smallest growth forms within dense vegetation.

Surveys targeted candidate species identified through the BAM-C and those flagged in the likelihood of occurrence assessment as having a moderate or higher LoO. Methods included systematic visual searches, assessment of habitat characteristics, and floristic documentation. Survey locations are shown in **Figure 4** to **Figure 6** (Threatened Flora Surveys), with dates, targeted species, methods, and results summarised in **Table 6**.

All floristics data was collected under the guidance and supervision of accredited BAM assessors (Arne Bishop [BAAS 17065], Patrick McEvoy [BAAS 20018], Brea Heidke [BAAS 24085] and Julian Carson

[BAAS 25044]). All survey data and associated files are held by EcoResolve and have been provided in the data package to CPHR.

4.4.2 Diurnal Birds

Bird surveys were conducted using a rapid point count (5-minute listening period) followed by a 500m wandering transect within the Modification Disturbance Area. These surveys were performed during February 2023. All bird species detected (by sight or sound) during the surveys were recorded, and any opportunistic avian sightings encountered during other survey activities or while traversing the site were also documented. Searches for large stick nests (used by raptor species such as the White-bellied Sea Eagle, Square-tailed Kite and Little Eagle) were undertaken throughout the investigation area as part of vegetation surveys, habitat assessments, and other fauna surveys.

4.4.3 Nocturnal Bird Surveys

Call playback surveys targeting the Masked Owl (*Tyto novaehollandiae*) were undertaken across areas of suitable habitat during May 2023 and July 2024 (see **Table 6**). Survey sites were selected based on habitat features aligned with BioNet Atlas Survey Comments for the species, including the presence of mature hollow-bearing trees for the owl. Sites were situated along forest edges, riparian corridors, and lightly timbered areas considered to have high habitat suitability.

Each survey session commenced at least 30 minutes after sunset and followed a standardised protocol comprising a 5-minute passive listening period, followed by 3–5 minutes of species-specific call playback, and a subsequent 10-minute listening period. Call sequences were tailored to the target species and broadcast at a volume replicating natural territorial or contact calls. Spotlighting was employed during and after playback for approximately 30 mins to enhance visual detection, particularly for the owls. To improve detection probability, each site was surveyed under calm, dry conditions.

4.4.4 Nocturnal Mammals

Targeted surveys were undertaken at locations identified as supporting potential habitat for nocturnal mammal species during May 2023. Site selection was informed by stratification based on vegetation structure, area, and the distribution of associated Plant Community Types (PCTs), ensuring representative coverage of habitat variability across the subject land.

A standardised array of detection methods were deployed across the site for a minimum duration of three consecutive nights. The survey effort at each location included:

- Two motion-triggered remote cameras installed at arboreal height
- Two motion-triggered remote cameras positioned at ground level
- Spotlighting.

Baiting protocols were designed to maximise the likelihood of detection of nocturnal mammal species with differing dietary preferences. The primary bait consisted of a mixture of honey, oats, and peanut butter, with a diluted honey solution applied to the bait and tree trunks to enhance scent dispersal and attract fauna. Several ground-based cameras were additionally baited with sardines to target omnivorous or carnivorous species. Baits were secured within 15 cm tea strainers or custom ventilated capped plastic tubes, which also served as a consistent size reference in captured imagery to assist



with species identification. This was particularly important for differentiating between morphologically similar species with overlapping distributions. All imagery obtained from camera traps was reviewed and interpreted by experienced ecologists from EcoResolve.

4.4.5 Frog Surveys

Targeted surveys were undertaken at locations identified as supporting potential habitat for the Stuttering Frog (*Mixophyes balbus*) in November/December 2022 and January 2026 (see **Table 6**). Each survey session commenced around sunset and followed a standardised protocol comprising a 5-minute passive listening period, followed by 3–5 minutes of species-specific call playback, and a subsequent 10-minute listening period. Call sequences were tailored to the target species and broadcast at a volume replicating natural territorial or contact calls. Spotlighting was employed during and after playback for approximately 30 mins to enhance visual detection. To improve detection probability, each site was surveyed under calm, dry conditions.

4.4.6 Anabat Detector

An automated ultrasonic bat detector (Anabat Swift unit) was deployed to target the Large-eared Pied Bat (*Chalinolobus dwyeri*), the Little Bent-winged Bat (*Miniopterus australis*), the Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), the Large Bent-winged Bat (*Miniopterus orianae oceanensis*), the Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*) and the Eastern Cave Bat (*Vespadelus troughtoni*) during February and December 2023 (see **Table 6**). Site selection was informed by the presence of suitable roosting and foraging habitat, including escarpments, cliff lines, exposed rock outcrops, and adjacent woodland or forested areas, consistent with habitat preferences outlined in the BioNet Atlas Survey Comments and species profile. The detector was mounted on a tree at a height between 1.5 and 2.5 metres above ground level to optimise acoustic coverage and reduce ground clutter. The unit was programmed to record from dusk to dawn for a minimum of four consecutive nights. Microphone calibration was verified prior to deployment to ensure data quality and acoustic data were later analysed using specialised bat call identification software. Deployment conditions (e.g. weather, temperature, moon phase) were recorded to assist with interpreting bat activity levels.

Appendix D.

4.4.7 Hollow-bearing Tree Habitat Mapping & Stag Watches

Surveys for hollow-bearing trees (HBTs) were conducted using a series of 20-metre transects spaced to maximise coverage in areas of dense vegetation. This approach followed recommendations in the *NSW Survey Guide for the Biodiversity Assessment Method – Surveying Threatened Plants and their Habitats* (DPIE), which outlines appropriate traverse spacing based on vegetation structure and life form.

Trees were recorded as hollow bearing where visible features met the criteria outlined in the BAM 2020—specifically, hollows of a suitable size and shape to be used by fauna, located within the trunk or branches and typically above 1 metre from ground level. Due to the limitations of ground-based survey such as limited visibility and safety or access constraints, features such as basal hollows or those not clearly visible during assessment were excluded.

Stag watches were completed at six sites within the Project boundary to determine if suitable sized hollows were being utilised by a range of hollow dependent species (see **Figure 8**).





4.4.8 Opportunistic Surveys

Opportunistic surveys were conducted throughout the duration of fieldwork to supplement targeted survey efforts and improve the likelihood of detecting threatened fauna species. These surveys involved incidental observations made during diurnal and nocturnal field activities, including vegetation mapping, plot surveys, habitat assessments, and species-specific trapping. All fauna species observed visually, aurally, or through secondary evidence (e.g. tracks, scats, nests, or scratches) were recorded along with associated habitat information and geographic coordinates. Spotlighting was also undertaken opportunistically during travel between sites and in areas with suitable habitat features, particularly along access tracks and forest edges. Observations were made using head torches and handheld spotlights. Opportunistic detections were assessed against habitat suitability criteria to inform the presence of threatened species and potential requirements for further targeted survey effort.



Table 6 – Candidate Threatened Species Surveys on the Modification Disturbance Area

Common name	Scientific name	BC Act	EPBC Act	Threatened species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
				Survey method	Timing of survey –within recommended period?	Effort (hours and no. people)		
Flora								
Variable Midge Orchid	<i>Corunastylis insignis</i> Syn. <i>Genoplesium insigne</i>	CE	CE	5m flora transects; Expert Report	Transects -11/10/2022-12/10/2022 -within recommended survey period Expert Report (Field Inspection) – 23/02/2026	~160 person hours 4 people	NO	NO
Charmhaven Midge Orchid	<i>Corunastylis</i> sp. <i>Charmhaven</i> Syn. <i>Genoplesium branwhiteorum</i>	CE	CE	5m flora transects; Expert Report	Transects - 13/02/2023-14/02/2023 and 13/03/2026 - within recommended survey period Expert Report (Field Inspection) – 23/02/2026	~32 person hours 2 people	NO	NO
Small-flowered Grevillea ¹	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	5m flora transects	11/10/2022-12/10/2022 -within recommended survey period	~60 person hours 4 people	YES	YES
Eastern underground orchid	<i>Rhizanthella slateri</i>	V	E	5m Flora Transects	11/10/2022-12/10/2022 -within recommended survey period	~60 person hours 4 people	NO	NO
Black-eyed Susan ²	<i>Tetratheca juncea</i>	V	V	5m Flora Transects	11/10/2022-12/10/2022 -within recommended survey period	~60 person hours 4 people	YES	YES
Wyong Sun Orchid	<i>Thelymitra adorata</i>	CE	CE	5m Flora Transects; Expert Report	Transects - 11/10/2022-12/10/2022 -within recommended survey period Expert Report (Field Inspection) – 23/02/2026	~160 person hours 4 people	NO	NO
Patersonia rosea	<i>Patersonia rosea</i>	P-CE ³	-	Due to the provisional listing and the candidate species only recently being added to the BAM-C following completion of targeted surveys, this species has not been considered further ⁴ .	NA	NA	NA	NA
Fauna								
Regent Honeyeater ⁵	<i>Anthochaera phrygia</i>	CE	CE	Opportunistic Survey; Dawn and Dusk Bird Survey	Dawn & Dusk Bird Survey – 14- 16/2/2023- within recommended survey period Opportunistic- 12/10/2022, 22/6/2023	Standard Bird Survey ~32 hours 2 people Opportunistic ~200 people hours 4 people	NO	NO
South-eastern Glossy Black-Cockatoo ⁶	<i>Calyptorhynchus lathami lathami</i>	V	V	Opportunistic Survey; Dawn and Dusk Bird Survey; Camera traps; Nest Tree Search	Dawn & Dusk Bird Survey – 14- 16/2/2023- within recommended survey period Camera Traps - 18/07/2024-08/08/2024 within recommended survey period Nest Tree Search – 6&27/01/2026 within recommended survey period	Standard Bird Survey ~32 hours 2 people Opportunistic ~200 people hours 4 people Camera Traps ~264 hours 2 people	YES	YES

¹ This species was added manually due to being recorded during surveys.

² This species was added manually due to being recorded during surveys.

³ Provisional listing as Critically Endangered on 26 September 2025 and a preliminary and final determination is yet to be made by the NSW Threatened Species Scientific Committee.

⁴ Previous correspondence with the department of CPHR has noted that ‘if the department publishes new or revised survey guides, assessors are expected to apply them to all assessments for which the survey component is yet to be completed, and to all new assessments that commence on or after the publication date’.

⁵ The Project site is not within an area mapped as important habitat and targeted surveys failed to detect the species, consequently, this species is not considered further as part of the assessment.

⁶ This species was added manually due to being recorded during surveys.



Common name	Scientific name	BC Act	EPBC Act	Threatened species surveys		Effort (hours and no. people)	Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
				Survey method	Timing of survey –within recommended period?			
						Nest Hollow Search –20 people hours		
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	Anabat; Bat Habitat Search	Anabat -13-17/02/2023 & 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 person hours 2 people	NO	NO
Swift Parrot ⁷	<i>Lathamus discolor</i>	E	CE	Opportunistic Survey; Dawn and Dusk Bird Survey	Dawn & Dusk Bird Survey – 14- 16/2/2023- within recommended survey period Opportunistic- 12/10/2022, 22/6/2023	Standard Bird Survey ~32 hours 2 people Opportunistic ~200 people hours 4 people	NO	NO
Eastern Coastal Free-tail Bat ⁸	<i>Micronomus norfolkensis</i>	V	-	Anabat; Bat Habitat Search	Anabat -13-17/02/2023 & 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 hours	YES	YES
Little Bent-winged-bat	<i>Miniopterus australis</i>	V	-	Anabat; Bat Habitat Search	Anabat -13-17/02/2023 & 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 hours	YES	YES
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V	-	Anabat; Bat Habitat Search	Anabat -13-17/02/2023, 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 hours	YES	YES
Stuttering Frog	<i>Mixophyes balbus</i>	E	V	Call Playback & Spotlighting	28-30/11/2022, 1&2/12/2022, 06-08/01 & 27/01/2026. Within recommended survey period.	~40 person hours	NO	NO
Squirrel Glider ⁹	<i>Petaurus norfolcensis</i>	V	-	Call Playback & Spotlighting; Camera Traps	Spotlighting- 16&23/05/2023, 22-24/07/2024; Call Playback-22/05/2023; Camera Traps-13-17/02/2023. Within recommended survey period	~50 person hours 4 people	Assumed	YES
Brush-Tailed Rock-Wallaby	<i>Petrogale penicillate</i>	E	V	Camera Traps; Spotlighting	Spotlighting- 16&23/05/2023, 22-24/07/2024; Camera Traps-13/2/2023-17/2/2023. Within recommended survey period	~40 person hours 4 people	NO	NO
Yellow-bellied Sheathtail-bat ¹⁰	<i>Saccolaimus flaviventris</i>	V	-	Anabat; Bat Habitat Search	Anabat -13-17/02/2023 & 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 hours	YES	YES
Masked Owl ¹¹	<i>Tyto novaehollandiae</i>	V	-	Call Playback & Spotlighting; Stag Watch & Hollow Search	Call Playback & Spotlighting- 16, 22 & 23/05/2023, 18/07/2024 & 22-24/07/2024; Stag Watch & Hollow Search -06-08/01/2026, 27/01/2026. Within recommended survey period	~60 person hours 4 people	YES	YES
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	-	Anabat; Bat Habitat Search	Anabat -13-17/02/2023 & 11-15/12/2023; Habitat Search - 06/01/2026. Within recommended survey period.	~192 hours	NO	NO

⁷ This project site is mapped as important habitat for this species. Consequently, the species is assumed present.

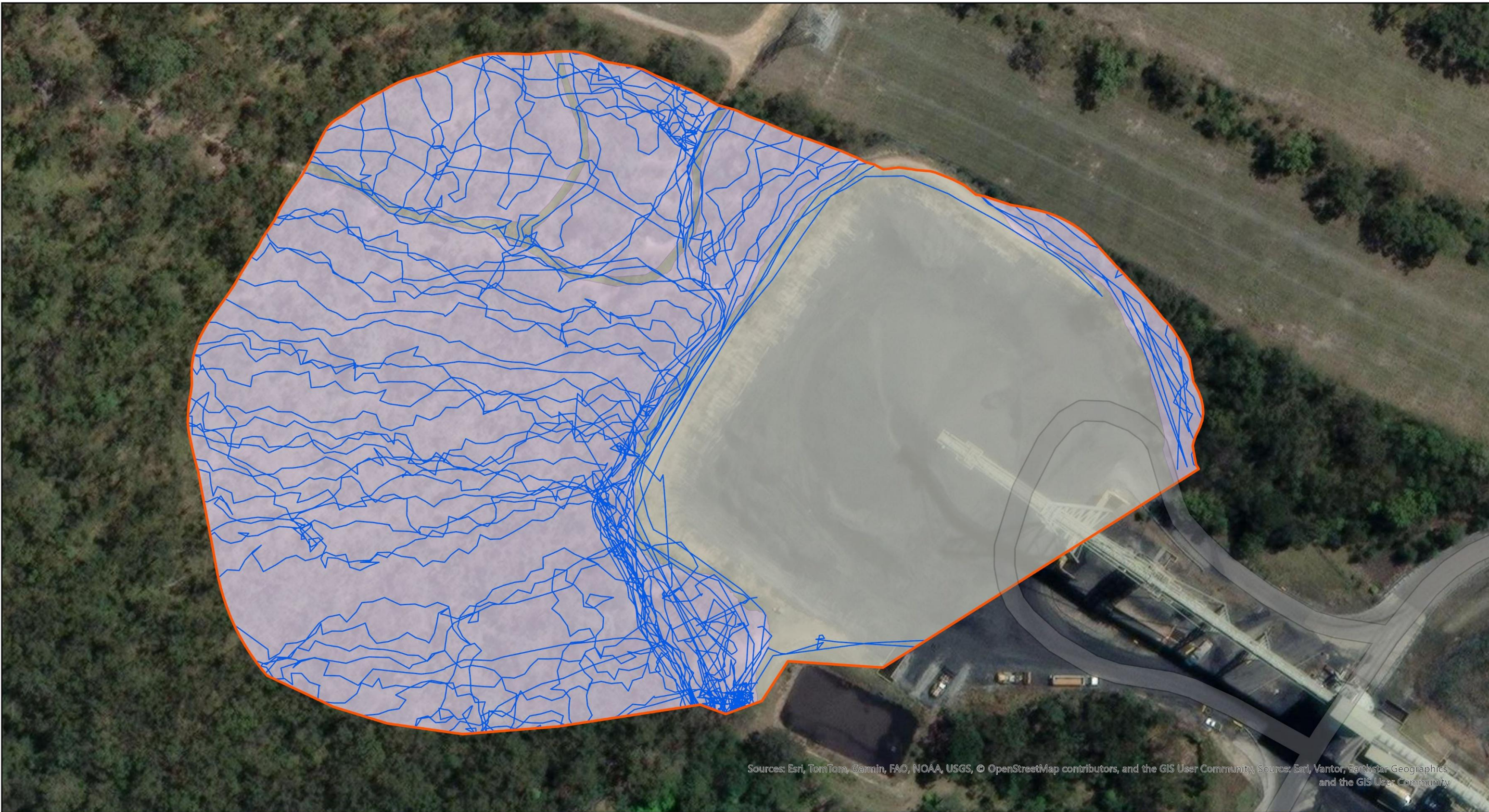
⁸ Although this species was recorded within the Project site during targeted surveys, this species is an ecosystem credit species, and no further assessment is required.

⁹ This species has been added manually and assumed present on the basis of secondary observations and local records.

¹⁰ This species was added manually due to being recorded during surveys.

¹¹ This species was added manually due to being recorded during surveys.





Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

EcoResolve



Environment & Design

5/14 Honeysuckle Drive Newcastle NSW 2300

Author: AD | Version: A-A3 | Date: 9/04/2026

Figure 4. October 2022 Threatened Flora Surveys

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Plant Community Type (PCT)

 0

 3583

Threatened Flora Transects

 October 2022

0 0.05 Kms

N



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100



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Author: AD | Version: A-A3 | Date: 2/07/2025

Figure 5. Feburary 2023 Threatened Flora Surveys

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Systematic Field Traverses
(Month & Year)

 February 2023

0 0.01 0.03 0.05 Kilometers



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator
Scale: 1:1,000



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Author: AD | Version: A-A3 | Date: 2/07/2025

Figure 6. June 2023 Threatened Flora Surveys

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Systematic Field Traverses (Month & Year)

 June 2023

0 0.03 0.07 Kms

Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator



Scale: 1:1,100



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Environment & Design

5/14 Honeysuckle Drive Newcastle NSW 2300

Author: TS | Version: A-A3 | Date: 4/05/2026

Figure 7: March 2026 Threatened Flora Surveys

Location: Cooranbong, NSW
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Systematic Field Traverses (Month & Year)

 March 2026

0 0.01 0.03 0.05 Kilometers



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator
Scale: 1:1,100

4.5 Site Habitat Characteristics

The subject land contains mature woodland with a moderate level of disturbance from human activities. The site is bounded on two sides by highly disturbed land, a high-voltage electricity easement to the north and the existing CES facility in the east. There are unsealed access tracks bordering the CES facility and extending to the south, north and west. Some areas show signs of historic disturbance and clearing with some overcrowding in stands of densely spaced trees and more open areas. Beyond these areas, the vegetation community is in good condition with many mature trees, HBTs, intact fallen timber and hollow logs. The subject land borders a dam at the southern side of the CES facility; however, it is likely to contain contaminated runoff from the CES facility and thus provide very poor aquatic habitat.

4.6 Survey Results

The surveys detected two threatened flora and six threatened fauna (**Table 7**). For the location of detected threatened species, refer to **Figure 9**. Of the species detected, two are listed SAIL species; Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Little Bentwing-bat (*Miniopterus australis*) **Appendix G**. However, these two SAIL species are dual credit species and their habitat constraint for species credits (breeding habitat) has not been identified. Another SAIL species, the Swift Parrot (*Lathamus discolor*), has been assumed present on the basis of important habitat being mapped within the Modification Disturbance Area.

Several other species were considered likely to occur or were recorded incidentally during surveys and were considered further:

- *Petaurus norfolcensis* (Squirrel Glider) (species credit species)
- *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-Cockatoo) (dual credit species)
- *Tyto novaehollandiae* (Masked Owl) (species credit species)
- *Micronomus norfolkensis* (Eastern Coastal Free-tail Bat) (ecosystem credit species)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat) (ecosystem credit species)

Two threatened flora species were incidentally recorded during field surveys and are likely to be impacted:

- *Grevillea parviflora subsp. parviflora* (Small-flowered Grevillea) (species credit species)
- *Tetratheca juncea* (Black-eyed Susan) (species credit species)

Of the above listed species, the *Micronomus norfolkensis* (Eastern Coastal Free-tail Bat) and the *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat) are ecosystem credit species and they were retained as predicted threatened species in the BAM-C.

The *Calyptorhynchus lathami lathami* (south-eastern Glossy Black-Cockatoo) is a dual credit species (ecosystem and species credit species) and further investigations were undertaken to establish if the habitat constraints associated with the species credits (breeding habitat in the form of actual nest



trees) are present. In this case it required additional surveys with reference to BioNet and EcoResolve conducted additional surveys as outlined briefly below.

EcoResolve conducted surveys for the South-eastern Glossy Black-Cockatoo to identify signs of breeding and mapped potential nest trees where hollows were at least 8 m above the ground; and hollow diameter is at least 15 cm. Five trees that contained these parameters were marked and Camera traps were deployed to monitor these tree hollows during the breeding season for 22 days (18/07/2024-08/08/2024) to confirm presence of any actual nest trees on site. Because no actual nest trees were identified during these further comprehensive surveys, it can be deduced that there is no breeding currently taking place within the site. Whether the absence of actual nest trees constitutes enough evidence to suggest that species credit offsets are not required is up to the determining authority and species credit offsets have been calculated precautionarily until confirmation is obtained.



Table 7 - Threatened Species Recorded within the Modification Disturbance Area

Common name	Scientific name	BC Act	EPBC Act	Date(s) observed	Surveyor(s)	Survey method	Biodiversity risk weighting	SAIL entity	Species count (total)	Habitat constraints / microhabitat present on the subject land / vegetation zone (BioNet, 2024)	Extent (ha) of suitable habitat present on site	TBDC species specific recommendations e.g. buffers, general comments (where relevant) (BioNet, 2024)	Habitat condition
Black-eyed Susan	<i>Tetratheca juncea</i>	V	V	11/10/2022 - 12/10/2022	Julian Carson Mel Thurtell	5 m flora transect	Species credit 2.00	No	86	Present-open Forest/woodland with a mixed shrub understorey and grassy groundcover. Generally, prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.	2.93 ha	Large populations of this species are particularly important. Protect and actively manage large populations and those at the limit of the species range through conservation mechanisms such as covenanting and the preparation/implementation of site-specific vegetation management plans. Improve vegetative connectivity within and between populations through revegetation/regeneration programs. When <i>Tetratheca juncea</i> is recorded within an assessment area, the species polygon does not necessarily need to extend over the whole zone for a given Plant Community Type where the species is detected. Suitable habitat may be modified to restrict the polygon to low nutrient, well drained soils on substrates that are generally sandy skeletal soil on sandstone or sandy-loam, or pH neutral clayey soil from conglomerates.	Good
Eastern Coastal Free-tail Bat	<i>Micronomus norfolkensis</i>	V	-	13-17/02/2023, 11-15/12/2023	Wingbeat Ecology	Anabat	Ecosystem credit	No	9 passes	Present - dry sclerophyll forest. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Frequently changes breeding sites, making it challenging to confirm locations. Although it breeds in hollows, it exhibits a nomadic breeding behaviour, occasionally forming large breeding groups, even in man-made structures.	2.93 ha	The species was allocated to ecosystem credit class (rather than dual credit species) because whilst it does breed in hollows it will usually change breeding sites regularly (every few days), rendering it very difficult to confirm breeding sites. Additionally, selected <1 for average number of offspring because females do not give birth every year (often miscarry etc). Retain hollow-bearing trees and provide for hollow tree recruitment. Retain foraging habitat.	Good
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	V	16/02/2023	Brea Heidke Mel Thurtell	Opportunistic	Dual credit species 2.00	No	1	Present - Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Feeds almost exclusively on the seeds of several species of she-	2.93 ha	Where potential nest trees are identified on site, monitor for this species during the breeding season (Apr – Aug) to confirm the presence of any actual nest trees on site.	Good

Common name	Scientific name	BC Act	EPBC Act	Date(s) observed	Surveyor(s)	Survey method	Biodiversity risk weighting	SAIL entity	Species count (total)	Habitat constraints / microhabitat present on the subject land / vegetation zone (BioNet, 2024)	Extent (ha) of suitable habitat present on site	TBDC species specific recommendations e.g. buffers, general comments (where relevant) (BioNet, 2024)	Habitat condition
										oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.			
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V	-	13-17/02/2023, 11-15/12/2023	Wingbeat Ecology	Anabat	Dual credit species 3.00	Yes	8 passes	Foraging habitat present - Hunt in forested areas, catching moths and other flying insects above the tree tops. No breeding habitat present, consequently, no Species Credits generated for this dual credit species.	2.93 ha	Any impacts on breeding habitat could be considered potentially serious and irreversible. This species is retained as dual credit because foraging habitat is broad ranging, but breeding habitat is highly specific. At lower altitudes this species is usually more abundant during winter months, the lower numbers of individuals from October to February are due to females moving to maternity sites. Additionally, selected <1 for average number of offspring because females do not give birth every year (often miscarry etc). Potential breeding habitat is caves, tunnels, mines or other structures known or suspected to be used by <i>M. schreibersii oceanensis</i> including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature. All breeding habitats including the cave, or other features, used for breeding and the area immediately surrounding this feature must be mapped. Species polygon boundaries should have a 100 m radius buffer around an accurate GPS point location centred on the cave/feature entrance. Surveys must be undertaken as per the Threatened Bat Survey Guide to confirm breeding habitat.	Good
Little Bentwing-bat	<i>Miniopterus australis</i>	V	-	13-17/02/2023, 11-15/12/2023	Wingbeat Ecology	Anabat	Dual credit species 3.00	Yes	27 passes	Foraging habitat present - dry sclerophyll forest and at night forage for small insects beneath the canopy of densely vegetated habitats. No breeding habitat present, consequently, no Species Credits generated for this dual credit species.	2.93 ha	Any impacts on breeding habitat could be considered potentially serious and irreversible. The is retained as dual credit because foraging habitat is broad ranging, but breeding habitat is highly specific. Additionally, selected <1 for average number of offspring because females do not give birth every (often miscarry etc).	Good

Common name	Scientific name	BC Act	EPBC Act	Date(s) observed	Surveyor(s)	Survey method	Biodiversity risk weighting	SAIL entity	Species count (total)	Habitat constraints / microhabitat present on the subject land / vegetation zone (BioNet, 2024)	Extent (ha) of suitable habitat present on site	TBDC species specific recommendations e.g. buffers, general comments (where relevant) (BioNet, 2024)	Habitat condition
												All breeding habitats including the cave, or other features, used for breeding and the area immediately surrounding this feature must be mapped. Species polygon boundaries should have a 100m radius buffer around an accurate GPS point location centred on the cave/feature entrance.	
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	22/07/2024	Brea Heidke Julian Carson	Call playback	Species credit 2.00	No	1	Present – lives in dry eucalypt forests and woodlands from sea level to 1100m. A forest owl, but often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 1000 hectares or more, depending on prey availability. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Uses large tree hollows for nesting (>20 cm diameter that occurs >4 metres above the ground).	2.93 ha	Masked Owls will use patches of habitat within fragmented areas especially as foraging habitat but also for roosting and occasionally nesting. Hollows in dead stags are commonly selected for roosting and nesting habitat and are a limited resource due to natural attrition. Hollows in live trees are also used, and the prey of owls are often hollow-dependent. Masked Owls may be found nesting in paddock trees and caves. Masked Owls need large home ranges to provide adequate prey resources, with 2000 hectares being a reasonable estimated standard to expect in many habitats occupied by the species. Care must be taken to avoid disturbing nesting pairs. The species polygon must be drawn to include all vegetation zones; 1. within 800 m (being the approximate home range) from the location of a detected owl, and 2. containing a living or dead tree with a hollow >20cm diameter that occurs >4m above the ground.	Good
Small-flowered Grevillea	<i>Grevillea parviflora subsp. parviflora</i>	V	V	11/10/2022 12/10/2022	Julian Carson Mel Thurtell	5 m flora transect	Species credit 2.00	No	22	Present - Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Occurs in a range of vegetation types from heath and shrubby woodland to open forest.	2.93 ha	Ensure that this species is considered in all planning matters on land that contains or may contain populations.	Good
Yellow-bellied Sheathtail-bat	<i>Saccolaimus flaviventris</i>	V	-	13-17/02/2023, 11-15/12/2023	Wingbeat Ecology	Anabat	Ecosystem credit	No	2 passes	Present - Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	2.93 ha	The likely response to likely management prescriptions varies from fairly predictable to highly uncertain. For example, limiting visitation to breeding sites may lower the risk to roosting aggregations from human carried pathogens but not for a pathogen that is transmitted between bats from	Good



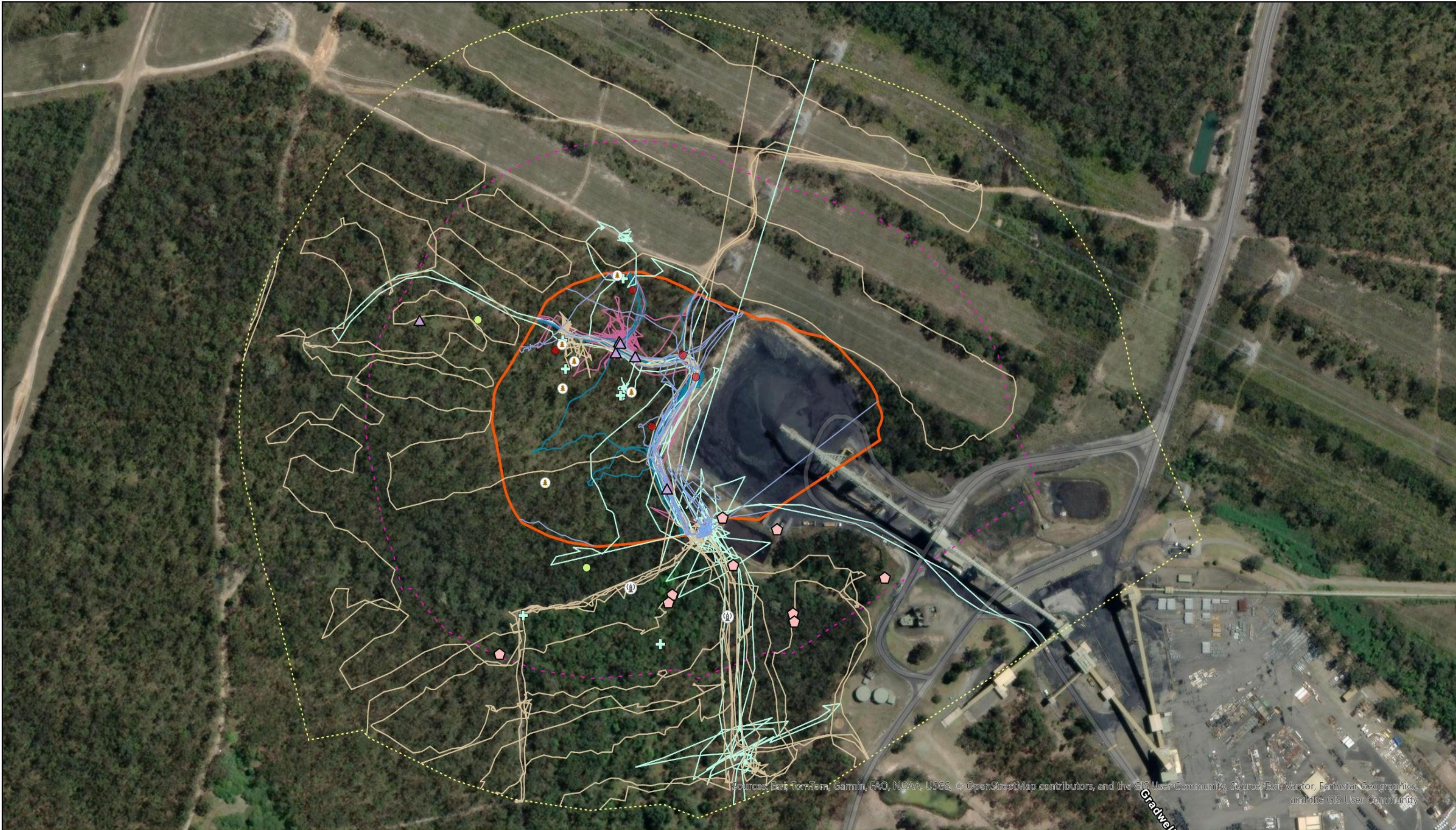
Common name	Scientific name	BC Act	EPBC Act	Date(s) observed	Surveyor(s)	Survey method	Biodiversity risk weighting	SAIL entity	Species count (total)	Habitat constraints / microhabitat present on the subject land / vegetation zone (BioNet, 2024)	Extent (ha) of suitable habitat present on site	TBDC species specific recommendations e.g. buffers, general comments (where relevant) (BioNet, 2024)	Habitat condition
												roost to roost. Roost requirements poorly known, paddock trees should be flagged as potential roosts. Additionally, selected <1 for have number of offspring because females do not give birth every year (often miscarry etc).	

Table 8 - Threatened Species Assumed Present within the Modification Disturbance Area

Common name	Scientific name	BC Act	EPBC Act	Date(s) observed	Surveyor(s)	Survey method	Biodiversity risk weighting	SAIL entity	Species count (total)	Habitat constraints / microhabitat present on the subject land / vegetation zone (BioNet, 2024)	Extent (ha) of suitable habitat present on site	TBDC species specific recommendations e.g. buffers, general comments (where relevant) (BioNet, 2024)	Habitat condition
Squirrel glider	<i>Petaurus norfolcensis</i>	V	-	Assumed present (potentially seen spotlighting, secondary observations of chew marks and local records).	N/A	N/A	Species credit 2.00	No	N/A	Present - Require abundant tree hollows for refuge and nest sites. Prefers mixed species stands with a shrub or Acacia midstorey. Diet varies seasonally and consists of <i>Acacia</i> gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	2.97 ha	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	Good
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Assumed present based on important habitat being mapped within the Project site.	N/A	N/A	Dual credit species 3.00	Yes	N/A	The species is a dual credit species, assessed for species credits (important habitat map) and ecosystem credits (all other areas the species is likely to occur). No survey is required if the subject land is on an important habitat map for a species unless the species profile in the TBDC states otherwise.	1.1 ha	The species is considered present and the part of the subject land that is within the important habitat map forms the species polygon used to generate species credits (BAM section 5.2.5 Box 2). Any remaining habitat on the subject land, e.g. unmapped locations used by these species is assessed for ecosystem credits. If the species is at risk of a serious and irreversible impact (SAIL), the area mapped as important habitat is the area identified as a potential SAIL and section 9.1 of the BAM must be addressed.	Good

Notable, important habitat features identified within the site include the following:

- Glider chew marks on one tree
- 29 x hollow-bearing trees (HBT)
- 1 x den/wombat burrow





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Figure 8. Threatened Fauna Surveys

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary	 Anabat	 Arboreal (Squirrel Glider)	 Potential Nest Hollow HBT	Nest Hollow & Bat Habitat Search	Dawn & Dusk Bird Survey
 Subject Land 100m Buffer	 Call Playback Survey	 Glossy Black Cockatoo	 Stag Watch Tracks	January 2026	February 2023
 Subject Land 200m Buffer	 Frog Survey	 Stag Watch Point	July 2024		
			May 2023		

0 0.05 0.1 0.15 Kms

N

Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:2,800

© 2025. This map has been prepared with due care; however, EcoResolve, Centennial Coal, and Geoscience Australia do not guarantee its accuracy, reliability, completeness, or suitability for any specific purpose. They accept no liability or responsibility (whether arising from contract, tort, or otherwise) for any expenses, losses, damages, or costs—including indirect or consequential damages—that may arise from inaccuracies, omissions, or unsuitability of the map for any reason.

5 Avoid and Minimise Impacts

Centennial will adopt a hierarchy of management principles during the Project, taking into consideration environmental and engineering constraints. These management principles are:

- **Avoidance** – Avoid direct and indirect risk of adverse impacts to threatened species and their habitats where feasible.
- **Minimise** – Minimise the risk of adverse impacts to threatened species and their habitats where they cannot be avoided.
- **Mitigate** – Implement mitigation and displacement measures to manage the risk of adverse direct, indirect and cumulative impacts to threatened species and their habitats.
- **Rehabilitation** – Areas no longer required for operations will be rehabilitated.
- **Provide Offsets** – Where required, offsets will be provided in accordance with the BOS under the BC Act.

5.1 Project Location and Design

The footprint for the original Project was a total area of 12.19ha, including 9.45ha of native vegetation. As the Project was developed this footprint was reduced to 3.2 ha to minimise impacts.

The revised Project footprint incorporated a larger area of impact (~3.2 ha) and involved impacts to an additional PCT that contained an ephemeral drainage line that provides potential habitat for additional threatened species such as amphibians. The Project footprint was further reduced to 2.98 ha. The change in design to avoid this area has resulted in a positive outcome for this habitat type and the potentially occurring threatened species therein. The proposed location for the Project is an incremental increase in the existing disturbed area currently used for stockpiling coal and will allow for use of the existing coal loading infrastructure and road network.

During the first revision phase, the Project footprint was decreased from a total area of 12.19ha, including 9.45ha of native vegetation to 2.98ha. The Project footprint was further reduced by an additional 0.05 ha of native vegetation avoided through the exclusion of Lot 179 DP 755218.

Figure 10 demonstrates changes in the Subject Land boundary and the above-mentioned reduced impact on adjacent native vegetation.





Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 9. Threatened Species Recorded in the Subject Land

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

Subject Land Boundary

Threatened Flora

- Grevilla parviflora
- Tetratheca juncea

Threatened Fauna

- Glossy Black-Cockatoo
- Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Yellow-bellied Sheathtail Bat

HBT

0 0.05 Kms



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,200

5.2 Recommendations for Mitigation

Some impacts could not be avoided or minimised by the Project design and must be mitigated instead. These include standard construction impacts and those specific to the Project. These are outlined in **Table 9**. For each mitigation measure or suite of measures, an adaptive response is planned to be implemented in the event that the proposed mitigation measures fail.

Table 9 - Impact Mitigation Measures

Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
Vehicle strike	Speed limits maintained and enforced for Project traffic.	Construction, post-construction	N/A	Construction contractor	Low	Harm to protected fauna, potentially threatened species	Injured fauna to be transported to vet for assessment and treatment.
Pathogen infestation	Best practice protocols as presented in Hygiene Protocols (DPIE, 2020b) will be implemented. During the clearing activities and the construction of the Proposed Development, plant and machinery will be cleaned of any foreign soil and propagative material prior to being transported to the construction areas to prevent the spread of weeds. If machinery is transported	Construction	As required	Construction contractor	Very low	Potentially severe, including harm to known threatened flora and vulnerable species within the local plant community and local amphibian populations. Overall ecosystem degradation and decline.	Work must cease and consultation with DPE commence to discuss an appropriate response to the outbreak or infestation.



Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
	from an area of confirmed infection of Myrtle rust, Phytophthora or Chytrid fungus to the construction areas, stringent wash down will be completed before leaving the area, removing all soil and vegetative material from cabins, trays, and under carriages.						
Weed infestation	Weed management procedures will be implemented to prevent the spread of weeds both inside and outside the site. The Arrive Clean, Leave Clean guidelines will be followed.	Construction, post-construction	As required	Construction contractor	Low	Weed infestation with potential impacts to the habitat of threatened species	Novel weed infestations caused by project works to be treated by professional bush regenerators until they are eliminated.
Unauthorised clearing and trampling of threatened flora species and their habitat	During construction, the Modification Disturbance Area will be delineated to ensure clearing is not undertaken outside of these areas.	Construction	As required	Construction contractor	Negligible	Loss of biodiversity not assessed by BAM. Breach of the BC Act.	Stop work immediately and enter consultation with DPE about appropriate action to take.
Indirect impacts from	Hours of construction would be	Construction	N/A	Construction contractor	Low	Disruption of local fauna	Ecology contractor to





Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
construction and operation	restricted to reduce overall noise, dust, light spill etc. Placement of construction and operational lighting to minimise light spill into surrounding undisturbed areas. Noisy work timed (seasonally and within daylight/nighttime hours) to minimise impacts to breeding of known locally occurring threatened fauna species. Dust generation to be minimised by water spraying.					behaviour and life cycles	consider further measures to reduce the relevant indirect impacts of the Project.
Erosion and sediment transport	Erosion and sediment control will be implemented and maintained during Project construction and operation	Construction	As required	Construction contractor	Low	Altered local hydrological regimes. Transport of contaminated runoff and sediment into healthy ecosystems. Ecological degradation.	Temporary remediation to be undertaken as soon as practicable upon detection. Remediation of damaged earthworks and landforms to be undertaken to restore to





Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
							pre-impact form and hydrological function
Contamination of surrounding bushland	- To minimise potential impacts on adjacent land and waterways all liquids (fuel, oil, cleaning agents, drilling liquids etc.) will be stored appropriately and disposed of at suitably licensed facilities. Spill management procedures will be implemented as required. Rubbish will be collected and removed from the Project Sites.	Construction	As required	Construction contractor			
Harm to unexpected threatened species during construction	- A procedure would be developed and implemented to respond to the unexpected detection of threatened species during activity on the subject land. This would include plans for providing appropriate veterinary care in the event of injuries, e.g., vehicle strike.	Pre-construction, construction	As required	Ecology contractor, construction contractor	Low	Harm to threatened species that have not been assessed under the BAM. Unmitigated impacts.	Work should cease and consultation commenced with DPE about an appropriate course of action.





Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
Harm to hollow-dependent fauna during clearing	- All clearing would be supervised by an ecologist or team trained to detect and remove and relocate fauna from clearing sites. - Clearing will take into consideration periods when most fauna species are not breeding. - Clearing of native vegetation would take place using a two-stage clearing process, e.g., under scrubbing would be completed 24-48 hours before clearing of HBTs and other habitat features to allow fauna to relocate. - Rescue agencies and local veterinarians would be contacted prior to the commencement of clearing to confirm the availability of resources for any captured/injured fauna that is	Pre-construction, construction	During all clearing activities	Construction contractor, ecology contractor	Moderate	Harm to protected fauna species, including threatened species known or assumed to occur within the subject land.	Clearing to cease until all injured fauna are treated, the incident has been analysed by the Project ecologist and construction contractor and appropriate modifications to the clearing methodology have been made to prevent further injuries.





Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
	unable to be released. - Hollow-bearing trees (HBTs) will be removed in a staged and controlled manner (e.g. sectionally felled) to minimise the risk of injury to any fauna occupying hollows. - Vegetation clearing should not be undertaken during extreme heat conditions (greater than 35°C) to reduce stress and mortality risk to fauna. - Clearing will be undertaken in a progressive and directional manner towards retained vegetation, ensuring fauna are guided to refuge areas and avoiding the formation of isolated vegetation patches. - Felled trees containing hollows will be placed to ensure hollows remain accessible (e.g. oriented upwards or laterally) to						





Impacts	Mitigation method/technique	Timing	Frequency	Responsibility	Risk of failure	Consequences of failure	Adaptive response
	allow fauna to safely exit. - Sections of cleared vegetation containing hollows will be relocated into adjacent retained habitat, where practicable, to provide opportunities for ongoing habitat use. - A hollow replacement strategy will be developed and implemented to offset the loss of habitat features and support long-term fauna habitat availability.						

5.3 Unavoidable Direct and Indirect Impacts

Despite the avoidance and mitigation measures considered and recommended, some residual impacts will occur. Approximately 2.93 ha of native vegetation will be disturbed, which has been identified as PCT 3583. The direct and indirect impacts of the Project are summarised along with proposed mitigation measures in **Table 10**.

The impacts considered in this assessment represent the maximum extent likely to be affected under the Project. The areas of native vegetation and threatened species habitat to be impacted and offset is presented in **Figure 10** to **16**. A species polygon was constructed for each threatened species detected during surveys undertaken or assumed present, with reference to the advice in their TBDC records (see **Table 7** and **Table 8** for this information).

5.3.1 Fauna Handling and Relocation

Despite the implementation of avoidance and minimisation measures, some impacts to fauna may occur as a result of vegetation clearing and habitat disturbance. A fauna management approach may be implemented to minimise impacts to both injured and uninjured fauna during the works.





A suitably qualified ecologist should be present during the clearing of habitat features with a high likelihood of fauna occupancy, including hollow-bearing trees, dense vegetation and riparian habitats. Pre-clearing inspections will be undertaken to identify fauna and implement appropriate management measures prior to disturbance.

Uninjured fauna encountered during clearing will be encouraged to disperse naturally where practicable or captured and relocated by a qualified ecologist to suitable nearby habitat outside the disturbance footprint. Release locations will be selected based on the availability of appropriate habitat, including shelter and foraging resources, and proximity to existing habitat connectivity.

Injured fauna will be assessed by a qualified ecologist and managed in accordance with relevant animal welfare guidelines. Where appropriate, injured fauna will be transported to a licensed wildlife carer or veterinary facility for treatment. In cases where injuries are severe and recovery is unlikely, humane euthanasia will be undertaken in accordance with relevant guidelines and licensing requirements.

Clearing of habitat features such as hollow-bearing trees will be undertaken in a staged and controlled manner to provide fauna with an opportunity to escape prior to handling.

All fauna handling, relocation and management actions will be undertaken in accordance with the conditions of the relevant scientific licence and applicable animal welfare requirements.





Table 10 - Direct and Indirect Impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	BC Act status	EPBC Act status	SAIL entity	Project phase/timing of impact (e.g., construction, operation, rehabilitation)	Extent (ha, number of individuals)
<i>Calyptrorhynchus lathamii lathamii</i> (South-eastern Glossy Black- Cockatoo)	V	V	No	Construction & operation	2.93 ha
<i>Grevillea parviflora subsp. parviflora</i> (Small-flowered Grevillea)	V	V	No	Construction	2.93 ha
<i>Tetradlea juncea</i> (Black-eyed Susan)	V	V	No	Construction	2.93 ha
<i>Tyto novaehollandiae</i> (Masked Owl)	V	-	No	Construction & operation	2.93 ha
<i>Lathamus discolor</i> (Swift Parrot)	E	CE	Yes	Construction & operation	1.14 ha

Key: V = Vulnerable, E= Endangered, CE = Critically Endangered

6 SAILs

An impact is to be regarded as SAIL if it is likely to contribute significantly to the risk of a threatened species or an ecological community becoming extinct based on the following four (4) principles set out in clause 6.7 of the BC Regulation:

1. The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
2. The impact will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
3. The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
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.

Field surveys identified two SAIL species and one additional SAIL species has been assumed present based on mapped important habitat (see **Table 11**) These SAIL species were assessed against their habitat preferences and SAIL thresholds (where available). Potential impacts to these species are required to be avoided and minimised.



Table 11 - SAI Species Identified

Scientific name	Common Name	Principle 1	Principle 2	Principle 3	Principle 4
<i>Miniopterus australis</i>	Little Bent-winged Bat	-	-	-	4
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	-	-	-	4
<i>Lathamus discolor</i>	Swift Parrot	1	-	-	-

Habitat descriptions below have been sourced from BioNet (DCCEW, 2024) for each SAI species.

6.1.1 Bat Species

Little Bent-winged Bat (*Miniopterus australis*)

- Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.
- Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.
- They often share roosting sites with the Common Bentwing-bat, and, in winter, the two species may form mixed clusters.
- In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (*Miniopterus schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young.
- Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer.
- Only five nursery sites /maternity colonies are known in Australia.

Large Bent-winged Bat (*Miniopterus orianae oceanensis*):

- Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.
- Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.
- Maternity caves have very specific temperature and humidity regimes.
- At other times of the year, populations disperse within about 300 km range of maternity caves.
- Cold caves are used for hibernation in southern Australia.
- Breeding or roosting colonies can number from 100 to 150,000 individuals.
- Hunt in forested areas, catching moths and other flying insects above the treetops.

After extensive field surveys, it can be confirmed that there are no caves present within the Modification Disturbance Area and hence, the individuals detected are most likely to have been recorded in foraging habitat, not breeding habitat. Consequently, because these are both dual credit





species and their species credit habitat constraints are not present, they are only retained as predicted ecosystem credit species. These two SAI species are not currently listed under the EPBC Act and therefore, an assessment of significance is not required.

6.1.2 Swift Parrot (*Lathamus discolor*)

The Swift Parrot (*Lathamus discolor*) breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south-west slopes.

The species is a dual credit species, assessed for species credits (important habitat map) and ecosystem credits (all other areas the species is likely to occur). No survey is required if the Modification Disturbance Area is on an important habitat map for a species unless the species profile in the TBDC states otherwise.

The Swift Parrot (*Lathamus discolor*) has been considered further against the relevant SAI criteria which is rapid decline (Principle 1). Although the species is in rapid decline, the small area of proposed foraging habitat loss on the peripheries of the mapped important habitat (only ~1.14 ha is mapped within the ~2.93 ha site) is unlikely to cause a decline of the species in the locality.

This SAI species is also listed as Critically Endangered under the EPBC Act and therefore, an assessment of significance has been conducted. This assessment determined that a significant impact was unlikely (**Table 12**).



Table 12 - SAI Assessment for the Swift Parrot (*Lathamus discolor*)

Current Status	
1. Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation)	The Swift Parrot is listed as Endangered under the NSW Biodiversity Conservation (BC) Act and Critically Endangered under the Environment Protection and Biodiversity Conservation (EPBC) Act. Swift Parrots are declining due to loss of habitat in both breeding and non-breeding areas (DCCEEW 2024). Birdlife Australia (2026) indicate through long-term monitoring that the Swift Parrot population is undergoing a severe decline. Recent studies suggest that the wild population may be as low as 500 individuals, placing the species at significant risk of extinction as early as 2031 if current trends continue. Heinsohn et al. developed a population viability analysis using demographic data collected over an intensive five-year field study. The analysis modelled five scenarios. One scenario, based on data from islands free of sugar gliders, predicted population growth in the absence of predation. In contrast, four additional scenarios incorporated sugar glider predation using different generation times and consistently projected substantial population declines. On average, these scenarios indicated a decline of approximately 86.9% over three generations, with estimates ranging from 78.8% to 94.7%. The preferred model projected a severe decline of up to 94.7% within three generations, based on a generation time of 5.4 years. Although breeding success is higher in areas without sugar gliders, this increase was not sufficient to prevent overall population collapse in the modelled scenarios. The study also noted that these projections are likely conservative, as they do not account for all known factors affecting the species' survival (Threatened Species Scientific Committee 2016). The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016–2017. The review found that, although knowledge had improved across several areas and progress had been made on many actions, the overall objective of the plan had not been met. It also noted ongoing declines in the number of mature individuals, as well as reductions in the extent and quality of available habitat, including the continued clearing of breeding areas. Of the 28 actions outlined in the plan, seven had not commenced or showed minimal progress, 14 had made some progress, and seven were considered complete or ongoing. Overall, the review concluded that population trends for the Swift Parrot remain uncertain due to the absence of reliable population estimates or comparable indices to quantify change over time. However, modelling based on reproductive success and predation by Sugar Gliders indicates that the population is in rapid decline (DCCEEW 2024).
2. Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation)	Population trends for the Swift Parrot remain uncertain due to the absence of reliable population estimates or comparable indices to quantify change over time. However, modelling based on reproductive success and predation by Sugar Gliders indicates that the population is in rapid decline (DCCEEW 2024). Population may be as low as 500 individuals placing the species at significant risk of extinction (Birdlife Australia 2026).
3. Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation)	Although migratory, the Swift Parrot relies on spatially and temporally limited flowering events, meaning functional habitat availability is highly constrained. Loss of key foraging areas in NSW may disrupt migratory pathways and reduce access to critical seasonal resources (DCCEEW 2024). The Project site is mapped as 'important habitat' for this species. Consequently, the species is assumed to be present. Therefore, this principle may be triggered.





Current Status	
4. Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	The species depends on mature, autumn and winter-flowering eucalypts, which require decades to develop and cannot be readily replaced through offsets or short-term restoration. Loss of these habitat features represents a long-term and effectively irreversible impact (LLS, 2026). This principle is likely to be triggered where mature feed trees are removed. However, only 1.14 hectares of foraging habitat is present on site, it is unlikely that the proposed action will be detrimental to the species subpopulation.
Impact Assessment	
The impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land and as a percentage of the total NSW population, and	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south-west slopes. As a number of favoured feed trees have been observed within the subject land, it cannot be ruled out that <i>L. discolor</i> may use the site to forage. With only 1.14 hectares of habitat present on site, it is unlikely that the proposed action will be detrimental to the species subpopulation.
ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal	It is estimated that the wild population may be as low as 500 individuals, placing the species at significant risk of extinction as early as 2031 if current trends continue (Birdlife Australia 2026). It is difficult to estimate the number of individuals that could be impacted by the proposed action due to the migration patterns of the species and the uncertain nature of population size. The area of important habitat to be affected is unlikely to have the potential to support more than a small percentage of the population even when feed trees present there are in full flower.
The impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW	Approximately 1.14 ha loss of foraging habitat of the species geographic range will be impacted by the proposed action





Current Status	
ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted	The impact may cause further decline of the species as the Project has been mapped as 'Important Habitat'.
iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	Exact habitat area size is difficult to quantify due to the nomadic behaviour of the species and dependence on specific flowering patterns and the presence of wooded areas.
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites.	The Swift Parrot is rapidly declining, has a very small population (less than 500 individuals) and depends on specialised and often irreplaceable foraging habitat. Where important foraging habitat is present and impacted, the proposal could potentially result in a Serious and Irreversible Impact (SAII). However, although the species is in rapid decline, the small area of proposed foraging habitat loss of the mapped important habitat (1.14 ha) is unlikely to cause a decline of the species in the locality. The Project will result in fragmentation of the migratory subpopulation's habitat.



6.2 Impacts to Vegetation Integrity

This assessment assumes the complete removal of all vegetation within the Modification Disturbance Area, represented by the reduction of all VI components and scores to 0 (**Table 14**).

6.3 Loss of Hollow-bearing Trees

There are numerous hollow-bearing trees (HBTs) within in the Modification Disturbance Area. These are located within all native vegetation zones. A total of 29 individual HBTs were mapped within the Modification Disturbance Area, with some containing multiple hollows.

Of the 29 HBTs with medium to large size hollows, only four were deemed to be potential roosting and nest trees for Masked Owls (i.e., having at least one hollow greater than 20 cm diameter, at least 4m above ground level).

Hollows suitable for Glossy-black Cockatoo habitat were observed (i.e. at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees and may be near-vertical or vertical.). Five cameras were deployed to monitor for the Glossy-black Cockatoo during breeding season (August 2024) for a period of ten days. Although no individuals were detected on the camera traps and no actual nest trees were observed, the precautionary principle has been adopted until consultation with the determining authority can confirm the preferred approach, given that the presence of suitably sized and shaped HBTs.

The Squirrel Glider relies on large old trees with hollows for breeding and nesting. Approximately 27 trees within the Modification Disturbance Area provided suitable breeding hollows for the Squirrel Glider.

Table 13 - HBTs within the Modification Disturbance Area

Hollow-bearing Trees	Number of HBTs
Small hollows (≤ 5 cm)	2
Medium hollows (5-20 cm)	21
Large hollows (20 - 30 cm)	3
Extra-large hollows (>30 cm)	3
Total number of individual HBTs	29

6.4 Prescribed Impacts

Prescribed impacts are impacts on threatened species which are not accounted for during assessment of native vegetation disturbance impacts within the BAM-C. They include impacts to features listed in **Table 14**.



Table 14 – Prescribed Impacts

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	No	-	-
Human-made structures	No	-	-
Non-native vegetation	No	-	-
Habitat connectivity	Yes	The Project will not introduce any impermeable linear barriers to fauna movement within the Modification Disturbance Area. The subject land is bounded to the north and east by undesirable habitat for most threatened species considered in this assessment (open grassy easements) and the westward extension of the stockpile does not greatly change the local pattern of disturbance.	Eight threatened fauna species were detected or assumed present within the subject land. The arboreal mammal; <i>Petaurus norfolcensis</i> (Squirrel Glider) – The subject land occurs at the northern edge of a contiguous tract of woodland running south to Newport Rd at Dora Creek and east to Rocky Point Rd. Connectivity to the north and west of this tract has already been largely severed for the species because the slashed easements have created open spaces without cover of 60–160 m which this species cannot glide across (Goldingay and Tayler, 2009; although terrestrial movement across such gaps may sometimes be undertaken, it is unlikely to be common). The easement is likely to represent a territorial boundary for the local population. Because the Project occurs at the edge of existing territory next to areas that are not normally visited, it represents a negligible impact to connectivity for the species. Aerial species, including: • <i>Calyptorhynchus lathami lathami</i> (South-eastern Glossy Black-Cockatoo) • <i>Tyto novaehollandiae</i> (Masked Owl) • <i>Micronomus norfolkensis</i> (Eastern Coastal Free-tail Bat) • <i>Saccolaimus flaviventris</i> (Yellow-bellied Sheath-tail-bat) • <i>Lathamus discolor</i> (Swift Parrot) • <i>Miniopterus australis</i> (Little Bent-winged Bat) • <i>Miniopterus orianae oceanensis</i> (Large Bent-winged Bat) These species all have the capacity to fly over the proposed modification. While heavily developed open spaces may provide a behavioural barrier to movement, the size of this barrier is relatively small and non-linear. It occurs next to an area largely stripped of value to these species (the high





Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
			voltage easement) rather than occurring between two areas of desirable habitat. The distance from north to south across the subject land is 250m. If an aerial species chose not to cross the subject land during its cleared operational phase, it could fly around the perimeter for a minimum distance of 750m. While this is a tripling of the distance to travel, it is well within the capabilities of these species to do. These species are unlikely to experience any connectivity impacts.
Waterbodies, water quality and hydrological processes	No	-	-
Wind turbine strikes (wind farm development only)	No	-	-
Vehicle strikes	Yes	Vehicle movements on and around the Modification Disturbance Area will increase because of increased traffic during construction of the Project.	It is very unlikely the aerial species detected would be affected by vehicle movements. Squirrel Gliders are unlikely to occur on the ground crossing spaces used by vehicles and are similarly unlikely to be affected.





6.5 Residual Indirect Impacts

Despite the implementation of appropriate mitigation measures, indirect impacts will be unavoidable under the Project. These impacts are primarily related to the construction and operation phase and are listed in **Table 15**. These indirect impacts include soil and water contamination, barriers to fauna movement, and the generation of excessive dust, light, and noise.

Table 15 - Residual Indirect Impacts

Indirect impact (Describe impact, e.g., transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g., construction, operation, rehabilitation)	Likelihood and consequences
Reduced viability of adjacent habitat because of edge effects	All vegetation, all fauna, including species listed in Table 11 .	Long-term	Construction and operation	Some loss of viability is almost certain. The effects would be local and limited to a marginal proportion of habitat within the Modification Disturbance Area and surrounding landscape.
Trampling of threatened flora	Threatened species, including those known to occur. i.e., <i>Grevillea parviflora</i> and <i>Tetratheca juncea</i>	Long-term	Construction and operation	Very Unlikely. The subject land can be reached from the existing road network and the Project boundary will be clearly demarcated. Vehicle/plant movements outside the approved clearing area will not occur under normal operations (project boundaries will be included in site induction briefings), however there is a small chance of a one-off impact. Impacts would likely be limited to the tracks of a single machine and affect a very small part of any local population threatened flora in the immediate vicinity of the subject land.
Reduced viability of adjacent habitat because of noise, dust and light spill from construction areas	All fauna, including species listed in Table 11 .	Short-term	Construction	Likely but limited to areas adjacent to construction activity. Consequences dependent on intensity and duration of activity. Fauna may avoid affected habitat or be less successful there. The area affected is unlikely to be





Indirect impact (Describe impact, e.g., transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g., construction, operation, rehabilitation)	Likelihood and consequences
				a significant proportion of the distribution of most species.
Introduction of invasive flora species to the subject land	All vegetation, all fauna, including species listed in Table 11 .	Long-term	Construction and operation	Likely. May result in the establishment of new invasive flora species and degradation of native vegetation, although infestations would be relatively easy to identify and control during the construction and operational phase.
Introduction of waste (rubbish, fuels and lubricants, materials) into surrounding ecosystems	All vegetation, all fauna, including species listed in Table 11 .	Long-term	Construction and operation	Possible, if effective materials storage and waste management systems are not implemented. Consequences may include harm to fauna through ingestion or exposure to rubbish, contamination of soil and waterways etc.
Increased risk of starvation, exposure and loss of shade or shelter	All fauna, including species listed in Table 11 .	Long-term	Construction and operation	Likely to occur, but the impact on most species is likely to be marginal given the abundance of similar habitat in the surrounding landscape. Less mobile species with smaller ranges may experience greater local competition for these resources.
Loss of breeding habitats (Stick nests & HBTs)	All fauna, including species listed in Table 11 .	Long-term	Construction and operation	Certain to occur for many species, although impact on hollow-dependent species is directly proportional to the number of hollows removed.
Hydrological changes	All vegetation	Long-term	Construction and operation	Possible. Likely to be limited to the area of direct impacts. The modified stockpile footprint and clean water diversions will affect local flows of runoff. Effects on groundwater are uncertain. The viability and health of affected vegetation may be impacted if appropriate





Indirect impact (Describe impact, e.g., transport of weeds and pathogens from the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g., construction, operation, rehabilitation)	Likelihood and consequences
				erosion and sediment controls are not implemented and maintained.
Increase in predatory species populations	All fauna, including species listed in Table 11.	Long-term	Construction and operation	Possible, although the Project does not include any activities likely to directly promote predator population growth. The presence of waste and disturbance may attract feral predators.
Increase in pest animal populations	All fauna, including species listed in Table 11.	Long-term	Construction and operation	Possible, although the Project does not include any activities likely to directly promote pest population growth. Some species may benefit from disturbance caused by Project activities, resulting in increased competition in the landscape surrounding the Modification Disturbance Area.
Fertiliser or herbicide drift	All vegetation	Short-term	Construction	Possible. Herbicide drift could kill or sicken native vegetation in areas adjacent to treated sites. Best practice herbicide application minimises the risk of drift by avoiding spraying when drift is likely to cause harm.



7 Impact Summary

7.1 Impacts on Native Vegetation and Threatened Ecological Communities

The total area of PCT 3583 to be cleared is approximately 2.93 ha. This PCT is not considered to form part of any BC Act or EPBC Act listed EECs.

As the Project will involve the complete removal of all vegetation within the Modification Disturbance Area, changes to the vegetation integrity are represented by the reduction of all VI components and scores to 0 (**Table 16**).

Table 16 - Changes to Vegetation Integrity

Vegetation zone	PCT ID	Mgt zone	Area (ha)	Before development				After development				Change in VI score
				Comp	Struc	Func	VI Score	Comp	Struc	Func	VI Score	
3583_High	3583	1	2.93	38.6	72.1	98.1	64.9	0	0	0	0	-64.9

7.2 Impacts on Threatened Species

The surveys detected two threatened flora and six threatened fauna (**Table 7**). Of the species detected, two of the fauna species are listed SAI species. However, these were dual credit species and their habitat constraint for species credits (breeding habitat) has not been identified in the Modification Disturbance Area and they were retained as ecosystem credit/predicted species only. Similarly, two more of the detected fauna were ecosystem credit species that were retained as predicted threatened species.

Of the above-mentioned species, six dual or species credit species were assumed present or were recorded incidentally during surveys as follows:

- *Petaurus norfolcensis* (Squirrel Glider) (species credit species) – assumed present based on local records and secondary observations.
- *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-Cockatoo) (dual credit and SAI species) – actual nesting trees not recorded but included precautionarily for both ecosystem and species credits.
- *Tyto novaehollandiae* (Masked Owl) (species credit species) – recorded on site.
- *Lathamus discolor* (Swift Parrot) (dual credit and SAI species) - assumed present based on the important habitat map.



- *Grevillea parviflora subsp. parviflora* (Small-flowered Grevillea) (species credit species) – recorded on site.
- *Tetradlea juncea* (Black-eyed Susan) (species credit species) – recorded on site.

The above listed species have been considered likely to be impacted as part of the Project and species credit liabilities have been calculated for them accordingly. Of these species, the Swift Parrot (*Lathamus discolor*) is listed as an SAI species, and it has been considered further against the relevant SAI criteria (refer to **Section 5.4**). This assessment concluded that although the species is in rapid decline the small area of proposed foraging habitat loss on the peripheries of the mapped important habitat (only ~1.14 ha is mapped within the ~2.93 ha site) is unlikely to cause a decline of the species in the locality.

The Swift Parrot (*Lathamus discolor*) is also listed as Critically Endangered under the EPBC Act and therefore, an assessment of significance has been conducted accordingly. This assessment resulted in a potential for a significant impact to the species as part of the Project.

7.3 Biodiversity Credit Report and Offsets

The Project would require an offset of **83** ecosystem biodiversity credits if clearing to the maximum extent considered in this assessment occurred (**Table 17**). A combined total of **530** Species credits are made up of **380** species credits and **150** dual credit species credits, if the potential breeding habitat is cleared (precautionarily including potential nest trees for Glossy Black Cockatoos) (**Tables 18 - 19, Figures 10 - 15**)

Under the like-for-like offsetting rules, the ecosystem credits used to offset development impacts to native vegetation that is not part of a TEC may be from the same PCT or different PCTs within the same vegetation class and in the same or higher offset trading group. These ecosystem credits must be from within the same IBRA subregion, adjacent subregions or subregions within 100 km of the Modification Disturbance Area (**Table 20**). Species credits may not be substituted in this way and can only be offset with credits from the species that have been impacted.

Table 17 - Impacts that Require an Offset – Ecosystem Credits

Common name	Scientific name	BC Act status	EPBC Act status	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
PCT 3583	Hunter Coast Lowland Scribbly Gum Forest	-	-	2.93	64.9	0	-64.9	Ecosystem credit	83
Total									83





Table 18 - 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
Black-eyed Susan	<i>Tetradlea juncea</i>	V	V	2.93 ha	Species credit 2.00	95
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	2.93 ha	Species credit 2.00	95
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	2.93 ha	Species credit 2.00	95
Squirrel glider	<i>Petaurus norfolcensis</i>	V	-	2.93 ha	Species credit 2.00	95
Total						380

Table 19 - Impacts that Require an Offset – Dual Credit Species

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	V	2.93 ha	Dual credit species 2.00	95
Swift Parrot	<i>Lathamus discolor</i>	E	CE	1.14 ha	Dual credit species 3.00	55
Total						150





Table 20 - Ecosystem Credit Class and Matching Credit Profile.

Ecosystem credit	PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC or EC	Attributes shared with matching credits		
					Offset trading group (BAM Section 10.2, Tables 4 & 5)	HBTs present?	IBRA subregion (in which proposal is located)
3583	Hunter Coast Lowland Scribbly Gum Forest	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 3583, 3592, 3594	Dry Sclerophyll Forests (Shrubby sub-formation)	Not a TEC	Sydney Coastal Dry Sclerophyll Forests ≥50% and <70%	Yes	Wyong





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Figure 10. Subject Land Boundary Changes

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

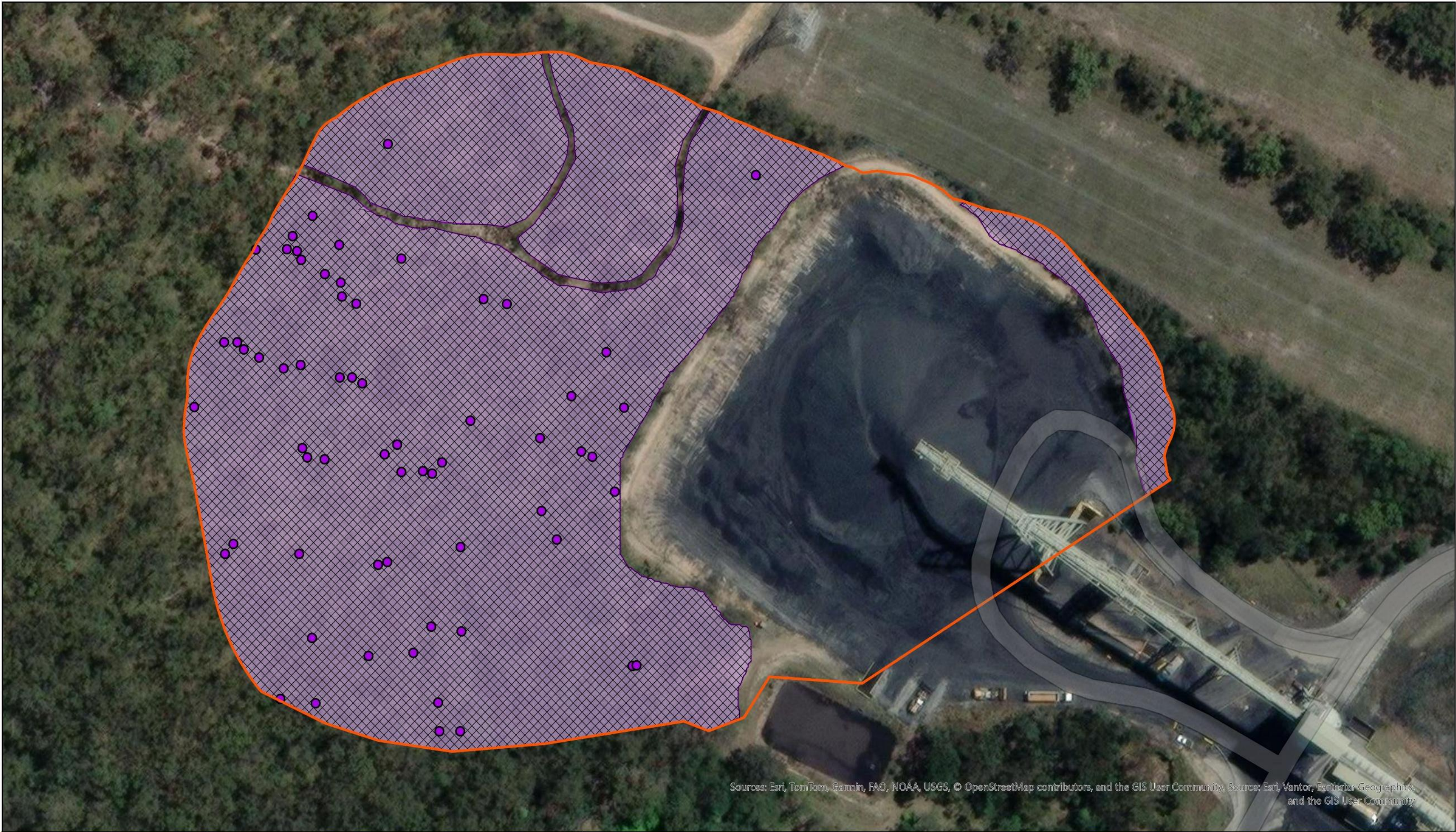
-  Initial Subject Land Boundary
-  First Revised Subject Land Boundary

-  Second Revised/Current Subject Land Boundary
-  Cadastral Lot Boundaries

0 15 30 60 90 120
Meters



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator
Scale: 1:2,000



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community. Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 11. Tetratheca juncea Species Polygon

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Tetratheca juncea Species Polygon

 Tetratheca juncea

Species Observation

 Tetratheca juncea

 PCT 3583 (High)

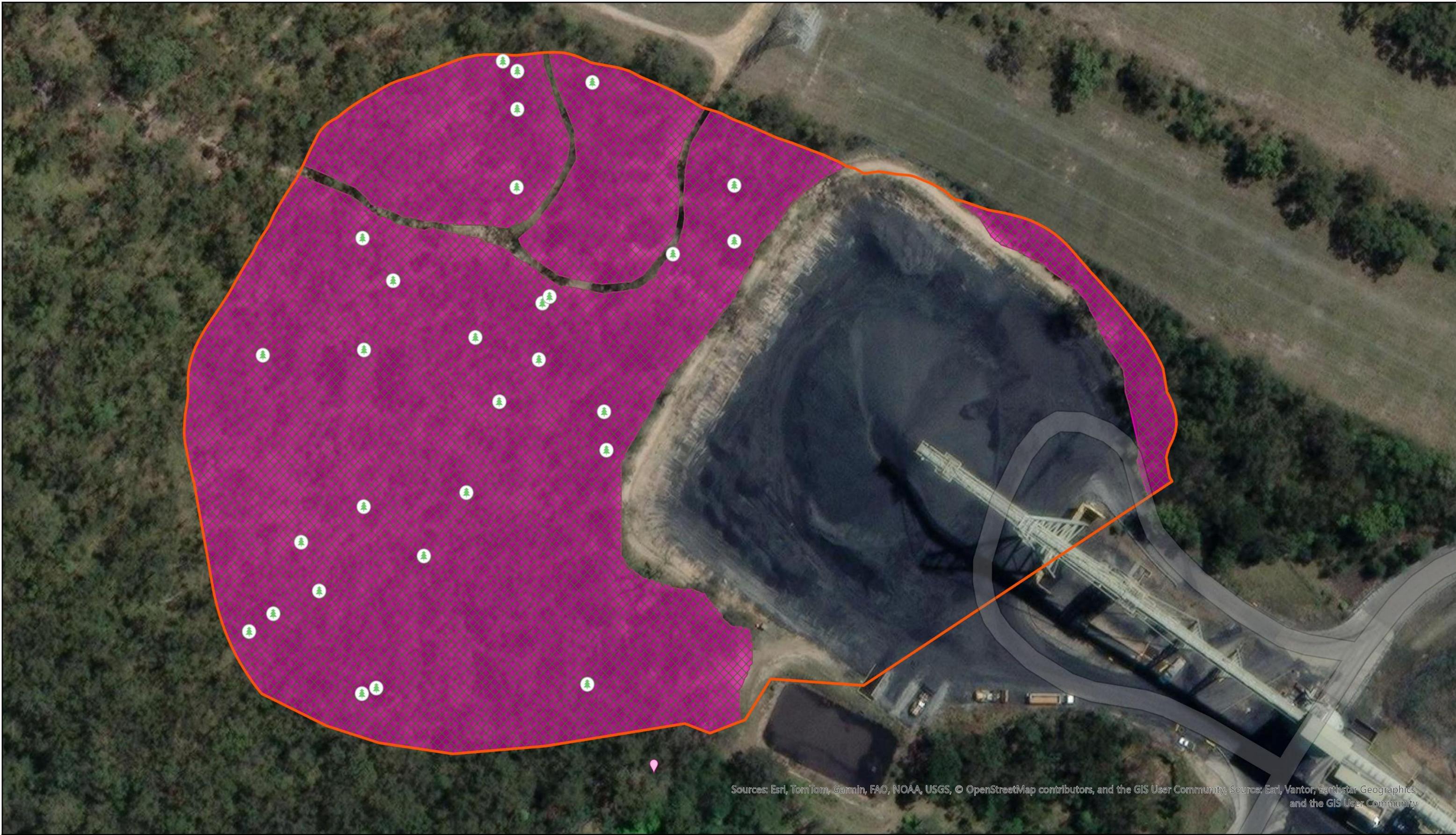
0 0.05 Kms

N



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community. Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 12. Squirrel Glider Species Polygon

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

Subject Land Boundary

Squirrel Glider Species Polygon

Squirrel Glider

Incidental Observation_Glider Chew Marks

Glider Chew Marks

PCT 3583 (High)

HBTs

0 0.05 Kms

N



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100

Place Holder for Masked Owl Species Polygon. Figure redacted due to sensitive species listing

FIGURE 13 MASKED OWL SPECIES POLYGON





Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community. Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 14. South-eastern Glossy Black-Cockatoo Species Polygon

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

 South-eastern Glossy Black-cockatoo Species Polygon

 Southern

 PCT

0 0.05 Kms

N



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 15. Swift Parrot Species Polygon

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Swift Parrot Species Polygon

 Swift Parrot

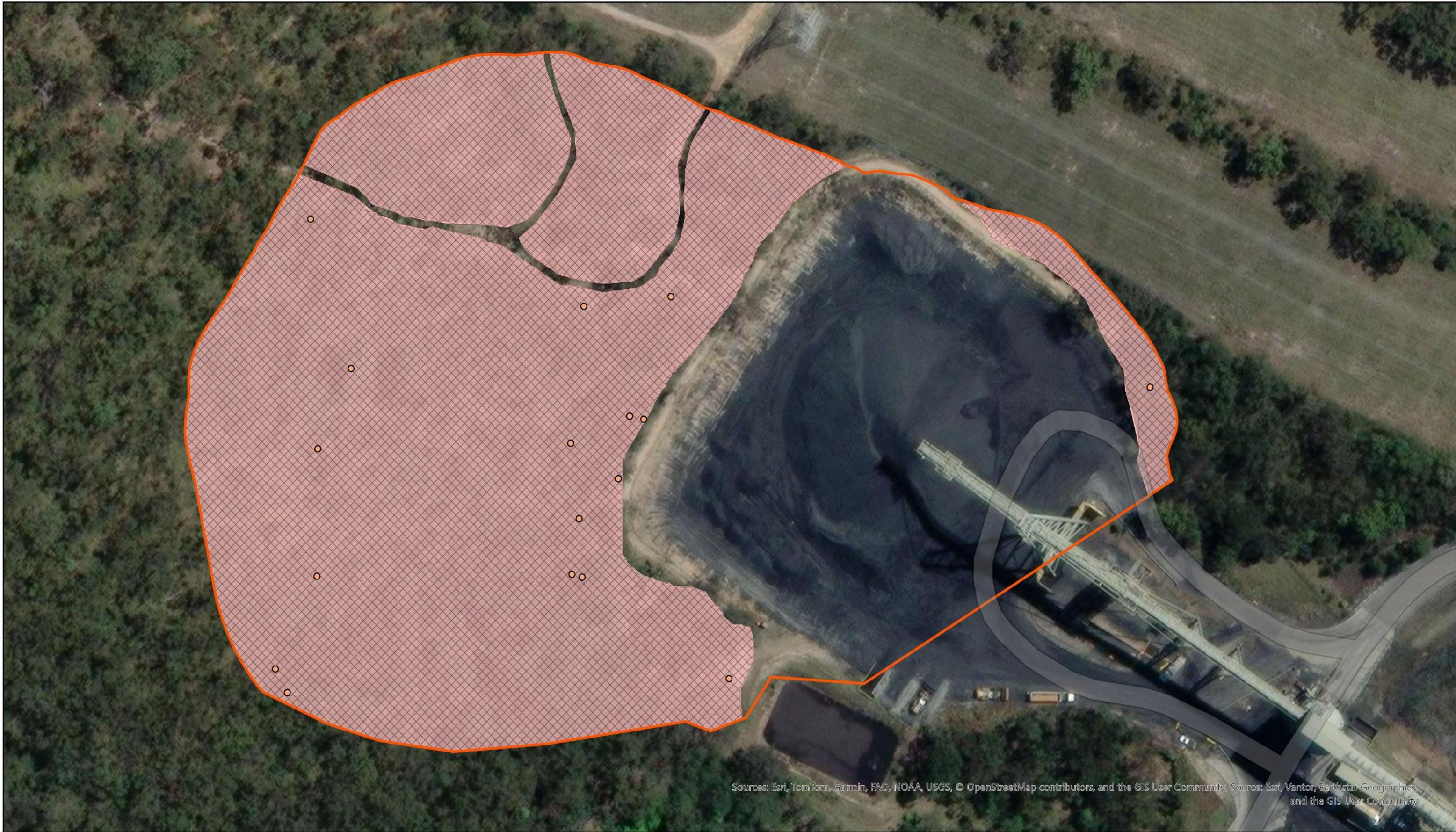
0 0.05 Kms

N



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 16. Grevillea parviflora subsp. parviflora Species Polygon

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

 Subject Land Boundary

Grevillea parviflora subsp. parviflora Species Polygon

 Grevillea parviflora subsp. parviflora

Species Observation

 Grevilla parviflora subsp parviflora

 PCT 3583 (High)

0 0.05 Kms



Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator

Scale: 1:1,100



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

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Figure 17. Area Requiring Offsets

Location: Cooranbong Colliery
Purpose: S-BDAR
Client: Centennial Coal
Reference: ER092

Legend

-  Subject Land Boundary
-  Offset Area (2.93 ha)

0 0.05 Kms

N
Spatial Reference
Datum: GDA2020
Projection: Transverse Mercator
Scale: 1:1,100

7.4 Limitations

The limitations and assumptions applying to this assessment include:

- All calculations of direct impacts assume clearing of vegetation to the maximum extent of the proposed Modification Disturbance Area indicated in **Figure 1**.
- The likelihood of indirect and prescribed impacts can generally be estimated with reasonable accuracy, however, their magnitude and consequences for any individual species or ecosystem can rarely be reliably quantified, even where specialist information (e.g., noise assessments, hydrological studies) is available for the potential impacts.

8 Conclusion

Approximately 2.93 ha of native vegetation belonging to PCT 3583, *Hunter Coast Lowland Scribbly Gum Forest*, was identified as being potentially impacted by the Project. None of this vegetation forms part of a TEC.

The surveys detected two threatened flora and six threatened fauna. Of the species detected, two of the Fauna species are listed SAI species, however, these were dual credit species and their habitat constraint for species credits (breeding habitat) has not been identified in the Project site and they were retained as ecosystem credit/predicted species only. Similarly, two more of the detected fauna were ecosystem credit species that were retained as predicted threatened species.

Of the above-mentioned species, six dual credit or species credit species were assumed present or were recorded incidentally during surveys as follows:

- *Petaurus norfolcensis* (Squirrel Glider) (species credit species) – assumed present based on local records and secondary observations.
- *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-Cockatoo) (dual credit species and SAI species) – actual nesting trees not recorded but included precautionarily for both ecosystem and species credits.
- *Tyto novaehollandiae* (Masked Owl) (species credit species) – recorded on site.
- *Lathamus discolor* (Swift Parrot) (dual credit and SAI species) - assumed present based on the important habitat map.
- *Grevillea parviflora subsp. parviflora* (Small-flowered Grevillea) (species credit species) – recorded on site.
- *Tetradlea juncea* (Black-eyed Susan) (species credit species) – recorded on site.

The above listed species have been considered likely to be impacted as part of the Project and species credit liabilities have been calculated for them accordingly. Of these species, the Swift Parrot (*Lathamus discolor*) is listed as an SAI species, and it has been considered further against the relevant SAI criteria. This assessment concluded that although the species is in rapid decline the small area of proposed foraging habitat loss on the peripheries of the mapped important habitat is unlikely to cause a decline of the species in the locality.





The Swift Parrot (*Lathamus discolor*) is also listed as Critically Endangered under the EPBC Act and therefore, an assessment of significance has been conducted accordingly. This assessment resulted in a potential for a significant impact to the species.

The Project would require an offset of **83** ecosystem biodiversity credits if clearing to the maximum extent considered in this assessment occurred. A combined total of **530** Species credit species are made up of **380** species credits and **150** dual credit species credits, if the potential breeding habitat (including actual nest trees for Glossy Black Cockatoos) identified in this assessment is cleared.



9 References

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Appendix A – S-BDAR Content Requirements Compliance Checklist – Small Area

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
Introduction	Chapters 2 and 3	INFORMATION	
		Introduction to the biodiversity assessment including:	
		☐ brief description of the proposal	1.2 1.4
		☐ identification of subject land boundary, including:	1.3
		☐ operational footprint	Figure 1 & 2
		☐ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	
		☐ general description of the subject land	1.2 1.3 2.0 Figure 1 & 2
		☐ sources of information used in the assessment, including reports and spatial data	1.6
		☐ Identification of assessment method applied (i.e. linear or site-based)	1.5
		MAPS AND TABLES	
		☐ 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	Figures 1 & 2
Landscape	Sections 3.1 and 3.2, Appendix E	INFORMATION	
		Identification of site context components and landscape features, including:	
		☐ general description of subject land topographic and hydrological setting, geology and soils	Table 1, Figures 1 & 2
		☐ percent native vegetation cover in the assessment area (as described in BAM subsection 3.2(4.))	Table 2
		☐ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Table 1 Figure 2
		☐ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3-4.) and Appendix E)	Table 1
		☐ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(4.))	Table 1
		☐ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Table 1



S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(10.).	NA (could not find in report – should it be added?)
		☐ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Table 1
		MAPS AND TABLES	
		Site Map:	Figure 1
		☐ boundary of subject land	
		☐ cadastre of subject land	
		☐ landscape features identified in BAM Subsection 3.1.3	
		☐ areas of outstanding biodiversity value within the subject land	
		Location Map:	Figures 1 & 2
		☐ digital aerial photography at 1:1,000 scale or finer	
		☐ boundary of subject land	
		☐ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development)	
		☐ landscape features identified in BAM Subsection 3.1.3	
		☐ additional detail (e.g. local government area boundaries) relevant at this scale	
		☐ areas of outstanding biodiversity value within the assessment area	
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	
		☐ IBRA bioregions and subregions	Figure 2
		☐ rivers, streams and estuaries	
		☐ wetlands and important wetlands	
		☐ connectivity of different areas of habitat	
		☐ areas of geological significance and soil hazard features	
		DATA	
		☐ All report maps as separate jpeg files	Yes, attached separately

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		Individual digital shape files of:	Yes, attached separately
		☐ subject land boundary	Yes, attached separately
		☐ assessment area (i.e. buffer area) boundary	Yes, attached separately
		☐ cadastral boundary of subject land	Yes, attached separately
		☐ areas of native vegetation cover	Yes, attached separately
		☐ areas of habitat connectivity	Yes, attached separately
Native vegetation, TECs and vegetation integrity	Chapter 4	INFORMATION	
		☐ Patch size (in accordance with BAM Subsection 4.3.2)	3.3
		☐ Identification of the dominant PCT on the subject land and extent (ha) with justification of method used (existing information or plot-based survey data)	3.2 Table 2 Figure 5, Appendix C
		☐ Identification of any TECs associated with the PCT (BAM Subsection 4.2.2)	N/A
		☐ Estimate of percent cleared value of dominant PCT (BAM Subsection 4.2.1(5.))	Table 3
		☐ Identification of any TEC on site that is not associated with the dominant PCT (Note: This TEC is required to best assessed and offset.)	NA
		☐ Equivalence with mapping units of previous vegetation maps reviewed as part of the assessment (i.e. equivalent mapping units)	Figure 5
		☐ Vegetation integrity of the PCT(s) on the subject land as individual vegetation zones	3.4 Table 3
		☐ Justification for how this was determined (i.e. qualitatively by observing values for the condition attributes set out in Table 2 of the BAM, or quantitatively by collecting field data for the condition attributes at a plot in accordance with BAM Subsection 4.3.4)	3.4 Table 3
		Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsections 4.4.4(5.)). Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, 4.3.3(5.) and BAM Appendix A):	
		☐ identify the PCT or vegetation class for which local benchmark data will be applied	N/A
		☐ identify published sources of local benchmark data (if benchmarks obtained from published sources	N/A

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	N/A
		☐ provide justification for use of local data rather than BioNet Vegetation Classification values	N/A
		MAPS AND TABLES	
		☐ Map of native vegetation extent within the subject land (as described in BAM Section 3.1)	Figure 3
		☐ Map of PCT/vegetation zones within the subject land (as described in BAM Section 4.2(1.))	Figure 3
		☐ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 3
		☐ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	N/A
		☐ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	N/A
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	
		☐ composition condition score	Table 3
		☐ structure condition score	
		☐ function condition score	
		☐ Report from BAM-C (small area module) including vegetation integrity scores (BAM Section 4.4)	Appendix E
		DATA	
		☐ All report maps as separate jpeg files	Yes, attached separately
		☐ Plot field data (MS Excel format)	Appendix C
		☐ Field data sheets (if relevant) for determining vegetation integrity (BAM Subsection 4.3.4)	Appendix C
Habitat suitability for threatened species	Chapter 5 and Section 9.1	INFORMATION	
		☐ Describe the review of existing information and any field survey undertaken to assess habitat constraints and microhabitats for threatened species within the subject land	3.1 4.1 4.3 Table 5 Figures 4-8

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ Determination of the suite of threatened species likely to occur on or use the proposed site according to Steps 1 and 2 in BAM Section 5.2 including species to be assessed for ecosystem credits and the list of species to be assessed for species credits	4.3 Table 5 Appendix B
		☐ list of ecosystem credit species derived from the TBDC (as described in BAM Subsection 5.2.1 and Section 5.2.2.) with justification for the exclusion of any ecosystem credit species based on habitat constraints (as described in BAM Subsection 5.2.2)	Table 6
		☐ Identification of candidate credit species that are at risk of an SAI and therefore, must be further assessed (BAM Section 9.1) Note: Candidate species credit species that are not at risk of an SAI and not incidentally recorded on the subject land do not require further assessment	4.4 Tables 6 & 10
		For candidate species credit species that are at risk of an SAI, a description of the species, any habitat constraints or microhabitats associated with the species on the subject land and information used to create the species polygon/s in accordance with Steps 3 to 5 of BAM Section 5.2 including:	
		☐ justification for determining that a candidate species credit species at risk of an SAI is unlikely to have suitable habitat on the subject land or specific vegetation zone (based on a field assessment of the subject land and published literature or an expert report prepared in accordance with Box 3 of the BAM)	5.4 Tables 6 & 10
		☐ determination of the presence of remaining candidate species credit species at risk of an SAI (by assuming presence, conducting a threatened species survey or an expert report). Note: If the subject land is mapped on an important habitat map for a species, or for a component of its habitat, the subject land is considered to have suitable habitat for the species to be present.	Tables 6 & 7
		☐ species polygons identifying the location and area of suitable habitat for each candidate threatened species at risk of an SAI that is recorded on the subject land and is measured by area, OR	N/A
		☐ species polygons identifying the area of suitable habitat and targeted surveys identifying the count and location of individuals on the subject land for each candidate threatened flora species at risk of an SAI that is recorded on the subject land and is measured by count	N/A
		☐ species polygons for each threatened species identified on the subject land that is not at risk of an SAI (i.e. incidentally observed during site visit)	Figures 10 - 13
		☐ Determination of habitat condition within species polygon/s for each threatened species (measured by area) at risk of an SAI or incidentally observed during the site visit (Step 6 of BAM Section 5.2)	Tables 6 & 7

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ For flora species credit species at risk of an SAI or incidentally observed during the site visit, provide a count, or an estimation, of the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(4.))	Table 6
		MAPS AND TABLES	
		☐ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	
		☐ any ecosystem credit species removed from the list on the basis of further assessment in accordance with BAM Subsections 5.2.2 and 5.2.3	Table 5
		☐ the sensitivity to gain class of each species (BAM Section 5.4)	Table 19
		☐ Table detailing species credit species within the subject land at risk of an SAI (BAM Section 9.1) or incidentally observed during the site visit including any associated habitat feature/components and its abundance (flora)/extent of habitat (flora and fauna) and biodiversity risk weighting (BAM Sections 5.2-5.4)	Table 6
		☐ Map of species credit species records within the subject land and species polygons for flora and fauna species at risk of an SAI or incidentally observed during the site visit (as described in BAM Subsection 5.2.5(1-7.))	Figure 11-17
		DATA	
		☐ Digital shape files of species polygon	Yes, attached separately
		☐ Species polygon map in jpeg format	Yes, attached separately
		☐ Expert reports and any supporting data used to support conclusions of the expert report	N/A
		☐ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	4.3 Appendix C Appendix D
Prescribed impacts	Chapter 6	INFORMATION	
		☐ Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K	5.7 Table 12
		MAPS AND TABLES	
		☐ If relevant, maps showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	NA
		DATA	
		☐ If relevant, digital shape files of prescribed impact feature locations	Yes, attached separately

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ Prescribed impact features map in jpeg format	Yes, attached separately
Avoid and minimise impacts	Chapter 7	INFORMATION	
		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:	Table 8
		☐ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Table 8
		☐ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	5.1
		☐ 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	5.1
		☐ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1.2 and 7.2.2)	5.1 Table 8
		☐ 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.))	5.1 Table 8
		MAPS AND TABLES	
		☐ Table of measures to be implemented before, during, and after construction to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 8
		☐ Map of the final proposal footprint, including construction and operation	Figure 2
		☐ Maps demonstrating indirect impact zones where applicable	Figure 2
		DATA	
		Digital shape files of:	
		☐ final proposal footprint	
		☐ direct and indirect impact zones	
		☐ Maps in jpeg format	
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	INFORMATION	
		Determine the impacts on native vegetation and threatened species habitat, including:	

S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	5.5 5.6 6.1
		☐ a description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal (as described in BAM Subsection 8.2)	Table 13
		☐ Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K.	Table 12
		MAPS AND TABLES	
		☐ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 15
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	INFORMATION	
		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 ☐ identify measures for which there is risk of failure ☐ evaluate the risk and consequence of any residual impacts ☐ document any adaptive management strategy proposed	Tables 8 & 13
		Identification of measures for mitigating impacts related to:	
		☐ displacement of resident fauna (as described in BAM Subsection 8.4.1)) ☐ 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)	Table 8
		☐ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Tables 8 & 14
		MAPS AND TABLES	
		☐ 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



S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
Thresholds for assessing and offsetting the impacts of the proposal	Chapter 9	INFORMATION	
		☐ Information from the TBDC and/or other sources to report on the current status of threatened species, threatened populations at risk of an SAIL and TEC/s for the proposal and	Table 9
		☐ Report on impacts of the proposal on TEC/s in accordance with BAM Subsection 9.2.1	N/A
		☐ Report on impacts of the proposal on threatened species and/or threatened populations at risk of an SAIL in accordance with BAM Section 9.1	Tables 9 & 12
		☐ Identification of impacts requiring offset in accordance with BAM Section 9.2	Tables 16 - 18
		☐ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	N/A
		☐ Identification of areas not requiring assessment in accordance with BAM Section 9.3	N/A
		MAPS AND TABLES	
		☐ Map showing the extent of TECs at risk of an SAIL within the subject land	N/A
		☐ Map showing location of threatened species at risk of an SAIL within the subject land	N/A
		Map showing location of:	
		☐ impacts requiring offset	Figure 11-17
		☐ impacts not requiring offset	N/A
		☐ areas not requiring assessment	N/A
		DATA	
		Digital shape files of:	
		☐ extent of TECs at risk of an SAIL within the subject land	N/A
		☐ location of threatened species at risk of an SAIL within the subject land	N/A
		☐ boundary of impacts requiring offset	Figure 17
		☐ boundary of impacts not requiring offset	N/A
		☐ boundary of areas not requiring assessment	N/A
		☐ Maps in jpeg format	
Applying the no net loss standard	Chapter 10	INFORMATION	





S-BDAR section	BAM ref.	BAM requirement	Section in the S-BDAR
		☐ Description of the impact on PCTs/TECs	6.1 Table 15
		☐ Description of the impact on the threatened species at risk of an SAI or incidentally observed via site visit	6.2 Table 13
		☐ Number of ecosystem credits required for impacts on biodiversity values according to BAM Subsection 9	1.8 Table 14
		☐ Number of species credits required for impacts on biodiversity values according to BAM Subsection 10.1.3, including any species credit species that has been incidentally observed on the subject land Note: Species credits for any species at risk of an SAI are calculated in the event that the decision-maker forms the opinion that the proposed impact is unlikely to be serious and irreversible and therefore can be offset.	1.8 Table 15
		☐ Identification of credit class for ecosystem credits and species credits according to BAM Section 10.2 (this can be generated from BAM-C)	1.8 Table 16
		MAPS AND TABLES	
		☐ Table showing biodiversity risk weightings	Tables 16 - 18
		☐ Table of BC Act listing status for PCTs and threatened species requiring offset	6.3 Table 16
		☐ Table of PCTs requiring offset and the number of ecosystem credits required (Subsection 10.2.1)	6.3 Table 16
		☐ Table of species at risk of an SAI or incidentally observed on site assessed for species credits and the number of species credits required	Table 17, Table 18



Appendix B – Likelihood of Occurrence (LoO) and Matters Requiring Additional Consideration

Stage 1 involved a preliminary desktop ‘likelihood of occurrence’ (LoO) assessment for threatened species identified. NSW BioNet records, habitat requirements and breeding and foraging behaviour were considered in relation to the habitat and location of the proposed action. Stage 2 involved refining the threatened species LoO assessment following field observations and further assessment of habitat constraints and the potential impact of the proposed action. The LoO classifications were assigned to each threatened species based on the criteria set out in below:

- None:

Habitat features within the area of interest are unsuitable for the species e.g., aquatic species within a terrestrial environment.
- Low:

The area of interest seldom contains suitable habitat for the species, no recent records (i.e., NSW BioNet records) occur with the area of interest.
- Moderate:

Important habitat features occur within the area of interest for the species. The area of interest may or may not be within the species indicative ‘known or predicted mapped distribution’. Species may or may not have been detected recently within the locality i.e., within NSW BioNet records.
- High:

High quality habitat features specifically associated with the species generally occur within the area of interest and is within the species known distribution. Recent NSW BioNET records have recently observed the species within the location.
- Known:

The species has been identified on site by EcoResolve following field surveys.

Table B1- Likelihood of Occurrence Assessment Terrestrial Species

Scientific Name (Common Name)	BC Act	EPBC Act	Habitat	Number of Records (DPE 2024)	Likelihood of Occurrence
<i>Acacia bynoeana</i> (Bynoe's Wattle)	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	102	Moderate.
<i>Actitis hypoleucos</i> (Common Sandpiper)	-	M, MAR	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	0	Low.
<i>Angophora inopina</i>	V	V	Endemic to the Central Coast region of NSW. The known northern limit is near Karuah where a disjunct population occurs; to the south populations extend from Toronto to Charmhaven with the main population occurring between Charmhaven and Morisset. Occurs most frequently in red bloodwood – scribbly gum woodland, wet heath, red mahogany – paperbark sedge woodland and stringybark – red bloodwood forest.	536	High.
<i>Anous stolidus</i> (Common Noddy)	-	MAR, M	During the non-breeding period, the species occurs in groups throughout the pelagic zone. During the breeding season, usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters.	0	Low.
<i>Anthochaera Phrygia</i> (Regent Honeyeater)	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	1	Moderate.
<i>Apus pacificus</i> (Fork-tailed Swift)	-	M	The Fork-tailed Swift is almost exclusively aerial, flying from less than one metre to at least 300 metres above ground and probably much higher.	1	Moderate.
<i>Ardenna grisea</i> (Sooty Shearwater)	-	V, MIG, MAR	the Sooty Shearwater breeds on islands off New South Wales (NSW) and Tasmania. The species occurs off the coast of south-east Queensland in small numbers and is a moderately common migrant and visitor to Victoria and South Australia	0	Low.
<i>Ardenna tenuirostris</i> (Short-tailed Shearwater)	-	MAR, M	<i>Ardenna tenuirostris</i> is an abundant seabird species in Australian waters, which migrate to the seas off the Aleutian Islands and Kamchatka in the Australian winter. In the austral spring, they migrate down the coast of California before crossing the Pacific back to Australia.	2	Low.
<i>Arenaria interpres</i> (Ruddy Turnstone)	-	V, M	Rocky shores	0	Low.
<i>Artamus cyanopterus cyanopterus</i> (Dusky Woodswallow)	V	-	The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris (Higgins and Peter 2002). Birds are also often observed in farmland, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.	0	Moderate.



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<i>Asperula asthenes</i> (Trailing Woodruff)	V	V	This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens-Wallis Lakes area. Damp sites, often along river banks.	1	Moderate.
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	E	E	The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spike rushes.	0	Low.
<i>Burhinus grallarius</i> (Bush Stone-curlew)	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and, in the south-east, it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	0	Moderate.
<i>Caladenia tessellate</i> (Thick-lip Spider Orchid)	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	1	Moderate
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	-	V, M	Freshwater or saltwater wetlands- the muddy edges of lagoons, swamps, lakes, dams, soaks, sewage dams or temporary floodwaters.	0	Low.
<i>Calidris canutus</i> (Red Knot)	-	V	The Red Knot is common in all the main suitable habitats around the coast of Australia. Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The only places it is not found in significant numbers are the northern part of the Great Australian Bight in South Australia and Western Australia, and along much of the NSW coast, where wader habitat is rather scarce (excluding the Hunter Estuary). It is widespread along the coast south of Townsville and along the coasts of NSW and Victoria. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps.	0	Low.
<i>Calidris ferruginea</i> (Curlew Sandpiper)	E	CE, MAR, M	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland	0	Low.
<i>Calidris melanotos</i> (Pectoral Sandpiper)	-	M	Tends to live and feed over shallow coastal waters- the estuaries, lagoons and channels around river and harbour entrances and along the shallows close in shore.	0	Low.
<i>Calidris ruficollis</i> (Red-necked Stint)	-	M	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in salt flats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation	0	Low.
<i>Callistemon linearifolius</i>	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	9	High
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)	V	E	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	1	High.
<i>Calyptrorhynchus lathamii lathamii</i> (South-eastern Glossy Black-Cockatoo)	V	V	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	23	Known
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	V	E	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	1	Moderate.
<i>Charadrius leschenaultia</i> (Greater Sand-plover)	V	-	Occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons. Non-breeding in Australia.	0	Low.
<i>Charadrius veredus</i> (Oriental Plover)	-	MAR, M	Non-breeding visitor to Australia, occurring in both coastal and inland areas. Rarely recorded in the south-east, with highest occurrences in Australia being in northern and north-western Australia. Spends a few weeks in coastal habitats before heading inland to flat grassy and semi-arid to arid grasslands.	0	Low.
<i>Chthonicola sagittate</i> (Speckled Warbler)	V	-	The Speckled Warbler lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	0	Low.
<i>Climacteris picumnus victoriae</i> (Brown Treecreeper (eastern subspecies))	V	V	Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and river red gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	1	Moderate.
<i>Corunastylis insignis</i> (Variable Midge Orchid)	CE	CE	Grows in patches of kangaroo grass amongst shrubs and sedges in heathland and forest. Associated vegetation at Chain Valley Bay is described as dry sclerophyll woodland dominated by scribbly gum, red bloodwood, smooth-barked apple and black she-oak.	0	Moderate.
<i>Corunastylis</i> sp. Charmhaven (NSW896673)	CE	CE	Corunastylis sp. Charmhaven (NSW896673) is currently only known from the Wyong Shire of NSW where it is restricted to a few locations in the Charmhaven, Warnervale and Tooheys Road (Bushells Ridge) areas. It occurs within low woodland to heathland with a shrubby understorey and ground layer. Dominants include Black She-oak (Allocasuarina littoralis), Prickly Tea-tree (Leptospermum juniperinum), Prickly-leaved Paperbark (Melaleuca nodosa), Narrow-leaved Bottlebrush (Callistemon linearis) and Zig-zag Bog-rush (Schoenus brevifolius).	0	Moderate.



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<i>Corybas dowlingii</i>	E	-	Sheltered areas such as gullies and southerly slopes in tall open forest on well-drained gravelly soil at elevations of 10-200 m.	2134	High.
<i>Crinia tinnula</i> (Wallum Froglet)	V	-	Wallum Froglets is found in acid paperbark swamps and sedge swamps of the coastal 'wallum' country. Their tadpoles are adapted to acid conditions and may be outcompeted by the Common Froglet. Males call from the base of vegetation in and around the breeding site and are almost impossible to locate. Calling occurs from Autumn to Spring, being most strongly associated with flooding following rainfall. Its range extends from SE QLD to the Kurnell Peninsular of Sydney.	4	High.
<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	10	High.
<i>Cuculus optatus</i> (Oriental Cuckoo, Horsefield's Cuckoo)	-	M, MAR	Occurs in a variety of environments throughout tropical and subtropical Australia extending from the Pilbara in WA to southern NSW east of the Great Dividing Range.	0	Low.
<i>Cynanchum elegans</i> (White-flowered Wax Plant)	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	0	Moderate.
<i>Daphoenositta chrysoptera</i> (Varied Sittella)	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	4	High.
<i>Dasyurus maculatus</i> (Spotted-tailed Quoll)	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	0	Moderate.
<i>Dasyurus maculatus maculatus</i> (Spotted-tailed Quoll (SE population))	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	0	High.
<i>Diomedea antipodensis</i> (Antipodean Albatross)	V	V	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. The Antipodean Albatross breeds biennially in colonies on ridges, slopes and plateaus of isolated subantarctic islands, usually in vegetation such as grass tussocks. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	0	Low.
<i>Diomedea antipodensis gibsoni</i> (Gibson's Albatross)	V	-	The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney and regularly occurs off the NSW coast usually between Green Cape and Newcastle. This species is known only to breed on the Adams, Disappointment and Auckland Islands in the subantarctic Auckland Island group. Potential forage in NSW waters during the winter is considered significant for the species.	0	Low.
<i>Diomedea epomophora</i> (Southern Royal Albatross)	V	V	Breeding occurs on Adams, Enderby and Auckland Islands (Auckland Islands group), Campbell Island, and on Taiaroa Head (Otago Peninsula, South Island), New Zealand. This otherwise pelagic species is most commonly recorded in New Zealand and South American waters in the non-breeding season, but may circumnavigate all the way around the Southern Ocean	0	Low.
<i>Diomedea exulans</i> (Wandering Albatross)	E	-	The Wandering Albatross is marine, pelagic and aerial.	0	Low.
<i>Diomedea sanfordi</i> (Northern Royal Albatross)	E	E	Marine, subtropical to sub-Antarctic oceans; occasionally further south into the Antarctic.	0	Low.
<i>Diuris praecox</i> (Rough Doubletail)	V	V	Occurs between Ourimbah and Nelson Bay. Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.	0	Moderate.
<i>Ephippiorhynchus asiaticus</i> (Black-necked Stork)	E	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.	1	Low.
<i>Epthianura albifrons</i> (White-fronted Chat)	V	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter.	0	Moderate.
<i>Erythrotriorchis radiatus</i> (Red Goshawk)	CE	E	The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia.	0	Moderate.
<i>Eucalyptus camfieldii</i>	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small, scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	0	Low.
<i>Eucalyptus parramattensis subsp. decadens</i>	V	V	Generally, occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.	0	Moderate.
<i>Eucalyptus parramattensis subsp. parramattensis</i> (Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas)	EP	EP	Occurs within Wyong in the Porter's Creek and the Wallarah Creek catchments, on sandy alluvium within a floodplain community which also supports swamp mahogany, forest red gum, red bloodwood as well as paperbarks.	4	Low.
<i>Euphrasia arguta</i>	CE	CE	Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest. Sites have either been logged in the last few decades or appear to have regrown from past clearing.	0	Moderate.
<i>Falco hypoleucos</i> (Grey Falcon)	E	V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	0	Moderate.



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<i>Falco subniger</i> (Black Falcon)	V	-	The Black Falcon is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day.	0	Low.
<i>Falsistrellus tasmaniensis</i> (Eastern False Pipistrelle)	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	0	Moderate.
<i>Gallinago hardwickii</i> (Latham's Snipe)	-	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and in saltmarsh and creek edges on migration.	2	Low.
<i>Glossopsitta pusilla</i> (Little Lorikeet)	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	14	High.
<i>Grantiella picta</i> (Painted Honeyeater)	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	0	Low.
<i>Grevillea parviflora subsp. parviflora</i> (Small-flowered Grevillea)	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	226	Known.
<i>Haematopus fuliginosus</i> (Sooty Oystercatcher)	V	-	In NSW the Sooty Oystercatcher occupies rocky headlands, reefs and offshore islands along the entire coast, apparently as a single continuous population.	0	Low.
<i>Haematopus longirostris</i> (Pied Oystercatcher)	E	-	The Pied Oystercatcher inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	0	Low.
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	V	MAR	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	8	High.
<i>Heleioporus australiacus</i> (Giant Burrowing Frog)	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	0	Low.
<i>Hibbertia procumbens</i> (Spreading Guinea Flower)	E	-	Within NSW, known from several locations only on the Central Coast in the Gosford and Wyong LGAs. These populations are at Bumble Hill near Yarramalong in Wyong LGA; Kulnura, Strickland State Forest, Mangrove Mountain, Somersby, Calga/Mt White and Peats Ridge in the Gosford LGA; and near Mogo Creek to the west of Mangrove Creek Dam. Majority of known populations occur within heath banksia scrub on skeletal sandy soils. May also be found associated with upland swamps on sandy deposits.	1	High.
<i>Hieraaetus morphnoides</i> (Little Eagle)	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	0	Moderate.
<i>Hirundapus caudacutus</i> (White-throated Needletail)	-	MAR, M, V	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	4	Moderate.
<i>Hoplocephalus bungaroides</i> (Broad-headed Snake)	V	V, M	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	0	Low.
<i>Hoplocephalus stephensii</i> (Stephens' Banded Snake)	V	-	The Stephens Banded Snake is found through the coast and adjacent ranges of NSW from the Central Coast northwards and into SE Queensland. It is most commonly found living in wet sclerophyll and rainforest areas but can be found in taller dry forest areas and even in some areas of dry forest where there is significant rock outcropping. They spend most of their time in tree-tops, either in large hollows or in dense vegetation, coming to the ground for forage for a range of vertebrates.	0	Moderate.
<i>Hydroprogne caspia</i> (Caspian Tern)	-	M	Patrols surf line and inshore waters. Prefers sheltered estuaries, inlets, bays, harbours and lagoons with muddy or sandy shores. Also extends well inland on freshwater or saltwater lakes, temporary floodwater, large rivers, reservoirs or sewage ponds.	1	Low.
<i>Isotoma fluviatilis subsp. fluviatilis</i>	-	Extinct	Grows in wet places around dams and creeks on coastal plains north and west of Sydney, south from Gloucester, sometimes becoming weedy in lawns.	0	Low.
<i>Ixobrychus flavicollis</i> (Black Bittern)	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	1	High.
<i>Lathamus discolor</i> (Swift Parrot)	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania, and nomadic, moving about in response to changing food availability.	4	High.
<i>Limosa lapponica</i> (Bar-tailed Godwit)	-	M	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	0	Low.
<i>Limosa lapponica baueri</i> (Nunivak Bar-tailed Godwit)	-	E, M	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	0	Low.



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<i>Litoria aurea</i> (Green and Golden Bell Frog)	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	179	High.
<i>Litoria brevipalmata</i> (Green-thighed Frog)	V	-	This species is distributed from south-east Queensland to the NSW Central Coast. It occurs in a range of habitat types including rainforest, moist eucalypt forest, dry eucalypt forest and heath, but is most closely associated with wetter forest types in the southern part of its range. Calling and breeding is highly correlated with heavy rainfalls that lead to the formation of large ephemeral pools in a range of sites, but always in association with some native vegetation. Calling occurring only for one or two nights at a time anywhere between September and May.	0	Moderate.
<i>Litoria littlejohni</i> (Littlejohn's Tree Frog)	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	0	Moderate.
<i>Lophoictinia isura</i> (Square-tailed Kite)	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100km2. They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	0	Moderate.
<i>Macronectes giganteus</i> (Southern Giant Petrel)	E	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20 S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	0	Low.
<i>Macronectes halli</i> (Northern Giant-petrel)	V	V	Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer.	0	Low.
<i>Maundia triglochinox</i>	V	-	Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Flowering occurs during warmer months. Diaspore is the seed and root tubers, which are probably dispersed by water.	9	High.
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	161	High.
<i>Melanodryas cucullata cucullata</i> (Hooded Robin (south-eastern form))	V	E	Occupy a wide range of eucalypt woodlands, Acacia shrublands and open forests.	0	Moderate.
<i>Micronomus norfolkensis</i> (Eastern Coastal Free-tailed Bat)	V	-	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures (OEH, 2022).	4	Known
<i>Miniopterus australis</i> (Little Bentwing-bat)	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat prefers moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	5	Known
<i>Miniopterus orianae oceanensis</i> (Large Bent-winged Bat)	V	-	Eastern Bent-winged-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops (OEH, 2019).	1	Known
<i>Mixophyes balbus</i> (Stuttering Frog)	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.	2	Low.
<i>Mixophyes iteratus</i> (Giant Barred Frog)	E	V	This species is found along larger streams of the coast and adjacent ranges of NSW and SE QLD. It inhabits rainforest and wet sclerophyll forest but is also found within cleared farmland where fringing vegetation is retained, including lantana beds. Many sites where the Giant Barred Frog is known to occur are the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters.	11	Low.
<i>Monarcha melanopsis</i> (Black-faced Monarch)	-	M	Found along the coast of eastern Australia, becoming less common further south. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	0	Moderate.
<i>Motacilla flava</i> (Yellow Wagtail)	-	MAR, M	Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range, it is also found in large forest clearings.	0	Low.
<i>Myiagra cyanoleuca</i> (Satin Flycatcher)	-	M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	0	Low.
<i>Myotis macropus</i> (Southern Myotis)	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. They generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	3	High.
<i>Neophema chrysostoma</i> (Blue-winged Parrot)	-	V	The blue-winged parrot is found across southeastern Australia. In eastern South Australia, it is found north to the Flinders Ranges, and across Victoria. It is more sporadic across central and western New South Wales and into Queensland, as far north as Diamantina National Park. It lives in savannah woodland, grasslands, orchards, farmlands, marshes, heath, dunes, and other open habitats up to 1,200 m (3,937 ft) above sea level. It is one of only three species of parrot that make regular yearly migrations over a sea or ocean, with many members of the species flying between Tasmania, where they breed in spring and summer, and the mainland, where they winter. Some birds, however, do remain in Tasmania over the winter and some remain on the mainland to breed in the summer.	0	Moderate.



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<i>Neophema pulchella</i> (Turquoise Parrot)	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	0	Low.
<i>Ninox connivens</i> (Barking Owl)	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	0	Low.
<i>Ninox strenua</i> (Powerful Owl)	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	10	High.
<i>Notamacropus parma</i> (Parma Wallaby)	V	V	Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	0	Low.
<i>Numenius madagascariensis</i> (Eastern Curlew)	-	CE	The Eastern curlew spends its breeding season in northeastern Asia, including Siberia to Kamchatka, and Mongolia. Its breeding habitat is composed of marshy and swampy wetlands and lakeshores. Most individuals winter in coastal Australia, with a few headings to South Korea, Thailand, Philippines and New Zealand, where they stay at estuaries, beaches, and salt marshes. It uses its long, decurved bill to probe for invertebrates in the mud. It may feed in solitude, but it generally congregates in large flocks to migrate or roost. Its call is a sharp, clear whistle, cuuue-reee, often repeated.	0	Low.
<i>Numenius phaeopus</i> (Whimbrel)	-	M, MAR	Intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. Roosts in mangroves and other structures flooded at high tide.	0	Low.
<i>Oxyura australis</i> (Blue-billed Duck)	V	-	Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	0	Low.
<i>Pachyptila turtur subantarctica</i> (Fairy Prion)	V	V	The fairy prion is the smallest prion, and it measures between 23 and 28 cm (9.1–11.0 in) long. [2] Its plumage is blue-grey on its upperparts, and white underneath. They have a dark "M" on their upperparts extending to their wingtips, and their tail is wedge-shaped with a dark tip. They have a blue bill and feet. The diet consists mainly of planktonic crustaceans and other tiny sea animals, which they feed at night from the water's surface. They breed colonially and prefer small islands. The nest is situated in soil, hidden by vegetation and is dug with the bill or feet, or it is in a hollow in a crevice. When coming back to their nest at night, they will coo softly and listen for their mate. The fairy prion is found throughout oceans and coastal areas in the Southern Hemisphere. Their colonies can be found on Chatham, Snares and Antipodes Islands of New Zealand, Bass Strait Islands of Australia, Falkland Islands, Marion Island, the Crozet Islands and Macquarie Island. Outside of the breeding season, the fairy prion is most often found feeding over deep waters, far from shore. During stormy weather it may come towards coastal habitats. It breeds on oceanic islands, where it nests in crevices on cliffs and rock falls or in burrows in soil, although it may also nest in scrub, herblands, tussock or pasture.	0	Moderate.
<i>Pandion cristatus</i> (Eastern Osprey)	V	M, MAR	Eastern Ospreys are found right around the Australian coastline, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	14	Low.
<i>Pandion haliaetus</i> (Osprey)	V	-	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	0	Moderate.
<i>Persicaria elatior</i>	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	1	Moderate.
<i>Petauroides Volans</i> (Greater Glider)	-	E	The Greater Glider occurs in eucalypt forests and woodlands. Utilise tree hollows	0	Moderate.
<i>Petaurus australis</i> (Yellow-bellied Glider)	V	V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	10	High.
<i>Petaurus australis australis</i> (Yellow-bellied Glider (South-eastern))	-	V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive ‘V’-shaped scar. Live in small family groups of two - six individuals and are nocturnal. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	0	Moderate
<i>Petaurus norfolcensis</i> (Squirrel Glider)	V	-	Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	28	High.



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<i>Petrogale penicillata</i> (Brush-tailed Rock-wallaby)	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	2	Low.
<i>Petroica boodang</i> (Scarlet Robin)	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	1	High.
<i>Phascogale tapoatafa</i> (Brush-tailed Phascogale)	V	-	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west off the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	0	Moderate.
<i>Phascolarctos cinereus</i> (Koala)	E	E	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	24	High.
<i>Phoniscus papuensis</i> (Golden-tipped Bat)	V	-	Distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to Bega in southern NSW. Found in rainforest and adjacent sclerophyll forest. Roost in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests located in rainforest gullies on small first- and second-order streams.	0	Low.
<i>Pluvialis fulva</i> (Pacific Golden Plover)	-	M	Mainly coastal habitats; usually in small parties or quite large flocks on estuaries, intertidal mudflats, beaches, reefs, saltmarshes and offshore islands; only rarely far inland.	0	Low.
<i>Pluvialis squatarola</i> (Grey Plover)	-	M, MAR, V	In Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes.	3	Low.
<i>Pomaderris brunnea</i> (Brown Pomaderris)	V	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	0	Low.
<i>Pomatostomus temporalis temporalis</i> (Grey-crowned Babbler (eastern subspecies))	V	-	In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open box-gum woodlands on the slopes, and box-cypress-pine and open box woodlands on alluvial plains.	0	Low.
<i>Potorous tridactylus tridactylus</i> (Long-nosed Potoroo (Southern Mainland))	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	0	Moderate.
<i>Pseudomys novaehollandiae</i> (New Holland Mouse)	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	0	Moderate.
<i>Pseudophryne australis</i> (Red-crowned Toadlet)	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain, these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	1	Low.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	68	High.
<i>Ptilinopus magnificus</i> (Wompoo Fruit-dove)	V	-	Distributed north of the Hunter River in NSW on the coast and coastal ranges. Inhabits rainforest, monsoon forest, adjacent eucalypt forest and brush box forest.	1	High.
<i>Ptilinopus regina</i> (Rose-crowned Fruit-dove)	V	-	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	0	Low.
<i>Ptilinopus superbus</i> (Superb Fruit-dove)	V	-	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	0	Low.
<i>Pycnoptilus floccosus</i> (Pilot bird)	-	V	Pilotbirds are endemic to south-east Australia. Upland Pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy Mountains in New South Wales and north-east Victoria (Higgins & Peter 2002; Loyn et al. 2021). Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne	0	Low.
<i>Rhipidura rufifrons</i> (Rufous Fantail)	-	M	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	0	Low.
<i>Rhizanthella slateri</i>	V, EP (Great Lakes)	E	Habitat requirements are poorly understood, and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	1	Moderate.
<i>Rhodamnia rubescens</i> (Scrub Turpentine)	CE	CE	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	15	Low.
<i>Rhodomyrtus psidioides</i> (Native Guava)	CE	CE	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	2	Low.



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<i>Rutidosis heterogama</i>	V	V	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	304	High.
<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheathtail-bat)	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	2	Known
<i>Scoteanax rueppellii</i> (Greater Broad-nosed Bat)	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	0	Moderate.
<i>Stagonopleura guttata</i> (Diamond Firetail)	V	V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Usually encountered in flocks of between 5 to 40 birds, occasionally more. Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting. Appears to be sedentary, though some populations move locally, especially those in the south. Has been recorded in some towns and near farm houses.	0	Moderate.
<i>Sterna hirundo</i> (Common Tern)	-	MAR, M	Non-breeding migrant to Australia, where it is widespread and common on the eastern coast south to eastern Victoria, and common on parts of the northern coast, mainly east of Darwin. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores.	0	Low.
<i>Sternula nereis nereis</i> (Fairy Tern)	-	V	Distribution includes the southern half of NSW coast. Fairy Terns utilise a variety of habitats including offshore, islands in estuaries or lakes, wetlands, beaches and spits.	0	Low.
<i>Stictonetta naevosa</i> (Freckled Duck)	V	-	The freckled duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.	0	Low.
<i>Symposiachrus trivirgatus</i>	-	MAR, M	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies, and waterside vegetation, as well as mangroves.	0	Low.
<i>Syzygium paniculatum</i> (Magenta Lilly Pilly)	E	V, M	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	3	Low.
<i>Tetratheca juncea</i> (Black-eyed Susan)	V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	3541	Known.
<i>Thelymitra adorata</i> (Wyong Sun Orchid)	CE	CE	Occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. The vegetation type in which the majority of populations occur (including the largest colony) is a spotted gum - ironbark forest with a diverse grassy understorey and occasional scattered shrubs.	0	High.
<i>Thesium australe</i> (Austral Toadflax)	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass.	0	Moderate.
<i>Tringa brevipes</i> (Grey-tailed tattler)	-	M, MAR	Sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves.	0	Low.
<i>Tringa nebularia</i> (Common Greenshank)	-	M, E	Habitat is diverse, both inland and coastal. Found inland on both permanent and temporary wetland- billabongs, swamps, lakes, floodplains, sewage, farms and saltwater ponds. On the coast, it uses sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons and occasionally rocky tidal edges.	0	Low.
<i>Tringa stagnatilis</i> (Marsh Sandpiper)	-	M, MAR	Permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	0	Low.
<i>Turnix maculosus</i> (Red-backed Button-quail)	V	-	Red-backed Button-quail inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. Observations of populations in other parts of its range suggest the species prefers sites near water, including grasslands and sedgelands near creeks, swamps and springs, and wetlands.	0	Low.
<i>Tyto novaehollandiae</i> (Masked Owl)	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	0	Known



Scientific Name (Common Name)	BC Act	EPBC Act	Habitat	Number of Records (DPE 2024)	Likelihood of Occurrence
<i>Tyto tenebricosa</i> (Sooty Owl)	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	0	Moderate.
<i>Uperoleia mahonyi</i> (Mahony's Toadlet)	E	E	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (<i>Shoenoplectus</i> spp., <i>Baumea</i> spp. and <i>Lepironia articulata</i>) and Broadleaf Cumbungi (<i>Typha orientalis</i>). Females have been recorded up to 400m from water-bodies indicating moderate dispersal distances and use of multiple habitat types. Tadpoles have been observed using leaf litter in the shallow verges of water bodies on sandy substrate. Rocks, logs and leaf litter may also be used for shelter and provide important foraging areas for invertebrate prey items.	0	Moderate.
<i>Vespadelus trououghtoni</i> (Eastern Cave Bat)	V	-	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	1	Moderate.

Key: V = Vulnerable, E = Endangered, CE = Critically Endangered, EP = Endangered Population, M = Migratory, MAR = Marine



Appendix C – Vegetation Survey Data

Table C1- BAM Plot Habitat Function Assessment

BAM Plot						Habitat Function			Tree Stem Size Class (cm)							Other	
Plot	PCT	Condition class	Easting	Northing	Bearing	Hollow trees	Litter Cover Mean (%)	Fallen Logs	<5	5 to 9	10 to 19	20 to 29	30 to 49	50 to 79	80+	Tree Regen	High Threat Exotic
BHMT1	3583	High	151.4957685	- 33.05661258	322	7	66	26	YES	YES	YES	YES	YES	3	1	NO	NO
ER092BHJC1	3583	High	151.5	-33.055841	129	1	52	40	YES	YES	YES	YES	YES	2	0	YES	NO
ER092BHJC2	3583	High	151.5	-33.055441	265	1	70	28	YES	YES	YES	YES	NO	6	1	YES	NO

Table C2- Floristics Cover and Abundance Data

BAM Plot		Composition (species richness)								Structure (cover %)									
Plot		TG	SG	GG	FG	EG	OG	Exotic	HTW	HTW (M)	TG	SG	GG	FG	EG	OG	Exotic	HTW	HTW (M)
BHMT1		4	11	3	0	1	1	0	0	0	72	35.11	11.1	0	0.1	70	0	0	0
ER092BHJC1		5	11	4	0	0	2	0	0	0	43	25	48.5	0	0	30	0	0	0
ER092BHJC2		5	9	6	0	0	2	0	0	0	52	26	70	3	0	20	0	0	0





Table C3 - Floristics Cover and Abundance Data

Family	Scientific Name	Common Name	Form	Plot ID					
				BHMT1		BHJC1		BHJC2	
				C	A	C	A	C	A
Fabaceae (Mimosoideae)	<i>Acacia spp.</i>	Wattle	Shrub (SG)					1	1
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-Oak	Tree (TG)			3	0	15	10
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	HTW					.01	1
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass	Grass & grasslike (GG)					.5	5
Proteaceae	<i>Banksia integrifolia</i>	Coast Banksia	Tree (TG)			5	7	2	1
Proteaceae	<i>Banksia serrata</i>	Old-man Banksia	Tree (TG)	2	5				
Proteaceae	<i>Banksia spinulosa</i>	Hairpin Banksia	Shrub (SG)	5	10	10	6	5	3
Fabaceae (Faboideae)	<i>Bossiaea obcordata</i>	Spiny Bossiaea	Shrub (SG)			3	3	1	2
Lauraceae	<i>Cassytha spp.</i>	-	Other (OG)			.5	10	.5	10
Polygalaceae	<i>Comesperma ericinum</i>	Pyramid Flower	Shrub (SG)			.01	1		
Myrtaceae	<i>Corymbia gummifera</i>	Red Bloodwood	Tree (TG)	5	1	15	4	15	2
Goodeniaceae	<i>Dampiera stricta</i>	-	Forb (FG)			3	15		
Fabaceae (Faboideae)	<i>Dillwynia retorta</i>	-	Shrub (SG)			3	2	2	2
Droseraceae	<i>Drosera binata</i>	Forked Sundew	Forb (FG)			.01	1	.1	3
Poaceae	<i>Entolasia stricta</i>	Wiry Panic	Grass & grasslike (GG)	10	500	40	1000	70	1000
Ericaceae	<i>Epacris pulchella</i>	Wallum Heath	Shrub (SG)	1	10	.5	10	1	5
Myrtaceae	<i>Eucalyptus capitellata</i>	Brown Stringybark	Tree (TG)	50	5				
Myrtaceae	<i>Eucalyptus globoidea</i>	White Stringybark	Tree (TG)			5	1	5	1
Myrtaceae	<i>Eucalyptus haemastoma</i>	Broad-leaved Scribbly Gum	Tree (TG)	15	4	15	4	15	3
Myrtaceae	<i>Eucalyptus resinifera</i>	Red Mahogany	Tree (TG)	0	0				
Proteaceae	<i>Grevillea parviflora</i>	-	Shrub (SG)	0.01	1				
Proteaceae	<i>Hakea bakeriana</i>	-	Shrub (SG)	10	10	2	3		
Proteaceae	<i>Hakea dactyloides</i>	Finger Hakea	Shrub (SG)	2	5	5	10	3	2
Fabaceae (Faboideae)	<i>Hovea linearis</i>	-	Forb (FG)			.01	1	.01	1
Proteaceae	<i>Isopogon anemonifolius</i>	Broad-leaf Drumsticks	Shrub (SG)			5	10	3	2





Family	Scientific Name	Common Name	Form	Plot ID					
				BHMT1		BHJC1		BHJC2	
				C	A	C	A	C	A
Proteaceae	<i>Lambertia formosa</i>	Mountain Devil	Shrub (SG)	2	5	5	3	5	3
Cyperaceae	<i>Lepidosperma laterale</i>	Variable Sword-sedge	Grass & grasslike (GG)	1	3	5	20		
Myrtaceae	<i>Leptospermum juniperinum</i>	Prickly Tea-tree	Shrub (SG)			5	3	10	3
Myrtaceae	<i>Leptospermum polygalifolium</i>	Tantoon	Shrub (SG)	2	5				
Myrtaceae	<i>Leptospermum trinervium</i>	Slender Tea-tree	Shrub (SG)	10	4				
Lindsaeaceae	<i>Lindsaea dimorpha</i>	-	Fern (EG)	0.1	10				
Lomandraceae	<i>Lomandra obliqua</i>	-	Grass & grasslike (GG)			0.5	5	.5	10
Fabaceae (Faboideae)	<i>Mirbelia rubiifolia</i>	Heathy Mirbelia	Shrub (SG)					.01	1
Iridaceae	<i>Patersonia sericea</i>	Silky Purple-Flag	Forb (FG)			5	20	3	10
Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung	Shrub (SG)	1	3				
Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower	Shrub (SG)	0.1	2				
Apiaceae	<i>Platysace linearifolia</i>	-	Shrub (SG)	2	30				
Cyperaceae	<i>Ptilothrix deusta</i>	-	Grass & grasslike (GG)					.01	1
Poaceae	<i>Rytidosperma pallidum</i>	Silvertop Wallaby Grass	Grass & grasslike (GG)					.01	1
Poaceae	<i>Rytidosperma spp.</i>	-	Grass & grasslike (GG)			3	5		
Elaeocarpaceae	<i>Tetralochea juncea</i>	Black-eyed Susan	Shrub (SG)			2	3		
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass	Grass & grasslike (GG)	0.1	2			.01	1
Xanthorrhoeaceae	<i>Xanthorrhoea spp.</i>	-	Other (OG)	70	150	30	20	20	25





Plate 1 BHJC1 BAM Plot Centerline



Plate 2 BHJC2 BAM Plot Centerline



Plate 3 BHMT1 BAM Plot Centerline



Appendix D – Weather Conditions

While the threatened species identified in the tables below are not retained for further assessment in **Table 5**, targeted and incidental survey efforts relevant to these species were undertaken throughout the progression and refinement of the Project as the scope evolved over time. The survey dates, weather conditions, and associated methodologies have been retained herein to provide a complete and transparent account of the survey effort undertaken across the Modification Disturbance Area, and to demonstrate the broader robustness of the assessment process.

Table D 1 – Camera Trapping Weather Conditions

Type	Number of cameras deployed	Bait	Target species	Deployment	Collection	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)
							Min.	Max.		
Ground	2	Sardines	<i>Dasyurus maculatus</i> (Spotted-tailed quoll)	13/02/2023	17/02/2023.	13/02/2023	21.7	25.4	15.4	26
						14/02/2023	18.1	23.6	0.2	26
						15/02/2023	17.6	29.1	11	26
						16/02/2023	15.6	36.1	0	26
						17/02/2023	15.4	32.8	0	26
Arboreal	2	Oat and peanut butter mix.	<i>Pseudomys novaehollandiae</i> (New-Holland Mouse) <i>Cercartetus nanus</i> (Eastern Pygmy possum) <i>Petrogale penicillata</i> (Brush-tailed Rock-Wallaby) <i>Phascogale tapoatafa</i> (Brush Tailed Rock- Phascogale) <i>Planigale maculata</i> (Common Planigale) <i>Potorous tridactylus tridactylus</i> (Long-nosed Potoroo) <i>Petauroides volans</i> (Greater Glider) <i>Petaurus norfolcensis</i> (Squirrel Glider) <i>Petaurus australis australis</i> (Yellow-bellied Glider)	13/02/2023	17/02/2023.	13/02/2023	21.7	25.4	15.4	26
						14/02/2023	18.1	23.6	0.2	26
						15/02/2023	17.6	29.1	11	26
						16/02/2023	15.6	36.1	0	26
						17/02/2023	15.4	32.8	0	26
4 arboreal, 1 star picket outside HBT	5	N/A	<i>Calyptrorhynchus lathamii lathamii</i> (South-eastern Glossy Black Cockatoo)	16/07/2024	24/07/2024.	16/07/2024	5.3	14.9	0	39
						17/07/2024	10.7	19.2	0	28
						18/07/2024	6.5	19.1	0	20
						19/07/2024	5.2	17.6	0	30
						20/07/2024	11.3	17.6	0	54
						21/07/2024	9.0	19.1	0	28
						22/07/2024	2.0	19.4	0	15
						23/07/2024	1.9	20.1	0	15
						24/07/2024	1.4	20.4	0	24
						25/07/2014	4.2	22.8	0	31
						26/07/2024	9.2	21.6	4.2	19
						16/07/2024	5.3	14.9	0	39
						17/07/2024	10.7	19.2	0	28
						18/07/2024	6.5	19.1	0	20
						19/07/2024	5.2	17.6	0	30
						20/07/2024	11.3	17.6	0	54
						21/07/2024	9.0	19.1	0	28
						22/07/2024	2.0	19.4	0	15
						23/07/2024	1.9	20.1	0	15
						24/07/2024	1.4	20.4	0	24
						25/07/2014	4.2	22.8	0	31
						26/07/2024	9.2	21.6	4.2	19

Table D 2 – Funnel Trapping Weather Conditions

Number of funnel traps deployed	Target species	Deployment	Collection	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)	Relative humidity (%)	Moon phase
					Min.	Max.				
18	<i>Hoplocephalus bitorquatus</i> (Pale headed snake) <i>Hoplocephalus bungaroides</i> (Broad-headed Snake)	13/02/2023	17/02/2023.	11/02/2023 (2 days prior to survey)	-	-	0	-	-	-





Number of funnel traps deployed	Target species	Deployment	Collection	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)	Relative humidity (%)	Moon phase
					Min.	Max.				
	<i>Hoplocephalus stephensii</i> (Stephens' Banded Snake)			13/02/2023	20.2	25.9	15.4	26	92	Waning Gibbous (56% illuminated)
				14/02/2023	18.8	22.5	0.2	26	80	Last Quarter (46% illuminated)
				15/02/2023	17.0	26.3	11	26	83	Waning Crescent (35% illuminated)
				16/02/2023	12.8	28.7	0	26	79	Waning Crescent (24% illuminated)
				17/02/2023	14.6	28.9	0	26	82	Waning Crescent (15% illuminated)

Table D 3 – Call-playback (Gliders and Owls) and Spotlighting

Target species	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)
		Min.	Max.			
<i>Petauroides volans</i> (Greater Glider)	16/05/2023	8.5	21.9	0	19	No data.
<i>Petaurus norfolcensis</i> (Squirrel Glider)	22/05/2023	2.9	20.7	0	No data.	No data.
<i>Petaurus australis australis</i> (Yellow-bellied Glider)	23/05/2023	1.4	21.3	0	13	No data.
<i>Ninox connivens</i> (Barking Owl)	18/07/2024	6.5	19.1	0	6 NW	45
<i>Tyto novaehollandiae</i> (Masked Owl)	22/07/2024	2.0	19.4	0	15	77
<i>Ninox strenua</i> (Powerful Owl)	23/07/2024	1.9	20.1	0	15	77
<i>Tyto tenebricosa</i> (Sooty Owl)	24/07/2024	1.4	20.4	0	24	70

Table D 4 –Bird Survey Weather Conditions

Target species	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)
		Min.	Max.			
Dawn & Dusk Bird Survey	14/02/2023	18.8	22.5	No data	No data	No data
<i>Stictonetta naevosa</i> (Freckled Duck)	15/02/2023	17.0	26.3	No data	No data	No data
<i>Rostratula australis</i> (Painted Snipe)						
<i>Pycnoptilus floccosus</i> (Pilot Bird)						
<i>Botaurus poiciloptilus</i> (Australasian Bittern)						
<i>Limosa lapponica baueri</i> (Bar-tailed Godwit)						
<i>Ephippiorhynchus asiaticus</i> (Black-necked Stork)						
<i>Burhinus grallarius</i> (Bush Stone-curlew)						
<i>Calidris ferruginea</i> (Curlew Sandpiper)						
<i>Artamus cyanopterus cyanopterus</i> (Dusky Woodswallow)						
<i>Numenius madagascariensis</i> (Eastern Curlew)						
<i>Pandion cristatus</i> (Eastern Osprey)						
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)						
<i>Calyptorhynchus lathami lathami</i> (South-eastern Glossy Black-Cockatoo)						
<i>Charadrius leschenaultia</i> (Greater Sand-Plover)						
<i>Falco hypoleucos</i> (Grey Falcon)						
<i>Hieraaetus morphnoides</i> (Little Eagle)						
<i>Glossopsitta pusilla</i> (Little Lorikeet)						





Target species	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)
		Min.	Max.			
<i>Grantiella picta</i> (Painted Honeyeater) <i>Erythrotriorchis radiatus</i> (Red Goshawk) <i>Calidris canutus</i> (Red Knot) <i>Anthochaera Phrygia</i> (Regent Honeyeater) <i>Lophoictinia isura</i> (Square-tailed Kite) <i>Lathamus discolor</i> (Swift Parrot) <i>Asperula asthenes</i> (Trailing Woodruff) <i>Daphoenositta chrysoptera</i> (Varied Sittella) <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle) <i>Hirundapus caudacutus</i> (White-throated Needletail) Stag Watch & Hollow Search <i>Tyto novaehollandiae</i> (Masked Owl)	16/02/2023	12.8	28.7	No data	No data	No data
	06/01/2026	16.7	28.7	0	22	79
	07/01/2026	17.9	30.4	0	26	84
	08/01/2026	15.7	33.3	6	28	78

Table D 5 – Call-Playback and Spotlighting Weather Conditions (Frogs)

Target species	Start	End	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)	Barometric pressure (hPa)	Cloud cover (oktas)	Moon phase
				Min.	Max.						
<i>Heleioporus australiacus</i> (Giant Burrowing Frog) <i>Mixophyes iteratus</i> (Giant Barred Frog) <i>Litoria aurea</i> (Green and Golden Bell Frog) <i>Litoria brevipalmata</i> (Green-thighed Frog) <i>Litoria littlejohni</i> (Littlejohn's Tree Frog) <i>Uperoleia mahonyi</i> (Mahony's Toadlet) <i>Mixophyes balbus</i> (Stuttering Frog) <i>Crinia tinnula</i> (Wallum Froglet)	28/11/2022	01/12/2022	Previous month	-	-	41.2	-	-	-	-	-
			Previous 7 days	-	-	2.8	-	-	-	-	-
			Previous 24 hours	-	-	2.8	-	-	-	-	-
			28/11/2022	13.7	22.8	0	31	55	1015.9	No data	Waxing Gibbous (66% illuminated)
			29/11/2022	11.9	25.2	0	33	40	1012.7	No data	Waxing Crescent (33% illuminated)
			30/11/2022	10.9	22.3	0	26	55	1016.8	No data	Waxing Crescent (44% illuminated)
			01/12/2022	12.6	21.6	0	24	56	1014.8	No data	First Quarter (55% illuminated)
	06/01/2026	08/01/2026	Previous month	-	-	108.0	-	-	-	-	-
			Previous 7 days	-	-	26.0	-	-	-	-	-
			Previous 24 hrs	16.2	31.1	5.4	22.9	74	1012.3		-
			06/01/2026	16.7	28.7	0	22	79	1017.5	-	Waning Gibbous (93% illuminated)
			07/01/2026	17.9	30.4	0	26	84	1019.7	7 th	Waning Gibbous (86% illuminated)
			08/01/2026	15.7	33.3	6	28	78	1017.4	-	Waning Gibbous (78% illuminated)
	27/01/2026	27/01/2026	Previous 24 hrs	20.5	28.1	0	25.3	61	1012.5	8 th	-



Target species	Start	End	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)	Barometric pressure (hPa)	Cloud cover (oktas)	Moon phase
				Min.	Max.						
			27/01/2026	16.0	27.7	0	22.3	69	1015.0	8 th	Waxing Gibbous (63% illuminated)

Table D 6 –Bat Survey Weather Conditions

Type of recorder	Number of recorders deployed	Target species	Deployment	Collection	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)	Relative humidity (%)
						Min.	Max.			
Anabat (Acoustic Recorder)	2	<i>Micronomus norfolkensis</i> (Eastern Coastal Free-tail Bat)	13/02/2023	17/02/2023	13/02/2023	21.7	25.4	15.4	26	No data
		<i>Falsistrellus tasmaniensis</i> (Eastern False Pipistrelle)			14/02/2023	18.1	23.6	0.2	26	No data
		<i>Phoniscus papuensis</i> (Golden Tipped Bat)			15/02/2023	17.6	29.1	11	26	No data
		<i>Scoteanax rueppellii</i> (Greater Broad-nosed Bat)			16/02/2023	15.6	36.1	0	26	No data
		<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)			17/02/2023	15.4	32.8	0	26	No data
		<i>Miniopterus orianae oceanensis</i> (Large Bent-winged Bat)								
		<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)								
		<i>Miniopterus australis</i> (Little Bentwing-bat)	11/12/2023	15/12/2023	11/12/2023	17.6	29.4	0	No data	No data
		<i>Myotis macropus</i> (Southern Myotis)			12/12/2023	18.9	27.7	0	No data	No data
					13/12/2023	17.6	29.3	0	No data	No data
					14/12/2023	21.5	39.4	0	No data	No data
					15/12/2023	21.2	26.3	0	No data	No data
Breeding Habitat Search	-		-	-	07/01/2026	17.9	30.4	0	26	84
					08/01/2026	15.7	33.3	6	28	78

Table D 7 – Spotlighting (Reptiles)

Target species	Start	End	Date	Temperature (°C)		Rainfall (mm)	Max wind speed km/h)	Relative humidity (%)	Moon phase
				Min.	Max.				
<i>Hoplocephalus bitorquatus</i> (Pale headed snake)	28/11/2022	01/12/2022	28/11/2022	13.7	22.8	0	31	55	Waxing Gibbous (66% illuminated)
<i>Hoplocephalus bungaroides</i> (Broad-headed Snake)			29/11/2022	11.9	25.2	0	33	40	Waxing Crescent (33% illuminated)
<i>Hoplocephalus stephensii</i> (Stephens' Banded Snake)			30/11/2022	10.9	22.3	0	26	55	Waxing Crescent (44% illuminated)
			01/12/2022	12.6	21.6	0	24	56	First Quarter (55% illuminated)

Table D 8 – Spot Assessment Technique (SAT Plots)

Target species	Start	End	Date	Temperature (°C)		Rainfall (mm)	Max wind speed (km/h)	Relative humidity (%)
				Min.	Max.			
<i>Phascolarctos cinereus</i> (Koala)	15/02/2023	16/02/2023	Preceding 3 days	-	-	15.6	-	-
			15/02/2023	17.0	26.3	11	No data	No data
			16/02/2023	12.8	28.7	0	No data	No data

Table D 9 – Threatened Flora Transects (5-10m transect)

Target species	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)	Relative humidity (%)
		Min.	Max.			
	Preceding 3 months	-	-	139	-	-





Target species	Date	Temperature (°C)		Rainfall (mm)	Mean wind speed (km/h)	Relative humidity (%)
		Min.	Max.			
<i>Acacia bynoeana</i> (Bynoe's Wattle)	11/10/2023	14.0	24.3	0	11	69
<i>Angophora inopina</i> (Charmhaven Apple)	12/10/2023	8.6	33.2	0	9.5	49
<i>Asperula asthenes</i> (Trailing Woodruff)						
<i>Caladenia tessellate</i> (Thick-Lip Spider Orchid)						
<i>Corunastylis insignis</i> (Variable Midge Orchid)						
<i>Isotoma fluviatilis subsp. fluviatilis</i> (Presumed Extinct)						
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)						
<i>Melaleuca groveana</i>						
<i>Persoonia hirsuta</i> (Hairy Geebung)						
<i>Pomaderris brunnea</i> (Brown Pomaderris)						
<i>Prostanthera askania</i> (Tranquillity Mintbush)						
<i>Pterostylis gibbosa</i> (Illawarra Greenhood)						
<i>Rhizanthella slateri</i> (Eastern Underground Orchid)						
<i>Rhodamnia rubescens</i> (Scrub Turpentine)						
<i>Rhodomyrtus psidioides</i> (Native Guava)						
<i>Rutidosia heterogama</i> (Heath Wrinklewren)						
<i>Tetratheca glandulosa</i> (Tetratheca glandulosa)						
<i>Tetratheca juncea</i> (Black-eyed Susan)						
<i>Thelymitra adorata</i> (Wyang Sun Orchid)						
<i>Cynanchum elegans</i> (White-flowered Wax Plant)						
<i>Genoplesium insigne</i> (Variable Midge Orchid)						
<i>Grevillea parviflora subsp. parviflora</i> (Small-flowered Grevillea)						
<i>Corunastylis insignis</i> (Variable Midge Orchid)	Preceding 3 months	-	-	191	-	-
<i>Corunastylis sp. Charmhaven</i> (Charmhaven)	13/02/2023	20.2	25.9	15.4	26	No data
<i>Eucalyptus Camfieldii</i> (Camfield's Stringybark)	14/02/2023	18.8	22.5	0.2	No data	No data
<i>Eucalyptus parramattensis subsp. decadens</i> (Earp's Gum)						
<i>Eucalyptus parramattensis subsp. parramattensis</i> (Paramatta Red Gum)						
<i>Euphrasia arguta</i> (Eyebrights)						
<i>Maundia triglochinos</i>						
<i>Diuris praecox</i> (Rough Doubletail)						
<i>Thesium australe</i> (Austral Toadflax)						
<i>Persicaria elatior</i> (Tall Knotweed) ¹²	Preceding 3 months	-	-	303.6	-	-
<i>Syzygium paniculatum</i> (Magenta Lilly Pilly)	16/05/2023	8.5	21.9	0	No data	No data
	23/05/2023	1.4	20.7	0	No data	No data
<i>Corybas dowlingii</i> (Red Helmet Orchid)	Preceding 3 months	-	-	240.4	-	-
	22/06/2023	2.9	17.9	0	No data	No data
<i>Genoplesium branwhiteorum</i>	Preceding 3 months	-	-	416.2	-	-
	16/03/2026	19.0	22.8	0	22	88

¹² *Persicaria elatior* and *Syzygium paniculatum* were surveyed, however, they are no longer associated with PCT 3581 and they have not been considered any further.



Appendix E – Biodiversity Credit Report





BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00062096/BAAS17065/25/00062109	ER092_Cooranbong_SSD_S_BDAR	09/04/2026
Assessor Name	Assessor Number	BAM Data version *
Arne Henry Bishop	BAAS17065	Current classification (live - default) (94)
Proponent Names	Report Created	BAM Case Status
	26/06/2026	Finalised
Assessment Revision	BOS entry trigger	Assessment Type
1		Major Projects
Date Finalised	* 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.	
26/06/2026		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Lathamus discolor / Swift Parrot		

Additional Information for Approval

Assessment Id	Proposal Name	Page 1 of 4
00062096/BAAS17065/25/00062109	ER092_Cooranbong_SSD_S_BDAR	







BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3583-Hunter Coast Lowland Scribbly Gum Forest	Not a TEC	2.9	83	0	83

Assessment Id

00062096/BAAS17065/25/00062109

Proposal Name

ER092_Cooranbong_SSD_S_BDAR

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Streamlined Biodiversity Development Assessment Report
Cooranbong Stockpile Expansion Project





BAM Biodiversity Credit Report (Like for like)

3583-Hunter Coast Lowland Scribbly Gum Forest	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 3583, 3592, 3594	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	3583_High	Yes	83	Wyong, 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
Calyptrorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	3583_High	2.9	95.00
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	3583_High	2.9	95.00
Lathamus discolor / Swift Parrot	3583_High	1.1	55.00
Petaurus norfolcensis / Squirrel Glider	3583_High	2.9	95.00
Tetradlea juncea / Black-eyed Susan	3583_High	2.9	95.00
Tyto novaehollandiae / Masked Owl	3583_High	2.9	95.00

Credit Retirement Options

Like-for-like credit retirement options

Assessment Id

00062096/BAAS17065/25/00062109

Proposal Name

ER092_Cooranbong_SSD_S_BDAR

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Streamlined Biodiversity Development Assessment Report
Cooranbong Stockpile Expansion Project





BAM Biodiversity Credit Report (Like for like)

Calyptrorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	Spp	IBRA subregion
	Calyptrorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	Any in NSW
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Spp	IBRA subregion
	Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Any in NSW
Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Tetradlea juncea / Black-eyed Susan	Spp	IBRA subregion
	Tetradlea juncea / Black-eyed Susan	Any in NSW
Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW

Assessment Id

00062096/BAAS17065/25/00062109

Proposal Name

ER092_Cooranbong_SSD_S_BDAR

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Appendix F –

CPHR supporting email for SBDAR Approach

EcoResolve



Environment & Design

From: [REDACTED]

Sent: Tuesday, 11 November 2025 10:57 AM

To: [REDACTED]

[REDACTED]

Cc: [REDACTED]

[REDACTED]

Subject: RE: CPHR site visit request - Mod 4 - Cooranbong Coal Stockpile Extension (SSD-5145-Mod-4) (Lake Macquarie City)

The Biodiversity Credit Report (Appendix E of BDAR) shows the project has been entered and completed as a Part 4 Development (Small Area) Assessment Type under Tab 1 of BAM-C. This is not the recommended approach given the project is considered SSD.

The case will need to be re-entered and resubmitted. An SSD may meet the criteria for *Streamlined Assessment Module – Small Areas* (the module) in Appendix C of the Biodiversity Assessment Method (BAM) 2020. Please note that the streamlined assessment modules under BAM are intended to provide flexibility for low-risk scenarios, so that assessment effort matches risk. As such the assessor needs to provide an evidence-based justification why use of the streamlined module meets the SEARs.

There is currently no option for applying this module to an SSD application in the *Biodiversity Offsets and Agreement Management System* (BOAMS). The recommended systems approach is that you use the regular BAM-C option (being Major Projects) and exclude irrelevant data points, being species credit species that are not at risk of Serious and Irreversible Impacts (SAIL) within Tab 5. Please note this is an interim measure, as a more accurate selection is not currently available.

The Biodiversity Development Assessment Report (BDAR) will have to include the following:

- provide evidence of the survey results/photos and assessment undertaken to support eligibility of the streamlined assessment module for this modification,
- provide justification for the exclusion of species credits species (being the assessment via Appendix C),
- Include this communication as evidence for support of the approach to BAM-C
- outline available information about the original impact of the development and consider any measures already taken to avoid, minimise or offset the impact on biodiversity values in connection with the approval before the proposed modification

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Environment & Design

- assess any new impacts on biodiversity values resulting from the modification of the development in accordance with the Biodiversity Assessment Method streamlined assessment module
- identify offset requirements and any new measures to avoid and minimise impacts in accordance with the Biodiversity Assessment Method – streamlined assessment module.

Recommended action:

The Accredited Assessor will need to start a new BAM-C case where they will need to select 'Major Project' as Assessment Type in Tab1 and assess the proposal against all of the Candidate Species which are generated in Tab 5.

Note: please ensure Hunter Regional Planning Team – DPE has been assigned as the 'Consent Authority' in Case Parties.

Adding Hunter Regional Planning as a case party on BAM-C

- On the Parent Case
- Click 'New' next to 'Case Parties'
- Select 'Consent Authority Member', click 'Next'
- Search for the 'Hunter Regional Planning Team – DPE'
- Select the correct username and click 'Save'

Please submit all data required to DPIE as well as uploading to the BAM-C. Please also email the data package directly huntercentralcoast@environment.nsw.gov.au.

Appendix K of the BAM (2020) provides details of the minimum information requirements to be provided.

Kind regards,

[Redacted Signature]

Senior Regional Biodiversity Conservation Officer

Conservation Programs, Heritage and Regulation

Department of Climate Change, Energy, the Environment and Water

www.dccceew.nsw.gov.au

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Appendix G

– MNES

Assessment of Significance Report

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Cooranbong Entry Site Stockpile Extension Project

Likelihood of occurrence analysis and assessment of the
significance of potential impacts on Matters of National
Environmental Significance

1 Executive Summary

This report assesses the potential significance of the impacts of extending the existing coal stockpile at the Northern Coal Services Cooranbong Entry Site ('the proposed action') on Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A self-assessment process determined if any MNES likely or known to occur within the proposed action area was likely to be significantly impacted by the proposed action. The assessment process considered both desktop and field survey results. Assessments of Significance (AoS) for MNES likely to be impacted were undertaken in accordance with the Significant Impact Guidelines 1.1 for MNES (DEWHA, 2013).

The proposed action is likely to have a significant impact upon two (2) MNES species, *Grevillea parviflora subsp. parviflora* (Small Flowered Grevillea), and *Tetratheca juncea* (Black-eyed Susan), and may potentially impact a further nine (9) MNES species, including four (4) orchid species: *Corunastylis insignis* (*syn. Genoplesium insigne*) (Variable Midge Orchid), *Corunastylis sp.* Charmhaven (*syn. Genoplesium branwhiteorum*), *Rhizanthella slateri* (Eastern Underground Orchid), and *Thelymitra adorata* (Wyong Sun Orchid), and five (5) fauna species: *Calyptorhynchus lathami* (Glossy Black-Cockatoo), *Petaurus australis* (Yellow-bellied Glider), *Pteropus poliocephalus* (Grey-headed Flying Fox), *Lathamus discolor* (Swift Parrot), and *Phascolarctos cinereus* (Koala) (**Attachment 2**).

This report forms part of biodiversity impact assessments prepared for Northern Coal Services Pty Ltd (Northern Coal Services Pty Ltd) for the proposed stockpile extension at the Cooranbong Entry Site. This report and associated works (desktop assessment and field surveys) were conducted by EcoResolve Pty Ltd (EcoResolve) during 2022–2023. EcoResolve has assessed an area of ~12 ha surrounding the existing Cooranbong Entry Site and the proposed action area. The size and extent of the impact footprint of the proposed action is up to 2.97 ha.



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2.1 Introduction

This report details a self-assessment process which reviews and highlights potential impacts associated with the proposed extension of the coal stockpile at the Northern Coal Services Pty Ltd (Northern Coal Services Pty Ltd) Cooranbong Entry Site (the 'proposed action') and determines whether a referral may be required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This assessment ensures that impacts upon all Matters of National Environmental Significance (MNES) listed under the EPBC Act, including flora and fauna species and associated habitats, threatened ecological communities (TECs) and other MNES, are considered. The final size and extent of the proposed footprint is still to be refined. EcoResolve has assessed an area of ~12 ha surrounding the existing Cooranbong Entry Site and the proposed action area. The size and extent of the impact footprint of the proposed action is up to 2.97 ha.

2.2 Methodology

The methodology was comprised of three stages of desktop assessments which were refined with field observations and targeted survey results.

2.3 Desktop Assessment

Stage 1 of the desktop assessment determined the Likelihood of Occurrence (LoO) of MNES within the proposed action area (**Attachment 1; Table 4**). It included a review of the existing desktop research previously conducted by EcoResolve, consisting of:

- A review of existing vegetation mapping, habitat mapping and reports of relevance to proposed action area and surrounding locality.
- Database searches to identify records of the threatened entities and MNES that may occur within 10 km of the proposed action area, including:
 - Office of Environment Energy and Science (EES) BioNET database.
 - Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool.
 - Use of the New South Wales (NSW) BAM Credit Calculator to generate a list of threatened species requiring specific targeted survey.
- Identify all threatened species, populations and ecological communities to be targeted during field surveys using knowledge of habitat requirements and characteristics of the proposed action area.

Additional sources of information used in the assessment included:

- Proposal layers and concept designs provided by the Northern Coal Services Pty Ltd.
- Australian Government's Species Profiles and Threats (SPRAT) database (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>).
- NSW EES's Threatened Species Profiles (<http://www.environment.nsw.gov.au/threatenedspeciesapp/>).
- Australia's IBRA Bioregions and sub-regions (<http://www.environment.gov.au/land/nrs/science/ibra>).
- DPI profiles of threatened species, populations, and ecological communities.

- EES Vegetation Information System (VIS) Mapping (<http://www.environment.nsw.gov.au/research/VISmap.htm>).
- NSW Biodiversity Values and Important Habitat Maps.
- Department of Planning Industry and Environment BAM (DPIE, 2020).

Stage 2 refined the LoO by analysing the potential impact of the proposed action, the results of the field observations and targeted surveys (**Section 2.2**), species specific information contained in the SPRAT, including conservation advice and recovery plans, species sightings data contained in the NSW BioNet Atlas, NSW Threatened Biodiversity Profiles and vegetation data contained in the NSW BioNet VIS. The distribution and habitat requirements of each MNES were then considered to determine if a significant impact was possible (**Attachment 1; Table 5**).

Stage 3 was applied where an impact on an MNES had the potential to be significant. An Assessment of Significance (AoS) was conducted according to the Significant Impact Guidelines 1.1 for MNES (**Attachment 2**; DEWHA, 2013).

2.4 Field Survey

Field surveys were completed by EcoResolve during 2022–2023. **Attachment 3** contains a complete survey timetable and details of the survey methods applied for each species.

2.4.1 Flora Survey

Vegetation integrity surveys were undertaken in accordance with the BAM, and included:

- Review of the identification and assessment of the condition of vegetation communities, including any Threatened Ecological Communities.
- Use of BAM plots to gather specific vegetation floristics, condition and habitat feature data as per the BAM.
- Recording all survey locations and threatened flora sites with a handheld GPS..

Two (2) BAM plots were undertaken to measure the composition, structure and functional components of the site's native vegetation cover. Where possible, BAM plots were placed in a manner that best reflected the biological character of the vegetation zone being assessed (i.e., avoided placement of plots near ecotones and disturbed boundaries).

Each BAM plot included:

- One standard 20 x 20 m plot, to assess the composition and structure attributes, including trees, shrubs, grasses, forbs, ferns and other growth forms;
- One standard 20 x 50 m plot (1,000 m²) to assess the function attributes: number of large trees (i.e., > 50cm DBH), stem size class, tree regeneration, length of fallen logs, high threat exotic vegetation cover and hollow-bearing trees (HBTs); and
- Five 1 m² sub-plots to assess average litter cover for the plots.

Surveys for threatened flora were undertaken using a transect-based method with reference to '*Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method*' (DPIE 2020). Targeted flora survey timing corresponded with the prescribed survey period, as indicated by the BAM Calculator candidate species list (**Attachment 3**).

2.4.2 Fauna Surveys

Targeted surveys were conducted for species identified through the Biodiversity Opportunities and Constraints Assessment (**Attachment 3**). Fauna surveys performed used the following methods:

- Remote infrared cameras baited with tinned cat food bait and/or a rolled oat, honey and peanut butter mixture. This methodology is used in place of the now obsolete wire cage methodology.
- Spotlighting for relevant targeted nocturnal fauna species during their survey period
- Spot Assessment Technique (SAT) to assess Koala activity within the site, if suitable habitat occurs in the site.
- Placement of stationary ultrasonic bat call detection equipment in potential flyways
- Frog and reptile census will be conducted if and where suitable habitats are recorded within the site.
- Identification of fauna habitat features, and an assessment of their condition and value to threatened species.
- Incidental observations of fauna species and indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches, and diggings)
- Pitfall and funnel trapping
- Taking photographs of any significant ecological values occurring within the site

All survey locations, locations of any threatened species, populations and/or ecological communities and notable habitat features were recorded with a handheld GPS.

3 Results summary

Stage 1 of the desktop assessment identified one-hundred and twenty-six (126) MNES with some potential of occurring in the locality of the proposed action, including forty-five (45) marine/migratory species and one (1) conservation dependant (CD) species (**Table 4**).

The preliminary assessment assigned a moderate or high LoO to forty-six (46) MNES including four (4) marine/migratory species (**Table 21**). These species were further assessed following field surveys and further desktop assessment of habitat constraints (**Table 5**). The refined results identified fourteen (14) MNES species to consider using the Significant Impact Guidelines (DEWHA, 2013).

The Assessments of Significance concluded that the proposed action is likely to have a significant impact upon two (2) MNES flora species, *Tetratheca juncea* (Black-eyed Susan) and *Grevillea parviflora subsp. parviflora* (Small-flowered Grevillea).

The proposed action may potentially impact a further nine (9) MNES species, including four (4) orchid species: *Corunastylis insignis* (*syn. Genoplesium insigne*) (Variable Midge Orchid), *Corunastylis sp.* Charmhaven (*syn. Genoplesium branwhiteorum*), *Rhizanthella slateri* (Eastern Underground Orchid), and *Thelymitra adorata* (Wyang Sun Orchid), and five (5) fauna species: *Calyptorhynchus lathami lathami* (Glossy Black-Cockatoo), *Petaurus australis* (Yellow-bellied Glider), *Pteropus poliocephalus* (Grey-headed Flying Fox), *Lathamus discolor* (Swift Parrot), and *Phascolarctos cinereus* (Koala) (**Attachment 2**).



Refinement to the original project design and footprint has been applied to avoid and mitigate some of the impacts anticipated. Subsequently, the significance of impacts has been reduced slightly, however change in the likelihood of a significant impact upon many of the affected species has not changed.

Table 21. Summary of significant impact assessment for MNES and Marine species.

Scientific Name	Common Name	EPBC Act	Significant impacts possible?	Significant impacts likely?
<i>Acacia bynoeana</i>	Bynoe's Wattle	V	No	No
<i>Actitis hypoleucos</i>	Common Sandpiper	MAR, MIG	Not assessed - presence unlikely	No
<i>Angophora inopina</i>	Charmhaven Apple	V	No	No
<i>Anous stolidus</i>	Common Noddy	MAR, MIG	Not assessed - presence unlikely	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	No	No
<i>Apus pacificus</i>	Fork-tailed Swift	MAR, MIG	No	No
<i>Ardenna grisea</i>	Sooty Shearwater	MAR, MIG	Not assessed - presence unlikely	No
<i>Arenaria interpres</i>	Ruddy Turnstone	V, MIG	Not assessed - presence unlikely	No
<i>Asperula asthenes</i>	Trailing Woodruff	V	No	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	Not assessed - presence unlikely	No
<i>Caladenia tessellata</i>	Thick-lip Spider Orchid	V	No	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MAR, MIG	Not assessed - presence unlikely	No
<i>Calidris canutus</i>	Red Knot	E	Not assessed - presence unlikely	No
<i>Calidris ferugiana</i>	Curlew Sandpiper	CE, MAR, MIG	Not assessed - presence unlikely	No
<i>Calidris melanotos</i>	Pectoral Sandpiper	MAR, MIG	Not assessed - presence unlikely	No
<i>Calidris ruficollis</i>	Red-necked Stint	MIG	Not assessed - presence unlikely	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	E	No	No
<i>Calonectris leucomelas</i>	Streaked Shearwater	MAR, MIG	Not assessed - presence unlikely	No
<i>Calyptrorhynchus lathamii lathamii</i>	Glossy Black-Cockatoo	V	Yes	Potential
<i>Carcharodon carcharias</i>	Great White Shark	V	Not assessed - presence unlikely	No
<i>Caretta caretta</i>	Loggerhead Turtle	E	Not assessed - presence unlikely	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	No	No
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	Not assessed - presence unlikely	No
<i>Charadrius veredus</i>	Oriental Plover	MAR, MIG	Not assessed - presence unlikely	No



Scientific Name	Common Name	EPBC Act	Significant impacts possible?	Significant impacts likely?
<i>Chelonia mydas</i>	Green Turtle	V	Not assessed - presence unlikely	No
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	Not assessed - presence unlikely	No
<i>Corunastylis insignis</i>	Variable Midge Orchid	CE	Yes	Potential
<i>Corunastylis sp. Charmhaven</i>	-	CE	Yes	Potential
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	Yes	No
<i>Cuculus optatus</i>	Oriental Cuckoo, Horsefield's Cuckoo	MAR, MIG	Not assessed - presence unlikely	No
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	No	No
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	E	No	No
<i>Dermochelys coriacea</i>	Leathery Turtle	E	Not assessed - presence unlikely	No
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	Not assessed - presence unlikely	No
<i>Diomedea epomophora</i>	Southern Royal Albatross	V	Not assessed - presence unlikely	No
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E	Not assessed - presence unlikely	No
<i>Diuris praecox</i>	Rough Doubletail	V	No	No
<i>Epinephelus daemeli</i>	Black Cod	V	Not assessed - presence unlikely	No
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	V	Not assessed - presence unlikely	No
<i>Erythrorhynchus radiatus</i>	Red Goshawk	E	No	No
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	No	No
<i>Eucalyptus parramattensis subsp. decadens</i>	Earp's Gum	V	No	No
<i>Eucalyptus parramattensis subsp. parramattensis</i> – Endangered Population		EP	No	No
<i>Euphrasia arguta</i>		CE	No	No
<i>Falco hypoleucos</i>	Grey Falcon	V	No	No
<i>Fregata ariel</i>	Lesser Frigatebird	MAR, MIG	Not assessed - presence unlikely	No
<i>Fregata minor</i>	Great Frigatebird	MAR, MIG	Not assessed - presence unlikely	No
<i>Gallinago hardwickii</i>	Latham's Snipe	MAR, MIG	Not assessed - presence unlikely	No



Scientific Name	Common Name	EPBC Act	Significant impacts possible?	Significant impacts likely?
<i>Grantiella picta</i>	Painted Honeyeater	V	Not assessed - presence unlikely	No
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flowered Grevillea	V	Yes	Yes
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	MAR	No	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	Not assessed - presence unlikely	No
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	V, MAR, MIG	No	No
<i>Hoplocephalus bungaroides</i>	Broad-headed snake	V	Not assessed - presence unlikely	No
<i>Hydroprogne caspia</i>	Caspian Tern	MIG	Not assessed - presence unlikely	No
<i>Lamna nasus</i>	Porbeagle	MIG	Not assessed - presence unlikely	No
<i>Lathamus discolor</i>	Swift Parrot	CE	Yes	Potential
<i>Limosa lapponica</i>	Bar-tailed Godwit	MAR, MIG	Not assessed - presence unlikely	No
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit	E, MIG	Not assessed - presence unlikely	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	V	No	No
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	No	No
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	Not assessed - presence unlikely	No
<i>Macronectes halli</i>	Northern Giant-petrel	V	Not assessed - presence unlikely	No
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	No	No
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern)	E	No	No
<i>Mixophyes balbus</i>	Stuttering Frog	V	Not assessed - presence unlikely	No
<i>Mixophyes iteratus</i>	Giant Barred Frog	V	Not assessed - presence unlikely	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	MAR, MIG	No	No
<i>Motacilla flava</i>	Yellow Wagtail	MAR, MIG	Not assessed - presence unlikely	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	MAR, MIG	Not assessed - presence unlikely	No
<i>Natator depressus</i>	Flatback Turtle	V	Not assessed - presence unlikely	No
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	Not assessed - presence unlikely	No



Scientific Name	Common Name	EPBC Act	Significant impacts possible?	Significant impacts likely?
<i>Notamacropus parma</i>	Parma Wallaby	V	Not assessed - presence unlikely	No
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	Not assessed - presence unlikely	No
<i>Numenius phaeopus</i>	Whimbrel	MIG, MAR	Not assessed - presence unlikely	No
<i>Onychoprion anaethetus</i>	Bridles Tern	MIG, MAR	Not assessed - presence unlikely	No
<i>Pachyptila turtur subantarctica</i>	Fairy Prion	V	No	No
<i>Pandion cristatus</i>	Eastern Osprey	MAR, MIG	Not assessed - presence unlikely	No
<i>Persicaria elatior</i>	Tall Knotweed	V	No	No
<i>Petauroides volans</i>	Greater Glider	E	No	No
<i>Petaurus australis australis</i>	Yellow-bellied Glider	V	Yes	Potential
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V	Not assessed - presence unlikely	No
<i>Phaethon lepturus</i>	White-tailed Tropicbird	MAR, MIG	Not assessed - presence unlikely	No
<i>Phascogale carolinensis</i>	Koala	E	Yes	Potential
<i>Pluvialis fulva</i>	Pacific Golden Plover	MAR, MIG	Not assessed - presence unlikely	No
<i>Pomaderris brunnea</i>	Brown Pomaderris	V	Not assessed - presence unlikely	No
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo	V	No	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	No	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Yes	Potential
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	E	Not assessed - presence unlikely	No
<i>Pycnoptilus floccosus</i>	Pilot bird	V	Not assessed - presence unlikely	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	MAR, MIG	Not assessed - presence unlikely	No
<i>Rhizanthella slateri</i>		E	Yes	Unlikely
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	No	No
<i>Rhodomertus psidioides</i>	Native Guava	CE	No	No
<i>Rostratula australis</i>	Australian Painted Snipe	E, MAR	No	No
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	No	No



Scientific Name	Common Name	EPBC Act	Significant impacts possible?	Significant impacts likely?
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CD	Not assessed - presence unlikely	No
<i>Stagonopleura guttata</i>	Diamond Firetail	V	No	No
<i>Stercorarius parasiticus</i>	Arctic Jaeger	MAR, MIG	Not assessed - presence unlikely	No
<i>Sterna hirundo</i>	Common Tern	MAR, MIG	Not assessed - presence unlikely	No
<i>Sternula nereis nereis</i>	Fairy Tern	V	Not assessed - presence unlikely	No
<i>Symposiachrus trivirgatus</i>	Spectacled Monarch	MAR, MIG	Not assessed - presence unlikely	No
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	No	No
<i>Tetradlea juncea</i>	Black-eyed Susan	V	Yes	Yes
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross	V	Not assessed - presence unlikely	No
<i>Thalassarche bulleri</i>	Pacific Albatross	V	Not assessed - presence unlikely	No
<i>Thalassarche cauta</i>	Shy Albatross	E	Not assessed - presence unlikely	No
<i>Thalassarche eremita</i>	Chatham Albatross	E	Not assessed - presence unlikely	No
<i>Thalassarche impavida</i>	Campbell Albatross	V	Not assessed - presence unlikely	No
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	Not assessed - presence unlikely	No
<i>Thalassarche salvini</i>	Salvin's Albatross	V	Not assessed - presence unlikely	No
<i>Thalassarche steadi</i>	White-capped Albatross	V, MAR, MIG	Not assessed - presence unlikely	No
<i>Thelymitra adorata</i>	Wyong Sun Orchid	CE	Yes	Potential
<i>Thesium australe</i>	Austral Toadflax	V	No	No
<i>Tringa brevipes</i>	Grey-tailed Tattler	MIG, MAR	Not assessed - presence unlikely	No
<i>Tringa nebularia</i>	Common Greenshank	MAR, MIG	Not assessed - presence unlikely	No
<i>Tringa stagnatilis</i>	Marsh Sandpiper	MAR, MIG	Not assessed - presence unlikely	No
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	E	No	No

Note: V = Vulnerable, E = Endangered, CE = Critically Endangered, MAR = Marine, MIG = Migratory, CD = Conservation Dependant



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5 Attachment 1 – Likelihood of Occurrence Assessment

Stage 1 of the desktop assessment involved a preliminary 'likelihood of occurrence' (LoO) determination for threatened species identified in **Table 4**. NSW BioNet records, habitat requirements and breeding and foraging behaviour were considered in relation to the location of the proposed action. The LoO classifications in **Table 4** were assigned to each threatened species based on the criteria set out in **Table 2**.

Stage 2 involved assessing the potential for impact on moderate or high LoO species (**Table 25**). The moderate or high LoO threatened species list was then refined following field observations and further assessment of habitat constraints and the potential impact of the proposed action. The survey outcome classifications in **Table 25** were assigned to each threatened species based on the criteria set out in **Table 3**.

Table 22 Likelihood of Occurrence criteria.

Likelihood of Occurrence	Definition (species specific)
None	Habitat features within the area of interest are unsuitable for the species e.g., aquatic species within a terrestrial environment.
Low	The area of interest seldom contains suitable habitat for the species, no recent records (i.e., NSW BioNet records) occur with the area of interest.
Moderate	Important habitat features occur within the area of interest for the species. The area of interest may or may not be within the species indicative 'known or predicted mapped distribution'. Species may or may not have been detected recently within the locality i.e., within NSW BioNet records.
High	High quality habitat features specifically associated with the species generally occur within the area of interest and is within the species known distribution. Recent NSW BioNET records have recently observed the species within the location.

Table 23 Potential for impact analysis criteria.

Survey Outcomes	Definition
None	Habitat analysis only following site inspection. No targeted surveys required.
Potential	Targeted surveys performed outside guideline specifications and/or cryptic nature of the threatened



	species require further targeted surveys to determine the species presence or absence.
Absent	Targeted surveys performed adhering to guideline specification. No populations or individuals were identified on site.
Present	Targeted surveys performed adhering to guideline specification. Threatened species has been identified on site during field observations.

Table 24 Likelihood of Occurrence from desktop assessments on EPBC Act listed species within the area of interest (10km radius of proposed action area).

Note: V = Vulnerable, E = Endangered, CE = Critically Endangered, MAR = Marine, MIG = Migratory.

Scientific Name (Common Name)	BC Act	EPBC Act	Habitat (DPiE; DCCEEW, 2023)	Number of Records (DPHI 2024)	Likelihood of Occurrence
<i>Acacia bynoeana</i> (Bynoe's Wattle)	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	102	Moderate
<i>Actitis hypoleucos</i> (Common Sandpiper)	-	MAR, MIG	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	0	Low
<i>Angophora inopina</i> (Charmhaven Apple)	V	V	Endemic to the Central Coast region of NSW. The known northern limit is near Karuah where a disjunct population occurs; to the south populations extend from Toronto to Charmhaven with the main population occurring between Charmhaven and Morisset. Occurs most frequently in red bloodwood – scribbly gum woodland, wet heath, red mahogany – paperbark sedge woodland and stringybark – red bloodwood forest.	536	High
<i>Anous stolidus</i> (Common Noddy)	-	MAR, MIG	During the non-breeding period, the species occurs in groups throughout the pelagic zone. During the breeding season, usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters.	0	Low
<i>Anthochaera phrygia</i> (Regent Honeyeater)	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	1	Moderate
<i>Apus pacificus</i> (Fork-tailed Swift)	-	MAR, MIG	The Fork-tailed Swift is almost exclusively aerial, flying from less than one metre to at least 300 metres above ground and probably much higher.	1	Moderate
<i>Ardenna grisea</i> (Sooty Shearwater)	-	MAR, MIG	In Australia, the Sooty Shearwater breeds on islands off New South Wales (NSW) and Tasmania. The species occurs off the coast of south-east Queensland in small numbers and is a moderately common migrant and visitor to Victoria and South Australia. The Sooty Shearwater is found in the southern hemisphere during summer, where the species breeds around New Zealand, southern Australia and southern South America. During winter (non-breeding season) most birds move to the North Pacific Ocean, but some move into the North Atlantic Ocean, or remain in the southern hemisphere. The Sooty Shearwater occurs in New Zealand during September to May, where it is common along both the east and west coasts. On the mainland, the species breeds on headlands and islands, as far north as Three Kings Island. Further offshore it breeds on Chatham, Antipodes and Auckland Islands. During the southern hemisphere summer, the species ranges from breeding islands south to Antarctic waters (as far as the iceberg-belt), although some remain in northern hemisphere.	0	Low
<i>Ardenna tenuirostris</i> (Short-tailed Shearwater)	-	MAR, MIG	<i>Ardenna tenuirostris</i> is an abundant seabird species in Australian waters, which migrate to the seas off the Aleutian Islands and Kamchatka in the Australian winter. In the austral spring, they migrate down the coast of California before crossing the Pacific back to Australia.	2	Low
<i>Arenaria interpres</i> (Ruddy Turnstone)	-	V, MIG	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In north Australia it is known to occur in a wide variety of habitats and may prefer wide mudflats. Surveys have demonstrated that the Ruddy Turnstone can live away from coastal areas in habitats such riverbeds, and on inland lakes and adjacent farmland (Higgins & Davies 1996).	0	Low
<i>Asperula asthenes</i> (Trailing Woodruff)	V	V	This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens-Wallis Lakes area. Damp sites, often along riverbanks.	1	Moderate
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	E	E	The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spike rushes.	0	Low
<i>Caladenia tessellata</i> (Thick-lip Spider Orchid)	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	1	High
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	-	MAR, MIG	Freshwater or saltwater wetlands- the muddy edges of lagoons, swamps, lakes, dams, soaks, sewage dams or temporary floodwaters.	0	Low
<i>Calidris canutus</i> (Red Knot)	-	E	The Red Knot is common in all the main suitable habitats around the coast of Australia. Very large numbers are regularly recorded in north-west Australia, with 40 Mile Beach and Roebuck Bay being strongholds. The only places it is not found in significant numbers are the northern part of the Great Australian Bight in South Australia and Western Australia, and along much of the NSW coast, where wader habitat is rather scarce (excluding the Hunter Estuary). It is widespread along the coast south of Townsville and along the coasts of NSW and Victoria. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats, and sandy beaches of sheltered coasts, in estuaries, bays, inlets,	0	Low



Scientific Name (Common Name)	BC Act	EPBC Act	Habitat (DPIE; DCCEEW, 2023)	Number of Records (DPHI 2024)	Likelihood of Occurrence
			lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools, and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps.		
<i>Calidris ferruginea</i> (Curlew Sandpiper)	E	CE, MAR, MIG	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland	0	Low
<i>Calidris melanotos</i> (Pectoral Sandpiper)	-	MAR, MIG	Tends to live and feed over shallow coastal waters- the estuaries, lagoons and channels around river and harbour entrances and along the shallows close in shore.	0	Low
<i>Calidris ruficollis</i> (Red-necked Stint)	-	M	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation	0	Low
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)	V	E	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	1	High
<i>Calonectris leucomelas</i> (Streaked Shearwater)	-	MAR, MIG	Recorded in tropical waters from Broome across Cape York; and SE QLD to southern NSW.	0	Low
<i>Calyptorhynchus lathami</i> <i>lathami</i> (Glossy Black-Cockatoo)	V	V	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> spp. Tends to prefer drier forest types with a middle stratum of <i>Allocasuarina</i> below <i>Eucalyptus</i> or <i>Angophora</i> . Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	23	Known
<i>Carcharodon carcharias</i> (Great White Shark)	-	V	Found in coastal waters around Australia, South Africa, California and northeastern USA. The great white can swim at the surface, as well as more than 250m deep.	0	None
<i>Caretta caretta</i> (Loggerhead Turtle)	E	E	Loggerhead turtles have a worldwide tropical and subtropical distribution. In Australia, they occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of Queensland, Northern Territory, Western Australia and New South Wales.	2	Low
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	1	Moderate
<i>Charadrius leschenaultia</i> (Greater Sand Plover)	V	V	Primarily found in coastal areas of NSW, this species inhabits sheltered sandy, shelly, or muddy beaches and estuaries with extensive intertidal mudflats or sandbanks. During high tide, they roost on sandy beaches and rocky shores, and begin foraging on wet ground at low tide, typically away from the water's edge. They may forage and roost alongside other waders. Their diet consists of insects, crustaceans, polychaete worms, and molluscs, and they locate prey by running short distances, pausing to observe, and then collecting the prey.	0	Low
<i>Charadrius veredus</i> (Oriental Plover)	-	MAR, MIG	Non-breeding visitor to Australia, occurring in both coastal and inland areas. Rarely recorded in the south east, with highest occurrences in Australia being in northern and north-western Australia. Spends a few weeks in coastal habitats before heading inland to flat grassy and semi-arid to arid grasslands.	0	Low
<i>Chelonia mydas</i> (Green Turtle)	V	V	Green turtles occur in seaweed-rich coral reefs and inshore seagrass pastures in tropical and subtropical areas of the Indo-Pacific region.	0	Low
<i>Climacteris picumnus victoriae</i> (Brown Treecreeper (eastern subspecies))	V	V	Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and river red gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	1	Low
<i>Corunastylis insignis</i> (Variable Midge Orchid)	CE	CE	Recorded from four localities between Chain Valley Bay and Wyong in Wyong local government area. A small population also occurs within Lake Macquarie LGA. Appears to be associated with PCT 1636 Scribbly Gum – Red Bloodwood – <i>Angophora inopina</i> (not always present) heathy woodland on lowlands of the Central Coast and variations containing <i>Angophora costata</i> (Smooth-barked Apple).	0	Moderate



Scientific Name (Common Name)	BC Act	EPBC Act	Habitat (DPIE; DCCEEW, 2023)	Number of Records (DPHI 2024)	Likelihood of Occurrence
<i>Corunastylis</i> sp. Charmhaven (syn. <i>Genoplesium branwhitorum</i>)	CE	CE	Currently only known from the Wyong Shire of NSW where it is restricted to a few locations in the Charmhaven, Warnervale and Tooheys Road (<i>Bushells Ridge</i>) areas. It occurs within low woodland to heathland with a shrubby understorey and ground layer. Dominants include Black She-oak (<i>Allocasuarina littoralis</i>), Prickly Tea-tree (<i>Leptospermum juniperinum</i>), Prickly-leaved Paperbark (<i>Melaleuca nodosa</i>), Narrow-leaved Bottlebrush (<i>Callistemon linearis</i>) and Zig-zag Bog-rush (<i>Schoenus brevifolius</i>).	0	Moderate
<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	10	High
<i>Cuculus optatus</i> (Oriental Cuckoo, Horsefield's Cuckoo)	-	MAR, MIG	Occurs in a variety of environments throughout tropical and subtropical Australia extending from the Pilbara in WA to southern NSW east of the Great Dividing Range.	0	Low
<i>Cynanchum elegans</i> (White-flowered Wax Plant)	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	0	Moderate
<i>Dasyurus maculatus maculatus</i> (Spotted-tailed Quoll)	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria, and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath, and inland riparian forest, from the sub-alpine zone to the coastline.	0	Moderate
<i>Dermochelys coriacea</i> (Leathery Turtle)	V	E	Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW.	0	Low
<i>Diomedea antipodensis</i> (Antipodean Albatross)	V	V	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. The Antipodean Albatross breeds biennially in colonies on ridges, slopes and plateaus of isolated subantarctic islands, usually in vegetation such as grass tussocks. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	0	Low
<i>Diomedea epomophora</i> (Southern Royal Albatross)	V	V	Breeding occurs on Adams, Enderby and Auckland Islands (Auckland Islands group), Campbell Island, and on Taiaroa Head (Otago Peninsula, South Island), New Zealand. This otherwise pelagic species is most recorded in New Zealand and South American waters in the non-breeding season, but may circumnavigate all the way around the Southern Ocean	0	Low
<i>Diomedea sanfordi</i> (Northern Royal Albatross)	E	E	Marine, subtropical to sub-Antarctic oceans; occasionally further south into the Antarctic.	0	Low
<i>Diuris praecox</i> (Rough Doubletail)	V	V	Occurs between Ourimbah and Nelson Bay. Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.	0	Moderate
<i>Epinephelus daemeli</i> (Black Cod)	-	V	In Australia, the distribution of black cod ranges from southern Queensland through NSW to northern Victoria. However, records from Queensland and Victoria are rare, and the single specimen recorded from South Australian waters is considered a vagrant. The NSW coastline forms the species' main range, both in Australia and internationally. Black cod are known to occur to some degree in all six NSW Marine Parks – Lord Howe, Cape Byron, Solitary Island, Port Stephens, Jervis Bay and Batemans Bay	0	Low
<i>Eretmochelys imbricata</i> (Hawksbill Turtle)	V	V	Found mainly throughout the world's tropical oceans, predominantly in coral reefs	0	Low
<i>Erythroriorchis radiatus</i> (Red Goshawk)	CE	E	Occurs coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia.	0	Moderate
<i>Eucalyptus camfieldii</i>	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small, scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	0	Low
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	V	V	Generally, occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.	0	Moderate
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> (Threatened population)	EP	EP	The population of <i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> in Wyong and Lake Macquarie local government areas is at the north eastern limit of the range of the species and is disjunct from other known populations of the subspecies. The current population of the subspecies is estimated to be about 1300 trees in Wyong local government area and about 10 trees in Lake Macquarie local government area. The population is threatened by grazing (which may affect regeneration), localised clearing and effects of septic overflow. Planned road construction and future development may substantially reduce the population and its habitat.	4	Low
<i>Euphrasia arguta</i>	CE	CE	Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest. Sites have either been logged in the last few decades or appear to have regrown from past clearing.	0	Moderate
<i>Falco hypoleucos</i> (Grey Falcon)	E	V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	0	Moderate



Scientific Name (Common Name)	BC Act	EPBC Act	Habitat (DPIE; DCCEEW, 2023)	Number of Records (DPHI 2024)	Likelihood of Occurrence
<i>Fregata ariel</i> (Lesser Frigatebird)	-	MAR, MIG	This species occurs across tropical and subtropical waters in the Pacific and Indian Oceans, and the Atlantic coast of Brazil. In Australia this species is known from records around the coastal areas of the continent, however rarely south of Perth across to the southern extent of NSW. Frigatebirds take fish in flight from the surface of the ocean.	0	None
<i>Fregata minor</i> (Great Frigatebird)	-	MAR, MIG	A seabird with records around most of Australia's coast, predominantly concentrated to the north east of the continent. Some vagrants have been recorded inland however these are exceptional occurrences.	0	None
<i>Gallinago hardwickii</i> (Latham's Snipe)	-	MAR, MIG	Latham's Snipe is a non-breeding migrant to the southeast of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and in saltmarsh and creek edges on migration.	2	Low
<i>Grantiella picta</i> (Painted Honeyeater)	V	V	Paddock trees are important if mistletoes are present at a density of greater than five mistletoes per hectare. The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria, and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	0	Low
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Small-flowered Grevillea)	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	226	Known
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	V	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	8	High
<i>Heleioporus australiacus</i> (Giant Burrowing Frog)	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	0	Low
<i>Hirundapus caudacutus</i> (White-throated Needletail)	-	V, MAR, MIG	An aerial species found in feeding concentrations over cities, hilltops, and timbered ranges.	4	Moderate
<i>Hoplocephalus bungaroides</i> (Broad-headed snake)	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	0	Low
<i>Hydroprogne caspia</i> (Caspian Tern)	-	M	Patrols surf line and inshore waters. Prefers sheltered estuaries, inlets, bays, harbours and lagoons with muddy or sandy shores. Also extends well inland on freshwater or saltwater lakes, temporary floodwater, large rivers, reservoirs or sewage ponds.	1	Low
<i>Lamna nasus</i> (Porbeagle)	-	M	Inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle utilises a broad vertical range of the water column and is known to dive to depths exceeding 1300 m.	0	None
<i>Lathamus discolor</i> (Swift Parrot)	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and nomadic, moving about in response to changing food availability.	4	High
<i>Limosa lapponica</i> (Bar-tailed Godwit)	-	MAR, MIG	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks, and airstrips, although it is commonly recorded in paddocks at some locations overseas.	0	Low
<i>Limosa lapponica baueri</i> (Nunivak Bar-tailed Godwit)	-	E, MIG	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	0	Low
<i>Litoria aurea</i> (Green and Golden Bell Frog)	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spike rushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes waterbodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	179	Moderate
<i>Litoria littlejohni</i> (Littlejohn's Tree Frog)	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 240 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	0	Moderate
<i>Macronectes giganteus</i> (Southern Giant Petrel)	E	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20°S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	0	Low



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<i>Macronectes halli</i> (Northern Giant-petrel)	V	V	Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer.	0	Low
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	161	Moderate
<i>Melanodryas cucullata cucullata</i> (Hooded Robin (south-eastern))	V	E	Occupy a wide range of eucalypt woodlands, Acacia shrublands and open forests.	0	Moderate
<i>Mixophyes balbus</i> (Stuttering Frog)	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.	2	Low
<i>Mixophyes iteratus</i> (Giant Barred Frog)	E	V	This species is found along larger streams of the coast and adjacent ranges of NSW and SE QLD. It inhabits rainforest and wet sclerophyll forest but is also found within cleared farmland where fringing vegetation is retained, including lantana beds. Many sites where the Giant Barred Frog is known to occur are the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters.	11	Low
<i>Mobula alfredi</i> (Manta Ray)	-	MIG	Occurring from the NSW south coast north up the Queensland Coast, around Cap York peninsula, north from Exmouth in WA. Manta rays frequently inhabit relatively shallow waters near coastal reefs of both continents and islands. Threatened by fisheries and climate change. (MantaTrust, 2024; Australian Museum, 2024)	0	None
<i>Mobula birostris</i> (Giant Oceanic Ray)	-	MIG	This species is distributed across the tropical and subtropical regions, spending most of their time in the open ocean away from reefs, and frequently diving deep to seek zooplankton. Current threats include climate change impacts to food resources, fisheries, and targeted harvesting of gill plates (MantaTrust.org, 2024).	0	None
<i>Monarcha melanopsis</i> (Black-faced Monarch)	-	MAR, MIG	The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest, but also in open eucalypt. Specific locations where breeding has been recorded includes: the Atherton Region in Queensland (wet tropics) - Julatten south to the Paluma Range and inland to the Atherton Tableland and from 26° S in south-eastern Queensland to near Lakes Entrance, Victoria. The Black-faced Monarch breeds in rainforest habitat, and generally nests near the top of trees with large leaves, in the tops of small saplings, or in lower shrubs.	0	Moderate
<i>Motacilla flava</i> (Yellow Wagtail)	-	MAR, MIG	This species has an extremely large range, extending from Europe, east through Siberia to west Asia and northwestern China, and south through the Arabian Peninsula to Egypt. This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range, it is also found in large forest clearings. It breeds from April to August, although this varies with latitude.	0	Low
<i>Myiagra cyanoleuca</i> (Satin Flycatcher)	-	MAR, MIG	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	0	Low
<i>Natator depressus</i> (Flatback Turtle)	V	V	Found only in the waters around Australia, Papua New Guinea and Timor, hence it is also known as the Australian flatback.	0	Low
<i>Neophema chrysostoma</i> (Blue-winged Parrot)	-	V	The blue-winged parrot is found across southeastern Australia. In eastern South Australia, it is found north to the Flinders Ranges, and across Victoria. It is more sporadic across central and western New South Wales and into Queensland, as far north as Diamantina National Park. It lives in savannah woodland, grasslands, orchards, farmlands, marshes, heath, dunes, and other open habitats up to 1,200 m (3,937 ft) above sea level. It is one of only three species of parrot that make regular yearly migrations over a sea or ocean, with many members of the species flying between Tasmania, where they breed in spring and summer, and the mainland, where they winter. Some birds, however, do remain in Tasmania over the winter and some remain on the mainland to breed in the summer.	0	Moderate
<i>Notamacropus parma</i> (Parma Wallaby)	V	V	Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	0	Low
<i>Numenius madagascariensis</i> (Eastern Curlew)	-	CE	The Eastern curlew spends its breeding season in northeastern Asia, including Siberia to Kamchatka, and Mongolia. Its breeding habitat is composed of marshy and swampy wetlands and lakeshores. Most individuals winter in coastal Australia, with a few heading to South Korea, Thailand, Philippines and New Zealand, where they stay at estuaries, beaches, and salt marshes. It uses its long, decurved bill to probe for invertebrates in the mud. It may feed in solitary, but it generally congregates in large flocks to migrate or roost. Its call is a sharp, clear whistle, cuuue-reee, often repeated.	0	Low
<i>Numenius phaeopus</i> (Whimbrel)	-	M, MAR	Intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. Roosts in mangroves and other structures flooded at high tide.	0	Low
<i>Onychoprion anaethetus</i> (Bridled Tern)	-	MIG, MAR	Bridled Terns are widespread throughout Australia, breeding on offshore islands in western, northern and north-eastern Australia, extending from Cape Leeuwin in the south-west, around northern Australia to north-eastern and mid-eastern Queensland, extending through the Great Barrier Reef and Coral Sea as far south as Lady Elliott Island. Has been known to breed with other offshore birds in South Australia, and on the mainland in south Western Australia. Forages in offshore, continental shelf waters in tropical and sub-tropical seas, and is only rarely recorded along mainland coasts. This species breeds on islands, including vegetated coral cays, rocky continental islands and rock stacks and are only rarely found in inshore continental waters and along mainland coastlines.	0	None



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<i>Pachyptila turtur subantarctica</i> (Fairy Prion)	V	V	The fairy prion is found throughout oceans and coastal areas in the Southern Hemisphere. Their colonies can be found on Chatham, Snares and Antipodes Islands of New Zealand, Bass Strait Islands of Australia, Falkland Islands, Marion Island, the Crozet Islands and Macquarie Island. Outside of the breeding season, the fairy prion is most often found feeding over deep waters, far from shore. During stormy weather it may come towards coastal habitats. It breeds on oceanic islands, where it nests in crevices on cliffs and rock falls or in burrows in soil, although it may also nest in scrub, herb lands, tussock, or pasture. The diet consists mainly of planktonic crustaceans and other tiny sea animals, which they feed at night from the water's surface.	0	Moderate
<i>Pandion cristatus</i> (Eastern Osprey)	V	MIG, MAR	Eastern Ospreys are found right around the Australian coastline, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	14	Low
<i>Persicaria elatior</i> (Tall Knotweed)	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	1	Moderate
<i>Petauroides volans</i> (Greater Glider)	-	E	Occurs in eucalypt forests and woodlands. Utilise tree hollows.	0	Moderate
<i>Petaurus australis australis</i> (Yellow-bellied Glider)	V	V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	10	High
<i>Petrogale penicillata</i> (Brush-tailed Rock-wallaby)	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	2	Low
<i>Phaethon lepturus</i> (White-tailed Tropicbird)	-	MAR, MIG	The white-tailed tropicbird (Christmas Island) is endemic to Christmas Island, which is its only known breeding location. It is widely distributed across the island (Christmas Island National Park, 2013) and roosts and forages over the Indian Ocean. Both adults and juveniles appear to disperse widely and have been recorded south and south-east of Christmas Island (Marchant & Higgins, 1990). The subspecies mostly occurs north of 14°S, but may occur up to about 1500 km from Christmas Island, at the edge of the continental shelf off Western Australia at 21°S.	0	Low
<i>Phascolarctos cinereus</i> (Koala)	E	E	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	24	High
<i>Pluvialis fulva</i> (Pacific Golden Plover)	-	MAR, MIG	Mainly coastal habitats; usually in small parties or quite large flocks on estuaries, intertidal mudflats, beaches, reefs, saltmarshes and offshore islands; only rarely far inland.	0	Low
<i>Pluvialis squatarola</i> (Grey Plover)	-	M, MAR, V	In Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes.	3	Low
<i>Pomaderris brunnea</i> (Brown Pomaderris)	V	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	0	Low
<i>Potorous tridactylus tridactylus</i> (Long-nosed Potoroo)	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	0	Moderate
<i>Pseudomys novaehollandiae</i> (New Holland Mouse)	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales, and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	0	Moderate
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	68	High
<i>Pterostylis gibbosa</i> (Illawarra Greenhood)	E	E	Grows in open forest or woodland, on flat or gently sloping land with poor drainage. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra).	0	Low
<i>Pycnoptilus floccosus</i> (Pilot bird)	-	V	Pilotbirds are endemic to south-east Australia. Upland Pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy Mountains in New South Wales and north-east Victoria (Higgins & Peter 2002; Loyn et al. 2021). Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne.	0	Low
<i>Rhipidura rufifrons</i> (Rufous Fantail)	-	MAR, MIG	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	0	Low
<i>Rhizanthella slateri</i>	V, EP	E	Habitat requirements are poorly understood, and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Endangered population identified at Great Lakes.	1	Moderate



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<i>Rhodamnia rubescens</i> (Scrub Turpentine)	CE	CE	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	15	Low
<i>Rhodomyrtus psidioides</i> (Native Guava)	CE	CE	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	2	Low
<i>Rostratula australis</i> (Australian Painted Snipe)	E	E, MAR	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	0	Low
<i>Rutidosia heterogama</i> (Heath Wrinklewort)	V	V	Grows in heath on sandy soils and moist areas in open forest and has been recorded along disturbed roadsides.	304	High
<i>Sphyrna lewini</i> (Scalloped hammerhead)	E	CD	Listed as Conservation Dependant, this species is coastal and semi-oceanic distributed across coastal warm-temperate and tropical seas. Generally inhabit deeper waters near the continental shelf. Threats include fisheries, shark netting, and shark fin harvesting.	0	Low
<i>Stagonopleura guttata</i> (Diamond Firetail)	V	V	Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	0	Moderate
<i>Stercorarius parasiticus</i> (Arctic jaeger)	-	MAR, MIG	Migrant to Australia, breeding in the northern hemisphere. An oceanic bird which is known along coastal areas and also occasionally enters bays.	0	None
<i>Sterna hirundo</i> (Common Tern)	-	MAR, MIG	Non-breeding migrant to Australia, where it is widespread and common on the eastern coast south to eastern Victoria, and common on parts of the northern coast, mainly east of Darwin. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores.	0	Low
<i>Sternula nereis nereis</i> (Fairy Tern)	-	V	Distribution includes the southern half of NSW coast. Fairy Terns utilises a variety of habitats including offshore, islands in estuaries or lakes, wetlands, beaches and spits.	0	Low
<i>Symposiachrus trivirgatus</i> (Spectacled Monarch)	-	MAR, MIG	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies, and waterside vegetation, as well as mangroves.	0	Low
<i>Syzygium paniculatum</i> (Magenta Lilly Pilly)	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	3	Low
<i>Tetradlea juncea</i> (Black-eyed Susan)	V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. Most populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	3541	Known
<i>Thalassarche bulleri platei</i> (Northern Buller's Albatross)	-	V	Marine, pelagic species that occurs in subtropical and subantarctic waters of the South Pacific Ocean. In Australia, the species occurs over inshore, offshore, and pelagic waters (Blaber 1946; Carter 1977; Rogers 1969) and off the coast of south-east Tasmania. Prefers waters of the East Australia Current where sea surface-temperatures are greater than 16.5 °C.	0	None
<i>Thalassarche bulleri</i> (Pacific Albatross)	V	V	Inhabits tropical to sub-Antarctic waters, shelf edge and pelagic, preferring warmer waters, of south seas where currents from the north make it warmer.	0	None
<i>Thalassarche cauta</i> (Shy Albatross)	V	E	Marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current off South America.	0	None
<i>Thalassarche eremita</i> (Chatham Albatross)	E	E	Breeds solely on a small, precipitous rock in the Chatham Islands called 'The Pyramid', to the east of New Zealand. When not breeding, the Chatham albatross migrates across the South Pacific and can be found off the coast of Peru and Chile	0	None
<i>Thalassarche impavida</i> (Campbell Albatross)	-	V	While most of its time is spent at sea, the Campbell albatross returns to land to breed, nesting on ledges and steep slopes which are covered with short grasses, tussocks, and mud.	0	None
<i>Thalassarche melanophris</i> (Black-browed Albatross)	-	V	Uses wide range of marine habitats from inshore shallows, bays and channels to the edge of the continental shelf and beyond to pelagic ocean environs.	0	None
<i>Thalassarche salvini</i> (Salvin's Albatross)	-	V	Breeds on just a few small barren and rocky islands, and otherwise occupies the open oceans	0	None
<i>Thalassarche steadi</i> (White-capped Albatross)	-	V, MAR, MIG	Mostly observed in inshore and offshore waters over the continental shelf and less frequently in pelagic waters off the shelf break. May occasionally enter larger bays. This species breeds on a number of islands in New Zealand waters. Virtually the entire population nests in the Auckland Islands, comprising between 75,000 and 117,000 breeding pairs. A small number of pairs nest on Bollons Island in the Antipodes Islands and occasionally on The Forty-Fours in the Chatham Islands. After breeding most birds remain in	0	None



Scientific Name (Common Name)	BC Act	EPBC Act	Habitat (DPIE; DCCEEW, 2023)	Number of Records (DPHI 2024)	Likelihood of Occurrence
			Australasian waters with some adults migrating across the Indian Ocean to seas off South Africa and Namibia. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Shy Albatross. However, it appears to be a regular visitor principally occurring between March and December (OEH, 2022).		
<i>Thalasseus bergii</i> (Greater Crested Tern)	-	MIG, MAR	Common in coastal seas, breeds in colonies on beaches and islands of Australia. Occasionally found inland.	0	None
<i>Thelymitra adorata</i> (Wyang Sun Orchid)	CE	CE	Currently known from several local government areas (LGA) within the Central Coast Council region of New South Wales. These include but are not limited to the LGAs of Wyong, Warnervale and Wyongah. Also recorded in the southern portion of Lake Macquarie City Council area. Occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. The vegetation type in which the majority of populations occur (including the largest colony) is a Spotted Gum – Ironbark Forest with a diverse grassy understorey and occasional scattered shrubs.	0	High
<i>Thesium australe</i> (Austral Toadflax)	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic Coolatai grass.	0	Moderate
<i>Tringa brevipes</i> (Grey-tailed tattler)	-	MIG, MAR	Sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves.	0	Low
<i>Tringa nebularia</i> (Common Greenshank)	-	MAR, MIG	Habitat is diverse, both inland and coastal. Found inland on both permanent and temporary wetland- billabongs, swamps, lakes, floodplains, sewage, farms, and saltwater ponds. On the coast, it uses sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons and occasionally rocky tidal edges.	0	Low
<i>Tringa stagnatilis</i>	-	MAR, MIG	Permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	0	Low
<i>Uperoleia mahonyi</i> (Mahony's Toadlet)	E	E	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (<i>Shoenoplectus spp.</i> , <i>Baumea spp.</i> And <i>Lepironia articulata</i>) and Broadleaf Cumbungi (<i>Typha orientalis</i>). Females have been recorded up to 400m from waterbodies indicating moderate dispersal distances and use of multiple habitat types. Tadpoles have been observed using leaf litter in the shallow verges of water bodies on sandy substrate. Rocks, logs and leaf litter may also be used for shelter and provide important foraging areas for invertebrate prey items.	0	Moderate

Table 25 Potential for impact analysis for Moderate or High EPBC Listed LoO species.

Scientific Name (Common Name)	EPBC Act	Survey Outcome	Potential for Significant Impact	Assessment of Significance required
<i>Acacia bynoeana</i> (Bynoe's Wattle)	V	Absent	Unlikely – The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Angophora inopina</i> (Charmhaven Apple)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Anthochaera phrygia</i> (Regent Honeyeater)	CE	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Critically Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Apus pacificus</i>	MIG	Absent	Unlikely - The proposed action may remove a large area of suitable foraging habitat. Although there are records in the locality, the proposed action is unlikely to significant affect the preferred aquatic habitat and nearby perch sites for this highly mobile migratory species.	No , this species is considered unlikely to be significantly impacted.
<i>Asperula asthenes</i> (Trailing Woodruff)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Caladenia tessellata</i> (Thick-lip Spider Orchid)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Calyptorhynchus lathami lathami</i> (Glossy Black-Cockatoo)	V	Present	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Corunastylis insignis</i> (Variable Midge Orchid)	CE	Potential	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute a population of this Critically Endangered species.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Corunastylis</i> sp. Charmhaven (syn. <i>Genoplesium branwhiteorum</i>)	CE	Potential	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute a population of this Critically Endangered species.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)	V	Potential	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Cynanchum elegans</i> (White-flowered Wax Plant)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Dasyurus maculatus maculatus</i> (Spotted-tailed Quoll)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Diuris praecox</i> (Rough Doubletail)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Erythrotriorchis radiatus</i> (Red Goshawk)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.

Scientific Name (Common Name)	EPBC Act	Survey Outcome	Potential for Significant Impact	Assessment of Significance required
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Euphrasia arguta</i>	CE	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Falcon hypoleucos</i> (Grey Falcon)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Small-flowered Grevillea)	V	Present	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	MAR	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of potential habitat. However, this species is considered unlikely to be significantly impacted by this action.	No , this species is considered unlikely to be significantly impacted.
<i>Hirundapus caudacutus</i> (White-throated Needletail)	MAR, MIG	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Lathamus discolor</i> (Swift Parrot)	CE	Absent	Likely – The area is within the area mapped as important habitat for the species (BOAMS 2023). Therefore, the species is assumed present regardless of survey results.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Litoria aurea</i> (Green and Golden Bell Frog)	V	Absent	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Litoria littlejohni</i> (Littlejohn's Tree Frog)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, this conspicuous tree wasn't identified within the site during targeted surveys. Therefore, it's unlikely that there is an important population of this Vulnerable species present.	No , this species is considered unlikely to be significantly impacted.
<i>Melanodryas cucullata</i> <i>cucullata</i> (Hooded Robin (south-eastern))	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Monarcha melanopsis</i> (Black-faced Monarch)	MAR, MIG	Absent	Unlikely - The proposed action may remove an area of suitable foraging and roosting habitat. However, there are no records of the species in the locality, consequently, there is unlikely to be an area of important habitat for this migratory species in the locality.	No , this species is considered unlikely to be significantly impacted.
<i>Neophema chrysostoma</i> (Blue-winged Parrot)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Pachyptila turtur</i> <i>subantarctica</i> (Fairy Prion)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Persicaria elatior</i>	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Petauroides volans</i> (Greater Glider)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.
<i>Petaurus australis australis</i> (Yellow-bellied Glider)	V	Absent	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .



Scientific Name (Common Name)	EPBC Act	Survey Outcome	Potential for Significant Impact	Assessment of Significance required
<i>Phascolarctos cinereus</i> (Koala)	E	Absent	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute a population of this Endangered species.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Potorous tridactylus</i> (Long-nosed Potoroo)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Pseudomys novaehollandiae</i> (New Holland Mouse)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	V	Absent	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Rhizanthella slateri</i>	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species and targeted surveys failed to identify the species.	No , this species is considered unlikely to be significantly impacted.
<i>Rutidosia heterogama</i> (Heath Wrinklewort)	V	Absent	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Stagonopleura guttata</i> (Diamond Firetail)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Tetralochea juncea</i> (Black-eyed Susan)	V	Present	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute an important population.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Thelymitra adorata</i> (Wyong Sun Orchid)	CE	Potential	Likely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat and there are records in the locality that may constitute a population of this Critically Endangered species.	Yes - AoS is considered necessary under the EPBC Act (i.e., Significant impact Guidelines 1.1). Refer to Attachment 2 .
<i>Thesium australe</i> (Austral Toadflax)	V	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute an important population of this Vulnerable species.	No , this species is considered unlikely to be significantly impacted.
<i>Uperoleia mahonyi</i> (Mahony's Toadlet)	E	Absent	Unlikely - The proposed action may remove a relatively small area (~3 ha) of suitable habitat. However, there are no records in the locality that may constitute a population of this Endangered species.	No , this species is considered unlikely to be significantly impacted.

6 Attachment 2 – Assessments of Significance (EPBC Act)

The species which have potential for significant impact by the proposed action, and therefore require consideration under the Significant Impact Guidelines 1.1 for MNES are:

Vulnerable Flora

- *Cryptostylis hunteriana* (Leafless Tongue-orchid)
- *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea)
- *Rutidosus heterogama* (Heath Wrinkelwort)
- *Tetradlea juncea* (Black-eyed Susan)

Vulnerable Fauna

- *Calyptorhynchus lathami lathami* (Glossy Black-Cockatoo)
- *Litoria aurea* (Golden Bell Frog)
- *Petaurus australis* (Yellow-bellied Glider)
- *Pteropus poliocephalus* (Grey-headed Flying Fox)

Endangered or Critically Endangered Flora

- *Corunastylis insignis* – syn. *Genoplesium insigne* (Variable Midge Orchid)
- *Corunastylis* sp. *Charmhaven* (syn. *Genoplesium branwhiteorum*)
- *Rhizanthella slateri* (Eastern Underground Orchid)
- *Thelymitra adorata* (Wyang Sun Orchid)

Endangered or Critically Endangered Fauna

- *Lathamus discolor* (Swift Parrot)
- *Phascolarctos cinereus* (Koala)

The assessments conducted in the following sections determine if the proposed action will have any significant impact on any MNES. If it is determined that there is a significant impact to any MNES then a referral of the matter to DCCEEW would be recommended.

Unless otherwise noted, the assessments have been conducted with reference to records of sightings in the BioNet Atlas (<https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet>) and information presented in NSW DPHI's threatened species profiles (<https://www.environment.nsw.gov.au/threatenedspeciesapp/>) and the published conservation advice and other documents referenced on the Commonwealth SPRAT page for each listed entity (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>).



Aquatic species have been assigned with a likelihood of occurrence of 'none' and have not been assessed further. This was determined as no anticipated impacts to habitat features for these species are likely to ensue as the proposed action will not result in impact to aquatic habitat.

6.1 Vulnerable Species Assessment

Vulnerable species are assessed on the basis of the presence of an 'important population', which is defined as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

Where currently available information and survey results are insufficient to determine whether a local population of the species is present and eligible to be considered an 'important population', a precautionary approach has been adopted and the presence of an important population has been assumed. Therefore, all species with a moderate to high likelihood of occurrence have been afforded an AoS, in line with the EPBC Act 1999 *Significant Impact Guidelines 1.1* below.

Table 26 Assessments of Significance for Vulnerable Flora Species.

Vulnerable Flora	<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Small-flowered Grevillea)	<i>Rutidosus heterogama</i> (Heath Wrinkewort)	<i>Tetratheca juncea</i> (Black-eyed Susan)
Lead to a long-term decrease in the size of an important population;	Possible - No important populations of the species are known to occur in the area likely to be affected by the proposed action. The species is cryptic and may emerge only every 1–3 years. Poor winter and spring rainfall and a denser understorey may hamper flowering. Therefore, the survey effort cannot rule out the presence of an important population. Any population present in the area affected by the proposed action would be considered an important population under the Significant Impact Guidelines. A major threat for the species is removal of potential habitat. The proposed action would reduce by a small amount the area of available habitat and the viability of rehabilitated habitat for the species is uncertain. The proposed action may reduce the size of an important population (if present).	Yes - The proposed action may lead to a long-term decrease in the size of an important population. A population of the species was detected within the proposed area. This population exists as a part of a collective of other known local populations within a 10km radius. Any population present in the area affected by the proposed action would be considered an important population under the Significant Impact Guidelines. The proposed action will (depending on the final footprint) reduce the size of an important population.	Possible - No important populations of the species are known to occur in the area likely to be affected by the proposed action. The targeted survey effort undertaken did not identify presence of an important population of this species. The habitat present within the proposal area is marginally suitable for this species. Major threats for the species include removal of potential habitat and increasing pollution and nutrient from anthropogenic developments. Therefore, the proposed action has the potential to reduce the area of available habitat, and the viability of rehabilitated habitat for the species is uncertain. However, given the targeted survey efforts carried out did not identify this species, the proposed action is unlikely to reduce the size of an important population.	Yes - The proposed action may lead to a long-term decrease in the size of an important population. A population of the species was detected within the proposed area. This population exists as a part of a collective of other known local populations within a 10km radius. Any population present in the area affected by the proposed action would be considered an important population under the Significant Impact Guidelines. The proposed action will (depending on the final footprint) reduce the size of an important population.
Reduce the area of occupancy of an important population of the species;	Possible - The proposed action could reduce the area of occupancy of an important population of the species by up to 3 ha. Due to the cryptic nature of the species, the presence of an important population cannot be ruled out.	Yes - The proposed action will reduce the area of occupancy of an important population.	Possible - The proposed action could reduce the area of occupancy of an important population of the species by up to 3 ha (where present). However, targeted surveys did not identify this species or an important population of this species.	Yes - The proposed action will reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations;	Possible – The presence of an existing population cannot be ruled out. The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed action are unknown. The proposed action may fragment an existing important population into two or more populations.	Possible - The proposed action may fragment an important population into two or more populations.	Possible - Targeted surveys did not identify this species or an important population of this species within the proposal area and therefore it is unlikely that the proposed action would fragment an existing important population into two or more populations.	Possible - The proposed action may fragment an important population into two or more populations.
Adversely affect habitat critical to the survival of a species;	Possible - The habitat is suitable for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). Critical habitat relevant to the site of the proposed action includes (but is not limited to) coastal forest and dry woodland with open areas of understorey, accumulated Eucalyptus leaf litter and suitable soils. The presence of an existing population cannot not be ruled out. Therefore, the proposal may adversely affect habitat critical to the survival of a species.	Yes – An important population has been identified in the habitat within the proposed site. Furthermore, the habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The specific criteria include shrubby woodland to open forest with a range of topography (e.g. sandy to gravelly clay, upper slopes or flat plains).	Possible - The habitat is suitable for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). Critical habitat relevant to the site of the proposed action includes (but is not limited to) low lying coastal area and suitable soils. The presence of an existing population is unlikely. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of a species.	Yes – An important population has been identified in the habitat within the proposed site. Furthermore, the habitat is suitable habitat for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The specific criteria include coastal districts from Lake Macquarie to Bulahdelah and open forest with associated species throughout the proposed site (<i>Angophora costata</i> , <i>Corymbia gummifera</i> , and <i>Eucalyptus haemastoma</i>).
Disrupt the breeding cycle of an important population;	Possible – The presence of an existing population cannot be ruled out. The effects on dispersal, genetic interchange, and other aspects of reproduction between plants affected by the proposed action are unknown. It is possible that the proposed action will disrupt the breeding cycle of an important population.	Possible - The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed alignment are unknown. It is that the proposed action will disrupt the breeding cycle of an important population.	Possible – This species was not identified during targeted surveys and therefore the presence of an existing population is unlikely. Subsequently, it is unlikely that the proposed action will disrupt the breeding cycle of an important population.	Possible - The effects on dispersal, genetic interchange, and other aspects of reproduction between plants affected by the proposed action are unknown. It is possible that the proposed action will 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;	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of habitat.	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of quality habitat, making it likely that the species will decline to some extent.	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of habitat.	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of quality habitat, making it likely that the species will decline to some extent.



Vulnerable Flora	<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Small-flowered Grevillea)	<i>Rutidosus heterogama</i> (Heath Wrinkelwort)	<i>Tetratheca juncea</i> (Black-eyed Susan)
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to. Note: Infestations of Bitou Bush is identified as a potential risk for the species.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to.
Introduce disease that may cause the species to decline; or	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	Possible - Given the responses to the previous criteria in this assessment, the proposed action may interfere with the recovery of the species.	Possible - The proposed action may interfere substantially with the recovery of this species because of its potentially significant effects on the local population.	Possible - Given the responses to the previous criteria in this assessment, the proposed action may interfere with the recovery of the species.	Possible - The proposed action may interfere substantially with the recovery of this species because of its potentially significant effects on the local population.
Conclusion:	Unlikely - Although this species has been considered as having the potential to occur. The small area impact assessment results in this species being considered as not an SAI. Subsequently, this species does not require further assessment.	The proposed action is likely to have a significant impact upon the species.	Given the adequate survey effort, the proposed action is unlikely to result in a significant impact on the species.	The proposed action is likely to have a significant impact upon the species.

Table 27 Assessments of Significance for Vulnerable Fauna Species.

Vulnerable Fauna	<i>Calyptorhynchus lathami lathami</i> (Glossy Black-Cockatoo)	<i>Litoria aurea</i> (Golden Bell Frog)	<i>Petaurus australis</i> (Yellow-bellied Glider)	<i>Pteropus poliocephalus</i> (Grey-headed Flying Fox)
Lead to a long-term decrease in the size of an important population;	Potential - A long-term decrease in population size is possible with the permanent loss of this feeding and breeding habitat. The consequence of the proposed action is listed as a moderate risk. A population of the species is known to occur in the Lake Macquarie region. Targeted surveys confirmed the species presence within the proposed area utilising <i>Allocasuarina littoralis</i> as foraging habitat. Any population present in the area affected by the proposed action may be considered an important population under the Significant Impact Guidelines. The proposed action would remove up to 3 ha of habitat for the species, including areas of vegetation likely to contain primary feed trees (<i>A. littoralis</i>) which can have major consequences because of the species preference for individual feed trees. Some HBTs within the proposed site may be used for breeding (mature trees with hollows located near foraging habitat). This is likely to have at least some effect on the reproductive success of the population.	Potential - A long-term decrease in population size is possible with the permanent loss of this feeding and breeding habitat. The consequence of the proposed action is listed as a moderate risk. A population of the species is known to occur in the Lake Macquarie region. Any population present in the area affected by the proposed action may be considered an important population under the Significant Impact Guidelines. The proposed action would remove up to 3 ha of potential habitat for the species. Targeted surveys did not identify this species presence within the proposed area.	Potential - A long-term decrease in population size is possible with the permanent loss of this feeding and breeding habitat. The consequence of the proposed action is listed as a moderate risk. A population of the species is known to occur in the Lake Macquarie region. Any population present in the area affected by the proposed action may be considered an important population under the Significant Impact Guidelines. The proposed action would remove up to 3 ha of potential habitat for the species. Targeted surveys did not identify this species presence within the proposed area.	Potential - A long-term decrease in population size is possible with the permanent loss of this feeding and breeding habitat. The consequence of the proposed action is listed as a moderate risk. A population of the species is known to occur in the Lake Macquarie region. Any population present in the area affected by the proposed action may be considered an important population under the Significant Impact Guidelines. The proposed action would remove up to 3 ha of potential habitat for the species. Targeted surveys did not identify this species presence within the proposed area.
Reduce the area of occupancy of an important population of the species;	Yes – The species' area of occupancy will be reduced by 3 ha.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.
Fragment an existing important population into two or more populations;	No - The species is aerial and would not be restricted by the impacts of the proposed action.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.	No – This species was not identified during targeted surveys therefore it is determined that an important population does not exist within the proposal area.
Adversely affect habitat critical to the survival of a species;	Potential - Given the relatively large contiguous area of habitat for this species within the Lake Macquarie region relative to that present in surrounding regions and its likely function as a stronghold for the species, it is likely to meet the criteria for being considered critical to the survival of the species. The removal of up to 3 ha of habitat is a minor impact relative to the area of suitable habitat available in the Lake Macquarie region. The proposed action will permanently remove primary feed trees and HBTs which are considered critical habitat for the species. This may increase competition for breeding resources and adversely impact the survival of the species in the long-term.	Potential - Given the relatively large contiguous area of potentially suitable habitat for this species within the Lake Macquarie region relative to that present in surrounding regions, it is unlikely that the habitat within the proposal area would meet the criteria for being considered critical to the survival of the species. The removal of up to 3 ha of marginally suitable habitat is a minor impact relative to the area of suitable habitat available in the Lake Macquarie region.	Potential - Given the relatively large contiguous area of potentially suitable habitat for this species within the Lake Macquarie region relative to that present in surrounding regions, it is unlikely that the habitat within the proposal area would meet the criteria for being considered critical to the survival of the species. The removal of up to 3 ha of habitat is a minor impact relative to the area of suitable habitat available in the Lake Macquarie region. The proposed action will permanently remove primary feed trees and HBTs which are considered critical habitat for the species. This may increase competition for breeding resources and adversely impact the survival of the species in the long-term.	Potential - Given the relatively large contiguous area of potentially suitable habitat for this species within the Lake Macquarie region relative to that present in surrounding regions, it is unlikely that the habitat within the proposal area would meet the criteria for being considered critical to the survival of the species. The removal of up to 3 ha of habitat is a minor impact relative to the area of suitable habitat available in the Lake Macquarie region.
Disrupt the breeding cycle of an important population;	Potential - The proposed action would require removal of up to 3 ha of habitat for the species, including vegetation likely to contain feed trees and HBTs potentially used for breeding. Given that the presence of suitably sized and shaped HBTs is a key constraint on the species breeding, the proposed action may disrupt its breeding.	Potential - The proposed action would require removal of up to 3 ha of potential habitat for this species, including vegetation likely to contain potential breeding habitat suitable for this species. Given this species was not identified during targeted surveys, it is unlikely that an important population occurs within the proposal area and therefore the breeding cycle of this species is unlikely to be impacted.	Potential - The proposed action would require removal of up to 3 ha of potential habitat for the species, including vegetation likely to contain feed trees. Given that the lack of suitably sized HBTs within the proposal footprint, it is considered unlikely that the habitat within the proposal footprint would form important breeding resources and therefore is unlikely to disrupt the breeding cycle of this species.	Unlikely - The proposed action would require removal of up to 3 ha of potential habitat for the species, including vegetation likely to contain roosting and feeding resources, potentially used for breeding. Given that no roost sites were identified during targeted surveys, the proposed action is unlikely to disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to	Potential - The proposed action will removal/destroy/modify of up to 3 ha of moderate–high quality habitat for the species. This is a small scale relative to the suitable habitat available in the Lake Macquarie region. However, the habitat to be impacted is considered critical habitat due to the presence of	Potential - The proposed action will removal/destroy/modify of up to 3 ha of potential habitat for this species. This is a small scale relative to the suitable habitat available in the Lake Macquarie region. It is unlikely the habitat to be impacted would be considered critical habitat due to the ephemeral	Potential - The proposed action will removal/destroy/modify of up to 3 ha of moderate–high quality habitat for the species. This is a small scale relative to the suitable habitat available in the Lake Macquarie region. However, the habitat to be impacted is considered critical habitat due to the presence of	Potential - The proposed action will removal/destroy/modify of up to 3 ha of moderate–high quality habitat for the species. This is a small scale relative to the suitable habitat available in the Lake Macquarie region. However, the habitat to be impacted is considered critical habitat due to the presence of



Vulnerable Fauna	<i>Calyptrorhynchus lathami lathami</i> (Glossy Black-Cockatoo)	<i>Litoria aurea</i> (Golden Bell Frog)	<i>Petaurus australis</i> (Yellow-bellied Glider)	<i>Pteropus poliocephalus</i> (Grey-headed Flying Fox)
the extent that the species is likely to decline;	primary feed trees and HBTs. Therefore, the removal of this habitat which may increase competition for breeding resources and potentially cause the species to decline.	nature of the damp areas of the site and its distance from bodies of water. Therefore, the removal of this habitat is unlikely to cause this species to decline.	primary feed trees and potential for HBTs. Therefore, the removal of this habitat which may increase competition for breeding resources and potentially cause the species to decline.	primary feed trees and roosting habitat. Therefore, the removal of this habitat could potentially cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.
Introduce disease that may cause the species to decline; or	No - There are no new diseases likely to be introduced or promoted by the proposed action.	No - There are no new diseases likely to be introduced or promoted by the proposed action if proper mitigation measures are followed.	No - There are no new diseases likely to be introduced or promoted by the proposed action.	No - There are no new diseases likely to be introduced or promoted by the proposed action.
Interfere substantially with the recovery of the species.	Potential - The loss of habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.	Potential - The loss of potential habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.	Potential - The loss of habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.	Potential - The loss of habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.
Conclusion:	The proposed action will potentially have a significant impact upon the species.	Given the adequate survey effort, the proposed action is unlikely to result in a significant impact on the species.	The proposed action will potentially have a significant impact upon the species.	The proposed action will potentially have a significant impact upon the species.

6.2 Endangered or Critically Endangered Species

Table 28 Assessments of Significance for Endangered or Critically Endangered Flora Species.

Endangered or Critically Endangered Flora	<i>Corunastylis insignis</i> (syn. <i>Genoplesium insigne</i>) (Variable Midge Orchid)	<i>Corunastylis</i> sp. Charmhaven (syn. <i>Genoplesium branwhiteorum</i>)	<i>Rhizanthella slateri</i> (Eastern Underground Orchid)	<i>Thelymitra adorata</i> (Wyong Sun Orchid)
Lead to a long-term decrease in the size of a population;	Possible – There are known populations of the species within a 5km radius of the proposed action. Targeted surveys did not identify the species within the area to be affected. However, the species is cryptic – its flowering time is dependent on rainfall and limited to two weeks. If winter rain is absent the species will remain dormant. The species requires flowering material to identify. Therefore, the survey effort cannot rule out the presence of an important population. A major threat for the species is removal of potential habitat. The proposed action would reduce by a small amount the area of available habitat and the viability of rehabilitated habitat for the species is uncertain. The effects on dispersal and genetic interchange between plants separated by the proposed action is also unknown. The proposed action may lead to a long-term decrease in the size of a population if one is present.	Possible – No populations of the species are known to occur in the area likely to be affected by the proposed action. Due to the cryptic nature of the species, which are similar to those of <i>C. insignis</i> , the survey effort cannot rule out the presence of a population. A major threat for the species is removal of potential habitat. The proposed action would reduce by a small amount the area of available habitat and the viability of rehabilitated habitat for the species is uncertain. The effects on dispersal and genetic interchange between plants separated by the proposed action is also unknown. The proposed action may lead to a long-term decrease in the size of a population if one is present.	Unlikely – There is one known occurrence of this species around 10km north west of the proposed action. However, the targeted 5m transect BAM compliant surveys did not identify the species within the area to be affected. Consequently, the species is considered unlikely to occur and the proposed action is unlikely to lead to a long-term decrease in the size of a population.	Possible – There are known populations of the species within 10km of the proposed action. Targeted surveys did not identify the species. However, it is cryptic, has highly variable rates of emergence and does not flower every year. Its flowers may only open for a few hours a day during a two-week period. The species requires flowering material to identify. Therefore, the survey effort cannot rule out the presence of an important population. A major threat for the species is removal of potential habitat. The proposed action would reduce by a small amount the area of available habitat and the viability of rehabilitated habitat for the species is uncertain. The effects on dispersal and genetic interchange between plants separated by the proposed action is also unknown. The proposed action may lead to a long-term decrease in the size of a population if one is present.
Reduce the area of occupancy of the species;	Possible - Due to the cryptic natures of the species the presence of an important population cannot be ruled out. The proposed action could potentially reduce the area of	Possible - Due to the cryptic natures of the species the presence of an important population cannot be ruled out. The proposed action could potentially reduce the area of	Unlikely - The targeted 5m transect BAM compliant surveys did not identify the species within the area to be affected. Consequently, the species is considered unlikely to occur and	Possible - Due to the cryptic natures of the species the presence of an important population cannot be ruled out. The proposed action could potentially reduce the area of



Endangered or Critically Endangered Flora	<i>Corunastylis insignis</i> (syn. <i>Genoplesium insigne</i>) (Variable Midge Orchid)	<i>Corunastylis</i> sp. Charmhaven (syn. <i>Genoplesium branwhiteorum</i>)	<i>Rhizanthella slateri</i> (Eastern Underground Orchid)	<i>Thelymitra adorata</i> (Wyong Sun Orchid)
	occupancy of an important population of the species by up to 3 ha.	occupancy of an important population of the species by up to 3 ha.	the proposed action is unlikely to potentially reduce the area of occupancy of an important population of the species.	occupancy of an important population of the species by up to 3 ha.
Fragment an existing population into two or more populations;	Possible – The presence of an existing population cannot be ruled out. The proposed action may fragment an existing population into two or more populations.	Possible – The presence of an existing population cannot be ruled out. The proposed action may fragment an existing population into two or more populations.	Unlikely – The targeted 5m transect BAM compliant surveys did not identify the species within the area to be affected. Consequently, the species is considered unlikely to occur and the proposed action is unlikely to fragment an existing population into two or more populations.	Possible – The presence of an existing population cannot be ruled out. The proposed action may fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species;	Yes - The habitat is suitable habitat for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The specific criteria include patches of <i>Themeda australis</i> and dry sclerophyll forest dominated by <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> , <i>Angophora costata</i> , and <i>Allocasuarina littoralis</i> . The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat critical to the survival of a species.	Possible - The habitat is suitable habitat for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The specific criteria include low woodland with a shrubby understorey and ground layer with the presence of <i>Allocasuarina littoralis</i> and <i>Melaleuca nodosa</i> . The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat critical to the survival of a species.	Unlikely - Although the habitat requirements are poorly understood for this species, the habitat within the proposed action area is likely suitable habitat for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). However, the targeted 5m transect BAM compliant surveys did not identify the species within the area to be affected. Consequently, the species is considered unlikely to occur and the proposed action is unlikely to adversely affect habitat critical to the survival of a species.	Possible - The habitat within the area to be affected is suitable habitat for the species, and includes woodland with a grassy understorey and well-drained soils. The typical associated habitat composition is partly present or absent from the proposed site, and it may not be considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population;	Possible – The presence of an existing population cannot be ruled out. The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed action are unknown. It is possible that the proposed action will disrupt the breeding cycle of a population.	Possible – The presence of an existing population cannot be ruled out. The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed action are unknown. It is possible that the proposed action will disrupt the breeding cycle of a population.	Unlikely –The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed action are unknown. However, the targeted 5m transect BAM compliant surveys did not identify the species within the area to be affected. Consequently, the species is considered unlikely to occur and the proposed action is unlikely to disrupt the breeding cycle of a population.	Possible – The presence of an existing population cannot be ruled out. The effects on dispersal, genetic interchange, and other aspects of reproduction between plants separated by the proposed action are unknown. It is possible that the proposed action will disrupt the breeding cycle of a population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of availability or quality habitat. The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat such that the species may decline.	Yes - The habitat is suitable habitat for the species and therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of availability or quality habitat. The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat such that the species may decline.	unlikely - Although the habitat requirements are poorly understood for this species, the habitat within the proposed action area is likely suitable habitat for the species and is therefore considered critical habitat under the Significant Impact Guidelines and Conservation Advice (DCCEEW). The proposed action would modify/destroy/remove up to 3 ha of availability or quality habitat. The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat such that the species may decline.	Possible - The habitat is suitable habitat for the species. The proposed action would modify/destroy/remove up to 3 ha of availability or quality habitat. The presence of an existing population cannot be ruled out. Therefore, the proposal may adversely affect habitat such that the species may 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;	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to. Note: Infestations of weeds are identified as a potential risk for the species.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to. Note: Infestations of weeds area identified as a potential risk for the species.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to.	No - The proposed action is unlikely to result in invasive species that are harmful to the vulnerable species becoming established in the species' habitat if the proposed mitigation measures (weed control programs, vehicle cleaning etc.) are adhered to. Note: Infestations of weeds are identified as a potential risk for the species.
Introduce disease that may cause the species to decline; or	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.	No - Mitigation measures will be implemented to prevent the introduction of plant diseases. Therefore, the proposed action is unlikely to introduce disease that may cause the species to decline.
Interfere with the recovery of the species.	Possible - Given the responses to the previous criteria in this assessment, the proposed action may potentially interfere with the recovery of the species.	Possible - Given the responses to the previous criteria in this assessment, the proposed action may potentially interfere with the recovery of the species.	Unlikely - Given the responses to the previous criteria in this assessment, the proposed action is unlikely to interfere with the recovery of the species.	Possible - Given the responses to the previous criteria in this assessment, the proposed action may potentially interfere with the recovery of the species.

Endangered or Critically Endangered Flora	<i>Corunastylis insignis</i> (syn. <i>Genoplesium insigne</i>) (Variable Midge Orchid)	<i>Corunastylis</i> sp. Charmhaven (syn. <i>Genoplesium branwhiteorum</i>)	<i>Rhizanthella slateri</i> (Eastern Underground Orchid)	<i>Thelymitra adorata</i> (Wyong Sun Orchid)
Conclusion:	In the absence of adequate survey effort, the proposed action has the potential to result in a significant impact on the species.	In the absence of adequate survey effort, the proposed action has the potential to result in a significant impact on the species.	Given the assessment provided above the proposed action is unlikely to result in a significant impact on the species.	In the absence of adequate survey effort, the proposed action has the potential to result in a significant impact on the species.

Table 29 Assessments of Significance for Critically Endangered and Endangered Fauna Species.

Critically Endangered Fauna	<i>Lathamus discolor</i> (Swift Parrot)	<i>Phascolarctos cinereus</i> (Koala)
Lead to a long-term decrease in the size of a population;	No - A long-term decrease in population size is possible with the permanent loss of important habitat in which the species is considered present (BOAMS 2023). The proposed action would remove up to 3 ha of habitat, which is a relatively small area within the surrounding large contiguous area of habitat. The habitat present does not include breeding habitat as the species breeds in Tasmania. Therefore, it is unlikely that the proposed action would decrease the size of a population.	Yes – The proposed action would remove up to 3 ha of habitat, which is a relatively small area within the surrounding large contiguous area of habitat. However, the habitat present is likely to constitute breeding habitat as a local population of this species occurs within the locality, with multiple records occurring within 1.5km of the proposed action area. Therefore, there is a potential that the proposed action would decrease the size of a population.
Reduce the area of occupancy of the species;	Yes - The known area of occupancy will be reduced by up to 3 ha. The permanent loss of important habitat under the proposed action will marginally reduce the area of occupancy of the local population.	Yes - The known area of occupancy will be reduced by up to 3 ha. The permanent loss of important habitat under the proposed action will marginally reduce the area of occupancy of the local population.
Fragment an existing population into two or more populations;	No - The species is aerial and would not be restricted by the impacts of the proposed action.	Yes - The known area of occupancy will be reduced by up to 3 ha. The clearing of vegetation will reduce the available habitat and cause a localised barrier, however is unlikely to fragment the local population of this species.
Adversely affect habitat critical to the survival of a species;	Yes - The habitat to be affected by the proposed action is identified as important habitat for the species. The removal of up to 3 ha of habitat is a relatively minor impact considering the area of suitable habitat available in the Lake Macquarie region. However, the habitat is noted as critical to the species and removal of such habitat may increase foraging and shelter competition within the area.	Yes - The habitat to be affected by the proposed action is identified as important habitat for the species. The removal of up to 3 ha of habitat is a relatively minor impact considering the area of suitable habitat available in the Lake Macquarie region. However, the habitat is noted as critical to the species and removal of such habitat may increase competition within the area.
Disrupt the breeding cycle of a population;	No - The species breeds in Tasmania, therefore, the proposed action is unlikely to disrupt the breeding cycle of a population.	Potential -The clearing of up to 3 ha of vegetation within an area already disturbed by clearing and industrial development, has the potential to further reduce critical habitat for this species, and cause the competitive dispersal of males beyond the known population. Therefore, there is a potential for the proposed action to disrupt the breeding cycle of the local population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	Potential - The proposed action will removal/destroy/modify of up to 3 ha of important habitat for the species. This is a small area relative to the area of suitable habitat available in the Lake Macquarie region and will not affect its breeding, however, the precise value of the habitat to the species is unknown and its loss may cause the species to further decline.	Potential - The proposed action will removal/destroy/modify of up to 3 ha of important habitat for the species. This is a small area relative to the area of suitable habitat available in the Lake Macquarie region and will not affect its breeding, however, the precise value of the habitat to the species is unknown and its loss may cause the species to further 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;	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.	No - The proposed action is unlikely to introduce invasive species that are harmful to the species and enable them to become established if proper mitigation measures are followed.
Introduce disease that may cause the species to decline; or	No - There are no new diseases likely to be introduced or promoted by the proposed action.	No - There are no new diseases likely to be introduced or promoted by the proposed action.
Interfere with the recovery of the species.	Potential - The loss of habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.	Potential - The loss of habitat under the proposed action, which may affect the success of reproduction and thus, the size of the regional population to some degree, may interfere with the recovery of the species.
Conclusion:	The proposed action will potentially have a significant impact upon the species.	The proposed action will potentially have a significant impact upon the species.

7 Attachment 3 – Survey Timetable

EcoResolve has completed the survey timetable in **Table 31** with reference to relevant survey guidelines for species survey times (BAM, 2020).

Table 30 Required Survey Types

	Survey Type
	Flora surveys
	Spotlighting/call-playback
	Opportunistic
	Koala SAT
	Acoustic recorder (Anabat/songmeter)
	Camera traps
	Pitfall Trapping, Funnel Traps
	Other Survey Techniques (e.g. suitable habitat/rocks, diurnal camp surveys)
	Additional Suitable Survey months
	Dawn and/or Dusk Bird Survey
	Not Suitable Survey Month

Table 31 Threatened Flora and Fauna Survey Requirements

Scientific Name (Common Name)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Acacia bynoeana</i> (Bynoe's Wattle)												
<i>Angophora inopina</i>												
<i>Anthochaera phrygia</i> (Regent Honeyeater)												
<i>Apus pacificus</i>												
<i>Asperula asthenes</i> (Trailing Woodruff)												



Scientific Name (Common Name)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Caladenia tessellate</i> (Thick-Lip Spider Orchid)												
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)												
<i>Calyptorhynchus lathami lathami</i> (Glossy Black-Cockatoo)												
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)												
<i>Corunastylis insignis</i> (Variable Midge Orchid)												
<i>Corunastylis sp. charmhaven</i>												
<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid)												
<i>Cynanchum elegans</i> (White-flowered Wax Plant)												
<i>Dasyurus maculatus maculatus</i> (Spotted-tailed Quoll)												
<i>Diuris praecox</i> (Rough Doubletail)												
<i>Erythroriorchis radiatus</i> (Red Goshawk)												
<i>Eucalyptus camfieldii</i>												
<i>Eucalyptus parramattensis subsp. decadens</i>												
<i>Euphrasia arguta</i>												
<i>Falco hypoleucos</i> (Grey Falcon)												
<i>Grevillea parviflora subsp. parviflora</i> (Small-flowered Grevillea)												
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)												
<i>Hirunapus caudacutus</i> (White Throated Needle-tail)												





Scientific Name (Common Name)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Heleioporus australiacus</i> (Giant Burrowing Frog)												
<i>Lathamus discolor</i> (Swift Parrot)												
<i>Litoria aurea</i> (Green and Golden Bell Frog)												
<i>Litoria littlejohni</i> (Littlejohn's Tree Frog)												
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)												
<i>Melanodryas cucullata cucullata</i> (Hooded Robin (south-eastern))												
<i>Monarcha melanosis</i> (Black-faced Monarch)												
<i>Mixophyes balbus</i> (Stuttering Frog)												
<i>Mixophyes iteratus</i> (Giant Barred Frog)												
<i>Neophema chrysostoma</i> (Blue-winged Parrot)												
<i>Persicaria elatior</i> (Tall Knotweed)												
<i>Petauroides volans</i> (Greater Glider)												
<i>Petaurus australis australis</i> (Yellow-bellied Glider)												
<i>Phascolarctos cinereus</i> (Koala)												
<i>Potorous tridactylus tridactylus</i> (Long-nosed Potoroo)												
<i>Prostanthera askania</i> (Tranquillity Mintbush)												





Scientific Name (Common Name)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Pseudomys novaehollandiae</i> (New Holland Mouse)												
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)												
<i>Pterostylis gibbosa</i> (Illawarra Greenhood)												
<i>Pycnoptilus floccosus</i> (Pilot Bird)												
<i>Rhizanthella slateri</i>												
<i>Rhodamnia rubescens</i> (Scrub Turpentine)												
<i>Rhodomyrtus psidioides</i> (Native Guava)												
<i>Rostratula australis</i> (Painted Snipe)												
<i>Rutidosis heterogama</i> (Heath Wrinklewort)												
<i>Stagonopleura guttata</i> (Diamond firetail)												
<i>Syzygium paniculatum</i> (Magenta Lilly Pilly)												
<i>Tetratheca juncea</i> (Black-eyed Susan)												
<i>Thelymitra adorata</i> (Wyang Sun Orchid)												
<i>Thesium australe</i> (Austral Toadflax)												
<i>Uperoleia mahonyi</i> (Mahony's Toadlet)												





Appendix H – Anabat Analysis Report

Table G1. Anabat presence data showing bat species recorded

Scientific Name	Common Name	BC Act	EPBC Act	Presence	Confidence	No. of passes	Notes
<i>Austronomus australis</i>	White-striped Freetail-bat			+	C		-
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			+	C		-
<i>Chalinolobus morio</i>	Chocolate Wattled Bat			+	Pr		-
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V		+	C	9	See Figure G2 for call frequency.
<i>Miniopterus australis</i>	Little Bentwing-bat	V		+	C	27	See Figure G1 for call frequency.
<i>Miniopterus orianae oceanensis</i>	Large Bentwing-bat	V		+	C	8	Numerous examples of downward sweeping tails at this frequency with uneven pulse shape/Time Between Calls which differentiate from <i>V. regulus</i> and <i>V. darlingtonia</i> . See Figure G3 for call frequency
<i>Ncytophilus sp.</i>	Long-eared Bat sp.			+	Pr		There is a possibility that some of the vertical calls within the dataset are from Southern Myotis but it is difficult to differentiate between these genres.
<i>Ozimops ridei</i>	Eastern Free-tailed Bat			+	C		-
<i>Saccolaimis flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		+	C	2	The calls aren't high quality but they are within the species' frequency range and the example shows the harmonics characteristic of this species. See Figure G4 for call frequency
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat			+	Pr		-
<i>Vespadelus pumilus</i>	Eastern Forest Bat			+	Pr		-
<i>Vespadelus vulturnus</i>	Little Forest Bat			+	C		-

C = confident, Cr = Probable, Po = Possible, V = Vulnerable

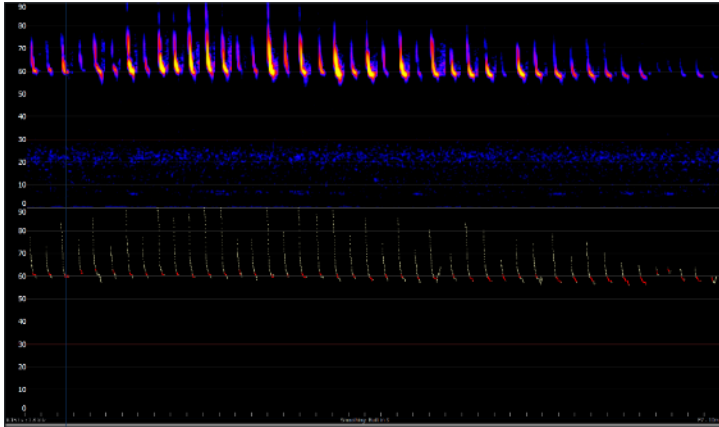


FIGURE 18 *MINIOPTERUS AUSTRALIS* CALL FREQUENCY

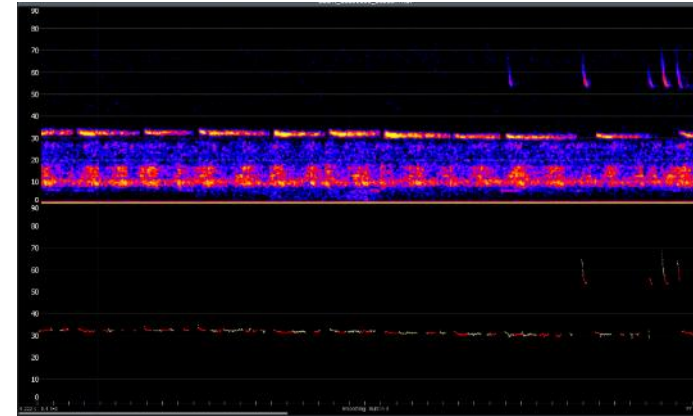


FIGURE 21 *MICRONOMOUS NORFOLKENSIS* CALL FREQUENCY

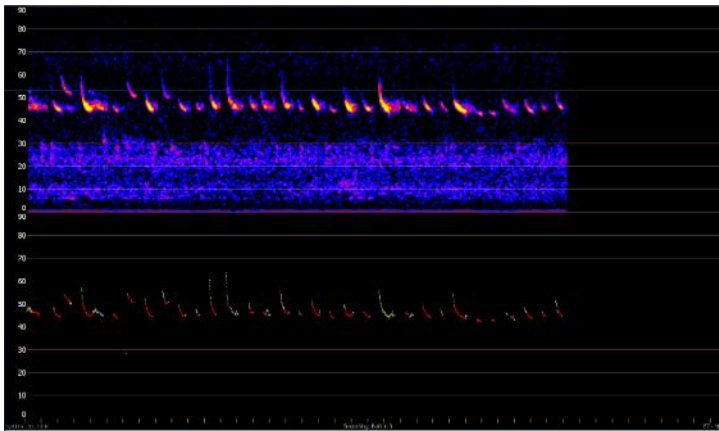


FIGURE 20 *MINIOPTERUS ORIANAE OCEANENSIS* CALL FREQUENCY

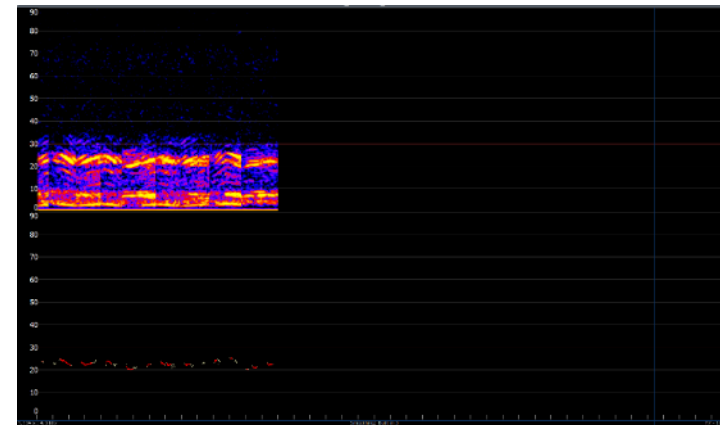


FIGURE 19 *SACCOLAIMIS FLAVIVENTRIS* CALL FREQUENCY



Appendix I – Expert Report: *Corunstylis* sp.
Charmhaven (*Genoplesium branwhiteorum*)
Genoplesium insigne, *Thelymitra adorata*



BJT Ecology

Expert Report: *Genoplesium branwhiteorum*, *Genoplesium insigne*,
Thelymitra adorata

Cooranbong Stockpile Extension Project

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Project title: Expert Report: *Genoplesium branwhiteorum*, *Genoplesium insigne*, *Thelymitra adorata*

Project: Cooranbong Stockpile Extension Project

Client: EcoResolve Environment & Design

Report Date: 7 May 2026

Version: 1.0

Cover photo: *Genoplesium branwhiteorum* (Brian Towle)

Certification: This report has been prepared by Brian Towle an approved biodiversity expert in accordance with section 5. 3 of the NSW *Biodiversity Conservation Act 2016*.



This report should be cited as:

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Glossary and abbreviations

Acronym	Description
BAM	Biodiversity Assessment Method
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
Comm. DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DoE	Former Commonwealth Department of Environment, now Comm. DCCEEW
DPHI	NSW Department of Planning, Housing and Industry
DPIE	Former NSW Department of Planning, Industry and Environment, now DPHI and NSW DCCEEW
IBRA	Interim Biogeographic Regionalisation of Australia

masl	Metres above sea level
OMF	Orchid mycorrhizal fungus
PCT	Plant Community Type
SoS	Saving our Species
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Database Collection
TSSC	Threatened Species Scientific Committee

1 Introduction

This expert report has been prepared for EcoResolve Environment & Design ('EcoResolve') on behalf of Centennial Northern Coal Services Pty Limited (Centennial) to inform a Biodiversity Development Assessment Report (BDAR) being prepared for the Cooranbong Entry Site Stockpile Extension Modification (hereafter referred to as the 'Project'). Specifically, this report aims to identify the distribution and abundance of suitable habitat for three orchid species (the subject species') listed as critically endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act). The three subject species are: *Genoplesium branwhiteorum* (Charmhaven Midge Orchid), *Genoplesium insigne* (Variable Midge Orchid) and *Thelymitra adorata* (Wyong Sun Orchid).

The BDAR and this expert report have been prepared in accordance with the requirements of the Biodiversity Assessment Method ('BAM'; DPIE 2020a). According to Section 5.3.3 (Box 3) of the BAM, an expert report must:

- Identify the relevant species or population.
- Justify the use of an expert report.
- Indicate and justify the likelihood of presence of the species or population and prepare a species polygon showing the location and area of the species polygon.
- Estimate the number of individuals or area of habitat (the latter being the unit of measurement that applies to the subject species for this report) for the subject land.
- Include the information considered in relation to the determination made in the report.
- Identify the expert and provide evidence of their expert credentials.

The findings of this report may impact future decisions regarding the BDAR, including areas of proposed future development and areas where development may be avoided to protect existing biodiversity values, being the likely presence of the subject species. Measures to avoid and minimise impacts to habitat for the subject species, and final calculations of the area of any residual impacts to potential habitat for the subject species do not form part of this report and will need to be presented within the final BDAR being prepared by EcoResolve.

1.1 The subject land

This report considers the likelihood of presence of the subject species within the 'disturbance area' as defined within the BDAR (EcoResolve 2025), hereafter referred to as the 'subject land'. The subject land is understood to include the total area of proposed disturbance, including both direct and indirect impacts. The subject land consists of an irregularly shaped area totalling 4.68 ha and is shown in **Figure 1.1**.

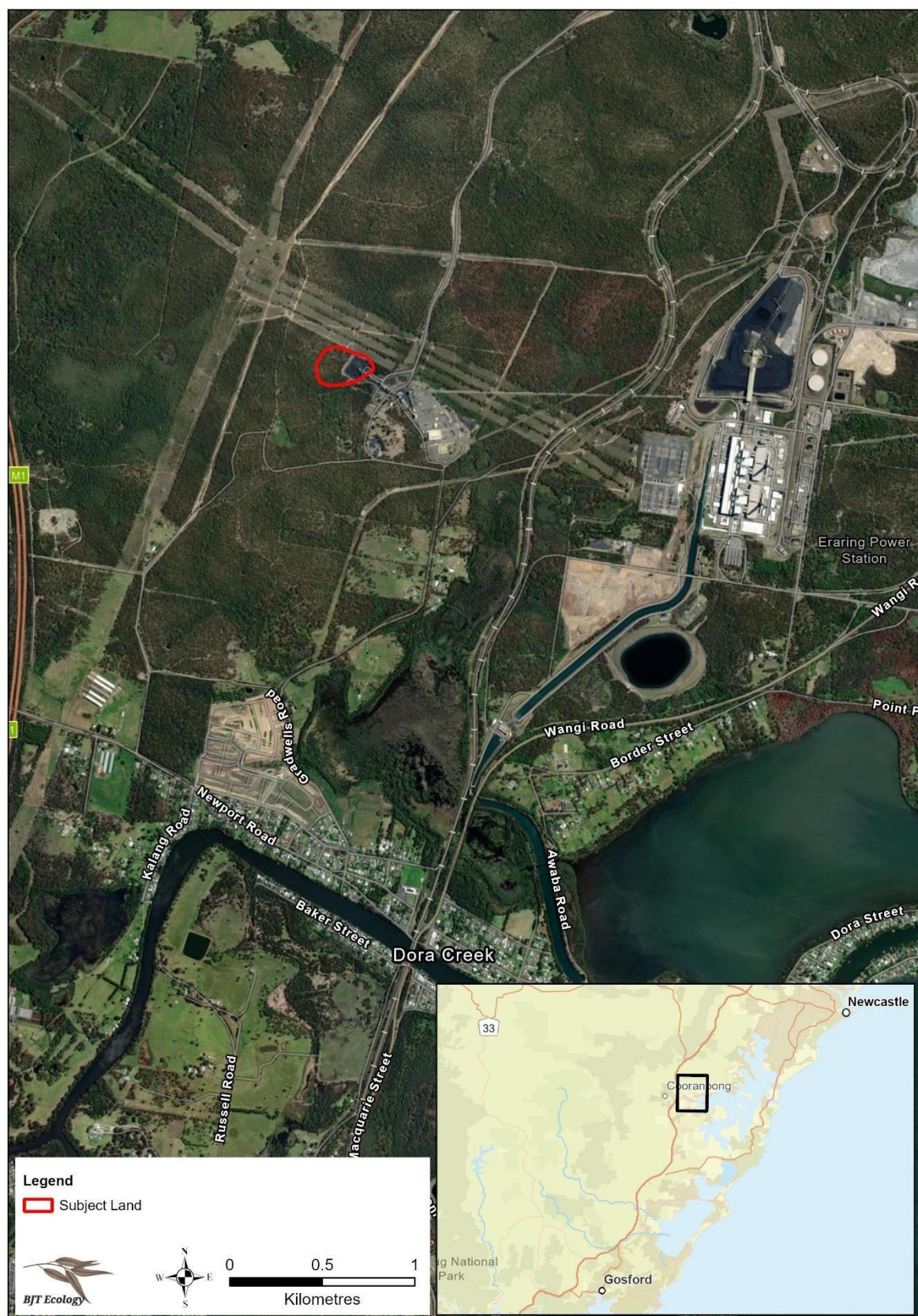


Figure 1.1: The subject land location

1.2 Expert credentials

I am an ecologist who specialises in the identification and ecology of members of the Orchidaceae with over 20 years' experience. During this time, I have worked primarily as a botanist undertaking a range of projects including orchid monitoring programs, targeted surveys for orchid species, expert reports for threatened orchid species, large-scale vegetation mapping/modelling projects, and a range of impact assessments. Most recently, I have worked extensively with the NSW Government's Saving Our Species (SoS) program. This has included designing and implementing monitoring surveys for multiple threatened flora species and participation in panels and workshops to review and develop conservation strategies for a range of threatened orchid species including the subject species for this report.

I have undertaken research into the ecology of native orchids, authoring and co-authoring multiple publications in peer-reviewed journals. I am an approved 'Species Expert' under the BAM for nine orchid species including the subject species for this report. I am also an accredited assessor under Section 6.10 of the BC Act and have a detailed working knowledge of the various aspects of the Biodiversity Offset Scheme established under this Act, including the BAM.

A full curriculum vitae is included as **Appendix A**.

1.3 Justification for use of an expert report

In accordance with Section 5.3.3 (Box 3) of the BAM, an expert report can be used for all proposals to determine whether a species is present or not present on the subject land. Nonetheless, the highly cryptic nature of the subject species and their relatively short flowering period can lead to imperfect detection during targeted surveys (which often are only undertaken over one flowering season), which further supports the use of an expert report.

1.4 Methods used in the preparation of this report

This report has been prepared based upon a review and collation of available information pertaining to the subject species and its habitats, including:

- A review of database records for the subject species from the NSW Department of Climate Change, Energy, the Environment and Water's (NSW DCCEEW) BioNet Atlas (NSW DCCEEW 2025a), which holds data from a number of custodians. Data obtained 23 October 2025.
- Information on the species included within the BioNet Threatened Biodiversity Database Collection ('TBDC'; NSW DCCEEW 2026a).
- Vegetation classification information as included within the BioNet Vegetation Classification (NSW DCCEEW 2026b).
- Existing vegetation mapping across the range of the subject species including Benson (1986), Bell (2019), Bell and Driscoll (2019) and the State Vegetation Type Map ('SVTM'; NSW DCCEEW 2025b).
- Vegetation mapping and survey results associated with the BDAR for the subject land (Ecoresolve 2025).

- My knowledge of the results of previous targeted surveys in proximity to the subject land, including surveys associated the NSW Government's SoS program and the Lake Macquarie Council Orchid Project.

In addition to a review of relevant information on the subject species, I also completed field inspections of habitats across the subject land specifically for the purposes of this report. These inspections were completed on 23 February 2026. During these inspections I made a comparison of current habitat types and their conditions against my knowledge and experience of known habitats for the subject species. Additionally, during these inspections I assessed the vegetation mapping and PCT allocation of EcoResolve (2025) to confirm its accuracy. To do this I compared the dominant species I observed across the subject land with the dominant species listed in the description of relevant PCTs in the BioNet Vegetation Classification (NSW DCCEEW 2026b). I also compared the structure and floristics of each PCT to known habitat for the subject species.

Whilst field inspections completed as part of this report were conducted during the flowering period of one of the subject species (*Genoplesium branwhiteorum*), no targeted surveys in accordance with current survey guidelines ('Surveying threatened plants and their habitats' [DPIE 2020b]) were undertaken. The results of targeted surveys completed in accordance with the guidelines (DPIE 2020b) by EcoResolve (2025) for all targeted species have informed this report.

The assessment of suitability of habitat within this report is based upon the current understanding of the habitat requirements of the subject species (determined from review and collation of information outlined above). This report identifies areas within the subject land as suitable habitat where the biophysical attributes match known habitat for the species, whilst also considering the results of targeted surveys for the subject species.

It is noted that this expert report has considered habitat types, and their conditions, as at the time of report preparation. Future changes to site conditions because of changes in land management practices or natural disturbances such as fire, may change the structure and condition of potential habitat which would have the potential to change the findings of this report. The BAM (DPIE 2020a) provides a method for a 'point in time' assessment of biodiversity values including the presence or absence of threatened species. This expert report, prepared in accordance with the requirements of the BAM, is a point in time assessment and cannot account for future changes to land management which may influence the distribution of threatened species.

2 Species information

2.1 *Genoplesium branwhiteorum*

2.1.1 Species description

The following description of *Genoplesium branwhiteorum* (**Plate 2.1**) comes from Renner *et al.* (2022):

"Terrestrial tuberous herb. Leaf to 19.5 cm long, 1.8 mm wide, slender, terete, mid green; free lamina c. 16 mm long (measured from base of terete part; 25 mm from tip to base of slit), 1.4 mm wide, linear-lanceolate, sheathing the scape, ending c. 8 mm above base of the first flower. Inflorescence length exposed outside of leaf to 40 mm long, bearing 3–15 closely

spaced flowers on a peduncle 6–12 mm long above the leaf; flowers opening in sequence from the base; flowers sessile. Ovary ellipsoidal, curved, 2.5–3.8 mm long, nearly straight on abaxial margin, and curved on the adaxial margin, lengthening with age, slightly longer at maturity. Flowers porrect, c. 8.5 mm long between tip of dorsal sepal and tips of lateral sepals, 6 mm wide between tips of lateral petals; green and cream with deep maroon markings. Dorsal sepal 4.0–4.5 mm long by 2.0–2.1 mm wide, ovate, cucullate, glabrous, greenish cream, with 3 maroon veins and maroon margins. Lateral sepals 5.0–5.5 mm long, 1.3–1.4 mm wide, narrow-ovate, bent abaxially c. 1 mm above base through 45–100°, erect to ascending, slightly to prominently divergent, distally involute, thick-textured, pale at base, then maroon and maroon with green in outer 1/2–2/3, glabrous, apex obtuse, without a gland. Lateral petals 3.2–3.7 mm long, 1.0–1.2 mm wide, narrow-ovate, acute or shortly acuminate, apex without a gland, divergent, cream with 3 maroon veins and maroon margins, with entire or with very sparsely ciliate margins, with as few as 1 or 2 cilia on the margin; cilia mostly less than 0.1 mm long. Labellum 3.0–3.5 mm long, 1.5 mm wide, broadly oblong-ovate to slightly obovate, rounded distally, with recurved, mucronate apex, maroon, in upper two thirds, pale in the basal third, but with maroon marginal and medial markings, narrowed in proximal 2/3, thick and fleshy, the margins densely ciliate, cilia varying in length from < 0.1 mm long to 1.0 mm long, flexuous and often entangled; callus defined by its intense maroon pigmentation in the outer half, slightly elevated profile above the surrounding lamina, and the smaller projecting cells on its surface, extending almost to labellum apex, ligulate from a broad base which encompasses nearly the whole labellum width, channelled for basal 2/3 of its length, thickest in the basal half. Column 2.2–3.3 mm long, erect, with two prominent basal callosities; column foot present c. 0.5 mm long, projected forwards, curved upwards. Column wings shallowly divided to 1/5–1/6 the wing length by a narrow sinus with acute vertex into two lobes, upper triangular to triangular oblong, lower narrow triangular, each with an acute apex; the lower lobe finely papillate on its surface and margin papillae longer toward the apex of the lobe, and there mixed with cilia; upper lobe pale, lower lobe maroon. Anther 1.0 mm long, truncate. Stigma broad-elliptical, 0.8 mm long, 0.7 mm wide, tapering to a free, forward projecting truncate protrusion beneath the anther, surface uneven but not papillate. Pollinarium 1.0 mm long; pollinia 0.45 mm long, yellow, granular; hamulus 0.45 mm long; viscidium 0.3 mm wide.”



Plate 2.1: *Genoplesium branwhiteorum* inflorescence (top-left), habit (top-right), habitat (bottom-right) and fertilised capsules (bottom-left). Photos by B. Towle

2.1.2 Life cycle

Genoplesium branwhiteorum is a perennial, deciduous, tuberous herb. The species persists as a dormant, fleshy underground tuber for much of the year during which it can escape periods of extreme heat and dryness (Jones 2001b). A single cylindrical leaf, which is fused with the peduncle in fertile plants, emerges from the dormant underground tuber in response to rainfall in late summer or early autumn (Bishop 2000; Jones 2001b). Flowering of *Genoplesium* species occurs approximately six weeks after triggering rains (Bishop 2000), with flowers of *Genoplesium branwhiteorum* typically observed from December to March. Flowering of *Genoplesium* species is dependent upon favourable environmental conditions, and in particular rainfall, with individuals not producing flowers during dry seasons (Bishop 2000). Flowering of *Genoplesium branwhiteorum* is reported as being enhanced in the seasons following fire (DPIE 2020c; Towle 2023), however, it is unclear whether flowering is enhanced by fire, or if the species is more easily detected in recently burnt areas (Jones 2001a; Towle 2023).

The dominant pollination mechanism in the genus *Genoplesium* is considered to be xenogamy (pollen transfer from another plant) or geitonogamy (pollen transfer from another flower on the same plant) mediated by small flies in the Family Chloropidae (Bishop 2000; Bower 2001; Bower et al. 2015; Towle et al. 2022). With the exception of those species which have been identified as being autogamous (*G. nudum*, *G. pumilum* and south-west Tasmanian *G. archeri*) or apomitic (*G. apostasioides*), most *Genoplesium* species are thought to reward fly pollinators with nectar produced either in the column appendages or the labellum callus (Garnet 1940; Jones 2001b; Bower 2001; Bower et al. 2015; Ren et al. 2020). There have been very few documented observations of pollinator activity on *Genoplesium branwhiteorum*. However, monitoring of the conversion rate of flowers to fruits has recorded a very high rate of pollination. Renner et al. (2022) suggest the species is facultatively autogamous, self-pollination occurring if pollinators do not remove pollinia. Mechanical self-pollination (autogamy) has been reported previously in Tasmanian populations of the related *Genoplesium archeri* (Jones 1998) and also in *G. nudum* and *G. pumilum* (Bower 2001).

Following flowering and pollination, fruit development occurs over approximately a four to six week period after which capsules dehisce and minute dust like seed is released. No detailed studies have been undertaken on the dispersal of *Genoplesium* seeds, although orchid seeds in general are considered well equipped for effective wind dispersal due to their small size and large volume to weight ratio and examples of colonisation across large distances support this conclusion. However, most studies investigating spatial genetic structure within terrestrial orchid populations have found a significant pattern, which in most cases was explained by limited seed dispersal (Machon et al. 2003; Jersáková and Malinová 2007). Kotlínek et al. (2020), in a study of two European terrestrial orchid species, found that most seeds landed very close to maternal plants (95% of captured seeds were within 7.2 m), although gene flow at greater distances was frequent. The typical seed dispersal in terrestrial orchids is thought to involve the vast majority of seed remaining close to the parent plant (<15 cm within *Spiranthes spiralis* studied by Machon et al. 2003) and only small portions travelling larger distances and capable of establishing new habitats (Machon et al. 2003; Jersáková and Malinová 2007). Grimm et al. (2020) noted in their study of *Genoplesium baueri* that plants often occur in dense clusters which was attributed to limited seed dispersal, or that seed dispersal was interrupted by surrounding understorey vegetation resulting in an accumulation of seed at the base of surrounding sedges. Based upon what is known about orchid seed in general and the morphology and habitat preferences of *Genoplesium branwhiteorum*, only a very small proportion of the seed produced by inflorescences to 19.5 cm tall (Renner et al. 2022) would be likely to disperse any large

distance beyond the parent plant (despite some elongation of the peduncle or flower stalk when the ovary is nearly mature) and the surrounding dense cover of sedges and other understorey species.

In general, very little is known about the longevity of orchid seeds in natural conditions (Bates and Weber 1990). Northern hemisphere studies have reported orchid seeds remaining viable in natural conditions for up to seven years (Whigham et al. 2006). However, in Western Australia seeds of the orchids *Caladenia arenicola* and *Pterostylis sanguinea* were found to be short-lived (< 1 year) within natural conditions (Batty et al. 2000). As the simple seeds of *Genoplesium* species do not possess a hardened seed coat, or other adaptations, which may protect seeds from fire, the seeds are almost certainly killed when exposed to the heat and steam produced by fire. Therefore, soil seed banks of *Genoplesium* species are likely to be relatively short-lived, particularly in habitats with short inter-fire intervals.

Like all other orchids, germination of *Genoplesium* seed is reliant on invasion of the seed by the hyphae of a specific fungal associate (Bates and Weber 1990), which in the case of *G. branwhiteorum* is an unnamed species of Rhizoctonia (*Ceratobasidiaceae*; Reiter and Dimon 2025). Unlike fungal associations in other families, the mycorrhizal fungi associated with species of the Orchidaceae occur within the roots or absorbing organs forming hyphal coils within cortical cells (Warcup 1990). The mycorrhizal fungi deliver sugars and inorganic substances to the orchid (Rasmussen 1995, Warcup 1990). Within the Orchidaceae, the duration of the association varies between orchid species, with some species of orchids being completely dependent on their mycorrhizal fungi for life while other species are capable of living without their fungi from shortly after germination. Difficulty propagating *Genoplesium* species prior to the work of Reiter and Dimon (2025) suggests that there may be some ongoing association between mature *Genoplesium* plants and their mycorrhizal associates.

2.1.3 Distribution and abundance

The distribution of *Genoplesium branwhiteorum* is limited to the Wyong sub-region in accordance with the Interim Biogeographic Regionalisation of Australia (IBRA), and the Sydney Basin region. The species has been recorded from the area bound by the localities of Morisset, Chain Valley Bay, Charmhaven and Bushells Ridge. The species has been observed growing within an altitudinal range of approximately 10 – 45 masl.

Estimates of the abundance of *Genoplesium branwhiteorum* include a large amount of uncertainty due to the difficulty detecting the species, even when in flower, and the variable flowering of the species in response to climate and habitat structure associated with time since fire. In 2012 the NSW Scientific Committee (2012) identified the total known population size of *Genoplesium branwhiteorum* as less than 20 mature plants occurring in one known population. In June 2014, the Commonwealth Threatened Species Scientific Committee (TSSC 2014b) estimated the total population to consist of 40-60 mature plants with Payne (2014) identifying 26 individuals within one population in this year (2014). Combining more recent records of the species as part of the SoS program and individuals recorded during targeted surveys, the total population of flowering plants observed in summer/autumn 2020 or 2021 (avoiding double counting of any individuals) was 255 plants. Based upon these observations, results of individual plant tagging and monitoring across seasons suggesting high dormancy rates, and considering the likelihood of unrecorded populations present on private land, the total population size is estimated by me to be over 300 individuals.

2.1.4 Habitat requirements

Known habitat for *Genoplesium branwhiteorum*, as determined from BioNet records (NSW DCCEEW 2025a) and my own field surveys, is associated with multiple geological units (Patonga Claystone Formation, Tuggerah Formation, Munmorah Conglomerate Formation) and soil landscapes (Doyalson, Gorokan, Tacoma Swamp, Woodburys Bridge) all of which are associated with either the Triassic age Clifton Subgroup geological unit or Quaternary sediments (Bryan et al. 1966; Murphy 1993). The species has not been recorded from areas of the Gosford Subgroup or Hawkesbury Sandstone which typically occur in the more elevated areas to the south and west of the species range including the Hunter Range and Watagan Mountains. The current known northern limit for the species is broadly associated with the presence of the Permian aged Newcastle Coal Measures which occur north of Awaba.

The NSW Scientific Committee (2012) described habitat for *Genoplesium branwhiteorum* as low woodland to heathland with a shrubby understorey and ground layer. Dominant species associated with this habitat include *Allocasuarina littoralis*, *Kunzea ambigua*, *Leptospermum juniperinum*, *Melaleuca nodosa*, *Callistemon linearis* and *Schoenus brevifolius* (NSW Scientific Committee 2012). Payne (2014) identifies habitat for the species as being associated with Patonga Claystone geology of the Clifton subgroup and a forest dominated by *Corymbia maculata*, *Eucalyptus fibrosa*, *Eucalyptus capitellata* and *Eucalyptus globoidea* with a conspicuous *Melaleuca nodosa* understorey. BioNet records of *Genoplesium branwhiteorum* and my own observations identify that the species is associated with a greater range of vegetation types and habitats than previously thought (TSSC 2014; Payne 2014). The BioNet TBDC identifies a total of 12 PCTs with which the species is associated (NSW DCCEEW 2026a; **Table 2.1**).

Most recorded locations of *Genoplesium branwhiteorum* and the greatest number of known individuals are associated with 'Hunter Coast Lowland Scribbly Gum Forest' (PCT 3583) and 'Hunter Coast Lowland Apple-Bloodwood Forest' (PCT 3582). The primary habitat types with which *Genoplesium branwhiteorum* is associated are relatively widespread across the Central Coast region (SVTM; NSW DCCEEW 2025b). The rare status of *Genoplesium branwhiteorum* despite the widespread occurrence of suitable habitat, where suitable habitat is defined as all areas supporting equivalent vegetation types and soil landscapes to known populations, suggests that the species is seed/dispersal limited rather than habitat limited. Consequently, there is likely to be large areas of suitable but unoccupied habitat for the species across its range. For cryptic species such as *Genoplesium branwhiteorum*, where flowering and detection is variable across season and influenced by bushfire, distinguishing between occupied and unoccupied habitat is very difficult and can require multiple surveys across numerous seasons.

The absence of *Genoplesium branwhiteorum* from suitable habitat, may be explained in some instances by the absence of the required mycorrhizal fungi. The dependence of *Genoplesium branwhiteorum*, and all orchid species, on mycorrhizal fungi for the germination of seed means that the occurrence of the species will ultimately be limited to areas where its associated mycorrhizal fungi occur. Factors which influence the distribution and abundance of the unnamed species of Rhizoctonia (*Ceratobasidiaceae*; Reiter and Dimon 2025) upon which *Genoplesium branwhiteorum* is dependent, are currently unknown. However, the results of studies of other orchids and their associated mycorrhizal fungi have found orchid mycorrhizal fungi to be wider ranging and frequently detected at locations where their host orchids are absent (Freestone et al. 2021). Additionally, results from propagation trials (Reiter and Dimon 2025) suggest that seed of *Genoplesium branwhiteorum* is

capable of being germinated by the same mycorrhizal fungi as more common and widespread species of *Genoplesium* which suggest that mycorrhizal fungi occurrence alone does not limit the range and distribution of *Genoplesium branwhiteorum*. Consequently, the absence of the associated mycorrhizal fungi may contribute to the absence of *Genoplesium branwhiteorum* from some otherwise suitable areas of habitat, however this factor alone does not explain the rarity of the orchid species more broadly.

2.1.4.1 Microhabitats

The BAM recognises that within the broader vegetation classification of PCTs, there are 'microhabitats' which influence the distribution and likelihood of occurrence of threatened species. In the case of *Genoplesium branwhiteorum*, the microhabitats with which the species is associated are poorly understood and there are no specific microhabitats listed within the TBDC (NSW DCCEEW 2026a) for the species. However, based upon my observations of the species across almost all known sub-populations, the species shows a preference for more open microhabitats and areas with increased moisture availability.

Genoplesium branwhiteorum is most frequently associated with more open microhabitats characterised by an open canopy and midstorey, with a dense understory of grasses and sedges. The species is rarely detected in areas which support dense vegetation, and which have not experienced bushfire for extended periods. However, observations of the species post bushfire suggest that the species persists in habitats that were densely vegetated habitats prior to the fire event, although it is very difficult to detect either because the species rarely flowers in these habitats or because plants are obscured by the surrounding dense vegetation (Towle 2023). *Genoplesium branwhiteorum* is also frequently recorded within habitats which show some level of increased moisture availability, or occasional water ponding, as evidenced by their occurrence in habitats which support high cover of *Melaleuca* species, or which have a high cover of sedges (Cyperaceae species) and rushes (Restionaceae species) in the understory. This includes occurrences around the margins of small and large swamps. However, *Genoplesium branwhiteorum* has not been observed within the wettest portions of swamps where inundation and standing water occurs for extended periods.

Table 2.1: Vegetation formations, class and PCTs which the TBDC (NSW DCCEEW 2026a) identifies *Genoplesium branwhiteorum* is associated (as of 6 March 2026)

Vegetation Formation	Vegetation Class	Plant Community Type (PCT)
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	PCT 3432: Hunter Coast Foothills AppleIronbark Grassy Forest
		PCT 3433: Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
		PCT 3435: Hunter Coast Lowland Flats Damp Forest
Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	PCT 3581: Hunter Coast Foothills Apple Forest

		PCT 3582: Hunter Coast Lowland AppleBloodwood Forest
		PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
Freshwater Wetlands	Coastal Heath Swamps	PCT 3906: Northern Lowland Clay Wet Heath
Forested Wetlands	Coastal Swamp Forests	PCT 3995: Hunter Coast PaperbarkSwamp Mahogany Forest
		PCT 3998: Lower North Creekflat Mahogany Swamp Forest
		PCT 4013: Wyong Paperbark-Woollybutt Swamp Forest
	Coastal Floodplain Wetlands	PCT 4020: Coastal Creekflat Layered Grass-Sedge Swamp Forest
		PCT 4021: Coastal Creekline Dry Shrubby Swamp Forest

2.2 *Genoplesium insigne*

2.2.1 Species description

The following description of *Genoplesium insigne* (**Plate 2.2**) comes from Jones (2001a):

“Terrestrial tuberous herb. Leaf terete, 6-15 cm long, c. 0.15 cm wide, dark green; base reddish; lamina sheathing the scape or distally free subulate, 10-15 mm long, 1.5-2 mm wide, ending 5-20 mm below the first flower. Inflorescence 9-18 cm tall, bearing 5-12 flowers in a moderately dense spike 15-25 mm long. Flowers porrect, c. 5 mm diam., dark purple to dark reddish purple with a dark reddish-purple labellum; lateral sepals obliquely erect. Floral bracts closely sheathing, transversely ovate-oblong, c. 0.8 mm long, c. 1.5 mm wide, broadly obtuse. Ovary linear-obovoid, c. 3.5 mm long, asymmetrically arcuate. Dorsal sepal cucullate, ovate-lanceolate to elliptic-lanceolate, 5-5.5 mm long, c. 2.5 mm wide, deeply concave; margins entire; apex long-acuminate to attenuate-apiculate. Lateral sepals narrowly linear-lanceolate, 6.5-7 mm long, c. 1.2 mm wide, not gibbous at the base, more or less parallel; distal margins involute; apex subacute. Petals widely spreading, narrowly ovate-lanceolate, 4.5-5 mm long, c. 1 mm wide; margins entire; apex long-acuminate. Labellum hinged by a short claw, porrect, mobile in a breeze; lamina obovate-elliptic, c. 4 mm long, c. 1.8 mm wide, fleshy, sharply recurved at the base and the apex; margins with short to long (0.3-1 mm long), coarse, spreading purple cilia; apex long-acuminate; callus occupying less than half the area of the ventral surface of the lamina, extending to within 1 mm of the labellum apex, dark purplish-black, colluviate, thickest and broadest just above the base then drawn out and tapered to an obtuse apex. Column c. 2.8 mm long, c. 1.4 mm

wide, purplish to reddish. Column foot ligulate, c. 0.7 mm long, the apex incurved. Column wings very shallowly notched; lobes slightly unequal, not divergent; posterior lobe slightly longer, linear, paler, obtuse, entire; anterior lobe slightly shorter, broadly deltate, dark purplish, obtuse, curved, the anterior margins densely and irregularly ciliate, with cilia to c. 0.5 mm long. Anther c. 1 mm long, with a filiform rostrum c. 0.6 mm long. Pollinarium c. 1 mm long; pollinia c. 0.9 mm long, yellow, coarsely granular; caudicle vestigial; viscidium c. 0.2 mm wide. Stigma ovate-elliptic, c. 1 mm long, c. 0.6 mm wide.”



Plate 2.2: *Genoplesium insigne* flower buds (top-left), pollinator with pollinia (top-right), habit (bottom-right) and open flowers (bottom-left). Photos by B. Towle

2.2.2 Life-cycle

Genoplesium insigne is a perennial, deciduous, tuberous herb. The species persists as a dormant, fleshy underground tuber for much of the year during which it can escape periods of extreme heat and dryness (Jones 2001b). A single cylindrical leaf, which is fused with the peduncle in fertile plants, emerges from the dormant underground tuber in response to rainfall in late winter or early spring (Bishop 2000; Jones 2001b). Flowering of *Genoplesium* species occurs approximately six weeks after triggering rains (Bishop 2000), with flowers of *Genoplesium insigne* typically observed from September to November, but with records in some seasons as early as July and as late as December. Flowering of *Genoplesium* species is dependent upon favourable environmental conditions, and in particular rainfall, with individuals not producing flowers during dry seasons (Bishop 2000). Flowering of *Genoplesium insigne* is reported as being enhanced in the seasons following fire (DPIE 2020c; Towle 2023), however, it is unclear whether flowering is enhanced by fire, or if the species is more easily detected in recently burnt areas (Jones 2001a; Towle 2023).

The dominant pollination mechanism in the genus *Genoplesium* is considered to be xenogamy (pollen transfer from another plant) or geitonogamy (pollen transfer from another flower on the same plant) mediated by small flies in the Family Chloropidae (Bishop 2000; Bower 2001; Bower et al. 2015; Towle et al. 2022). With the exception of those species which have been identified as being autogamous, most *Genoplesium* species are thought to reward fly pollinators with nectar produced either in the column appendages or the labellum callus (Garnet 1940; Jones 2001b; Bower 2001; Bower et al. 2015; Ren et al. 2020). Field observations of *Genoplesium insigne* confirm that the species attracts Chloropid flies which have been observed removing entire pollinia from open flowers (Towle et al. 2022; **Plate 2.2**).

Monitoring of *Genoplesium insigne* across four years as part of the NSW Government's SoS program has identified low rates of pollination and capsule production in *Genoplesium insigne* in comparison to other *Genoplesium* species for which data exists (Bower et al. 2015; Ren et al. 2020; Towle et al. 2022). Where pollination of *Genoplesium insigne* occurs, fruit development occurs over approximately a four to six-week period after which capsules dehisce and minute dust like seed is released. As discussed for *Genoplesium branwhiteorum* (**Section 2.1.2**), based upon what is known about orchid seed in general and the morphology and habitat preferences of *Genoplesium insigne*, only a very small proportion of the seed produced by inflorescences less than 18 cm tall (Jones 2001a) would be likely to disperse any large distance beyond the parent plant and the surrounding dense cover of sedges and other understorey species. Seeds of *Genoplesium* species including *Genoplesium insigne* are likely to be relatively short-lived in natural conditions, particularly in habitats with short inter-fire intervals (see **Section 2.1.2** for further discussion).

2.2.3 Distribution and abundance

Records of *Genoplesium insigne* are limited to the Wyong subregion of the Sydney Basin under the Interim Biogeographic Regionalisation of Australia ('IBRA'). The species has been recorded from the area bound by the localities of Wyong, Chain Valley Bay and Freemans Waterhole. The species has been recorded growing within an altitudinal range of approximately 10 – 70 masl, although Jones (2001a) reports the species as occurring from 20 – 100 masl.

Estimates of the abundance of *Genoplesium insigne* include a large amount of uncertainty due to the difficulty detecting the species, even when in flower, and the variable flowering of the species in response to climate and habitat structure associated with time since fire. At the time of its

description in 2001, fewer than 20 plants of *Genoplesium insigne* were known from three localities (Jones 2001; NSW Scientific Committee 2001). In 2013 only 13 individuals of the species were recorded across all of the then known sites (Threatened Species Scientific Committee [TSSC] 2014a). Following commencement of the SoS program and monitoring surveys including surveys for new populations to enable seed collection, the total counts of flowering stems increased to 442 individuals in 2020 (pers. obs.). Combining all known populations, and considering the likelihood of non-flowering individuals and populations present on private land, I estimate the total population size is estimated to be over 1,000 individuals.

2.2.4 Habitat requirements

Habitat for *Genoplesium insigne* was broadly described by Jones (2001) as “*Themeda triandra* patches and amongst shrubs and sedges in heathland and heathy forest on grey to white sand”. Known habitat for *Genoplesium insigne*, as determined from BioNet records (NSW DCCEEW 2025a) and my own field surveys, is associated with the Triassic age Clifton Subgroup geological units (including the Patonga Claystone Formation, Tuggerah Formation and Munmorah Conglomerate Formation) or Quaternary sediments (Bryan et al. 1966; Murphy 1993). Known habitat is associated with multiple soil landscapes: Doyalson; Gorokan; Wyong; Tacoma Swamp; and Woodburys Bridge. The species has not been recorded from areas of the Gosford Subgroup or Hawkesbury Sandstone which typically occur in the more elevated areas to the south and west of the species range including the Hunter Range and Watagan Mountains. The current known northern limit for the species is associated with the presence of the Permian aged Newcastle Coal Measures which occur north of Awaba.

The endangered species profile for *Genoplesium insigne* (DPIE 2020c) states that the species: “Appears to be associated with Plant Community Type (PCT) 1636 Scribbly Gum – Red Bloodwood – Angophora inopina (not always present) heathy woodland on lowlands of the Central Coast”. This PCT is a now decommissioned PCT, although is broadly equivalent to ‘Hunter Coast Lowland Scribbly Gum’ (PCT 3583). However, the TBDC (NSW DCCEEW 2026a) also lists additional PCTs with which the species is associated (**Table 2.2**). BioNet records of *Genoplesium insigne* (NSW DCCEEW 2025a) support this assessment of habitat with the greatest concentration of records and known individuals associated with PCT 3583, although the species has been recorded in a number of additional PCTs.

The primary habitat type with which *Genoplesium insigne* is associated (PCT 3583) is relatively widespread across the region (SVTM; NSW DCCEEW 2025b). The rare status of *Genoplesium insigne* despite the widespread occurrence of suitable habitat, where suitable habitat is defined as all areas supporting equivalent vegetation types and soil landscapes to known populations, suggests that the species is seed/dispersal limited rather than habitat limited. Consequently, there is likely to large areas of suitable but unoccupied habitat for the species across its range. For cryptic species such as *Genoplesium insigne*, where flowering and detection is variable across season and influenced by bushfire, distinguishing between occupied and unoccupied habitat is very difficult and can require multiple surveys across numerous seasons. As discussed in **Section 2.1.4**, the absence of the associated mycorrhizal fungi may contribute to the absence of *Genoplesium insigne* from some otherwise suitable areas of habitat, however this factor alone does not explain the rarity of the orchid species more broadly.

2.2.4.1 Microhabitats

The BAM recognises that within the broader vegetation classification of PCTs, there are ‘microhabitats’ which influence the distribution and likelihood of occurrence of threatened species.

In the case of *Genoplesium insigne*, the microhabitats with which the species is associated are poorly understood and there are no specific microhabitats listed within the TBDC for the species. However, in my experience, the species shows a preference for more open microhabitats and within areas with increased moisture availability (similar to that noted for *Genoplesium branwhiteorum*).

Genoplesium insigne is most frequently associated with more open microhabitats characterised by an open canopy and midstorey, with a dense understory of grasses and sedges. The species is rarely detected in areas which support dense vegetation, and which have not experienced bushfire for extended periods. However, observations of the species post bushfire suggest that the species persists in densely vegetated habitats, although it is very difficult to detect either because the species rarely flowers in these habitats or because plants are obscured by the surrounding dense vegetation (Towle 2023). *Genoplesium insigne* is also commonly observed within habitats which show some level of increased moisture availability, or occasional water ponding, as evidenced by their occurrence in habitats which support high cover of *Melaleuca* species, or which have a high cover of sedges and rushes in the understory. This includes occurrences around the margins of swamps. However, *Genoplesium insigne* has not been observed within wetter portions of swamps where inundation and standing water occurs for extended periods.

Table 2.2: Vegetation formations, class and PCTs which the TBDC (NSW DCCEEW 2026a) identifies *Genoplesium insigne* is associated (as of 6 March 2026)

Vegetation Formation	Vegetation Class	Plant Community Type (PCT)
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	PCT 3432: Hunter Coast Foothills AppleIronbark Grassy Forest
		PCT 3433: Hunter Coast Foothills Spotted GumIronbark Grassy Forest
		PCT 3435: Hunter Coast Lowland Flats Damp Forest
Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Coastal Dry Sclerophyll Forests	PCT 3581: Hunter Coast Foothills Apple Forest
		PCT 3582: Hunter Coast Lowland AppleBloodwood Forest
		PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
Freshwater Wetlands	Coastal Heath Swamps	PCT 3906: Northern Lowland Clay Wet Heath
Forested Wetlands	Coastal Swamp Forests	PCT 3998: Lower North Creekflat Mahogany Swamp Forest
Vegetation Formation	Vegetation Class	Plant Community Type (PCT)

		PCT 4013: Wyong Paperbark-Woollybutt Swamp Forest
	Coastal Floodplain Wetlands	PCT 4020: Coastal Creekflat Layered GrassSedge Swamp Forest
		PCT 4021: Coastal Creekline Dry Shrubby Swamp Forest
		PCT 4042: Lower North Riverflat EucalyptPaperbark Forest

2.3 *Thelymitra adorata*

2.3.1 Species description

The following description of *Thelymitra adorata* (**Plate 2.3**) comes from Jeanes (2011):

“Glabrous terrestrial herb. Tubers not seen. Leaf linear to linear-lanceolate, 10-40 cm long, 5-20 mm wide, erect, canaliculate, fleshy, ribbed abaxially, green with a purplish base, sheathing at base, apex acute. Inflorescence 20-60 cm tall. Scape 2-5 mm diam., slender to stout, straight, green or purplish. Sterile bracts 2-4, linear to lanceolate, 2-13 cm long, 5-15 mm wide, closely sheathing, green and purplish, acute, lower ones leaflike. Fertile bracts ovate-acuminate to obovate-acuminate, 6-22 mm long, 3-7 mm wide, closely sheathing the pedicel, green or purplish. Pedicels 1-14 mm long, slender. Ovary cylindric to narrowly obovoid, 3-12 mm long, 2-3.5 mm wide. Flowers 2-13, 15-27 mm across, opening moderately freely in warm weather. Perianth segments 8-13 mm long, 4-7 mm wide, often shortly apiculate, deep blue; dorsal sepal ovate to ovate-lanceolate, acute; lateral sepals ovate to ovate-lanceolate, often slightly asymmetric, acute; petals ovate to ovate-lanceolate, acute; labellum ovate lanceolate to lanceolate, acute, often narrower than other segments. Column erect from the end of ovary, 5.5-6.5 mm long, 2.5-3.5 mm wide, white to pale blue; post-anther lobe not hooding the anther, 2.5-3.5 mm long, 1.5-2.2 mm wide; post-anther lobe extension 1-1.5 mm long, more or less semi cylindric, gently curved, dark brownish, apex yellow, distal margin irregularly toothed or incised, incurved, also with a narrow central notch or split 0.5-1 mm deep; auxiliary lobes absent; lateral lobes converging, 1.5-2 mm long, digitiform, porrect or obliquely erect, curved gently, each with a more or less terminal mop-like tuft of white hairs, the individual hairs 1-1.5 mm long. Anther inserted about mid-way along column, base partly obscured behind stigma, ovoid, 2-3 mm long, 1.5-2 mm wide, connective produced into a beak 0.4-0.6 mm long; pollinarium 1.5-2.5 mm long; viscidium circular to reniform, c. 0.6 mm diam.; pollinia white, friable, mealy. Stigma situated at base of column, ovate-quadrate, 2-2.5 mm long, 2-2.5 mm wide. Capsules obovoid, 10-20 mm long, 5-7 mm wide, erect, ribbed.”



Plate 2.3: *Thelymitra adorata* habit (left) and open flowers (right) – B. Towle

2.3.2 Life Cycle

Thelymitra adorata is a perennial, deciduous, tuberous herb. The species persists as a dormant, fleshy underground tuber over the hottest periods of the year (typically November to March) during which it can escape periods of extreme heat and dryness. A single fleshy, ribbed linear to linear-lanceolate leaf, 10-40 cm long and up to 20 mm wide, emerges from the tuber during the autumn months. Flowering typically occurs from late September to early October, with mature capsules observed from late October to December. Flowering of *Thelymitra adorata* is dependent upon favourable environmental conditions, and in particular rainfall, with individuals not producing flowers during unfavourable conditions (NSW DCCEEW 2026c). Non-flowering individuals often produce shorter and narrower leaves, termed 'maintenance leaves' (pers. comm. Dr. C. Bower 2025), with the species also capable of remaining only as a dormant tuber (not producing leaves or an inflorescence) for one or more seasons. *Thelymitra* species are generally considered fire stimulated species, with many accounts of members of the *Thelymitrinae* subtribe and *Thelymitra* genus being stimulated to flower after fire (Lamont and Downes 2011; Duncan 2012; Bower 2019). However, seasonality of fire may determine the response of *Thelymitra* species with fire-stimulated flowering generally observed following wildfire in summer months. Within southeast Australia, the typical annual cycle of *Thelymitra* species involves leaf emergence in autumn or winter, flowering in spring or early summer with species dormant over the hottest and driest periods of the year. Therefore, most wildfires in southeast Australia would be likely to occur when members of the genus are dormant. Fires outside of the typical fire season, including fires in autumn and winter, when *Thelymitra* species are in early leaf development stages can have a negative impact upon population size (Jasinge *et al.* 2018).

There have been no specific studies on the pollination of *Thelymitra adorata*, although as part of a collaboration between the SoS program and Invertebrates Australia, a *Thelymitra adorata* pollinator study is currently underway. The study aims to further the understanding of pollinators of *Thelymitra adorata* and their occurrence across its range. For *Thelymitra* species, pollination mechanisms range from being completely self-pollinating (obligate self-pollination) to dependent upon insects for pollination (obligate insect-mediated pollination). Many *Thelymitra* species are identified as being capable of self-pollination where insect mediated pollination does not occur (facultatively self-pollinated; Bower 2001). Pollinator attraction in *Thelymitra* is primarily by food deception, with column hood structures imitating anthers, which attract a variety of native bee species attempting to collect pollen. However, this can only occur during warm and humid conditions when the perianth segments are open (Bower 2001; Weston *et al.* 2005). Some *Thelymitra* species have also been identified as emitting sweet odours which may enhance attractiveness to nectar-feeding or pollen-feeding insects (Bower 2001), although no odour has been reported for *Thelymitra adorata*.

Thelymitra adorata is thought to be facultatively self-pollinated, with self-pollination occurring when insects do not remove pollinia. The flowers of the species open readily and for extended periods on warm and humid days, which is commonly associated with facultatively selfpollinated *Thelymitra* species. However, the friable pollen and very high capsule development observed for *Thelymitra adorata*, despite very infrequent observations of visiting insects, indicate that autogamy (self-pollination) frequently occurs.

Capsules developed from pollinated flowers of *Thelymitra adorata* produce numerous, fine, dust-like seeds. *Thelymitra* seeds require infection of an appropriate orchid mycorrhizal fungus (OMF) shortly after germination to supply energy and rely on one or more OMFs for nutrition throughout their lives

(Rasmussen 1995; McCormick *et al.* 2018). The simple seeds of *Thelymitra* species do not possess a hardened seed coat or other adaptations and are thought to be killed by fire. Therefore, seeds of *Thelymitra* species are unlikely to form a long-term persistent soil seed-bank.

As for many orchid species, no detailed studies have been undertaken on the dispersal of *Thelymitra adorata* seeds. Orchid seeds in general are considered well equipped for effective wind dispersal, due to their small size and high volume to weight ratio (Rasmussen 1995). Examples of colonisation of orchid species across long distances support this conclusion. Despite this, most studies investigating spatial genetic structure within terrestrial orchid populations have found a significant pattern to the spatial genetic structure, which in most cases was explained by limited seed dispersal (Machon *et al.* 2003; Jersáková and Malinová 2007). The typical seed dispersal in terrestrial orchids is thought to involve the vast majority of seed remaining close to the parent plant (within 15 cm for *Spiranthes spiralis* studied by Machon *et al.* 2003) and only small portions travelling larger distances and capable of establishing new habitats (Machon *et al.* 2003; Jersáková and Malinová 2007). Based on this, it is considered highly likely that while *Thelymitra adorata* seed is probably capable of dispersing large distances via wind when conditions are suitable, the vast majority of seed produced is likely to disperse only a very short distance.

2.3.3 Distribution and Abundance

Thelymitra adorata is a terrestrial orchid which is generally considered endemic to the Central Coast and Lake Macquarie Local Government Areas, with extant occurrences known from the localities of Wallarah, Warnervale, Wyong, Watanobbi and Catherine Hill Bay. However, there is some uncertainty regarding the status of individuals from Catherine Hill Bay which may be intermediate between *Thelymitra adorata* and the morphologically similar *Thelymitra planicola*. Genetic studies of all known *Thelymitra adorata* are ongoing as part of the SoS program.

The total population size for the species was previously estimated to be very low (less than 250 individuals; NSW Scientific Committee 2008; DoE 2014). However, since the time of these estimates and with active targeted searches implemented through the SoS program, many more new populations and individuals of the species have been recorded. Incorporating these recent records, the total population size across the species range is estimated to be in the order of 1,300 individuals. This estimate is based upon a combination of data from records submitted to the BioNet Atlas (DCCEE 2025a), publicly available data from the SoS program (NSW DCCEE 2024) and my own personal observations from targeted surveys. It should be noted that the detection of *Thelymitra adorata* is almost exclusively from flowering individuals and therefore these estimates rarely incorporate non-flowering, dormant or juvenile individuals of the species, or potential hybrids with *Thelymitra peniculata*. Accordingly, the population estimate of 1,300 individuals should be considered a minimum population estimate.

2.3.4 Habitat requirements

Brief details on habitat for *Thelymitra adorata* are included in Bell *et al.* (2005), where all plants known at that time fell within vegetation described as 'Dooralong Spotted Gum Ironbark Forest' (considered equivalent to PCT 3437 – 'Hunter Coast Lowland Spotted Gum Dry Forest'). Bell *et al.* (2005) also notes the tendency of the species to occur in ecotonal situations and to take advantage of additional light generated through minor clearing activities. The NSW Scientific Committee (2008) describes *Thelymitra adorata* habitat as woodlands with a grassy understorey in well-drained clay loam or shale derived soils, including the Dooralong Spotted Gum - Ironbark Forest and ecotones

with other vegetation types. Jeanes (2011) describes habitat as grassy woodlands dominated by *Corymbia maculata* (Spotted Gum) with *Themeda triandra* (Kangaroo Grass) understorey.

BioNet records of *Thelymitra adorata* and my own observations identify that the species is associated with a greater range of vegetation types and habitats than previously thought (Bell *et al.* 2005 and Jeanes 2011). This is also demonstrated through the PCT associations listed for the species within the BioNet TBDC which identifies 15 PCTs with which the species is associated (NSW DCCEEW 2026a; **Table 2.3**). Analysis of BioNet records for *Thelymitra adorata* and the State Vegetation Type Map (SVTM; NSW DCCEEW 2025b) identifies that the species is most commonly associated with habitat which has not been mapped as supporting native vegetation (mapped as 'Not classified' on the SVTM; NSW DCCEEW 2025b), reflecting the association of the species with disturbed or modified habitats. Using the 1750 PCT mapping included within the SVTM (NSW DCCEEW 2025b), the vast majority of records of *Thelymitra adorata* occur within habitat modelled as previously supporting:

- PCT 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
- PCT 3582 - Hunter Coast Lowland Apple-Bloodwood Forest
- PCT 3244 - Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest • PCT 3436 - Hunter Coast Sandy Creekflat Low Paperbark Scrub
- PCT 4042 - Lower North Riverflat Eucalypt-Paperbark Forest.

The wide range of habitats in which *Thelymitra adorata* has been recorded, suggests that vegetation type (including PCTs) may not be accurate at predicting potential habitat for the species. Habitat condition and disturbance history across the narrow range of the species may better predict habitat for the species.

2.3.4.1 Microhabitats

The BAM recognises that within the broader vegetation classification of PCTs, there are 'microhabitats' which influence the distribution and likelihood of occurrence of threatened species. In the case of *Thelymitra adorata*, the specific microhabitats with which the species is associated are poorly understood and there are no specific microhabitats listed within the TBDC (NSW DCCEEW 2026a) for the species. However, based upon my observations of the species across almost all known sub-populations, the species shows a preference for open microhabitats which are associated with reduced vegetation cover (as a result of some level of vegetation removal/thinning) and past soil disturbance. The species has not been detected in areas which support dense vegetation and which have not experienced some level of disturbance (e.g. vegetation thinning or bushfire) for extended periods. It is possible, or even likely, that the species is able to persist in dense, undisturbed habitats as dormant tubers, or maintenance leaves, for at least some period of time between flowering events, although detection of these individuals in the absence of flowers is very difficult.

Table 2.3: Vegetation formation, class and PCT which the TBDC (NSW DCCEEW 2026a) identifies *Thelymitra adorata* is associated with (as of 6 March 2026).

Vegetation formation	Vegetation Class	Plant Community Type

Wet Sclerophyll Forests (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests	PCT 3241: Lower North White Mahogany-Spotted Gum Moist Forest
		PCT 3244: Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
Grasslands	Maritime Grasslands	PCT 3407: Central Headland Grassland
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	PCT 3432: Hunter Coast Foothills Apple-Ironbark Grassy Forest
		PCT 3433: Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
		PCT 3436: Hunter Coast Sandy Creekflat Low Paperbark Scrub
Dry Sclerophyll Forests (Shrubby subformation)	Sydney Coastal Dry Sclerophyll Forests	PCT 3582: Hunter Coast Lowland Apple-Bloodwood Forest
		PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
Heathlands	Coastal Headland Heaths	PCT 3789: Coastal Headland Clay Heath
		PCT 3793: Hunter Coast Headland Clay Heath
	Wallum Sand Heaths	PCT 3802: Lower North Sandplain Wallum Heath
Forested Wetlands	Coastal Swamp Forests	PCT 3983: Central Coast Flats Mesic Swamp Forest
		PCT 3998: Lower North Creekflat Mahogany Swamp Forest

	Coastal Floodplain Wetlands	PCT 4020: Coastal Creekflat Layered Grass-Sedge Swamp Forest
		PCT 4042: Lower North Riverflat Eucalypt-Paperbark Forest

3 Description of the subject land

3.1 Landscape context

The Central Coast region is generally characterised by a deeply dissected Hawkesbury Sandstone plateau in the west (the 'Hornsby Plateau'), while the eastern areas, including the subject land, consist of rolling hills formed from the Triassic aged Narrabeen Group Sediments and extensive floodplains consisting of deep quaternary alluvium (Benson 1986). The subject land is located in the Wyong IBRA subregion, which occurs in the north-east corner of the Sydney Basin, below the coastal fall of the Hornsby Plateau.

3.2 Local context

The subject land is located within an area of contiguous native vegetation which occurs north of Dora Creek, east of the M1 Pacific Motorway, and west of Eraring Power Station. The subject land occurs near the crest of a low hill and slopes to the east from a high point of approximately 40 masl in the west to approximately 12 masl in the east. The soil landscape of the entire subject land is mapped as consisting of the Doyalson soil landscape (Murphy 1993), associated with sandy soils on gently undulating rises on Munmorah Conglomerate.

3.3 Native vegetation

In accordance with Section 4.1 of the BAM, the distribution of PCTs, or the most likely PCTs, across the subject land has been prepared for the BDAR by EcoResolve (2025; **Figure 3.1**). All native vegetation across the subject land has been identified by EcoResolve as being most closely aligned to 'Hunter Coast Lowland Scribbly Gum Forest' (PCT 3583) which is consistent with regional vegetation mapping on the SVTM (NSW DCCEEW 2025b). Areas of the subject land were also mapped as not supporting native vegetation, associated with the existing Coal Stockpile in the east and existing tracks through the western portion of the subject land (**Figure 3.1**). The vegetation mapping by EcoResolve (2025) aligned with my own observations of the composition, structure, and extent of native vegetation within the subject land. The heathy woodland structure of vegetation within subject land and the canopy dominance of *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus capitellata* (Brown Stringybark) is shown in **Plate 3.1**.



Figure 3.1: PCT mapping across the subject land (Source EcoResolve).



Plate 3.1: Hunter Coast Lowland Scribbly Gum Forest (PCT 3583) within the subject land

3.4 Surveys within the subject land

Surveys for the subject species within the subject land were conducted by EcoResolve on 11 and 12 October 2022 (*Genoplesium insigne* and *Thelymitra adorata*), 13 and 14 February 2023 (*Genoplesium branwhiteorum*; EcoResolve 2025), and 13 March 2026. Surveys completed by EcoResolve were completed in accordance with the relevant survey guidelines (DPIE 2020b; EcoResolve 2025) and involved parallel transects, 5-10m apart throughout the subject land (**Figure 3.2** and **Figure 3.3**). In addition to the requirements of the survey guidelines (DPIE 2020b), the TBDC profiles for each of the subject species (NSW DCCEEW 2026a) state that surveys should be conducted when a nearby reference population is in flower. The use of reference populations to guide survey timing did not occur as part of the targeted surveys conducted by EcoResolve in 2022 and 2023, but were used for surveys completed in 2026. Based upon my own observations from monitoring known populations of each of the subject species during 2022 and 2023, the timing of targeted surveys by EcoResolve for *Genoplesium insigne* and *Thelymitra adorata* (11 and 12 October 2022) occurred when nearby populations were flowering (**Plate 3.2**). It is unclear whether the timing of targeted surveys by EcoResolve for *Genoplesium branwhiteorum* (13 and 14 February 2023) occurred when any of the known nearby populations were flowering. Flowering of *Genoplesium branwhiteorum* within the SoS management sites was first observed on 24 February 2023 with peak flowering observed in early March (pers. obs.). Thus, the surveys completed by EcoResolve for *Genoplesium branwhiteorum* are likely to have occurred when at least a portion of the flowering population in 2023 did not have open flowers, thereby decreasing the likelihood of detection (if present). The additional surveys for *Genoplesium branwhiteorum* on 13 March 2026 were undertaken when reference populations of the species were flowering (pers. obs.).

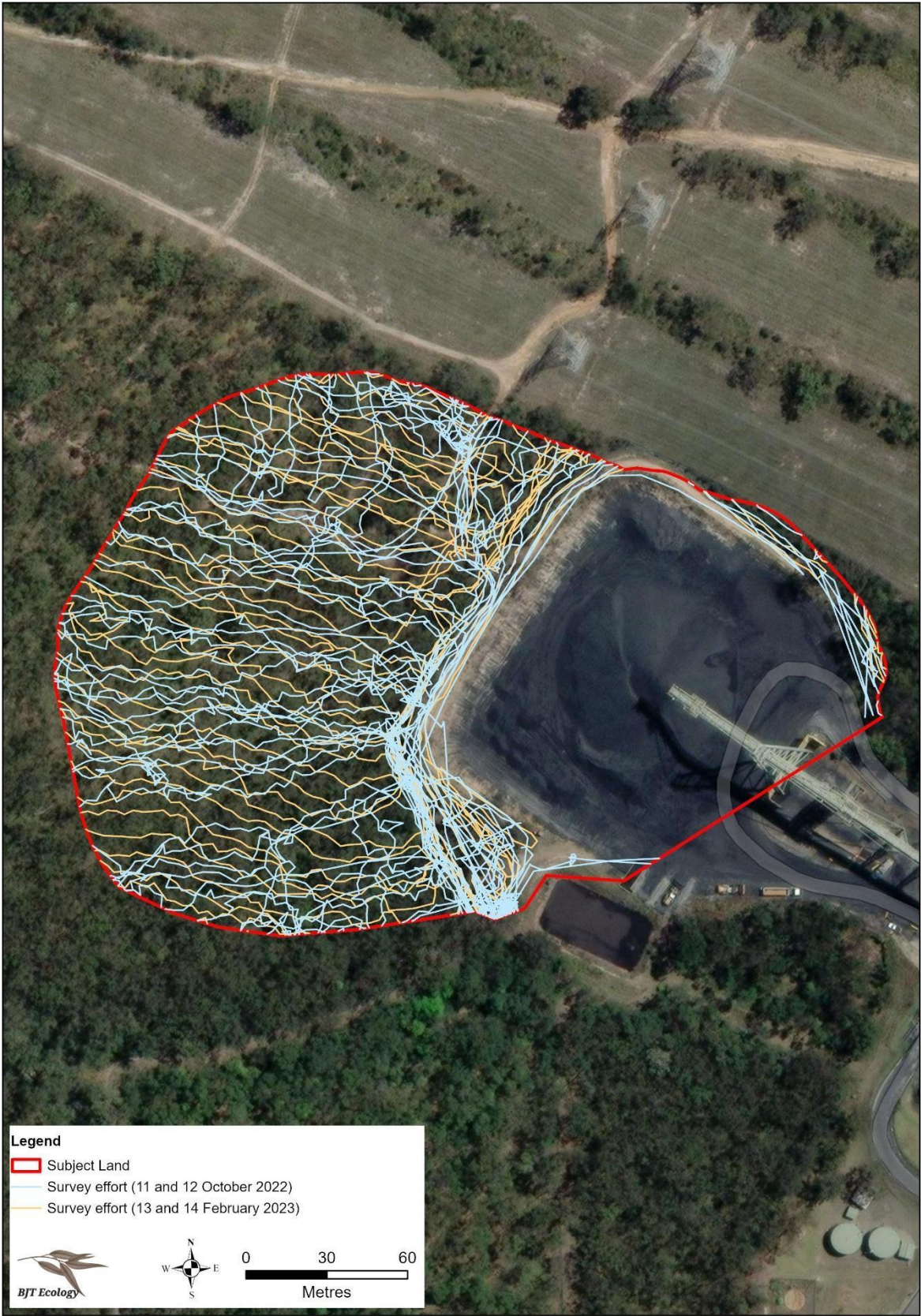


Figure 3.2: Survey tracks during targeted surveys for subject species (EcoResolve 2025)



Figure 3.3: Survey tracks during targeted surveys for subject species (EcoResolve 2026)



Plate 3.2: Flowering *Thelymitra adorata* (left) observed on 14 October 2022 and *Genoplesium insigne* (right) observed on 27 September 2022 – B. Towle

4 Assessment of species presence and suitable habitat

The identification of suitable habitat for the subject species within this report is largely based upon the current understanding of their habitat requirements with suitable habitat identified as habitat which has the same biophysical attributes as known habitat. Within suitable habitat, the likelihood of presence of the subject species has been determined by considering the intensity of targeted surveys and the results of these surveys.

4.1 *Genoplesium branwhiteorum*

The subject land is located approximately 10 km to the north of the currently known range of *Genoplesium branwhiteorum*. The nearest record of the species to the subject land is at the northernmost extent of its current range; approximately 10 km to the south of the subject land. Whilst the subject land is outside of the current known range of the species, I consider it unlikely that current records of *Genoplesium branwhiteorum* encompass the entire range of the species. This position is supported by the fact that northerly range extensions have been recorded within the last five years. Therefore, the fact that the subject land is outside the current known range is not considered sufficient evidence to conclude that the species is unlikely to occur there.

In terms of floristic associations of the species, there are records of *Genoplesium branwhiteorum* from habitat broadly similar to that within the subject land, in terms of PCT present. Therefore, based on associated PCTs the subject land represents 'suitable habitat' for *Genoplesium branwhiteorum*.

Observations of *Genoplesium branwhiteorum* across its entire range (including within PCT 3583) have been made within a range of vegetation condition classes. Within relatively intact areas of native vegetation, the species has been recorded infrequently, with some of these records only being discovered after vegetation was impacted by fire. However, this is likely to be due to difficulty detecting the species in areas which are densely vegetated (as it is difficult to see amongst dense vegetation) and potentially due to reduced flowering with increased time since fire (Towle 2023). More commonly records of the species are from the edge of cleared areas, track or road margins, easements subject to regular slashing or ecotones with heathlands or sedgeland. In the context of the vegetation mapping within the subject land, all vegetation is within the range of vegetation condition classes in which the species has been previously observed. Therefore, on the basis of the condition of vegetation across the subject land, all areas represent 'suitable habitat' for *Genoplesium branwhiteorum*.

In accordance with section 5.2 of the BAM, no further assessment is required for a species if a targeted survey conducted in accordance with the relevant guidelines (DPIE 2020b) confirms that it is not present or is unlikely to be present within the subject land or a vegetation zone. As outlined in **Section 3.4**, the initial targeted surveys undertaken for *Genoplesium branwhiteorum* (EcoResolve 2025) did not fully comply with the survey requirements of the BAM (DPIE 2020a), as no nearby reference populations of the species were known to be in flower when surveys were completed. Therefore, additional surveys were completed in 2026 when the species was known to be flowering at nearby reference populations. As targeted surveys have been conducted in accordance with the relevant guidelines (DPIE 2020b) and *Genoplesium branwhiteorum* has not been recorded it may be excluded from the species polygon.

While it is acknowledged that due to the cryptic nature of *Genoplesium branwhiteorum*, a survey comprising a single visit in a single season may fail to detect the species even when present, the current survey guidelines (DPIE 2020b) do not require repeat surveys or surveys across multiple seasons. As the surveys completed by EcoResolve and detailed in **Section 3.4** of this report comply with the survey requirements of the BAM (DPIE 2020a) and *Genoplesium branwhiteorum* was not detected during these surveys, it can be concluded that the species is unlikely to be present within the subject land.

In summary, on the basis of the results of surveys conducted in accordance with relevant survey guidelines, there is a low likelihood that the subject land currently represents habitat for *Genoplesium branwhiteorum*.

4.2 *Genoplesium insigne*

Genoplesium insigne has been recorded approximately 700 m to the north-west of the subject land, within vegetation broadly similar to that within the subject land, although in a modified (partially cleared) condition. Additionally, across its range *Genoplesium insigne* is most frequently associated with vegetation equivalent to PCT 3583, which occurs on the subject site. Therefore, on the basis of associated vegetation communities, the subject land represents 'suitable habitat' for *Genoplesium insigne*.

As with *Genoplesium branwhiteorum*, observations of *Genoplesium insigne* across its range have been made within a range of vegetation condition classes, although less frequently within relatively intact areas of native vegetation. Similar to *Genoplesium branwhiteorum*, it is possible that *Genoplesium insigne* occurs in greater numbers than recorded in more dense vegetation, but is difficult to detect. Nonetheless, based on the condition of vegetation across the subject land, all areas represent 'suitable habitat' for *Genoplesium insigne*.

In accordance with section 5.2 of the BAM, no further assessment is required for a species if a survey confirms that it is not present or is unlikely to be present within the subject land, or a vegetation zone. Therefore, where targeted surveys have been conducted in accordance with the relevant guidelines (DPIE 2020b) and *Genoplesium insigne* has not been recorded it may be excluded from the species polygon. Targeted surveys for *Genoplesium insigne* completed by EcoResolve were completed in accordance with the relevant survey guidelines (DPIE 2020b) and occurred when nearby reference populations were flowering (pers. obs; **Plate 3.2**).

While it is acknowledged that due to the cryptic nature of *Genoplesium insigne*, a survey comprising a single visit in a single season may fail to detect the species even when present, the current survey guidelines (DPIE 2020b) do not require repeat surveys or surveys across multiple seasons. As the surveys completed by EcoResolve and detailed in **Section 3.4** of this report comply with the survey requirements of the BAM (DPIE 2020a) and *Genoplesium insigne* was not detected during these surveys, it can be concluded that the species is unlikely to be present within the subject land.

In summary, on the basis of the results of surveys conducted in accordance with relevant survey guidelines, there is a low likelihood that the subject land currently represents habitat for *Genoplesium insigne*.

4.3 *Thelymitra adorata*

The subject land is located approximately 15 km to the north west of the currently known range of *Thelymitra adorata*. The nearest records of *Thelymitra adorata* to the subject land are approximately 18 km south and 15 km south-east of the subject land. As for *Genoplesium branwhiteorum*, the location of the subject land to the north of the known range of the species is not considered sufficient to conclude that the species is unlikely to occur within the subject land, as current records are unlikely to encompass the full range of the species.

In terms of floristic associations, there are records of *Thelymitra adorata* from habitat broadly similar to the subject land, in terms of PCT present, in the Bushells Ridge and Wallarah regions, although in a modified (partially cleared) condition. Therefore, on the basis of associated PCTs, the subject land also represents 'suitable habitat' for *Thelymitra adorata*.

Observations of *Thelymitra adorata* across its range have been made within multiple vegetation condition classes, although the species shows a strong preference for open microhabitats which are associated with reduced vegetation cover (as a result of some level of vegetation removal/thinning) and past soil disturbance. The species has not been detected in areas of dense vegetation and which have not experienced some level of disturbance (e.g. vegetation thinning or fire) for extended periods. It is possible, or even likely, that the species is able to persist in dense, undisturbed habitats as dormant tubers, or maintenance leaves, for at least some period of time between flowering events, although detection of these individuals in the absence of flowers is very difficult. Therefore, on the basis of the condition class of vegetation across the subject land, portions of the subject land represent 'suitable habitat' for *Thelymitra adorata*.

In accordance with section 5.2 of the BAM, no further assessment is required for a species if a survey confirms that it is not present or is unlikely to be present within the subject land, or a vegetation zone. Therefore, where targeted surveys have been conducted in accordance with the relevant guidelines (DPIE 2020b) and *Thelymitra adorata* has not been recorded it may be excluded from the species polygon. Targeted surveys for *Thelymitra adorata* completed by EcoResolve, as detailed in **Section 3.4** of this report and within the BDAR (EcoResolve 2025), were completed in accordance with the relevant survey guidelines (DPIE 2020b) and occurred when nearby reference populations were flowering (pers. obs; **Plate 3.2**).

While it is acknowledged that due to the cryptic nature of *Thelymitra adorata*, a survey comprising a single visit in a single season may fail to detect the species even when present, the current survey guidelines (DPIE 2020b) do not require repeat surveys or surveys across multiple seasons. As the surveys completed by EcoResolve and detailed in **Section 3.4** of this report comply with the survey requirements of the BAM (DPIE 2020a) and *Thelymitra adorata* was not detected during these surveys, it can be concluded that the species is unlikely to be currently present within the subject land.

In summary, on the basis of the results of surveys conducted in accordance with relevant survey guidelines, there is a low likelihood that the subject land currently represents habitat for *Thelymitra adorata*.

5 Justification and limitations of the species polygon

As outlined above, identification of suitable habitat for the subject species within this report is largely based upon the current understanding of their habitat requirements. The likelihood of presence of the subject species has been determined by considering both the presence of suitable habitat and the intensity of targeted surveys and the results of these surveys. Specifically, areas where the species has not been recorded during targeted surveys have been considered to have a low likelihood of supporting the subject species.

5.1 Information used in the assessment

This expert report has been prepared using information from a variety of sources including my own observations. Published information relied upon is referenced throughout the report and listed in **Section 6**. In addition to these sources, this report has been informed by my own personal knowledge from collection of monitoring data for the subject species from 2019 to 2025, as part of the SoS program. My knowledge and experience, gained from over 20 years as a professional botanist specialising in the ecology of the Orchidaceae has also informed this expert report.

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7 Appendix A Brian Towle curriculum vitae

Biography

I am an ecologist who specialises in the identification and ecology of members of the Orchidaceae with over 20 years' experience. During this time I have worked primarily as a botanist undertaking a range of projects including orchid monitoring programs, expert reports for threatened orchid species, targeted surveys, large scale vegetation mapping/modelling projects and a range of impact assessments.

In relation to threatened orchids, I have undertaken research into the ecology of native orchids and in particular *Genoplesium* (sensu lato) co-authoring several publications in peer-reviewed journals. I am also an accredited assessor under Section 6.10 of the BC Act and have a detailed working knowledge of the various aspects of the Biodiversity Offset Scheme established under this Act, including the BAM.

Qualifications

Bachelor of Environmental Science (Hons I), University of NSW, Sydney

Accreditations

- BioBanking Accredited Assessor (No. 0229)
- Former Office of Environment and Heritage Qualified Expert status: *Genoplesium baueri* (report prepared for previous BioBanking Assessment Methodology)
- Biodiversity Assessment Methodology Accredited Person (No. 17057)
- NSW Department of Planning Industry and Environment nominated Qualified Expert status:
 - o *Caladenia tessellata* o *Calochilus pulchellus* o *Cryptostylis hunteriana* o
 - Genoplesium baueri* o *Genoplesium branwhiteorum* (Syn. *Corunastylis* sp.
 - Charmhaven) o *Genoplesium insigne* o *Genoplesium littorale* o *Pterostylis*
 - ventricosa* o *Thelymitra adorata*

Current Employment

Senior Ecologist at Ecoplaning (since June 2017) and Principal Ecologist at BJT Ecology (since September 2025).

Previous relevant employment

2008 – 2017: Senior Ecologist at Eco Logical Australia

2007 – 2008: Project Officer at Australian Museum Business Services

2006 – 2007: Ecologist at Anne Clements & Associates

Expertise

I am a senior ecologist with over 20 years' experience as an environmental consultant. During this time, I have worked primarily as a botanist undertaking a range of projects including threatened

species monitoring, vegetation monitoring programs, BioBanking agreements, applications for Biodiversity certification, large scale vegetation mapping/modelling projects, targeted surveys and a range of impact assessments.

During my employment and in my own personal time I have undertaken numerous targeted searches for rare orchids, monitored orchid populations, collected orchid pollinators and recorded aspects of orchid ecology and taxonomy. In doing so, I have developed a detailed understanding of the ecology and habitat preferences of numerous terrestrial orchids, as well as the survey methods involved in targeted surveys and monitoring surveys. As a result of this knowledge, I have been directly contracted by numerous government agencies to provide expert advice regarding the ecology and habitat requirements of rare terrestrial orchid species. Agencies for which I have provided specific knowledge on rare orchids species include NSW Department of Planning, Housing and Industry (DPHI), NSW DCCEEW, Transgrid, Transport for NSW, Central Coast Council, and Lake Macquarie Council. Additionally, I have been contracted by multiple environmental consultancies and researchers to provide specific input to projects involving terrestrial orchids and specifically *Genoplesium* species. As a result of the history of expertise outlined above, I have been approved as a species expert under the BAM for eight terrestrial orchid species (listed under qualifications). Other orchid species for which I have prepared specialist reports identifying and assessing habitat include:

- *Prasophyllum bagoense*
- *Prasophyllum innubum*
- *Prasophyllum keltonii*
- *Pterostylis oreophila*
- *Pterostylis* sp. Botany Bay
- *Pterostylis vernalis*
- *Thelymitra adorata*
- *Thelymitra atronitida*

During my work surveying for threatened orchid species, I have discovered new populations of numerous threatened orchid species including:

- *Genoplesium insigne*
- *Genoplesium branwhiteorum*
- *Thelymitra adorata*
- *Calochilus pulchellus*
- *Cryptostylis hunteriana*
- *Genoplesium baueri*
- *Diuris tricolor*
- *Pterostylis cobarensis*
- *Pterostylis gibbosa*
- *Pterostylis alpina*
- *Prasophyllum fuscum*

Professional associations

Ecological Consultants Association NSW– member since 2017

Australian Network for Plant Conservation – member since 2020

Publications

I have authored and co-authored the following peer-reviewed journal articles which are relevant to the ecology and taxonomy of terrestrial orchid species as well as modelling habitat for terrestrial orchid species, specifically the following journal articles:

Phillips, G.P., Brown, B., Copeland, L., Jones, D.J., **Towle, B.** and Zimmer, H. (2026). *Prasophyllum laticallosum* (Orchidaceae), a new subalpine terrestrial orchid species from southern New South Wales. *Australian Journal of Taxonomy* **108**: 1–9.

Towle, B. and Humphries, R.K. (2025). A floral gem: A review of the conservation status of Bauer's Midge Orchid, *Genoplesium baueri* R.Br (Orchidaceae). *Cunninghamia* **25**: 013–022.

Towle, B., Ruiz-Talonia, L., Mullins, B., Brien-Cooper, J., Brown, B. and Neilson, C. (2024) Case study: Threatened plant translocation *Pomaderris queenslandica* (Scant Pomaderris), Rhamnaceae. *Australasian Plant Conservation* **33(1)**: 7-10.

Towle, B. (2023). A review of the fire response of *Genoplesium* R. Br. sensu lato (Orchidaceae) and implications of fire management on habitat. *Cunninghamia* **23**: 049–054.

Ren, Z., Grimm, W., **Towle, B.**, Qiao, Q., Bickel, D.J., Outim, S.K.M and Bernhardt, P. (2023). Comparative pollination ecology, fruit and seed set in *Corunastylis* species (Orchidaceae). *Plant Systematics and Evolution* (2023) 309:7.

Towle, B., Ransom, L., Pesu, D., Price, M. and Brown, B. (2022). Reproductive success and rarity of the variable midge orchid, *Genoplesium insigne*. *Cunninghamia* **22**: 045–052.

Renner, M.A.M, **Towle, B.** and Weston, P.H. (2022). Two new species of *Genoplesium* R.Br. sensu lato (Orchidaceae: Prasophyllinae) from the Central Coast of New South Wales. *Telopea* **25**: 285-299.

Towle, B., Coutts-McClelland, K. and Deards, S. (2020). A descriptive ecological model and targeted surveys for the rare *Calochilus pulchellus* (Orchidaceae). *Cunninghamia* **20**: 193– 198.

Ren, Z., Grimm, W., **Towle, B.**, Qiao, Q. and Bernhardt, P. (2020). Comparative floral traits in *Corunastylis* (Diurideae; Orchidaceae) with novel applications: do some species bleed or blink? *Muelleria* **39**: 27 – 38.

Bernhardt, P., Edens-Meier, R., Grimm, W., Ren, Z. and **Towle, B.** (2017). Global collaborative research on the pollination biology of rare and threatened orchid species (Orchidaceae). *Annals of the Missouri Botanical Gardens* **102(2)**: 364- 376.

Bower, C., **Towle, B.** and Bickel, D. (2015). Reproductive success and pollination of the Tuncurry Midge Orchid (*Genoplesium littorale*) (Orchidaceae) by Chloropid Flies. *Telopea* **18**:43-55.

Relevant projects

Saving our Species monitoring project (2019-2023) for *Corunastylis* sp. Charmhaven [*Genoplesium branwhiteorum*], *Genoplesium insigne* and *Thelymitra adorata*, NSW DPE. Involved population monitoring, targeted surveys, threat monitoring and seed collection for these Critically Endangered terrestrial orchid species.

A review of the fire response of *Genoplesium* R. Br. sensu lato and implications of fire management on habitat (2023). Report prepared for the NSW Saving our Species Program.

Saving our species monitoring – *Callistemon megalongensis*, *Callistemon purpurascens*, *Pimelea spicata*, *Prasophyllum fuscum*, *Thelymitra kangaloonica* and *Zieria involucrata*, NSW Department of Planning and Environment. Involved surveys within areas of habitat for these species to monitor population size, recruitment and existing threats.

Review of *Pterostylis ventricosa*, *Pterostylis vernalis*, *Genoplesium insigne*, *Genoplesium branwhiteorum* and *Thelymitra adorata* Draft Mapping Method, NSW Office of Environment and Heritage. Provided an independent review of OEH's mapping of known and likely habitat for these orchid species in accordance with the Method for mapping threatened species for inclusion in the Regulatory Framework.

Thelymitra adorata translocation plan. Involved preparation and implementation of a translocation plan for *Thelymitra adorata* as part of an approved EPBC Act referral.

Lake Macquarie Orchid Project. A five-year project (2020-2025) to improve information on the distribution and abundance of threatened and locally rare orchid species within the Lake Macquarie City Council LGA. Field surveys, reports and habitat models developed for land use planning, development assessment and management purposes.

Hume Link threatened species targeted surveys. Undertook targeted surveys for *Prasophyllum bagoense*, *Prasophyllum innubum*, *Prasophyllum keltonii*, and *Pterostylis oreophila* to inform the Biodiversity Assessment Verification Report for the Hume Link West project.

Vegetation of the Barwon-Darling and Condamine-Balonne floodplain systems of NSW, Murray Darling Basin Authority. Involved mapping and full floristic surveys of plant community types along the Darling River Floodplain between Wilcannia and Louth.

Lachlan River Catchment, validation of wetland and groundwater dependent ecosystem modelling, NSW Office of Environment and Heritage & Department of Primary Industries. Undertook field surveys to validate modelled habitat across the Lachlan River catchment.

Targeted surveys for *Lepidium monolocoides* within Pilliga National Park and Pilliga State Conservation Area. Undertook targeted surveys and established a monitoring program for *L. monolocoides*, in consultation with DPIE, to fulfil commitments by Whitehaven Coal to contribute to the study and on-going conservation of the regional population of the species.

Biodiversity Stewardship Site Assessment Report (BSSAR) – Boomi. Approved BSSAR for 530 ha site north-west of Boomi in the NSW North Western Plains botanical subdivision.

Targeted biodiversity surveys and expert reports for the Princes Highway Upgrade program including the Milton Ulladulla Bypass and Jervis Bay Road to Sussex Inlet. Multiple reports prepared for Transport for NSW.

Calochilus pulchellus and *Caladenia tessellata* Literature reviews and habitat model, NSW Office of Environment and Heritage (2020-2022). Prepared a literature review combining all known research into these endangered terrestrial orchids and prepared habitat models to guide targeted surveys across their known distribution.

Expert report for *Genoplesium insigne* and *Corunastylis* sp. Charmhaven for the Central Coast Strategic Conservation Plan. Prepared an expert report in accordance with the NSW Biodiversity Assessment Method for two critically endangered orchid species.

Coastal Upland Swamp vegetation monitoring. Project involved mapping, sampling design and implementing vegetation monitoring within Upland Swamps on the Woronora Plateau subject to longwall mining.



